FMNR
Farmer Managed Natural Regeneration

World Vision

Farmer Managed Natural Regeneration (FMNR) Manual

A resource for project managers, practitioners and all who are interested in better understanding and supporting the FMNR movement.

Tony Rinaudo
Alice Muller
Mary Morris

January 2019

Acknowledgements

The authors of the FMNR Manual would like to thank the many practitioners across the world who have generously shared their time and experiences to shape the body of knowledge on how to practise FMNR.

The authors would like to acknowledge the valuable contributions made by many to the production of this manual. In particular, Cedric Hoebreck, Sarah McKenzie, Dean Thomson, Anne Crawford, Brian Hilton, Steve Herbert and Rob Kelly of World Vision Australia. Valuable contributions have also been made by FMNR champions around the world including Sumaila Saaka, Chris McMillan, Carolyn Kabore, Irene Ojuok and Peter Weston.

We would also like to thank the FMNR Hub donors for their continuing support to furthering the FMNR movement.

Cover: A farmer practising FMNR on his peanut farm in Malawi (2015). Photo: S. McKenzie

Contents

Preface

World Resources Institute's Chris Reij calls it probably the largest positive environmental transformation in the Sahel and perhaps in all of Africa.

The Australian Commonwealth Scientific and Industrial Research Organisation's Dr Richard Stirzaker says what's important is that 'it has the farmers' vote'. And vote they did. It has spread at an estimated rate of 250,000 hectares per year for 20 years in one of the world's harshest agricultural environments, in one of its poorest countries with minimum NGO or government assistance.

This and more is Farmer Managed Natural Regeneration (FMNR), a simple tree management technique developed in 1984 in response to the prayer of one very frustrated and 'about to give up' young development worker trying to push back the Sahara Desert.

In time, FMNR has attracted multimillion dollar grants to hasten its spread, been added to sophisticated research agendas and included as a best practice intervention in the land restoration lexicon.

It has arguably changed the history of some nations otherwise destined to experience collapse of their primary industries and it has improved food security and livelihoods for millions of the world's poorest and most vulnerable people.

Landscapes have been regreened, water cycles restored, biodiversity enhanced, soils protected across millions of hectares and in the process, hope, dignity and even joy have returned.

Over the decades since it was born, FMNR has continued to spread and become more widely known, accepted and adopted. We hope that this first edition of the FMNR manual will be a very useful tool and reference and that it will be a catalyst for the further spread of FMNR while upholding a quality standard to emulate.

We invite your feedback on the manual, as above all we want it to be useful – and we want it to be used.

We invite you also to share your own experiences and learnings as you practise and promote FMNR in your context. While FMNR has guiding principles, it must be adapted to each new context for it to work. Your input will enrich the knowledge base and help others to take FMNR further than it has been before.

Our goal is that as many people as possible and the landscapes they live in will benefit from this low cost, rapid and scalable means of vegetation regeneration and land restoration.

Tony Rinaudo, Alice Muller and Mary Morris

How to use this manual

Not everyone can attend formal training or visit existing FMNR projects, but everyone should be able to succeed with the simple practices that make up FMNR.

The FMNR Manual is designed to provide anyone, anywhere, with the guidance to succeed in practising – or supporting others to practise – FMNR, and the benefit of several decades of learning and experimentation by thousands of FMNR practitioners. It is intended to be a resource at any stage of FMNR work: an introduction to FMNR for those who are new to the concept, and a reference book for those already familiar with FMNR.

This manual is primarily designed with project managers and implementers in community and development organisations in mind. But it can also be used by individuals and community groups to practise FMNR on their own, or by anyone who wants to better understand what pieces fit together to ensure that FMNR is successful.

The authors of the FMNR Manual are based at World Vision Australia, a Christian relief and development agency specialising in child-focused community development; so many of our experiences and examples come from the projects we know best – World Vision projects. But our goal is not to create a manual only useful for World Vision staff: we intend for the FMNR Manual to be a practical reference and resource for anyone in any organisation or community to use.

We welcome your thoughts and feedback on the manual, and would love to hear of your experiences as part of the growing FMNR movement.

Please send any comments or questions to fmnr@worldvision.com.au or get in touch with us via the FMNR Hub: fmnrhub.com.au/contact-us/.

How to use this manual

You can read the FMNR Manual from beginning to end, or turn directly to the parts that address your specific interests.

If you are new to FMNR, consider reading through the whole manual once to get a better idea of how FMNR works and what is involved in practising it, as well as to get used to where information is located in the manual. Alternatively, you can turn to specific sections for guidance on topics such as:

- How to introduce FMNR to new communities – **Chapter 5 – Community engagement**
- How to integrate FMNR into development and humanitarian programs – **Chapter 2 – Using FMNR in development programs**
- Troubleshooting problems and finding solutions for them – **Chapter 6 – Managing fire and other potential problems for FMNR**
- How to increase the success and sustainability of FMNR by creating a favourable policy environment – **Chapter 5 – Advocating for policy change**
- How to monitor and evaluate FMNR projects and contribute to the growing body of knowledge about the FMNR movement – **Chapter 10 – Monitoring and evaluation**

You will find extra resources and information in boxes including this icon throughout the manual.

You will find real-life case studies and examples in boxes including this icon throughout the manual.

For those using an electronic version of the manual:

- You can quickly turn to the section that you want by clicking on the page number in the Table of Contents, or the introductory infographic on the **FMNR Manual webpage**.
- Terms highlighted in **green**, and are linked to external websites[1] or resources, so that you can click the term to be taken to further information. Hover the cursor over a term to see the link; click to go to the resource information. Try it out: **FMNR Hub**

For those using a print version of the manual:

You can save a copy of the electronic manual in its entirety, or just the chapters or resources that you are interested in, for easy access offline. To access the additional information and resources included through links in the manual, you will need to be connected to the internet. A full list of weblinks in this manual is included on page 190.

All the resources on FMNR referred to in this manual are available on the FMNR Hub website.

1 Resources linked in the manual are functional at the time of writing, but websites change frequently, so we cannot guarantee that all of these sites will remain accessible. Please let us know if links do not work so we can update them!

Chapter 1

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.

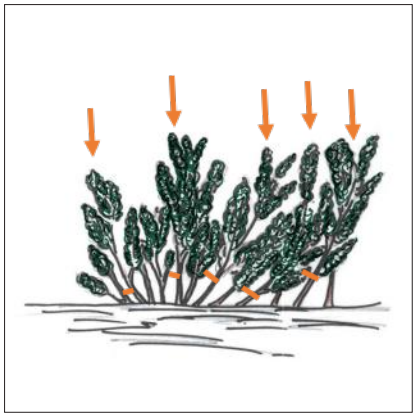
2. Prune and manage

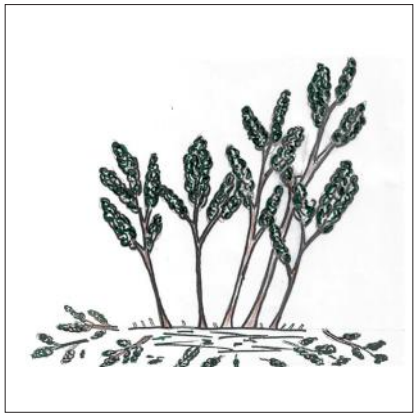
Remove the unwanted stems and side branches.

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 biomass[1] 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 restoration[6]	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: c.ymcdn.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
Agroforestry[7]	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]	Climate-smart agriculture prioritises practices that contribute to: • 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. 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.	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 Antei, 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.

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

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.

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.

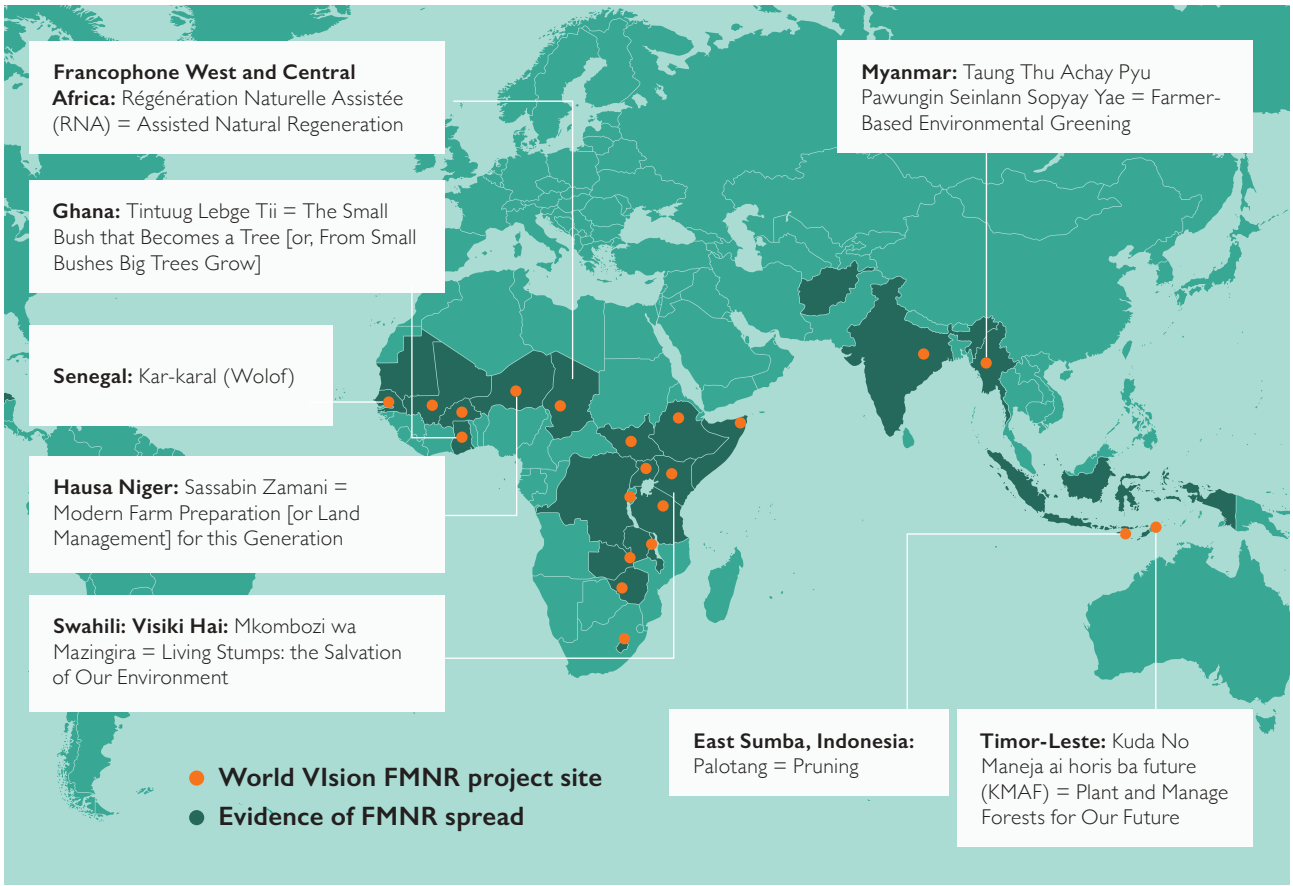
About that name

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 Rinaudo[12] 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

Chapter 2

Using FMNR in a development program

Summary: Using FMNR in a development program

- FMNR is a practice that can contribute to a range of desired development outcomes, including:
  - livelihood development
  - sustainable agricultural production systems
  - land restoration
  - climate change mitigation and adaptation
  - disaster risk reduction
  - community development
  - children's well-being
- FMNR can also be used in many contexts. Development organisations should consider this practice, especially in contexts where:
  - Land degradation has exacerbated food insecurity, drought, conflict or the resilience of vulnerable people, as FMNR tends to be more readily adopted in areas where people have few immediate alternative options.
  - The area was historically forested, is near a forested area, or there is evidence of stumps or seeds, bush encroachment or successful re-greening efforts present.
  - Local communities have expressed interest in addressing local land degradation issues, or are open to discussions about this.
  - The goals of FMNR link to organisational strategies and available investment opportunities.
- FMNR can be easily integrated into a range of different program areas, including: water, sanitation and hygiene; disaster risk reduction; education; nutrition and health; agricultural and natural resource management; and humanitarian and emergency response and food security programs.

Resources

- **Annex 1** provides a set of questions for taking stock with the community. These questions can also be useful for a preliminary assessment of the appropriateness of FMNR for an area, prior to meeting with the community.
- The **Restoration Diagnostic** is one tool in the more comprehensive **Restoration Opportunities Assessment Methodology** which can be used to help to identify key success factors, identify gaps and develop strategies for land restoration through FMNR.

The FMNR project approach

This manual has two aims: to support project-based approaches to implementing FMNR; and to build an independent FMNR movement.

In general, any FMNR activity, either at a community or multinational program scale, begins by considering the challenges being faced and what FMNR can contribute in improving environmental and human well-being.

Early in any FMNR intervention should be a process of 'taking stock' with the community to understand their situation, needs and goals for the future (Chapter 3). Once the community has considered FMNR of value and has committed to working together to apply it in their area, you are ready to start planning your FMNR work. This starts by working with the community to undertake a stakeholder analysis, develop an FMNR action plan (Chapter 5), and potentially a project proposal to a donor, or a project plan if resources are already available.

Any FMNR initiative has both **practical skills** (Chapter 4) and **community ownership** (Chapter 5) at its centre. Many of the activities supporting an FMNR project are focused on these two things, and may include FMNR champions, trainings, demonstration sites, FMNR groups, awareness-raising events, awards, school programs, community FMNR working days, resource centres and the development of community agreements and bylaws. A **positive enabling environment**, with supportive policies and strong links to viable markets for FMNR-related products, ensures that any benefits of FMNR are available to those practising it – and that those people continue to reinforce its adoption. When FMNR is successful in a community, its processes and benefits and stories of change should be shared widely. This fuels the **movement and the spread of FMNR to others** through media, exchange visits, multi-stakeholder platforms, conferences, and workshops and events.

Partnerships (Chapter 8) support activities at all levels, between organisations and individuals working within the community, to governments, research organisations, NGOs, national and international organisations, which can take FMNR to new areas. **Monitoring and evaluation** (Chapter 10) is critical to not only check progress is being made towards the community's goals, but also to build an evidence base of FMNR approaches and outcomes across different contexts.

These components of the FMNR model will be described in more detail throughout this manual.

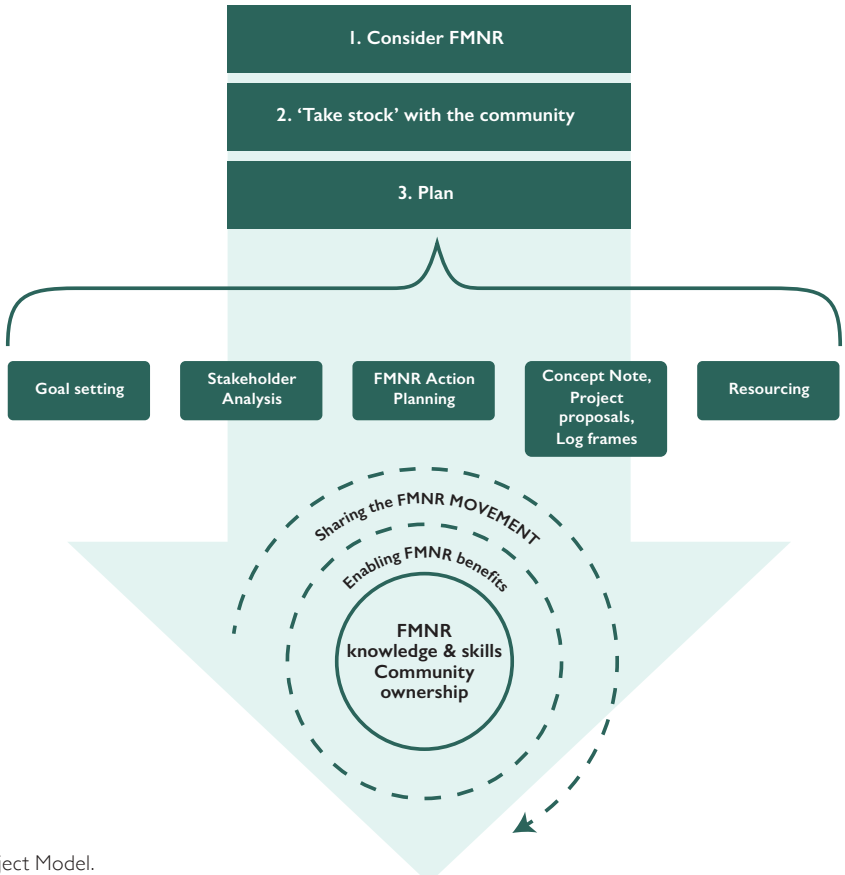


Figure 1 The FMNR Project Model.

When should FMNR be considered?

FMNR is possible in a wide range of environments, from arid to humid tropics. Because FMNR is inexpensive and contributes to numerous areas of value, a rule of thumb is to consider using it in any situation where loss of tree cover is negatively affecting human well-being, and where living tree stumps or self-sown seeds exist in the landscape.

Some indicators that FMNR could be useful to the community include:

- signs of decreasing income for people working in natural resources, such as farmers, herders or sellers of wood, charcoal or honey;
- farmers replanting crops one or more times during a season due to drought, flood or wind damage;
- lower crop yields due to soil erosion, drought, flood or wind damage, lack of access to fertiliser, poor or decreased water retention and poor soil fertility;
- loss of tree cover negatively impacting crop yields and livestock productivity;
- loss of critical levels of environmental biodiversity and a desire from the community to restore this;
- community members forced to migrate for work due to decreased crop yields and farm profits;
- tree loss causing or increasing the severity of winds, drought, floods, higher temperatures, dust storms or decreasing seasonal water flow and well recharge, making environments less habitable;
- low food, income and income diversity wholly or partly due to the above factors, increasing the risk profile of the community;
- productive land lost through erosion and deteriorating climatic conditions;
- fluctuations between too much and too little rain, and a tendency towards greater variability in rainfall;
- streams not flowing as much, as early or as long as in the past, or wells drying up for part of the year;
- insufficient wood for building, or too much time and distance spent collecting firewood for cooking; and
- resource-based conflict, eg. between agriculturalists and pastoralists, or between government efforts to protect forests and citizen efforts to survive and provide for families.

If one or more of these problems exist in a community, it's worth considering if FMNR can make a cost-effective contribution towards resolving them. When first considering whether to include FMNR in a program or project, a range of environmental, social and economic considerations should be taken into account through a needs assessment to determine the suitability of FMNR in a new area. These are described in more detail below.

More detailed 'taking stock' assessments should be done with the community before a project can start assessing people's interest in FMNR, build commitment and support and also shape how the project may be designed for the best chance of success. A preliminary review of these questions will also help development staff assess the suitability of FMNR at a specific project or site level, before going to the community as well (see **Annex 1**).

It's not uncommon for communities and even NGO project staff to be disinterested in FMNR at first. The reasons for this and ways to tackle this challenge are discussed later in this manual (**Chapter 6**). The point being, if you think FMNR is an appropriate tool, do not be discouraged by initial resistance. If possible, spend some time dispelling concerns and fears.

Environmental considerations

FMNR may prove to be a valuable starting point for addressing land degradation issues, especially when in areas where food insecurity, drought, conflict and other symptoms of poor environmental resilience to climatic and environmental shocks are the result.

Climate

FMNR can be practised on any land that has living tree stumps capable of resprouting or that is growing self-sown trees. To date, FMNR has most frequently been implemented in dry land environments, receiving roughly up to 1,200mm of annual rainfall, with existing root stock and stumps. However, it can also be practised in more humid environments. The principles remain the same, but the exact practices may vary according to context. Characteristics such as available species, soil quality, density of existing plants and water availability will affect the growth rate of trees and may mean that more or less frequent pruning is required. In areas where no tree stumps occur and there are few tree seeds in the soil, or where land users want to speed up the process, steps additional to FMNR – such as sowing seeds directly, planting seedlings and or taking truncheons (large cuttings of suitable species) – may be taken.

Very dry areas may present extra challenges, or mean that regenerating trees grow more slowly. Nevertheless, it can be surprising to see how fast trees can grow from stumps, even in dry environments; living tree stumps have been found in desert conditions with very low rainfall (50-100mm per year).

Always experiment to see if FMNR can be useful. For example, respectable growth rates have been achieved in arid parts of Somaliland by digging half-moon water catchments, which trap water run-off at the base of FMNR trees.

Historic tree coverage

It is also necessary to consider whether forests were present in the past and, if so, the current state of the forest. Surprisingly, in some areas deforestation occurred so long ago that people are unaware there is a problem; they've come to believe treelessness is the land's natural state, and they might not expect trees can survive there.

To gauge the extent of deforestation in an area, certainly consult the community, especially the elders, but also triangulate by checking historical records such as mapping of landcover or historic land uses and observations. In almost every situation you will find 'sentinel' trees, which provide a glimpse into what might have been and what could be again through FMNR and possibly tree planting. If the area was forested in the past, reforestation is more likely to be possible.

Presence of stumps, roots or seeds

Are there sprouting tree stumps, roots and or seeds present? You will need to physically inspect the landscape – preferably in areas where there have been no fires for at least six months. If livestock continuously graze the same area, you will need to look particularly closely to find signs of woody vegetation with the potential to grow into trees and shrubs. Also consider what species are present. Generally, coniferous species such as pines and cypress do not sucker once cut down. Pines, for example, die after being felled. Species present need to have the ability to resprout. Alternatively, there needs to be a 'bank' of seeds in the soil to regenerate or a source of seed, such as forests nearby, and vectors such as birds, wildlife and livestock. Often, even where there are non-suckering species, if there are remnant trees then regeneration through seed may be occurring, but threats such as fire, constant grazing or cultivation may prevent the seedlings from establishing.

Landscape restoration needs

In order to manage issues such as low groundwater, and to stabilise soil erosion and reduce weeds at a landscape scale, it is necessary to consider the whole water catchment. Often there are areas of land on the hillslopes in upper catchment areas, in gullies or along waterways that may be degraded and affecting dynamics such as water availability across the broader catchment. In projects focusing on landscape-scale restoration or improvement, consider whether these areas benefit from FMNR. When it comes to degraded communal land, FMNR can help provide cost-effective methods of stabilising soil and recharging groundwater for the benefit of the entire catchment. Furthermore, these communal areas can become a sustainable source of firewood and off-farm tree products for landless or disadvantaged community members who may not have access to such products on their own. In Ethiopia, local community leaders have allowed disadvantaged women in their community to access communal hillsides restored with FMNR to collect firewood and non-timber tree products to supplement their incomes as well as provide ongoing management of regenerated trees.

Social considerations

Often, what prevents regeneration from occurring is a combination of people's beliefs and attitudes about trees and prevailing land and vegetation management practices. When changes to these practices are made, spontaneous regeneration has occurred on seemingly treeless land, making FMNR possible.

Social conditions that may make FMNR difficult include:

- **Volatile conflict situations** where trees may be damaged frequently. Negotiating community agreement around the management and protection of trees may not be possible and pruning may be too difficult to complete safely.
- **Urban settings**, which may not have the necessary tree stumps or social cohesion required for practising FMNR on public or communal land. However, FMNR may still be possible in school and hospital yards, and along kerbsides. And, of course, anyone can manage trees on their own land using FMNR principles.
- **Peri-urban settings**, which pose problems where high densities of people rely on firewood for their fuel supplies. Similar levels of low social cohesion as in urban areas can make it difficult to collaborate with communities.
- **Areas where large numbers of livestock are regularly grazed.** These will present greater challenges because livestock can damage young growth.
- **Areas where land is burnt every year** and there is low community will to change this practice.

FMNR and conflict resolution

Despite its challenges, the authors have seen many situations where conflict was decreased through FMNR. This may be because, as trees grow, more natural resources become available and there is less competition for scarce resources. Also, the decision for stakeholders to practise FMNR involves consultation and agreement around how to best manage natural resources to everybody's benefit. The collaboration and transparency required to do this may also reduce the incidence of conflict. In a very real sense, FMNR can connect parties that experience differences.

You can read more stories about how FMNR is contributing to overcoming areas of conflict here:

FMNR reconciliation trees in Rwanda

Conflict resolution through sustainable management of trees in Ghana

The important thing to remember is that obstacles are surmountable: there are plenty of cases of communities overcoming great obstacles to take inspiration from.

Economic considerations

Monetary considerations are critical, because they're a major co-benefit of FMNR that affects people's motivation to act. Consider whether the species present are of economic value, either directly – through fuel, timber, fodder, medicine, etc – or indirectly, through tourist revenue, honey, reduced erosion, reduced wind damage to crops and increased pollination. A study undertaken in Kenya's Rift Valley, which used economic modelling to predict just a few benefits of FMNR, found a roughly 10 percent improvement in the economic well-being of grazing systems in a good year and, during low rainfall periods, an improvement of 200-500 percent.[1]

It is also worth considering if the project aligns with global restoration initiatives such as the Bonn Challenge, Global Restoration Initiative, AFR100 (the African Forest Landscape Restoration Initiative) or Initiative 20x20 in Latin America, which can provide an opportunity to work with national governments to contribute to their global commitments. Alternatively, consider whether there are funding or financing opportunities available to landholders in your project areas, based on their contributions to global carbon or land restoration objectives.

[1] Van Schoubroeck, F. 2018, "Integrating Trees in Farming Systems in Baringo county, Kenya reduces variability of food and fodder production", FarmTreeServices

Combining FMNR with other program approaches

Because FMNR empowers people and communities, and requires the inclusion of all groups who use or have access to the land, projects can benefit by supporting efforts such as women's empowerment, assistance to ethnic or other minorities and similar interventions.

FMNR is a foundational intervention. Therefore, it can be implemented with any programming that can benefit from healthy, functioning ecosystems, functional water cycles, increased and more secure access to food and income, or reduced climate impacts. In fact, most, if not all, sectors benefit from this 'no-regrets' technology. Some of these sectors include:

- disaster risk reduction and climate change adaptation
- humanitarian and emergency assistance
- water, sanitation and hygiene (WASH)
- food security, nutrition and/or agriculture
- education and youth engagement
- income generation and economic development
- environment and/or climate change projects

How FMNR contributes to each of these sectors is described below.

Disaster risk reduction and climate change adaptation

Figure 2 FMNR can add value to a wide range of common development activities undertaken by NGOs around the world. World Vision in Nakuru, Kenya (May 2018). Photo: A. Muller

In places where communities are affected by disasters and climate change impacts, such as drought, flooding, crop loss, famine or the effects of pests on crops and people, FMNR may be valuable for reducing these risks. Increased tree cover helps reduce wind speed, high temperatures, water run-off and flooding while also increasing the productivity of the land. Regenerated wetlands and forests can also reduce the risk of storm surge, coastal erosion and wind speed.

The environment provides resources and livelihood opportunities as well as presenting risks. Community activities such as farming, grazing and extraction of natural resources can all take place in high-risk locations, such as volcanic soils and alluvial plains. While these are highly fertile areas, they can also be vulnerable to erosion and flooding.

The most marginal groups in society are often located in unproductive or risk-prone lands. Their choices are often limited by the socio-economic factors they live under, particularly with regards to land tenure and distribution. As a consequence, community investment in risk-reduction measures in these areas may be very limited or even non-existent.

Activities such as FMNR that strengthen landscape resilience and long-term livelihoods are important disaster mitigation strategies. Following a disaster, FMNR activities can provide valuable assistance in the recovery of affected landscapes. If associated with food-for-work or cash-for-work programs, it can contribute towards short-term emergency relief while also supporting the re-establishment of livelihood systems.

Humanitarian and emergency assistance

FMNR has been successfully included in humanitarian and emergency assistance programs in a number of different countries. This is often in areas that have become extremely degraded because of disasters, such as drought or famine, or because of an influx of people through mass migration or establishment of refugee camps. FMNR can be used to quickly regenerate this land and provide a sustainable source of fuel wood. Programs such as cash-for-work and food-for-work are common in these contexts and have been used successfully to encourage people to implement FMNR across large areas. Beyond meeting initial needs, such as a sustainable source of firewood, FMNR also provides people with a productive resource to contribute to future income sources, and therefore increases the rate of recovery from such emergency situations. A **full report** on how FMNR has been implemented in one refugee camp context in northwest Uganda is available on the FMNR Hub website.

WASH

FMNR and the resulting increase in tree cover in a landscape provides improved water quality and availability through better infiltration, reduced erosion and improved filtering of sediment and some contaminants. As a result, FMNR can contribute to WASH objectives for improved water access and water quality in a community.

Case study

FMNR brings back the water

Farmer Managed Natural Regeneration was applied in East Sumba's dry land and it has changed the lives of villagers, especially children. In the driest parts of Sumba Island, villagers were forced to walk long distances to fetch water. Yovintus, aged eight, and Elton, aged seven, had to go to school without bathing since there was no water at home. But now, everything has changed.

There is a well located 200 metres from their home and the boys use jerry cans to fetch water for their family. "We can now take a bath every day because water is now abundantly available in our village," said Yovintus.

Because of FMNR there is still water in the well during the dry season. The trees that have been regenerated hold the water in the ground. Every afternoon, villagers come to the well to bathe, wash clothes and water cattle.

Figure 3 Yovintus and Elton fetch water from a well that has refilled since FMNR has been applied in the catchment. East Sumba (2016). Photo B. Mbete

"Before FMNR existed, the water was only available until August. After that time, people need to fetch water from a neighbouring village, 1.5 kilometres away. When the area really dries, we need to spend extra money from about 150,000 rupiah (US$10) or 300,000 rupiah (US$20) to buy water provided by the government," said Lusia, aged 26, a mother in the area. Today, there is sufficient water to meet people's needs. FMNR has brought many benefits to the village, especially for children like Yovintus and Elton

Food security and nutrition

A primary purpose of FMNR is to increase the productivity of degraded land. When this is agricultural land, FMNR increases farmers' ability to produce more food crops and livestock products with less inputs. In addition to improved production, certain species of trees regenerated through FMNR can also provide their own benefits including edible fruits and leaves and medicinal products. Increased access to firewood from trees closer to home makes cooking easier and therefore improves access to nutrients contained in foods such as grains and beans. Access to fodder from trees, shrubs or better grass growth supports livestock production (chickens, goats, cattle, etc) and helps provide families with important protein sources.

Education

School and youth environmental club programs aim to engage children and youth in environmental education. FMNR is a simple technology that can be easily adopted by children, and used to explain many environmental principles. Applying FMNR in schoolyards helps to improve learning environments (cooler, more shade, less wind) and provide valuable resources such as firewood closer to school kitchens. This reduces financial and time pressure on schools and students who are usually required to provide firewood from elsewhere.

FMNR implemented by children, or adults encouraged by children on home farms and communal land, reduces time required to fetch firewood or for grazing duties. As this work is often performed by children, it means they have more time to attend school and complete homework during the day.

More information about how to engage children in FMNR programs can be found in **Chapter 7**.

Income generation and economic development

Most developing economies rely predominantly on primary production from agriculture and natural resources. Therefore, to increase incomes and livelihoods at both a household and national level, a strong environment and natural resource base is important. FMNR can contribute not only to production of sustainable tree products that can be used to generate income (such as firewood, fruits, fodder or timber), it also improves the productivity of land used for growing crops and feeding livestock. By improving resilience to shocks such as drought, it helps households maintain an income source during difficult periods. FMNR is also often combined with value addition, savings and loan schemes, or market linkage interventions to enable land managers and communities to maximise income generation and economic development opportunities. See **Chapter 4** for more information about these interventions.

Environment conservation and climate change mitigation

FMNR seeks to increase tree cover in the landscape by integrating trees into farmland and restoring degraded forests. Including more trees in the landscape allows for the sequestration of greater volumes of carbon, mitigating further exacerbation of climate change impacts.

FMNR's emphasis on conserving indigenous tree species is valuable for maintaining species diversity. When FMNR is led by the community, traditional knowledge around these species and their uses is also conserved.

'Re-greening the mindset' through FMNR community engagement and experience results in land managers who value indigenous species and vegetation cover, and who are less likely to use environmentally destructive practices such as tree clearing and unsustainable charcoal and firewood generation.

FMNR global priorities

We have discussed ways that FMNR integrates with other types of programming, but it is also useful to understand how it contributes to global priorities that affect policy agendas, potential funding opportunities and exposure for FMNR.

Sustainability

Sustainability is one of the highest priorities for FMNR, and is also a priority for donors and policy makers. The ultimate goal for FMNR projects is for the community to manage their natural resource base in a way that continually replenishes the foundation of their food, water, shelter and livelihood systems. This is accomplished through the community's FMNR work as well as by collectively managing, protecting and governing the benefits of that work, and by ensuring that the local policy environment empowers land users to enjoy those benefits.

FMNR projects work towards sustainability in a number of ways:

- **FMNR is self-sustaining and replicable**. Its growth beyond project boundaries is primarily due to community members themselves, without project or government involvement or funding. Once started, the movement is generally maintained and spread using local initiative and resources.
- **FMNR increases social and financial sustainability.** FMNR has made rural areas more financially viable, improved physical living conditions and enhanced food security and livelihoods. In some regions, land users who have fully adopted FMNR have seen their average household income and value of consumed FMNR-related products increase by between US$200 to $1,000 per year. There is also less pressure on men to leave home during the dry season and seek work elsewhere – a common practice that places large strains on families and their health. Women and children spend less time collecting firewood, and have more time for productive activity and education.
- **FMNR restores and supports environmental sustainability.** By restoring tree cover, crops and livestock are less exposed to high temperatures, floods or strong, sand-laden winds, so land users are less likely to replant crops and animals endure fewer stresses. FMNR can also help improve biodiversity, as wildlife and birds return when vegetation and indigenous tree and plant species are restored. Water and wind erosion of barren landscapes decrease, and water infiltration increases so that natural springs and streams may resume flowing, or become available for longer, or even year-round.

Building resilience and safeguarding

Safeguarding has become increasingly important in recent years, especially with the increased potential of climate change mitigation efforts to cross national borders, and with increased recognition that local communities have often managed their land sustainably for generations.

Safeguarding policies and practices exist to ensure that local communities and their traditional knowledge of natural resource management are protected when implementing development and other programming. Safeguards are ultimately intended to ensure that local people have the power and support to secure and sustainably manage their resources and assets.

Safeguarding is a critical component of FMNR, which is based on the principle of community ownership and empowerment. From initial introductory meetings with a community through to project exit, FMNR ensures that the community's existing knowledge, traditional approaches and understanding of their resource base are the basis of programming, and that they maintain control of the process and benefits of FMNR to meet their specific needs. FMNR works not only with indigenous knowledge, but also with indigenous trees, and regenerates environments based on their natural capacity and characteristics.

Figure 4 FMNR can provide a foundation for building sustainable and resilient landscapes, capable of supporting healthy and productive communities into the future. Kerio Valley, Kenya (May 2018). Photo: A. Muller

Providing opportunities for youth

Many countries already struggle to educate and provide jobs for their young people – a population expected to increase significantly in coming years. As land degrades and rural livelihoods suffer, youth are likely to struggle to make a viable living in the same ways that their elders did.

FMNR helps create viable, sustainable livelihoods that provide for future generations. It helps to restore the productivity of landscapes and provides opportunities for diverse livelihood options. By increasing income for adults, children and youth are more likely to remain in school and complete their education. By fostering inclusion and empowerment, FMNR can also help communities to instil interpersonal skills and a sense of capacity in their youth that will serve them as adults.

Assisting the most vulnerable

Definitions of 'most vulnerable' populations differ across agencies, countries and areas of focus, but generally include chronic and extreme poverty and/or social marginalisation as characteristics. FMNR works to address both challenges by increasing the amount and sustainability of incomes over time, and by requiring inclusion of all groups who use or have access to the land. The community engagement and shared decision-making components of FMNR can help to reduce the vulnerability of minority groups, whether based on age, gender, tribe, religion, landholder status or vocation.

FMNR contributions to the Sustainable Development Goals

FMNR contributes to and supports progress towards the majority of the United Nations Sustainable Development Goals (SDGs). It provides a direct contribution to the following four goals:

SDG 1. No Poverty – FMNR contributes to ending poverty for local communities both by increasing income and by increasing the sustainability of land-based livelihoods due to improved natural resource base.

SDG 2. Zero Hunger – FMNR contributes to ending hunger and improving nutrition by improving soil fertility and crop viability, increasing access to wild foods and animal fodder, reducing stresses for livestock and decreasing disaster risk to food supplies.

SDG 13. Climate Action – As previously described, FMNR contributes to both the mitigation of climate change and to each community's ability to adapt to it. FMNR increases the number of trees sequestering carbon, reduces the burning of fields and the need for agricultural chemicals, and improves the soil's capacity to absorb carbon. FMNR also builds resilience among communities, by altering the micro-climate of crops, protecting them from extremes of heat and wind, reducing erosion by slowing wind and water speed, increasing water retention and infiltration, increasing soil complexity, diversifying food sources, and increasing capacity for advocacy and collective action. FMNR also qualifies as a climate change mitigation methodology under United Nations climate action initiatives such as the Clean Development Mechanism and REDD+.

SDG 15. Life on Land – FMNR contributes directly to every element outlined in goal 15, which aims to "[s]ustainably manage forests, combat desertification, halt and reverse land degradation [and] halt biodiversity loss".

In addition to these goals, common outcomes of FMNR also contribute to the following SDGs:

SDG 3. Good Health and Well-being – FMNR can contribute to communities' ability to access healthcare through increased income, and can also contribute to improved nutrition and increased availability of plant-based medicines.

SDG 4. Quality Education – FMNR can enable communities to access education for children through improved income and by reducing the need for children to contribute towards household income or devote excessive time to seeking firewood. Because of its focus on gender and minority group inclusion and empowerment, FMNR may also help to shift attitudes towards the education of girls and other marginalised groups.

SDG 5. Gender Equality – Inclusion and equality of women are key components of FMNR. FMNR not only seeks to lighten the burdens of women and girls by increasing access to resources such as firewood, but also seeks to improve their status as decision-makers who control assets, income and land rights equally with men. FMNR empowers women to benefit from their labour and increase their assets.

SDG 8. Decent Work and Economic Growth – FMNR helps to make traditional livelihoods sustainable and productive and increases opportunities for decent work that restores and enhances productive resources in a community.

SDG 10. Reduced Inequalities – FMNR can help to reduce income inequalities within communities and between communities as well, potentially reducing the need for economic migration.

SDG 11. Sustainable Cities and Communities – FMNR contributes to local communities becoming more inclusive, safe, resilient and sustainable. Through FMNR, incomes rise and resources – including food, water, timber and firewood – can increase, contributing towards the sustainability of cities and communities.

SDG 12. Responsible Consumption and Production – FMNR contributes to the sustainable consumption and production of wood and other forest products, as well as to sustainable agricultural production.

SDG 16. Peace, Justice and Strong Institutions – FMNR can contribute significantly to promoting peaceful and inclusive societies for sustainable development, improving access to justice for all users of the land under management, and building effective, accountable and inclusive institutions at all levels. Anecdotal evidence indicates that, as resource availability expands because of FMNR, conflict over scarce resources has reduced. See the case studies in **Chapter 6** for examples of this.

Chapter 3

Taking stock with the community

Summary: Taking stock with the community

- 'Taking stock' helps the community see how FMNR can benefit them by helping to address pressing problems while building enthusiasm and commitment to the practice.
- Taking stock assessments should look at the goals of the community and the unique characteristics of the land, climate, plants and animals of the area, how these are used and, most importantly, how they have changed over time.
- Encouraging the community to reflect and understand how the land and their lives have changed over time is a powerful exercise to help land users identify the role that deforestation has played in creating their current situation.
- Information gathered from a taking stock assessment should be used to shape the design of an FMNR project, helping to ensure that it will best meet the community and environmental needs of an area.
- Ensure all stakeholders are involved and able to contribute to the taking stock activities. This will increase the likelihood of community support and buy-in to the decision to undertake FMNR.

Resources

- **Annex 1** contains a set of questions to help the community take stock of their environment and plan for the future.
- **Annex 4** gives some examples of the variety of FMNR approaches around the world, which can be used to illustrate the range of FMNR variations that can exist and stimulate people's creativity when designing their own solutions.

The current FMNR movement, which is changing landscapes across Africa and the world, began when one man started to see the environment he was working in more clearly. Sometimes the answers to very difficult problems are right at your feet, but nothing changes until you can see them.

When considering using FMNR, the most important question for a person or community to ask is **whether FMNR will contribute to addressing the community's needs – both rapidly and cost effectively**. The answer to this question can come directly from a needs assessment that considers not only the needs of the landscape, but also the individual and community. We call this needs assessment **'taking stock'** with the community. This is an opportunity for people to reflect on their needs and current challenges, such as increased flooding, reduced soil fertility, increased insect attack on crops, reduced water and firewood availability, higher temperatures and winds or reduced food and fodder supply. The assessment also asks the community to consider how things have changed over time, and to analyse why these changes have occurred. Significantly, it invites people to consider their needs for the future, what their life will be like if they did nothing different at all, and how FMNR can contribute to creating the kind of life they want for themselves and their children.

For project managers, taking stock is a powerful way of engaging with the community and introducing the idea of FMNR. It also provides critical information for developing an action plan.

How to take stock with the community

Who should be involved?

A taking stock assessment should be done with the community that will potentially be involved in the FMNR project. This includes the farmers, pastoralists, neighbours, local leaders (traditional, religious and other thought leaders), government representatives and officers and traders (particularly those who sell firewood and charcoal), among other relevant stakeholders at the community level. It is important to ensure that all groups in the community are included – such as women, men, youth, older people and people with disabilities – so that all uses of the landscape and knowledge are represented.

How to go about it?

The taking stock assessment is best undertaken in a workshop format, as this level of formality, even if fairly low-key, highlights the seriousness of the topic being discussed. The assessment can also be conducted through group discussions or site visits to multiple locations in the area.

Topics to cover when taking stock

The taking stock assessment covers six main topics, reflecting on how these have changed over time and the causes of these changes.

1. Current situation and goals of the community.
2. Type(s) of land.
3. Land use.
4. Climate and disaster risks.
5. Plants and animals.
6. Social and cultural characteristics of the community.

Examining changes over time is a powerful tool when discussing FMNR within a community. Reflections on how the environment and community were before land became degraded or deforested might come from older people or even children if the environment has been degraded over a short period of time.

The following section describes in more detail the type of information that should be gathered as part of each of these topics. A tool in **Annex 1** provides a list of questions that can be drawn upon when developing questionnaires or workshop activities for completing a taking stock assessment.

When undertaking these activities, consider capturing the community's account in some way through pictures, quotes and testimonies. This will be powerful information to reflect upon when designing the FMNR project, and help provide a description of the environment and community at a point in time before FMNR was introduced, or before FMNR was expanded if already present in the area. This information is also of great value for evaluations and for communities to reflect on their achievements as time passes.

Questions that should be considered when taking stock include:

1. What is the current situation, and what are the goals of the individuals/community who will manage the trees?

In discussions about how to ensure FMNR is useful in a specific community, it is important to understand what individual and/or community goals are, and how FMNR can help to achieve them. To better understand these goals, it's important to understand the current situation in the community. What are the biggest and most pressing challenges?

Community members should list goals they have for their land, work and lives that are affected by the health and productivity of their land. **The FMNR project will ultimately be built to facilitate achievement of these goals.** Goals should be recorded and used in the **FMNR Action Planning** activity described in **Chapter 5**.

2. What type(s) of land are you working with?

Communities live and practice FMNR in a wide variety of places, including deserts, grasslands, agricultural land, forests and wetlands, among others.

Some locations are humid; some are dry. They can be cold or hot. They may include mountains, valleys and plains, and provide habitat for a wide variety of trees, other plants and animals.

FMNR planning begins by understanding the characteristics of the land you are working with and how they relate to FMNR success.

3. How is the land used?

Truly successful and sustainable FMNR projects meet the needs of the people practising it while enhancing the environmental integrity and function of the landscape. Therefore, it is important to understand how the people who live and work there use their land, as well as what key elements need to be restored and maintained in order to ensure environmental integrity and function.

The types of trees managed, how many trees are regenerated, and even the way that a regenerated tree is pruned, will be determined in part by how each FMNR practitioner wants to use and benefit from their land and trees, as well as the needs of the environment.

Crop farmers, for example, may practice FMNR differently from foresters, who may do things differently from migratory herders or urban land owners. A land user interested mainly in firewood will prune differently than someone seeking building poles, or fertiliser for crops. But all can shape FMNR to meet their needs and help them achieve their desired outcomes.

Restoring tree cover on hilltops and along stream banks may, on the surface, appear unimportant to a community, but the value of reduced flooding and erosion, increased ground water recharge and the benefits of increased biodiversity and habitat are very important for environmental function, and ultimately for the productivity and profitability of more intensively utilised land, such as cropping and grazing areas.

4. What is the local climate? What are the disaster risks in the area?

Because FMNR works with trees, it will influence and be influenced by the climate of the place it is practised in. An assessment of the environment will look into how much rainfall the area receives, when the rains come, what happens to the rainwater, what the temperatures are, what types of storms are to be expected, and any other important climate information that will affect decisions about how and where to do FMNR.

While FMNR can work in most ecological zones, it tends to be a favoured practice in lower rainfall areas where tree planting is difficult and where there are fewer high-value alternative land uses to choose from.

It is also necessary to be aware of what disaster risks occur in the area: many of these can be climate based, such as drought, floods and storms, while others may include natural disasters such as earthquakes or landslides.

5. What plants and animals occur naturally in the area?

One of the first things that FMNR practitioners need to understand is what types of trees grow in their area, and what types of stumps or self-sown seedlings are available to be managed with FMNR practices. In some landscapes, much of the original vegetation has been (or appears to be) completely removed. It is important to begin compiling lists of indigenous plant species and their characteristics and uses through direct observation, by talking to elders and by researching forestry reference materials. Often, women are the repository of extensive botanical knowledge – encourage them to share this experience by listing the traditional uses of each species. Often this activity will prove to be a critical step in reviving interest in landscape restoration, as it may touch on feelings of remorse for the rich heritage that has been lost, and kindle desires to bring it back. It is also helpful to understand what harmful and beneficial insects, animals and birds are present in the environment, and what other types of plants are common there.

6. Social and cultural characteristics of the community

It is important to understand how the community is organised, including what leadership and government structures, as well as influential groups and leaders, exist. These questions can start to inform the identification of key stakeholders that may need to be involved in any future FMNR projects. A template to capture this information can be found in **Annex 2**.

Ask what laws or community agreements (formal or cultural/traditional) influence the management of trees or natural resources. It is important to have an understanding about land ownership arrangements, as these are often very influential in how people decide to manage trees on their land. Knowing how the community has changed over time in terms of population, wealth and cultural aspects, such as religion and relationships with the natural resources, will also help to explain how some practices have changed over time. They can also remind the community of any close cultural relationships with nature that may have been held in the past.

7. Changes over time?

In each area of your assessment, you will also need to look at changes that have occurred over time. Identifying how the environment has changed, over what span of time and, whenever possible, what has caused those changes will help communities understand the best ways to use FMNR to make positive progress.

Most communities considering practising FMNR do so because their environment has changed for the worse over time, and they now find it more difficult to survive, let alone thrive. Changes in soil fertility, crop yields and weather patterns, the amount of water available to meet people's and animals' needs, and any other changes that affect people's lives and work, are all important to understand when deciding how to best use FMNR.

It is equally important to discuss the reasons for these changes. Conflict, changes in population and changes in laws and policies may all lead to changes in the local environment. While climate change is having a huge impact in some areas, other areas are less affected.

Using the taking stock assessment

If assessing the local environment has identified gaps in environmental health that FMNR can help to fill, there's an opportunity to introduce the practice through a facilitator or experienced practitioner (we call these people FMNR champions – see **Chapter 5** for more information). This can be done by following these three steps:

1. Introduce the concept of FMNR to the community, or identify a version of it that has been practised there in the past. This should involve a physical demonstration on how to do FMNR; partly because not everybody will understand FMNR through a verbal description, and partly because it's fun and engaging.
2. Identify and clarify any questions and concerns. This is particularly important, as overzealous FMNR trainers can forget that they too were once sceptical, and that there is a process everybody needs to go through to accept new ideas.
3. Provide a process for the community to make informed decisions about whether FMNR is the right choice for them. This could involve:
   a. Reflecting on information gathered about the past, present and future to help people accept that continuing with business as usual will result in disaster.
   b. Presenting the Niger case study as a before-and-after example of FMNR. There are films and written resources available on the FMNR Hub website about this story, and many other examples.
   c. Inviting the community on a farm or field walk to identify tree stumps, tree species and their traditional usage. This information should be recorded to begin to develop a local species list. See **Annex 5** for a template to help with this.
   d. Look for examples of 'positive deviance', ie. individuals who are already practising some form of FMNR. Ask them to share why they do it.
   e. Provide the community with a chance to vote or decide in another way if they would like to undertake FMNR.

What will FMNR look like here?

In general, it is not so much the environment as the land use that determines what FMNR looks like. FMNR is defined by a set of principles. Application of these principles will be strongly moulded by the objectives of the land users, which could include increasing crop yield, diversifying income sources, increasing livestock production, boosting forest production or protecting biodiversity. Ideally, a holistic approach will be taken to accommodate the varied needs across the landscape and result in optimum economic, social and environmental benefits.

Figure 1 A field where FMNR is being practised. Uganda (2018). Photo: T. Rinaudo

The diagram in Table 1 on page 31 shows how characteristics of FMNR may vary with different land uses. Apart from land use, the tree species present will also play a big role in defining what FMNR looks like in different places. Farmers will regenerate very valuable trees on farmland even if they compete with crops if the potential profit from the trees is greater than the value derived from crops alone. Alternatively, farmers will select some of the many tree species that do not compete with crops, which often can enhance crop performance (Figure 1). Additional information about tree species selection and variations in FMNR can be found in **Chapter 4**. It is important to remember that while FMNR is defined by a set of principles, each community and land user is free to adjust these practices to meet their needs. This may also involve the experimentation and adaptation of practices over time.

Table 1 How FMNR characteristics vary across different land use types

Land use	Cropping	Pasture	Hillslopes or degraded communal land	Forests
Tree density	Lower density (approximately 40 trees per hectare).	Moderate density (approximately 50-100 trees per hectare).		High density, depending on rainfall. (approximately 1,000-1,500 trees per hectare).
Types of trees or shrubs regenerated	Species that are high value or beneficial to crops.	Fodder species, or species with other uses such as medicine or food. Shrubs and grassland species may also be regenerated.	Indigenous species that promote soil conservation, or can be used for firewood.	Species with a range of community values as well as biodiversity conservation values.
Species diversity	Lower diversity. Trees species selected primarily for crop interaction and other uses.	Moderate diversity of species to meet fodder, firewood and soil conservation needs. Grass and shrub species may also be regenerated.		Maximum diversity of species to be encouraged, including trees, shrubs and grasses.

Chapter 4

How to practise FMNR

Summary: How to practise FMNR

- FMNR generally involves three practices:

  1. Select species and stumps

  a. Generate a preferred species list with the community based on required uses of regenerated trees, local species availability and possible restrictions, to inform tree species selection.

  b. When regenerating from tree stumps, base your selection on individual and community goals. For each stump, choose a number of the tallest and straightest stems to leave.

  c. Where there is bush encroachment, select the desired trees and species to be managed and cut out the rest. When dealing with dense thickets, you may need to make decisions as you go, because many trees will not be accessible until you have removed some of the unwanted ones. (For more information, see 'FMNR in woody thickets' on page 52.)

  2. Prune and manage

  Remove unwanted stems and side branches, leaving only the strongest and straightest stems. Protect the remaining branches from livestock, fire and competing vegetation or weeds.

  3. Maintain and utilise

  Periodically return to the trees and cull emerging new stems and prune side branches from time to time.

- The way these practices are undertaken will depend on what individual land users would like to achieve through FMNR, and how the community has agreed to manage it.
- FMNR can be successfully combined with other development practices, whether to provide a sustainable foundation of natural resources for further agricultural or environmental initiatives, such as water conservation, or in conjunction with other social or economic development activities, such as disaster risk reduction, water, sanitation and hygiene, savings groups or value chain development.

Resources

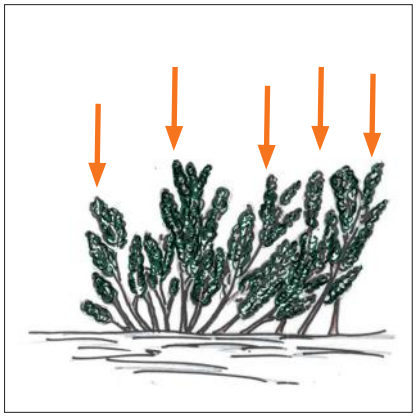
- In this chapter a range of technical terms are used. Please refer to the **Glossary** for explanations of any unfamiliar terms.
- Tree species information sources include:
  - **Agroforestree Database**
  - **Vegetationmap4africa species selection tool**
  - **Promising Agroforestry Tree Species in India**
  - **Annex 10** contains tools to record information about each plot and the tree species present.

Because the work of FMNR is undertaken by individuals using a few simple tools they already own, as well as the work of their hands, FMNR in practice is extremely versatile. It can be as simple as a family working to increase trees on their land for firewood, or it can be used to restore large areas of forest. In general, FMNR starts by understanding what challenges a family or community is facing, and what the causes are around the deforestation or land degradation that underpins these challenges.

The previous chapters described how to assess what a community's priorities and objectives are for FMNR. From this foundation, the basic steps of FMNR can be adapted through experimentation to determine what practices best meet the needs of the people managing the trees, in their own contexts.

The basic practices of FMNR

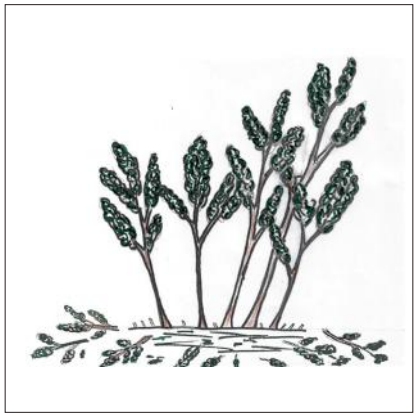
1. Select species and stumps or trees



Step 1. Survey land for sprouting stumps or seedlings and identify what species of trees are present.

Step 2. Select the species and stumps to be regenerated.

2. Prune and manage



Step 3. For each stump, select three to five stems to keep and prune away the unwanted stems.

Step 4. For each remaining stem, prune off side branches up to halfway up the trunk.

Step 5. Protect the stems while they are growing.

3. Maintain and utilise

Step 6. Prune unwanted emerging shoots every two to six months as needed.

Step 7. Utilise tree for planned purposes; harvesting branches, portions of wood or the whole tree as necessary.

Depending on the land user's management style and goals:

- **a tree may be maintained** with unwanted trimmings used for fertiliser, fodder or fuel wood;
- **portions of wood may be harvested periodically** once the tree is large enough to continue to grow;
- **the entire tree may be harvested** once large enough and regenerated from the stump, repeating the cycle; or
- **the entire tree may be preserved**, as in the case of protected forest restoration.

The objectives of each FMNR project will impact the practices used significantly. For example, if the objective is to restore a biodiverse forest for habitat conservation, the types and numbers of trees selected, as well as the amount of pruning and ongoing management required, will be very different to an FMNR project practised on cropping land, as part of an agroforestry system. As discussed in Chapter 5, it's important land users discuss their FMNR objectives and plans with others in the community, and preferably enact bylaws to ensure trees are not damaged by people unaware of why they're being protected.

Who can do FMNR?

As the process of FMNR is very simple, nearly any man or woman can manage trees; even older girls and boys can learn the basics of pruning, as long as they are supervised when using sharp tools.

Because the current FMNR movement began with farmers, it's easy to think of farmers first when considering whether to use it. But anyone with access to living tree stumps or encroaching bush can adopt the practice, especially if they want to improve their land. This includes herders, foresters, students, teachers and shop keepers.

FMNR nearly always works best on land with individual owners. Land owners or land users who control the process – and the proceeds – are highly motivated to do the work when convinced they will benefit from it. Community FMNR only works well where there are very strong leadership structures, or where there are incentives for people to work towards a common goal, such as payments through a carbon credit scheme.

When the land is individually owned, then FMNR is best managed by the land user or owner. This allows them to ensure they keep the number and types of trees that best suit their needs.

On communal land, the whole community, or those with a stake in the land, should jointly manage FMNR. This ensures that everyone understands why it's important to protect the trees, and that everyone can benefit from FMNR work. On communal land in Tanzania, for example, FMNR practitioners have very successfully formed groups of around 15 members to manage sections of land. In Ethiopia and Rwanda, community volunteer days are often used to contribute to pruning and management of communal land areas.

Chapter 7 provides more ideas around how to work with different members of the community.

When and where to practise FMNR?

FMNR can be practised at any time of the year. Physiologically, there may be times that better suit plants for pruning than others, however in practice FMNR is usually determined by when land users have time to do it.

Many land users prune during the dry season, when there is not as much farm work to do and labour is more plentiful. Insects and disease are also less likely to damage freshly cut bark. The downside of pruning too early in the dry season, especially on farmland, is that newly pruned stems are more vulnerable to livestock, at a time when little food is available.

FMNR can be practised on any land with living tree stumps capable of resprouting, as well as self-sown trees or encroaching bush. The biggest determining factor to success – more important than climate, geography or even presence of tree stumps – is the attitude of communities and individuals, and their commitment to succeeding. If the community is committed to FMNR and willing to make the changes necessary, then amazing results, even under extremely difficult conditions, are possible.

Practice 1 – Select species and stumps

Tree species selection is a critical part of the FMNR process. The land user should be responsible for selecting the tree species of most use to them and their family. FMNR specifically works with native species naturally occurring in the targeted area, helping to improve biodiversity and conservation of local environmental ecology while also meeting land users' needs.

In many situations, tree stumps of useful and desirable non-native species may be present. The same principles of thinning and pruning can be applied to these species as well if the land users wish.

Tree species identification and selection is often a mutual learning process on the part of both the land user and development workers[1], as well as other external experts who may be involved. As the names, uses and values of certain indigenous species may not be known to the same degree by all in the community, it will be important to consult elders, women, local experts or vegetation specialists and reference material to learn what trees are in your FMNR site, and what useful services they may provide. To assist in collecting this information, a 'preferred FMNR species list' can be developed, based on which species are locally available, what benefits they have for the communities' priority needs, or restrictions for use. Once this information is available, it is up to the community (on communal land) and each land user (on individual land) to select what species from this list, and how many of each they wish to regenerate.

Step 1: Survey land for sprouting stumps and identify what species are present

This is the first step to take when establishing an FMNR site. Look for stumps, shoots and seedlings available for regeneration. How many different species are there?

What are they, and how many are present?

Figure 1 A sprouting tree stump, Ethiopia (2014). Photo: S. Sainovski

Figure 2 Community FMNR agents surveying a site for stumps. Marigat, Kenya (May 2018). Photo: A. Muller

[1] As development practitioners, we are often taught that we are the experts and must know everything to help those we seek to serve. However, the very act of admitting ignorance and showing reliance on land users' knowledge and experience is a strength, not a weakness, in our behaviour, as it sends a powerful message to the land user that their views are respected and they have something to offer, instead of being treated as passive recipients or beneficiaries. This means so much to people's dignity, and it is this act of eliciting their contribution that sows the seeds of true 'farmer-managed', or 'farmer owned and internally motivated', natural regeneration.

Will you remember how it was in the beginning?

While you are surveying the site, record some details about the land to be treated with FMNR. This information will help with monitoring and evaluating your activities to learn what is working and what is not (see **Chapter 10** on monitoring and evaluation for FMNR). These notes will also be a powerful reminder of what conditions were like before FMNR to highlight the changes that have occurred.

Notes to take during an FMNR site survey:

a. Measure the area of the field.

b. Is FMNR practised on the field in any way already?

c. What is the field used for (cropping, grazing, forest, etc.)?

d. What crops are grown on the field (if applicable)?

e. Is there any erosion present, and what is the ground cover like?

f. Note how many trees, stumps or shrubs are available for regeneration and what species are represented.

g. Take **at least two photographs from fixed points** of the field to monitor change over time. We recommend recording the location of the photos with GPS coordinates. See this **guide on taking photopoints** for help.

Annex 10 includes an FMNR site and tree monitoring template to help you record this information.

Step 2: Select the species and stumps to be regenerated

Species selection is an important step in FMNR. The mix of tree species present will vary from farm to farm, district to district and country to country. In Niger's Maradi Region, species available for regeneration include *Philostigma reticulatum*, *Guiera senegalensis*, *Combretum* species and *Ziziphus* species. However, further east in the Zinder Region, *Faidherbia albida* and *Adansonia spp* are the dominant species used. Meanwhile, the mix of tree species in Ethiopia, Uganda, Swaziland and Myanmar are very different from the mix used for FMNR in Senegal, Mali, Niger and Chad.

Some land users will focus exclusively on trees already present for regeneration, while others will introduce non-native trees as well. Many land users regenerate a variety of tree species, while others focus exclusively on one kind, or just a few.

What tree and plant species are selected will strongly influence the outcomes of FMNR activities. Selection will depend on a number of factors, including what species are naturally occurring; their coppicing ability and uses; the local beliefs and values ascribed to each species; and characteristics such as thorniness, competitiveness with crops and growth rate.

Ultimately it is up to the land user to decide what species best meet their own needs, but often advice is sought about what species are good to prioritise, and what values they can offer. The following steps will help a community identify what species should be on their preferred FMNR species list. Going through this process also allows for additional information and knowledge that may not be widely known, so all land users have the best chance of maximising their FMNR outcomes. They might also feel encouraged to regenerate a larger number of species than initially considered.

Developing a preferred species list

a. Identify primary uses of regenerated trees

Refer back to the taking stock assessment completed with the community and expand upon their identified priority needs. Consider what urgent needs the regenerated species should work to address. Should they improve soil fertility for crops? Increase fodder, fuel wood or income? Act as a buffer for strong winds or provide shade? The template in **Annex 5** may help to collect this information.

Also consider what characteristics trees require to provide these needs and fit within the current farming system; for example, leaf palatability, bark and pods, deep tap roots that avoid competition with crops, valuable fruit and termite-resistant timber. Some typical tree characteristics for different uses are summarised below. Make sure to adapt these to the local area if necessary.

Table 1 Primary tree uses and characteristics of appropriate trees[2]

Primary use of trees	Common characteristics of useful trees
Intercropping with food or cash crops	- Deep roots that avoid competition with crop root zone - Open canopy for light shading (can also be managed through pruning) - High-nitrogen leaves for mulch - Nitrogen-fixing nodules on roots - No allelopathic characteristics, ie. does not suppress the growth of other plants - Root structures that provide 'hydraulic lift', drawing up deep water from the soil profile and releasing it for other parts of the tree, as well as other plants
Boundaries/living fences	- Dense or bushy habit - Thorns to deter livestock or intruders - Useful for fodder - Neutral or beneficial for crops grown in neighbouring plots
Timber and firewood	- Strong wood/high energy content for firewood - Withstands pruning of large branches and stems
Honey	- Flowers preferred by bees - Flowering occurs at different times throughout the year, particularly when alternative food sources are not available
Fodder	- Leaves, bark or pods palatable and nutritious for livestock - Quick to reshoot - Withstands regular pruning or grazing
Fruit and non-timber tree products	- Produces fruit or non-timber tree products useful at home, or valued for sale at accessible markets (may include tree seed from superior quality 'mother' trees)

[2] Additional information can be found in this FAO publication: fao.org/docrep/006/u4375e/U4375E08.htm#TopOfPage.

Forest restoration and biodiversity conservation	- Rare or less common indigenous species of trees, shrubs and grasses - A high density of stumps should be selected for regeneration - Species valuable for habitat and food sources for native wildlife to encourage their return to the area - Species that provide fruits, medicines, honey or firewood to increase the value of the forest area for local communities
Land stabilisation/erosion control	- Deep roots to stabilise soils - Fast growing to act as pioneer species, and provide improved conditions for additional species to be established in the future - Stumps or seedlings that are located along terraces or bunds to assist in slowing the rate of surface water run-off and encourage infiltration - Species that provide value to the local community such as for firewood, medicines, honey production, etc. are more likely to be successfully regenerated, especially in communal areas
Pasture land/communal grazing land	- Fast growing or able to grow large enough to withstand speedy browsing or grazing - Thorns, which may help a tree be more resilient to browsing pressure during its establishment - Nutritious leaves, pods or bark for supplementing livestock diets in times of grass shortages - Open canopy for dispersed shade and maximum grass growth (or tolerant of pruning to manage shading)
Water conservation[3]	- Root structures that provide 'hydraulic lift' by drawing up deep water from the soil profile and releasing it for other parts of the tree, and other plants, during dry spells - Heavy mulching, which provides organic matter to the soil to improve its water-holding capacity - Deep roots, which provide greater water infiltration opportunities through improvements in soil structure and reduction in compaction

[3] The Botanic Gardens of South Australia website summarises the eight roles of trees and forests in the hydraulic cycle. For a complete handbook on how to manage water in the landscape, including through trees, see the Green Water Management Handbook.

b. Develop a local tree species list

With the community, make an exhaustive list of what tree species occur in the area and any current and potential uses, including economic, social and environmental. Local knowledge can be supplemented with information from reference books, forestry or parks department personnel, forest researchers and knowledgeable individuals. Often, elders in the community, particularly women, are knowledgable about what trees occur and what their uses are. Try to record both the local and scientific names for each species if possible, along with any defining characteristics that may help in their identification. The template in **Annex 6** may assist to organise this information.

c. Understand possible restrictions

Review your list and make note of any pertinent rules for each species listed. These could include the species' government protection status, cultural taboos and beliefs[4], or restrictions to their use by different groups of people (eg. women, men, etc).

Some rare or very valuable trees may have government restrictions around harvesting, and for some this is a deterrent. Other trees may have no restrictions, which could also be a deterrent if the land user does not want people coming onto their fields to cut down trees. It is also important, especially on communal land, that no group of people is restricted from using or benefiting from the tree species selected for regeneration.

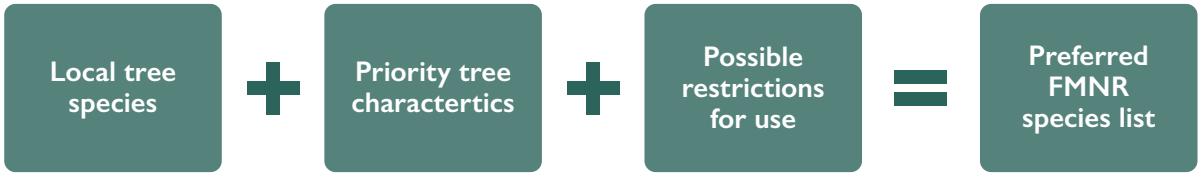
d. Generate a preferred FMNR species list

Identify all the trees from the local species list that:

a. have characteristics that meet the priority needs for the community;

b. have the right mix of characteristics to be incorporated into the local land-use system; and

c. do not have unreasonable restrictions on their use.



From this list, ensure there is maximum diversity of species, since every native species provides some ecosystem service or benefit. Many species also provide inclusive benefits for the community. Cross-check your list. Are there any land users excluding certain trees from it? Why? Are there any land users regenerating trees not on the list? Why?

If the FMNR site is managed by a group or is on communal land, it is important that all those involved in the site are able to contribute to the species selection process. Get people to participate in a voting process such as the 10-stone method[5] to prioritise which trees in the preferred FMNR species list they will focus on, while always encouraging them to leave as many different species as possible for enhanced biodiversity.

[4] Certain trees may be seen to bring good or bad luck, or harbour evil spirits. For example, in Niger it was believed that if you owned more than one baobab tree you would die. Other trees may be associated with some blessing or benefit; certain trees are said to indicate water is close to the soil surface.

[5] This method gives each person 10 stones (or seeds, leaves or any other locally available item). Each person puts their stones against their preferred species. They can allocate as many stones of their 10 to each species as they like. For example, they may vote for 10 species, with one stone each, or six species, with three stones for their most favourite, two stones for the next two favourites, and a single stone for the remaining three preferred species. It is important that each person in the group gets an equal number of stones/votes. Participants should be allowed to vote anonymously. At the end of voting the species with the most stones are the most preferred by the community.

e. Select and mark the individual stumps and trees to be regenerated and managed

Each land user can now use the preferred species list to select the most appropriate stumps and trees to meet their needs, based on the mix of tree species and their location in the field.

Trees and stumps can be marked with coloured fabric, ribbon or tape as a sign that these plants are being managed.

How many tree stumps should be selected?

Almost universally, farmers are reluctant to leave trees on farmland. All their lives, they have been taught this is bad practice. In most places, the cultural norm is to clear all trees from farmland. Conventional western approaches, which have influenced global farming practices, favour monocultures and the removal of trees on agricultural landscapes. An FMNR promoter should expect resistance and work wisely to introduce this radical change to accepted norms.

On cultivated land, farmers tend to begin very conservatively, often leaving only five to 10 trees per hectare. In Niger, after farmers saw there were no negative effects and many benefits to leaving trees on their land, the number was soon increased to 20, then 40 trees per hectare. Today, some farmers are leaving more than 100 trees per hectare on their lands and, because of the way they manage the trees, they are still experiencing better crop yields than the treeless fields of their neighbours. On grazing land, it may be possible to exceed 100 trees per hectare while still increasing fodder yield. On forest land, all stumps and species would ideally be encouraged to regrow, using thinning and selected pruning to aid tree growth, while also providing local communities with benefits such as firewood. Across all land types, the number of tree stumps left to grow will vary with climate, tree species and objectives.

What if there are not enough sprouting stumps?

If there are no living stumps remaining in an area, or there are not enough stumps to meet the land user's needs and goals, then trees can be nurtured through naturally sprouting seeds. These should be protected from damage by animals and humans, so they can grow large enough to start pruning and managing. While they won't have the advantage of mature root systems to give them the fastest start, land users can prune and protect them to ensure the best possible outcome.

Zai holes (planting pits containing compost) and half-moons (semi-circular water harvesting structures) can also be used to start growing trees. In Figure 6 seeds were introduced inadvertently through the manure placed in the pits.

Figure 3 Pruned and marked trees in Niger, 2011. If marking with ribbon, attach this loosely to a side branch. Photo: World Vision

Figure 4 Community FMNR agent identifying stumps for regeneration in Marigat, Kenya (May 2018). Photo: A. Muller

Figure 5 Half-moon micro-catchments are used around acacia trees (*Senegalia senegal*) for water retention at a landscape restoration site near the village of Loga, Dosso Region, Niger (September 2017). Photo: Rodrigo Ordonez/GLF[6]

Figure 6 Zai pits have been dug and will be filled with organic matter, including animal manure, before crop planting. Often, manure contains tree seeds that will germinate in the zai pit. Maradi District, Niger (c. 1985). Photo: T.Rinaudo

[6] First published by Landscape News (October 2017). See the original article, **'How do you stop the desert? Niger may have the answer'**, for more information around half-moons and other landscape restoration methods.

If there are no naturally occurring tree stumps or seedlings available, it is also possible to raise trees in a nursery, plant out and manage them using FMNR techniques. This is more labour intensive and costly than practising FMNR with existing root stock, and may not be as successful, but the principles of pruning and protecting will provide the same benefits to nursery trees as they do to wild seedlings. When seedlings are planted, or seeds are directly sown in zai holes near half-moons, the chances of successful tree establishment increase, particularly in more arid environments.

Figure 7 Thinning dense vegetation to allow for more productive use of land, such as better grass production and access for grazing livestock. Marigat, Kenya (May 2018). Photo: A. Muller

What if there are already lots of trees?

Some FMNR sites may not require more regeneration, but instead may focus on the better management of existing trees, shrubs and even grassland. The same process of species surveying, prioritisation and selection still applies; land users can choose which trees and shrubs they would like to manage, and what management needs to occur to help them reach their desired goals.

Tree management may include pruning techniques, such as thinning and pollarding, or harvesting of branches or leaves. For shrubs with multiple stems, three to five stems may be selected and pruned to encourage the shrub to grow to a larger tree form.

Regeneration of grasslands can be encouraged by thinning dense shrubs that may be competing with grasses, reducing the grazing pressure from livestock through rotation or short-term exclusion, introduction of improved grass seeds, and implementing soil and water conservation practices that reduce water run-off and increase infiltration into the soil.

Refer also to the section on page 52 on FMNR in woody thickets.

Feel like you don't know enough about tree species and how to identify them?

Remember, information on how to identify different tree species and their uses can be collected through:

- local knowledge gathered through meetings, focus groups, site visits, taking stock workshops and local expert experience;
- literature, reference material, tree manuals and guides such as the **Agroforestree Database**, the **Vegetationmap4africa species selection tool** and **Promising Agroforestry Tree Species in India**;
- observations of where you see trees growing naturally. Consider what is noteworthy about them. Do they appear to suppress grass growth? Do they harbour pests? Do they harbour beneficial organisms?;
- expert knowledge from researchers, forestry and agroforestry experts, extension staff and experienced individuals; and
- FMNR champions and trainers from other FMNR projects in your country, or beyond – check in with the FMNR Hub.

Examples of common FMNR species

There are some species commonly found in FMNR sites around the world. While these specific trees may not be available on your site, you might find alternative local species with similar characteristics and values, which would also make them valuable for FMNR.

As you will see from the following list of popular trees, the species that land users select are not always the ones you would expect. For example, not all are nitrogen fixing, and some grow a heavy canopy that shades nearby crops. Others have shallow root systems, which can limit crop growth. However, a unifying thread is that they all serve a useful purpose, or purposes, important to the land user.

If any of these species are available on your FMNR site and meet your community's priority needs, they may be a good place to start.

Figure 8 *Acacia nilotica* is commonly used for fodder. Bark, pods and leaves provide valuable sources of food for livestock in dry seasons and the flowers are important for honey production. Marigat, Kenya (May 2018). Photo: A. Muller

Ziziphus mauritiana

Ziziphus mauritiana is a medium-sized tree that grows vigorously and has a rapidly developing taproot. It is a popular FMNR tree in many parts of the world, and can be found throughout the tropics. *Ziziphus* has multiple uses for its durable wood, leaves for fodder and thorny branches for fencing. The fruit of wild growing *Ziziphus* are very small and have low or no market value. However, improved varieties are available and can be top grafted onto the regenerating trees. The fruit has high value in the fresh fruit market or for juicing. A case study of one farmer's experience with this fruit, 'the apple of the Sahel', can be found on page 58.

Prosopis cineraria

Prosopis cineraria[7] is a widely grown agroforestry tree in India, where it is intensively managed for fodder production. It is also widely found in arid areas of the broader southern and western Asia region and into Southeast Asia. In many parts of India's Thar Desert, *P. cineraria* pods are used as a vegetable in the dried and green form. The sweetish bark has also been ground into flour and made into cakes during periods of food scarcity. Leaves are used as dry fodder, while the tree itself is an excellent fuel, providing high-quality charcoal. The tree is also used for timber, gum and tanning, as well as for some medicinal purposes.

Acacia species

Many of the thousands of *Acacia* species existing in the world are useful FMNR species, often providing fodder, light, shading and nitrogen fixation for soil fertility, among other benefits. Many *Acacia* species are thorny, which may deter some land users, however these thorns can also become valuable living fences and help protect young regenerating plants from livestock. Specific species such as *Acacia tortilis* and *Acacia senegal* are often regenerated in low-lying savanna fields, and provide multiple products including fodder and gum. *Acacia nilotica* is found in South Asia and East and Southern Africa, and is particularly popular as a place where bees forage as well as a source of fodder for livestock during dry periods.

Cordia africana

Cordia africana is a popular cropland tree in Ethiopia, even though it doesn't appear to be nitrogen fixing and is broad-leaved, capable of casting heavy shade. However, its popularity may be attributed to its many useful products, including edible fruits, fodder for livestock, nectar and pollen for bees, firewood and reasonably termite-resistant timber. In addition, its thick canopy is used in coffee plantations to provide shade, while leaves that fall during the dry season provide a heavy mulch. The trees grow quickly and are often managed through pollarding and coppicing.

[7] Another Prosopsis species, *Prosopis juliflora*, has been used effectively to address severe land degradation. In some areas, due to its resilience, it has become highly invasive and dominant, as in Kenya's Baringo County. Unlike *P cineraria*, this species is not palatable by livestock, but it is an excellent fuel as firewood or charcoal.

Faidherbia albida

Faidherbia albida is perhaps the queen of agroforestry trees, with a number of unique qualities which have made it a popular farm tree across large parts of Africa.

F. albida is most valued for its nitrogen-fixing properties and reverse phenology. Unlike most trees, it sheds its leaves during the rainy season, so it's well suited for growing among crops. It doesn't compete with crops during the main growing season, and provides light, and beneficial shade during the hot dry season, where it can reduce air temperatures by up to 10 degrees Celsius and soil surface temperatures by as much as 35 degrees, providing crops with better growing conditions. The leaves from this legume tree are high in nitrogen and can double yields in maize crops when added to the soil.

Figure 9 *Faidherbia albida* - young trees in a field in Tigray, Ethiopia. Photo: T. Rinaudo

The flowers provide valuable food for bees at the close of the rainy season, when most other plants are not flowering. Pods and foliage are highly regarded as livestock fodder and can be collected and sold in markets. However, while the wood is used for carving or other uses in some places, it is not a high-quality firewood.

Pilostigma reticulatum

Pilostigma reticulatum is the most common FMNR tree in south-central Niger. It's a broad-leaved shady tree with deep and shallow roots, known for its nitrogen-fixing properties. The tree is used for firewood, timber, fodder, medicine, fibre, dye, famine food and shading. After drawing up deep water from the soil profile, it 'leaks' through its shallower roots, enabling nearby crops to thrive even in drought time through hydraulic lift.[8] Despite the heavy shade provided by the tree, crops do very well right up to the base (see Figure 10). Farmers can control how many trees they leave on a field and how they prune them to manage the shading of crops.

Figure 10 *Pilostigma reticulatum* in a field in Malawi (2015) Photo: T. Rinaudo

Guiera senegalensis

Guiera senegalensis is a very popular FMNR tree in Niger and across the Sahel in cropping land. The species uses 'hydraulic lift', where water is brought up by the roots from deep in the soil profile. The tree has multiple uses, including edible gum, medicines, fodder, firewood and timber for light construction poles, and is found across the Sahel.

Figure 11 *Guiera senegalensis*. Photo: Marco Schmidt/Wikimedia Commons

Tell us about your favourite FMNR species

The species listed above are only a small selection of species regularly regenerated by land users through FMNR. We would like to know more about what species are being regenerated, as well as where and how they are being used. This information can also be very helpful for beginners to FMNR.

[8] This paper explains more about some of the beneficial properties of ***Piliostigma reticulatum***.

Practice 2 – Pruning and management

Once the preferred species and stumps, trees or seedlings to be regenerated have been selected, it is time to start pruning and managing the trees to allow them to grow tall and reach their full potential. The pruning technique described below is the basic approach used in most situations. Over time, land users may adapt their techniques to maximise the particular outcomes they are looking for.

In addition to pruning, managing threats to the trees such as livestock, weeds, pests and disease is also necessary to give them the best chance to regenerate.

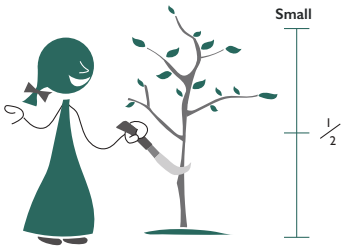
The three golden rules of pruning

While the act of pruning itself is not difficult, there are three golden rules to keep in mind to prevent trees becoming diseased or damaged:

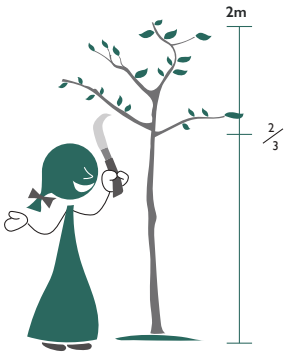
1) Use sharp tools. Sharp saws or secateurs are ideal pruning tools, since they provide a clean cut. If you don't have these tools, then machetes, harvesting knives, axes and even hoes will work fine as long as they are kept sharp.

2) Wherever possible, cut upwards not downwards. Cutting upwards causes less damage to the bark, so the tree will recover faster. Because this technique is less damaging, it also reduces the risk of disease and insects entering the wound where the tree has been cut.

3) Don't prune stems too high. Pruning too high up the stem may make the stem too fragile or top heavy to survive wind or animals brushing against it.



On small stems, it is best to prune no more than halfway up the trunk.



On established trees over two metres tall, prune no more than two-thirds of the way up the trunk.

Note: Pruning for habitat creation in a forest setting may be much lighter than what is demonstrated above.

Step 3: For each stump, select three to five stems to keep and prune away the unwanted stems

After selecting the stumps, the land user now decides how many stems will be allowed to grow on each one, based on his or her needs, the species selected and the ultimate objectives of the area. In general, it is advised to start by leaving three to five stems per stump.

The middle photo below shows multiple stems sprouting from a tree stump. In this case, we would suggest keeping up to five of the tallest, straightest, most vigorous stems, and pruning away the smaller, crooked and weaker ones.

If possible, tag the stems you are keeping with a coloured rag or paint. This helps identify the stems you want to keep and, after pruning, it tells others this tree is being managed and needs to be left alone. It's important to avoid tying a tag on the main stem, because as the stem grows it will be 'choked' by the tag. Instead, tie it on a side branch.

While it is possible to leave and manage only one regenerated stem, it's usually better to keep three to five, at least initially. This is because:

1. More than one stem allows the land user to harvest some of the regenerated wood in the short term, while still leaving a main stem to mature into a tree. Surplus stems can be harvested each year for firewood, stakes or poles, while leaving the main stem to continue to mature. A new sprout should be allowed to grow every time a stem is harvested.
2. Keeping multiple stems allows the land user to tie them together when they are young, to help protect them from livestock and strong winds. Several stems tied together are harder to break than single stems.
3. If one or multiple stems are damaged by animals or strong winds, some will remain to grow into maturity. If you only have one stem to start with and it gets damaged, it will take longer for a new shoot to emerge and replace it.

Step 4: For each remaining stem, prune side branches up to halfway up the trunk.

Under normal pruning practice, side branches are cut flush with the stem. However, in most areas where FMNR is practised, there is no fencing to deter livestock from trees. To help protect new growth, it is possible to cut the side branches 10 to 15 centimetres from the stem as a slight deterrent to livestock. After a year or so, when the tree is more robust to resist damage, these short side branches can be pruned right back to the trunk.

Figure 12 Lightly pruned trees are able to withstand livestock grazing, Niger (2011). Photo: T. Rinaudo

Record what FMNR has taken place

This is a good time to record some details about the **trees and stumps** being managed with FMNR. This information will help with monitoring and evaluating your activities to learn what is working and what is not (see **Chapter 10** on monitoring and evaluation for FMNR for more details), as well as serving as a powerful reminder of how much the trees you are managing have grown. While FMNR success does not require taking measurements, collecting this data will better inform you what is happening, contribute to the growing body of FMNR knowledge, and shape the way FMNR is implemented in the future.

After each FMNR attempt, remember to:

1. Record the species and number of trees and stumps being managed with FMNR.
2. Take a picture of the site after pruning from established photo points. If possible, activate geolocation functions on your camera or smartphone to record the GPS coordinates.

   If you wish to track the growth of the trees over time, you can:

3. Measure the diameter at breast height (DBH) in centimetres for any tree greater than 1.3 metres.
4. Note any other management practices being used, such as stock exclusion.

See **Annex 10** for tools to record information about the trees that are present.

Apical dominance: a plant's response to pruning, and why we prune!

Often the purpose of pruning a plant is to encourage it to grow taller, with larger stems. However, pruning stems and leaves away can seem counterintuitive to helping a tree grow bigger.

But plants, like humans, only have a limited amount of energy available to put into growing. If we can encourage them to channel this energy into growing certain stems, in certain directions, we can make plants taller and stronger.

Plants create a hormone called auxin at the topmost bud or growing tip of each branch. This hormone prevents any side branches from shooting too close to the tips. Plants that produce a lot of auxin generally have fewer stems and longer/taller habits. Plants that produce less auxin may have more branches and a thick, dense habit.

To encourage more vertical growth, it is important to prune away side branches, and not the topmost growing bud (also called the apex or terminal bud). This is why, although we retain a certain number of stems when pruning in FMNR, we always cut away the lower branches. (You can also choose to prune just the terminal bud of the lower branches, leaving a short stem for a level of protection from animals, at least in the short term.) By removing the terminal bud, the plant restricts its growth to a few stems – helping to grow them tall and strong – and doesn't waste energy growing multiple smaller stems. We don't remove all side branches, because this would result in the loss of leaves, which convert energy from sunlight into sugars used by the growing tree. Pruning is a balance between focusing tree growth and ensuring there are enough leaves left to fuel the growing plant.

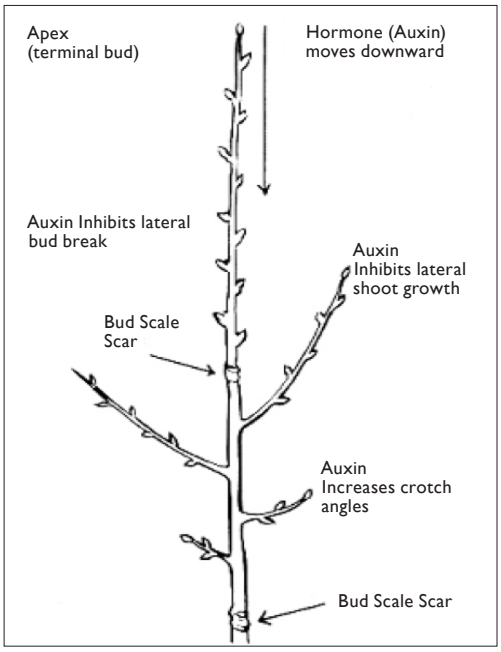


Figure 13 Parts of a tree or branch where growth occurs, or growth is hindered during pruning. Image: SickTree.com

Step 5: Protect the stems while they are growing

Once you've done the work of selecting, pruning and maintaining trees, it's important to ensure your trees will not be damaged. FMNR regrowth is hardier than transplanted seedlings, so reforestation using FMNR may succeed even without excluding livestock. However, if it is possible to exclude livestock from FMNR areas for six months to a year, this will give trees their best chance to become tall and strong enough to withstand grazing pressure. If you can't exclude livestock completely, don't let that stop you. There are still ways to protect your trees, such as:

1. Pruning side branches to deter stock slightly (see Figure 12 on page 46).
2. Setting aside a small portion of land each year to regrow trees away from livestock. In the second year, grazing is allowed among the first group of trees, and a new location is selected for excluding livestock and practising FMNR. This method is easiest for individuals practising FMNR on their own land, but can be performed on communal land as well, provided there is good communication and accepted bylaws.
3. Tying any thorny prunings around the stems to be regenerated, to discourage livestock.
4. Tying multiple stems together to make it harder for livestock to damage them.

Social fencing

Protecting trees doesn't need to be laborious or expensive. Using thorn branches is one traditional method of protection, but these are often difficult and labour intensive; in fact, traditional fencing techniques can involve the cutting down of thousands of thorny trees to protect large parcels of land, increasing deforestation. Other options, such as wire fencing, are very expensive and beyond the reach of most land users. Reforestation projects often use paid guards, which is unlikely to be sustainable once funding ceases. In some cases, initially employing some guards may be necessary. However, even in these cases, the ideal intention would be to steer the community towards ownership of and responsibility for the sustainable management of trees.

When we talk of protection, what we usually mean is 'social fencing'. That is, an agreement between everyone using shared natural resources (in this case, land and vegetation) to follow a jointly developed set of bylaws on how to manage these resources. In practical terms, this includes self-imposed regulations on livestock movements, use of fire and harvesting of trees.

When these bylaws are embedded in traditional legal structures, they can be just as or even more effective than wire fencing, which after even a short period can be no match for resourceful, hungry goats. In Timor-Leste, communities were encouraged to revive aspects of their largely abandoned traditional legal system, *Tara bandu*, to great effect. *Tara bandu* can be simplified as a system of local rules set by different communities, including limitations on how, when and by who trees can be cut.

Practice 3 – Maintain and utilise regenerated trees

Step 6: Prune unwanted emerging shoots every two to six months as needed

New branches and stems will continue to emerge, so every two to six months it is best to return and prune away new growth. This will produce straighter stems and help the selected stems grow quickly.

Land users may find this easiest to do this during the dry season, when there are lower labour demands, but pruning can be performed any time that works well for those managing the trees.

Once regrowth reaches **two metres or more**, it should be safe to prune side branches **up to two-thirds of the way up the stem**. However, the more branches you leave, the more leaves will be photosynthesising and fuelling tree growth. Crop farmers tend to over prune trees because they want to minimise shading of crops. A healthy compromise is to avoid over pruning, while keeping shade to a minimum.

Case study

Timing pruning and livestock exclusion in Niger

In Niger Republic, 240 million trees have been regenerated – without fencing. FMNR practitioners pruned regrowth on tree stumps before the onset of rains and the busy crop-planting season. Once crops were sown, livestock were automatically excluded from cultivated areas, giving the emerging FMNR trees a five- to six-month window of opportunity until harvest to grow free from livestock damage.

There is no doubt that some damage occurred once livestock returned to the fields, especially when large herds and flocks passed through. However most of that damage was so mild or localised that it did not affect the overall spread of FMNR, or the growth of the majority of trees.

Step 7: Utilise trees for planned purposes

FMNR trees can be managed for a wide range of purposes, depending on the land user's needs. Often, many of the traditional uses of trees will be known by someone in the community, and may have been identified during the FMNR species selection process (see Step 1). Resources such as the **Agroforestree Database** provide advice on how different tree species can be used, if these uses are not already known by someone in the community. Most FMNR practitioners have found ways of using prunings as well, whether for fodder, firewood or mulch.

Using the pruning system described above, land users are encouraged to harvest one stem per year over a four- to five-year cycle, always allowing a new shoot to replace the harvested stem. Ideally, in the fifth year, the largest stem will have attained tree stature and, when there is a need, land users are encouraged to harvest up to a third of the tree's branches in any one year. This way, there is no danger of replacement branches being damaged by livestock (they are too high), the tree recovers quickly, and the land always has a measure of protection from the standing tree.

Case study

Combining pruning with fodder collection by children

In Niger Republic, FMNR-practising land users were getting very discouraged because children collecting fodder would regularly break off all the stems left to regrow.

In such cases, a win-win solution is to host a community meeting and announce that, from now on, any stems the land user wants to keep will be marked in some way – with paint, or a cloth or tied together. Rather than pruning away the remaining stems during the normal FMNR pruning period (prior to the onset of rains in Niger), land users will leave them for children to harvest. The success of this tactic relies on strong community leadership, careful messaging, capacity building, advocacy and, where possible, supervision and monitoring.

1. Select sprouting tree stump.
2. Desired stems have been pruned and 'marked', in this case by tying them together.
3. Children harvest the remaining 'unwanted' stems for fodder and kindling.

A final word on pruning

Different species may require different pruning techniques; depending on the intended uses of each tree, some ways of pruning may be more useful than others. That's why FMNR can never be prescribed as 'one right way'. Rather, the right way must be determined through experimentation and observation, with land users empowered to do what is most effective for their needs and goals.

Examples of common FMNR systems

The FMNR practice varies from context to context and even from individual to individual, however the principles of thinning, pruning and managing regrowth are constant. The basic steps are simple, but the ways FMNR is practised are nearly as varied as the people who practise it.

Here are a few examples of how land users are practising FMNR around the world. (Undoubtedly you will come across something new before long.)

FMNR in cropland

Almost universally, farmers think trees on farmland will reduce crop yields. However, there are many examples where farmers have experienced no detrimental effects at all; some studies in Southern and West Africa have shown harvests to double or triple in fields with trees. This is possible where trees with the right characteristics are selected. Examples include nitrogen-fixing trees such as *Faidherbia albida* and species such as *Guiera senegalensis* and *Pilostigma reticulatum*, which draw water from the soil through hydraulic lift and disperse it within reach of crop roots. Many species also have mycorrhizal associations on their roots, which make more water and nutrients available to crops.

Figure 14 Trees regenerated with FMNR can be seen interspersed across cropping fields. Malawi (2015). Photo: T. Rinaudo

In FMNR systems, farmers can help control how much shading of crops occurs by the severity of pruning undertaken, and by the number of trees regenerated. To reduce competition during the growing period, some regenerated shrubs are routinely coppiced (pruned back heavily to just above ground level) as crops emerge, but are left to grow and provide ground cover when the crop is harvested. Trees also may be pollarded (all branches except the main stem removed), for the same benefits.

Many land users don't follow a particular pattern when regenerating trees in their fields, while others only regenerate trees that fall into a pattern they prefer, such as along the edges of fields, or arranged to protect crops from harsh sun or wind. In one district in Mali, for example, FMNR practitioners only leave trees that are growing approximately in straight lines, where they will also transplant naturally occurring seedlings. They grow most of the trees as bushes, slashing them to ground level each year except for single stems roughly 12 metres apart, which are allowed to continue growing into trees. The reasons for this are:

- so that the trees do not interfere with their ploughing;
- because they require low windbreaks in their fields to combat severe wind erosion; and
- because soil infertility is a major problem, and they can address it by mulching with the pruned branches.

Sometimes farmers choose FMNR species they know will have a detrimental effect on crop yields, but are prepared to allow this because of the value of the tree or tree products, such as fruit, medicine or fodder.

FMNR with *Faidherbia albida*

Faidherbia albida is a very popular fertiliser and fodder tree across much of Africa. Transplanting *F. albida* is expensive and tricky, as it develops a long tap root early in its life and can suffer shock during transplanting. However, where *F. albida* occurs naturally, there will nearly always be an abundance of naturally occurring young trees growing from seed, stumps and even from roots. Characteristically, young trees are multi-stemmed and multi-branched. With this species, it is preferable to leave just one main trunk and cull the remaining stems.

Figure 15 Young *Faidherbia albida*, regenerated in a teff field through FMNR. Tigray, Ethiopia (2010). Photo: T. Rinaudo

Figure 16 The value of revisiting pruned trees can be seen in this photo, where new shoots have sprouted from the tree's base. These should be removed before they grow too large. The side branches have also grown; at this stage, these could be shortened. Ethiopia (2010). Photo: T. Rinaudo

FMNR in woody thickets

Forest clearing and annual burning has resulted in bush encroachment in many subtropical and tropical regions, and some semi-arid tropical ones. When this happens, dense, impenetrable thickets of multi-stemmed bushes, thorn trees and vines grow to dominate the landscape after clearing, effectively turning them into 'green deserts'. These provide little benefit to either wildlife or humans (see Figure 17).

When FMNR is applied to woody thickets, branches are pruned and the thicket is thinned. This allows access for wildlife and livestock, increases fodder availability and reduces competition between trees, allowing them to reach their full size in a shorter time. Depending on the project's objectives, FMNR can also be nuanced to leave pockets of dense growth, which may be preferred by certain bird and animal species.

Figure 17 Bush encroachment after forest clearing (left). This thorn thicket is impenetrable by most wildlife and livestock. Effectively, a 'green desert' has been created. In the photo on the right, FMNR has been applied to an area of bush encroachment. Photos: T. Rinaudo (2013)

FMNR for forest conservation

FMNR can be successfully used to regenerate degraded forests. In forests that have been disturbed through clearing or over harvesting, there may be low species diversity or bush encroachment, leading to poor forest structure. Forests that can provide sustainable benefits, such as the provision of medicines, fruits and firewood, are more likely to have the support of the surrounding community, making them easier to conserve.

FMNR practices of thinning and pruning in a forest setting reduce competition and allow light to penetrate the canopy. While the ultimate goal is to create a biodiverse, natural forest, multiple stems can be left on each tree stump to meet short- and medium-term needs of the communities now managing and utilising the forest.

FMNR practices of thinning and pruning in a forest setting reduce competition and allow light to penetrate the canopy. While the ultimate goal is to create a biodiverse, natural forest, multiple stems can be left on each tree stump to meet short- and medium-term needs of the communities now managing and utilising the forest.

Figure 18 Forest restoration through FMNR. These photos are taken of the same hillside in 2005 (left) and 2017 (right). Humbo Community Forest Restoration Project, Ethiopia. Photos: T. Rinaudo

FMNR in pastoral land

Because pastoral lands are used for grazing livestock, the focus for FMNR in these areas is the plants that grazers and browsers feed on. These include trees and shrubs as well as grasses. Leaves and sometimes the bark of many species are eagerly sought after by sheep and goats, making regeneration in these areas challenging at times. This can be managed by excluding or limiting the access of livestock to regenerating areas, until the trees are large enough to withstand some grazing. Another option is to leave more branches and stems than desired until the tree has grown beyond the reach of livestock. Thorny species will also offer some degree of protection.

Figure 19 This area has been managed with FMNR to increase grass production for livestock. Kenya, (2017). Photo: A. Muller

Figure 20 Pasture land managed with FMNR (left of fence) in Senegal. Photo: beershebaproject.org

Alternatively, prunings of branches and stems can be tied around remaining stems. This makes it harder for livestock to browse emerging new growth. Side branches can also be used to protect young FMNR plants from livestock, by truncating branches and tying pruned branches back against the tree.

The density of vegetation regenerated in pastoral areas is often managed to maximise grass growth, where low shading from light canopy cover can reduce evaporation and encourage grass growth. Often FMNR in pastoral areas is combined with the regeneration of grass species and ground cover.

FMNR for water management

Increasing the number of trees in critical locations across a landscape can help address issues such as erosion, land instability, salinity and depleted groundwater resources in catchments or watersheds. Trees on hillslopes and upper catchment areas can assist in slowing the rate of surface run-off, allowing more time for water to infiltrate and recharge groundwater reserves. There are many examples of FMNR sites where long-absent natural springs have returned in great volumes. See the case study on Abreha Weatsbha in Ethiopia later in this chapter.

In areas where water tables are too high, bringing salts to the surface, trees can be used to absorb water and allow these minerals to recede.

Trees and vegetation restored in wetlands and riparian zones (along waterways) are important for ensuring water quality. As well as filtering sediments and impurities, trees can also reduce excessive evaporation and high temperatures, which may affect water quality and availability.

By increasing shading and ground cover on farmland or grazing land, FMNR can reduce the loss of soil moisture through evaporation, making more water available for crops and grasses to grow. Trees can also be regenerated along soil and water conservation structures such as bunds and terraces to help stabilise these structures and boost their ability to conserve water.

FMNR on communal sloping or degraded land

Usually, any non-agricultural sloping land is communal land. To implement an FMNR program on these slopes, it is necessary to work through community groups. This often requires a lot of advocacy, awareness raising and patience. If communities do not have exclusive or predominant access rights to the area, then it is important to engage with authorities to ensure they have legal user rights. Without reasonable assurance that they will benefit from any improvements they make to the communal land, communities are unlikely to persevere with FMNR beyond the life of a project or intervention from external parties. Local development of bylaws and enforcement procedures is also required for ensuring the shared natural resource base is managed in a way that enhances the environment and provides optimal benefit for the community.

FMNR on communal land provides a number of valuable goods. These include fodder, traditional medicines, firewood, timber and wild foods, as well as ecosystem services such as groundwater recharge, increased crop pollination (through increased pollinating insects), increased crop protection (through increases in birds and insects), improved nutrient cycling and soil fertility, plus reduction in erosion, flooding and even landslides. Potential negative effects include an increase in wild animals, which may be perceived as threats to crops or livestock.

FMNR along fence lines

Sometimes, and especially when FMNR is a new concept, farmers just can't bring themselves to restore tree cover on their valuable crop or grazing land. At the very least, they should be encouraged to practise it on the farm borders: along footpaths, in gullies and on rocky outcrops and hilltops. Restoring trees along farm borders can provide many beneficial goods and services. Not only can trees act as a windbreak and shelter belt for livestock, but farmers can harvest various products from them, such as firewood, wild foods, traditional medicines, dyes, resins, honey and fodder – depending on the species present. The trees also provide critical habitat for birds and wildlife, acting as wildlife corridors and increasing biodiversity.

Farmers also gain experience from managing trees and will make observations on the impact various species are having on crops and pasture. Practising FMNR along farm borders may be a stepping stone for farmers to eventually adopt the practice on more of their land.

Combining FMNR with other practices

The comprehensive benefits of FMNR make it a foundational practice for sustainable development. Increasing tree density and biomass has positive benefits for soil fertility, water availability, biodiversity and other ecosystem functions performed by a healthy environment. Without a strong, functioning environment, it is very difficult to achieve food security, economic development and resilience to shocks. FMNR is a foundational and complementary intervention that is rarely promoted as a standalone activity.

When planning FMNR interventions, it is important to address key limiting factors to sustainable livelihoods in order to take an integrated approach. Are water shortages, food insecurities or a lack of income-earning opportunities contributing to deforestation and land degradation? Unsustainable use of forests or trees on farms – such as excessive harvesting for charcoal or fodder – is a common detrimental coping strategy when people are desperate.

Finally, sometimes the short-term reduction in productivity as trees grow, and the mid-to-long term return on investment, can be seen by communities as a barrier to implementing FMNR. This is especially the case for the most vulnerable people, who prioritise immediate return on investment to cover all their daily needs. Combining FMNR with other livelihood options that provide short-term benefits, such as poultry, bees and market gardening, increases the likelihood of FMNR adoption.

Because of this, it is common to see FMNR interventions combined with other practices such as soil and water conservation, improved livestock management, climate change adaptation, disaster risk reduction or management,

economic development, irrigation and improved farming techniques. In fact, as long as communities are not overwhelmed with too many interventions simultaneously, FMNR is much more likely to be adopted when there are a range of benefits and entry points with which to engage them.

Building on the FMNR foundation

FMNR complements and improves the productivity of most agricultural practices, and many other forestry and natural resource management practices. When choosing complementary practices to be combined with FMNR, it is always wise to use the most locally adapted and climate-smart practice available to increase the long-term success of farming, herding or forestry.

Many interventions that complement FMNR, such as market gardening, beekeeping, fodder production and animal fattening, will also provide short-term benefits while the trees are growing and not yet providing an income. Such activities help land users commit to FMNR by providing essential short-term benefits.

The forestry, agriculture, environment and development practices that benefit from and complement FMNR are too many to name here, but these are some key practices often found in FMNR projects.

Beekeeping

Beekeeping and honey production benefit from an increase in trees, and can be a beneficial source of food and income. Beekeeping can also provide a valuable source of income during the short 'start-up' period of FMNR, when new trees are being protected but not yet contributing economic benefits. In fact, in East and Southern Africa, beekeeping in combination with FMNR is at the same time a major economic driver of the uptake of FMNR and an incentive to protect trees. Land users will go to great lengths to protect their considerable investment in beehives, as well as the resource base that makes honey production and the resultant profits possible: nectar-producing trees.

Case study

Beekeeping in Somaliland

An excerpt from: **From desperation comes hope: FMNR in Somaliland, April 2016**,
by Silvia Holten, World Vision Germany

The landscape in Somaliland is barren and desolate. Here and there, there is still some greenery, but it is mostly an invasive thorny tree called mesquite (*Prosopis juliflora*), that is beginning to overrun thousands of hectares of land. During 2016, drought conditions affected large areas of the Horn of Africa, leading to widespread livestock deaths and weakness, that affected the largely pastoralist communities dramatically.

Figure 21 Beekeeping in FMNR sites in Somaliland is a profitable exercise (2015). Photo: M. Badoreck

But even for a dry region like Somaliland there is hope for a better life and as bad as the drought is, it is also an opportunity for people to think of alternate livelihood strategies. Many pastoralists are now ready to settle down and grow fruits and vegetables. Farmer Managed Natural Regeneration (FMNR) has been used by some communities and despite the drought and barren soil, there are astonishing results. An FMNR pilot project, which was fenced to protect regenerating trees from livestock, has shown successful results. The head of the community, Haybe Ismail Buni told us that many trees have now grown well – from 90cm in 2014 to now 1.90cm. The trees – mostly indigenous acacias – provide shade, fuel wood and fodder. They help to build soil fertility and to prevent erosion. Meanwhile, because of the emerging forest, the community has started bee keeping. Already three harvests have been made with a total value of 1,450 USD. Because of the success of this pilot, neighbours are beginning to copy it, and current group members are practicing FMNR outside of the pilot area.

Fodder production

Leaves and seedpods of many trees are highly nutritious, while the regeneration and management of trees in pastoral areas contributes to an increase in grass growth. When trees are still being protected, fodder from grass in the field or tree prunings can be collected and carried away to supply animals. As the FMNR trees become established, animals can graze in regenerated areas, or a cut-and-carry system can be used in combination with holistic or rotational grazing systems (see below for more information). Fodder can also be dried and stored as dry or cold season feed.

In East Africa, land users are reporting increased stocking rates and milk production through FMNR of between 200 to 500 percent. Trees can also act as a standing fodder reserve, which is drawn on during times of drought and fodder shortage. In this way, land users not only manage to feed their animals during drought, but they also avoid devastating stock losses that are very difficult to recover from.

As grass-growing conditions improve through the effects of FMNR, it also becomes more viable to invest in grass seed varieties that provide high-value fodder. The collection and sale of valued pasture grass varieties can also be a lucrative income source for families.

Case study

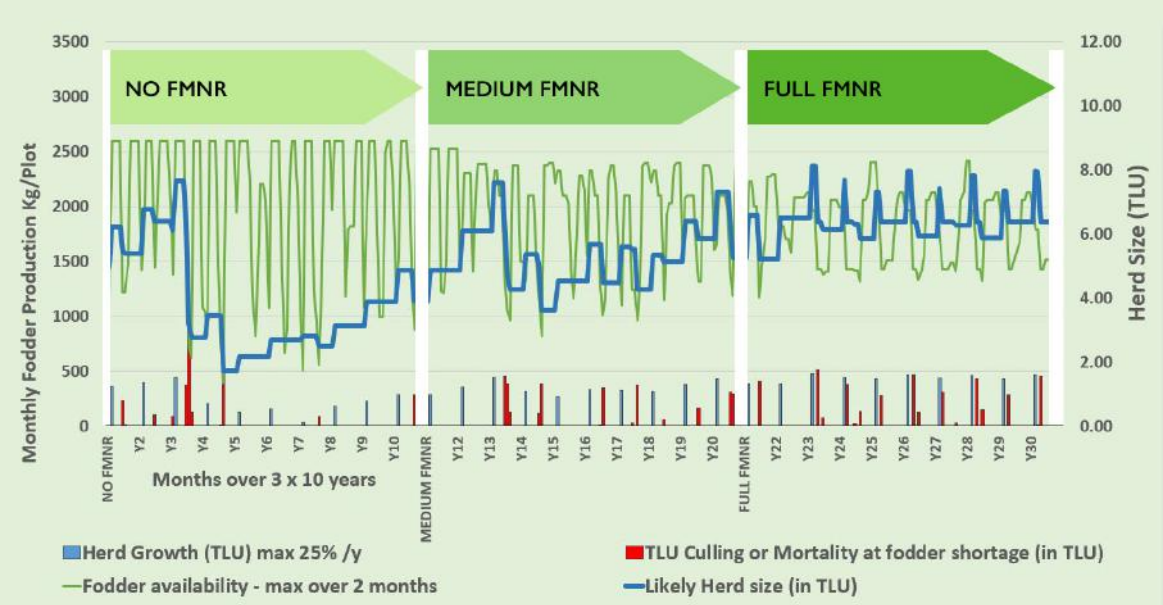
Fodder production in Kenya

Nancy, a farmer in Baringo, Kenya, has been using FMNR to foster tree regeneration on her land. In the past, the dry season each year would reduce the grass so much that her cows would have nothing to eat and in dry years many died. Since regenerating trees in her pasture land however, Nancy has had no cows die, even in years where neighbours' cows have succumbed. Nancy believes this is thanks to FMNR.

Figure 22 Nancy is using FMNR to increase her grass production. Kenya (2016). Photo: F. Schoubroeck

When there are no trees on the land, rain and sun reach the soil directly. This leads to more and more dense grass during moist seasons. After one month without rain, grass stops growing. A cow can survive only two months without fodder. On land with carefully pruned trees the growth of the grass is sufficient throughout the dry season. No cows will die of malnutrition. Nancy says: "trees make grass grow". This picture shows it: the grass is darker around the trunks.

What is the best ratio between trees and grassland? Nancy knows. Her neighbours grow few trees, and their cows died last dry season. An economic modelling tool was developed (called FarmTreeTool) to try to answer this question. The ideal ratio of trees to grass on land such as Nancy's was developed. The graph on the next page shows Nancy's observations are reflected in data about the interactions between the trees and grass cover.



The left side of this scheme shows a plot without trees, only grass. The situation is very uncertain. In wet periods, grass production is high – but during drought, fodder shortages wipe away almost a complete herd. It takes years to rebuild a lost herd. In the middle you see what happens if you allow local trees to grow on the grassland spontaneously and you prune them according to regulations: grass will endure the dry season longer. Still, the situation is not stable in the first few years. To retain enough water in the soil, you need sturdy, well pruned trees with open space for grass. On the right-hand side of the scheme you see the ideal situation. Mortality of cattle caused by drought is something of the past. Grass is growing less in wet months – but it grows year-round, feeding the cows. In times of scarcity dried bark can be fed to the cows. Goats will thrive on the tree leaves. The farm flourishes: cows may be sold or used for meat and milk at times the prices are high.

For more information about the FarmTreeTool see the **Farm Tree Services website**.

Small livestock, animal fattening and breed improvement

As grass, nutritious seedpods and leaves become more plentiful in FMNR sites, these can be stored by FMNR practitioners and used to fatten animals for profit. Now that additional feed and shelter is available, additional small livestock enterprises such as poultry or rabbits can also be introduced. These small breeds are of particular value to women, who can benefit from income, eggs and meat. This is another way to diversify incomes during the start-up period of FMNR, before trees are mature. Furthermore, once reliable fodder supplies are established, investments in improved breeds of livestock become more successful, and can be used to increase herd quality and productivity over time.

Market gardening

Home gardens or crops made more viable by the practice of FMNR, through improved soil quality and micro-climate, can be used to not only provide greater nutritional diversity at home, but also a good source of income. High-value wild fruits or other non-timber tree products such as gums, resins or medicinal herbs can also provide additional income before the trees are ready to harvest.

Case study

How the apple of the Sahel is feeding families in Niger

On his farm, Yaouza practises FMNR with a range of indigenous trees for various purposes. But one of his favourites is a modified variety of *Ziziphus mauritiana*: pomme du Sahel or, as it's known in English, 'apple of the Sahel'. The hardy tree produces a delicious, apple-like fruit that not only sells well, but is high in vitamin A and C.

Figure 23 Tree grafting. Photos: T. Rinaudo

Yaouza has grafted *Ziziphus* trees on his three-hectare, rain-fed farm to increase productivity and diversify his income sources, helping to enhance his family's livelihood and resilience.

The trees are pruned very hard each year, clearing the way for cultivation and resulting in vigorous regrowth. This is important, because the grafted trees grow fast. *Z. mauritiana* has a weeping willow shape and, if not pruned heavily, its thorny branches would seriously interfere with crop cultivation and harvest.

To protect his livelihood, Yaouza employs a man to stay on the farm and guard his 70 grafted trees. He pays him 40,000 francs (US$72) per season.

In 2017, poor rainfall saw the failure of Yaouza's entire cereal crop. But thanks to good harvests from his *Ziziphus* trees, he still managed to bring in 200,000 francs (US$360). From this sale, he invested half the profits into purchasing three sheep. These he sold for 395,000 francs ($708), for a profit of 295,000 francs ($530).

"With this profit I have invested in my household food provisions, children's education and health, and I support relatives," he said. "I [also] bought a motorbike."

Figure 24 Yaouza (centre) is earning good profits by selling fruit produced by his grafted *Ziziphus* trees. Photos: T. Rinaudo and World Vision Niger

Agroforestry, forestry and tree planting

Because FMNR can increase tree cover on both farm and forest land, it's not difficult to see how it can help forestry and agroforestry efforts. Through careful selection of the species and location of stumps to be regenerated, FMNR can be used to implement systems such as EverGreen Agriculture, alley cropping, woodlots and silvopastoral systems. FMNR can also provide both a social and physical foundation that increases the likelihood of planted trees surviving, if additional planted trees are desired. The authors have seen numerous instances in which FMNR practitioners, encouraged by the success of FMNR, have gone on to plant desired tree species and provide them with the necessary water and protection required to ensure high survival rates.

In some cases, tree planting is employed after FMNR and other methods have restored the soil and water to a point where planted trees have the best chance of surviving; essentially, after a more favourable micro-climate has developed. Tree or enrichment planting can also occur simultaneously with FMNR if there are not enough surviving stumps or self-sown seeds to meet a site's objectives. Land users may also choose to plant trees that are not native to the area, or not available through regeneration on their land, such as species valued for fruiting, fodder, fertiliser or timber.

Case study

Planting of high-value trees on regenerated land in Timor-Leste

Often FMNR is used to create a suitable environment to allow for the planting of alternative species to supplement what is naturally regenerated.

In Timor-Leste, Manuel practises FMNR on sloping land with native *Eucalyptus alba*. After stabilising erosion and improving the area's micro-climate, he plants more valuable species between his FMNR trees, such as cinnamon. Over time, he plans to reduce the number of FMNR trees while increasing growth of high-value tree species.

A similar strategy has been adopted by farmers in other parts of Timor-Leste with coffee plants and naturally occurring *Eucalyptus urophylla*. They groom the *E. urophylla* as shade trees for the coffee crop, which helps boost their harvests and increase their incomes.

Figure 25 Manuel Mendes (left) with Manuel da Silva (centre) are harvesting pineapple on Manuel da Silva's farm where he implements FMNR. Timor-Leste (2016). Photo: Roni Pati Tpoi

Farmer Managed Agroforestry Farming in Niger

A system of integrating planted trees with FMNR was developed by Peter Cunningham in Niger, called the Farmer Managed Agroforestry Farming system. In this system, Australian acacias are planted in a grid formation, with interspersed FMNR trees. The nitrogen-fixing acacia trees improve soil fertility, lower temperatures and wind speeds, while yielding nutritious seeds, firewood and small poles for construction.

Figure 26 Australian acacias planted alongside FMNR trees. Niger (2007). Photo: T. Rinaudo

Conservation agriculture with trees

Conservation agriculture is based on three principles:

- keeping bare land covered at all times;
- disturbing the soil as little as possible; and
- rotating crops.

This system works well with FMNR, where prunings and leaves can be used as ground cover and compost. Tree roots help to break up hard soil, avoiding the need for excessive tillage, while some trees produce natural fertiliser to boost soil fertility. As trees grow, they provide additional fodder and firewood. This reduces the need for families to use crop residues for fodder and fuel, and enables land users to leave the residues on the field, protecting the soil from erosion, building soil fertility, and reducing evaporation and water run-off.

Permaculture

Permaculture is an integrated approach to farming in which production systems are designed to mimic or directly use natural ecosystems. Permaculture systems are fully compatible with the natural regeneration of trees. The trees are able to contribute to other components of the permaculture system by providing mulch, improved micro-climates for crop growth and fodder for livestock, etc, while also being a productive component in and of themselves.

Conservation of soil and water, and erosion control

FMNR decreases the speed of wind and water run-off, while trees help to hold soil in place. Trees also allow more water to sink into the soil and recharge wells and aquifers. The organic matter from tree leaves being shed helps to improve the structure of soil, while fertiliser trees increase soil nitrogen.

FMNR is typically implemented to restore degraded land. Occasionally, land has been so degraded that there are few sprouting stumps or naturally sown seedlings remaining. In situations like this, soil and water conservation practices such as digging zai holes, half-moons and direct sowing of tree seeds may be implemented to bring the land to a point where FMNR can be practised. In locations with hardpan or compacted soil, digging zai holes and half-moons can be practised at the same time as FMNR is applied to existing tree growth. These methods increase the capture and infiltration of water, and concentrate fertility for crops and trees growing in the depressions. For more information, **refer to this tutorial on zai pits**.

Case study

More trees, more water

Scientists have proven that intermediate (moderate) tree cover can maximise groundwater recharge in the seasonally dry tropics. Where FMNR has been conducted at scale, such as in Niger and Ethiopia, there are documented cases of water tables rising, and springs which had long dried up flowing perennially again.

A number of factors can explain this. Most of the soils in the seasonally dry tropics have lost significant amounts of moisture-retaining organic matter. In addition, the removal of vegetative cover and continuous grazing has compacted these soils to the extent that they now shed water – in extreme cases, over 90 percent of the rain that falls does not soak in, but flows away, causing erosion and flooding in the process. Additionally, storms in the seasonally dry tropics tend to deliver large volumes of rainfall in a short period of time, further negatively affecting the ability of already compromised soils to absorb moisture.

Figure 27 A regenerated spring. Ethiopia (2016). Photo: T. Rinaudo

The Tigray region is one of the most water insecure regions of Ethiopia. However, Tigrayan communities that have combined soil and water conservation measures with natural regeneration of trees on the hills and valleys have become the most water secure communities in all of Ethiopia. In Abreha Weatsbha, the community decided to no longer overexploit the vegetation on the hills, and trees soon began regenerating. In addition, they dug many kilometres of contour banks and converted deep gullies into dams.

More water began to soak into the ground recharging water tables. In the valleys the water table rose from a depth of nine metres to less than three metres from the surface in just two years. Community leader Aba Hawi calls this 'water banking'. He says, "We make our deposit in the hills, and withdraw it in the valley." This community, which had been threatened with relocation because conditions had become so dire, went on to dig over 600 shallow wells. In several places the water table has risen to such an extent that it is even coming out of the ground under pressure. Now even in drought years they grow two to three crops per year through irrigation by drawing on their 'deposit'.

Today, this community which was vulnerable to both drought and flooding, is not only food secure, but they produce a surplus. Flooding has stopped and their 'water deposit' ensures that they have nothing to fear during drought.

On Mount Damota, in southern Ethiopia, heavy deforestation had contributed to most of the springs drying up completely, or only flowing after rain. Within a few years of regenerating the trees on 500 hectares, 12 formerly dry springs 'returned' and one completely new spring appeared. Nine of these springs now flow permanently through the year.

The importance of these experiences and the scientific findings cannot be underestimated. Two of the most serious issues facing communities globally in the semi-arid zones are water and food shortages. Ironically, many of these very same regions are subject to seasonal flooding during the rainy season. By the simple act of restoring tree cover through FMNR, flooding can be greatly reduced and more water can be 'banked' for times of need. For the semi-arid tropics at least, more trees do indeed mean more water.

Rotational grazing

Improved grazing management systems, also known as managed, holistic or planned grazing, are especially complementary to FMNR. This is because grazing livestock away from newly regenerating trees until they're large enough to withstand grazing pressure helps them to grow more quickly. FMNR in turn provides additional fodder, shade and shelter for livestock, and may contribute to increased water supply through groundwater recharge.

Fuel-efficient cookstoves and alternative fuel sources

Programs introducing fuel-efficient cookstoves and alternative fuels are a natural fit for FMNR, as these interventions reduce demand for firewood and, as a result, the pressure on people to cut more trees. These interventions are frequent in disaster and refugee relief contexts, as well as in health programming.

Economic development

Because so many people around the world make their living from the land and other natural resources, when they are able to improve the land, they can often improve their incomes too. As incomes increase, FMNR practitioners may want to build businesses, diversify their work, or increase their savings for the future.

Many communities practise FMNR in groups, giving people solidarity and mutual support as they implement FMNR and negotiate for change and collaborative partnerships with leaders and other stakeholders. Groups may include farmers' groups, women's groups, savings and loans groups and cooperatives. FMNR groups that function well are accustomed to working together and have built trust over time, so they can achieve other goals effectively as well.

Savings groups

Communities practising FMNR may choose to work together to achieve additional benefits. Savings groups allow community members to build their savings for future needs, learn financial skills, provide for emergencies and hard times, secure loans and support vulnerable members of the community. Both FMNR and savings groups build trust and cooperation skills, so they fit easily together.

Local Value Chain Development

Communities with improved land and increased income and savings may also want to consider small business and value chain development. These practices help people generate more sustainable incomes by building up their businesses, learning business skills and gaining better access to profitable markets. Like FMNR, these practices depend on groups of people coming together to support each other and collaborate for the benefit of the community.

Case study

From small bushes, big trees grow

Figure 28 Rhodes grass flourishes in an FMNR field in Kenya (2015). Photo: T. Rinaudo

Over the last decade, World Vision and partners have been working very hard to introduce FMNR wherever a receptive ear can be found. Uptake generally follows the following pattern.

First there is disbelief that this low-cost, simple technique can be beneficial. Deep-seated paradigms such as "trees are bad for crops, trees grow too slowly and indigenous trees have no value" are challenged, and so there is some pushback.

An enlightened few decide to pilot FMNR on a small scale. Within a short period, positive changes are self-evident: the landscape looks greener and now, with trees, is more pleasing to the eye. By thinning and pruning thorn tree thickets, light is allowed through to stimulate grass growth, and the trees themselves produce fodder. An improved habitat for natural predators results in fewer insect pests. Soil fertility increases. With lower temperatures and higher soil moisture holding capacity, when drought does occur, it has less impact.

As a result of these benefits, farmers are reporting more productive farmland, higher incomes, school fees paid on time and without stress. Children are spending more time in school and, along with their mothers, are spending less time foraging for firewood. Hope for a bright future is being restored. Confidence is growing and farmers are investing more in agriculture, because it pays to do so and because the impact of drought and flood are reduced, so there are less risks – allowing for new beehives, improved seed, fruit trees, haymaking and storage facilities. Incomes increase in line with these investments.

When farmers see their neighbours prospering and no longer toiling for little return, they in turn begin to take up FMNR, and what was an oddity very quickly becomes the norm. What was initially met with resistance quickly becomes a self-propelling movement.

Musa's story of change: from meagre harvests to plentiful production

Figure 29 FMNR has resulted in plenty of fodder for Musa's cattle, and milk production has increased from seven to 12 litres per day. Kenya (2015). Photo: T. Rinaudo

Musa's story is not atypical. Musa, from Kiambogoko district in Kenya's Nakuru County, was a struggling farmer. Musa's farm yielded meagre harvests even in good years. In 2009, he lost five head of cattle due to drought, despite desperately walking them long distances in search of fodder. In order to feed his family and pay school fees, Musa would leave home in search of day labour elsewhere. When he did find work, he was lucky to earn just 200 Kenyan shillings or about US$2 per day, barely enough to be worthwhile, but he had to do it to pay school fees. Musa's wife, along with the other village women, would regularly walk 10 kilometres to the Eburu forest reserve to collect firewood and accelerate deforestation. This was exhausting work that prevented her from performing other more productive activities, and it had to be repeated time and time again. Musa did not see his farm as helpful for his situation, let alone a profitable enterprise.

The FMNR for Kenya project is a partnership between World Vision Australia and the Australian Department of Foreign Affairs and Trade. Thanks to the project, Musa learnt about FMNR in 2013 and volunteered to become an extension agent.

"FMNR has brought me far," Musa says. *"I have seen many changes here in my life. Before, I had many problems, especially for obtaining firewood and fodder and for paying school fees. I did not know that if you have a farm, you should take care of the trees, or that the farm could help me in my situation."*

Musa has 2.4 hectares of land. Today, 1.4 hectares are under dense tree cover for grazing animals and the remaining hectare is reserved for crops, which are grown under lower density tree cover.

"With FMNR the grass has grown and my wife and children no longer have to go beyond my farm to obtain firewood," he says.

Thanks to FMNR, Musa reports that temperatures are lower, the air is fresher and he has plenty of fodder, which he also sources from the nutritious bark of pruned indigenous acacias. Not only did he not lose any livestock during the 2014 drought, he didn't have to move his animals long distances in search of fodder. Today he does not fear drought, as he has plenty of grass, tree leaves and bark, even in the dry season.

"I have so much grass that I'm thinking of building a hay shed. The fertility of my soil has increased."

Milk production from four cows has increased from seven to 12 litres per day. One litre of milk sells for 40 shillings (US$0.40). Growing trees has also enabled Musa to increase honey production. He had beehives previously, but they only yielded eight kilograms annually per hive. Post-FMNR, the same hives are yielding 32 kilograms annually per hive. Honey sells for 200 shillings (US$1.98) per kilogram and Musa has three hives, bringing total income from honey to 19,200 shillings (US$190). Musa plans to increase the number of hives, but at the moment most of his earnings are going into school fees.

Grain yields have also increased. From less than 0.4 hectares, Musa would typically harvest just 20 kilograms of maize, but since beginning FMNR, average yields have increased to 180 kilograms of maize and 90 kilograms of dried beans. Musa says life is much better for his children.

"I am no longer obliged to search for day labour far from home. I now stay home because FMNR has employed me."

Money earned from FMNR has enabled Musa to fence and subdivide his farm with barbed wire. Musa is also planting Rhodes grass, and plans to bale and sell hay in the future. One bale can sell for 400 shillings (US$4) when there is high demand. Rhodes grass is notably greener and denser beneath Musa's pruned acacia trees than out in the open.

"FMNR has opened my horizons to be a farmer and to adopt innovation," says Musa. *"Before, the farm wasn't much more than a place to live and it had low productivity. In fact, [it] was a liability, as I regularly lost my cows during drought. I did not see farming as a viable way to meet my family's needs. Today, I have a growing and thriving business which supports my family."*

Because of his renewed confidence and the reduction of risk, Musa is investing in improving his farm's productivity even further.

The changes arising from FMNR have been so sweeping and significant that Musa and his neighbours have come up with a new catch-cry: *"melele FMNR, FMNR melele"* (forever FMNR, FMNR forever).

Chapter 5

Community engagement to create a sustainable FMNR practice

Summary: Community engagement to create a sustainable FMNR practice

- Effective community engagement that helps a community to understand, be empowered, confident, innovative and share their experiences is critical for long-term sustainability of the FMNR movement.
- Community engagement generally covers six main areas:
  1. **Working with the community** to build relationships and trust when introducing the concept of FMNR, as well as understanding who to engage and how through a **stakeholder analysis.**
  2. Creating a community-led **FMNR action plan** to move from engagement to action.
  3. **Building capacity** in the community, not only to practise FMNR technically, but also to solve problems, negotiate, experiment, observe, advocate for policy changes, and communicate and share FMNR with others.
  4. Supporting **FMNR champions** to spread the movement and support the community to adopt the practice sustainably. This involves timely, regular follow-ups, particularly in the early stages.
  5. **Identifying, creating and implementing bylaws** to reflect the community's agreements about FMNR and how the resources should be managed.
  6. **Advocating for policy change** to help further enable the spread of FMNR.
- As each community is different – with different cultures, histories, politics and challenges – it will be necessary to work with them closely to design and implement both sensitive and effective community engagement activities.
- When community engagement in FMNR is effective, communities understand the link between their lives and the environment, and are fully empowered to identify, experiment, innovate and share the changes necessary in a sustainable way.

Resources

- **Guidelines for Facilitators**, available through the FMNR Hub, describe one way to introduce and explore FMNR with a community and work towards developing an action plan for its implementation.
- The **FMNR action plan template** (Annex 2) can be used to plan FMNR activities with the community.
- The **stakeholder analysis template** (Annex 3) can be used to identify key influencers and groups to engage in FMNR activities.

For FMNR to become a sustainable practice embedded in everyday life, it requires a community that is empowered and interested to:

- understand their environment and identify what is needed to improve their lives;
- change the ways they think about and manage their environment;.
- create and implement bylaws and other agreements on sustainable land management and income generation;
- when possible, work with government officials and others to create a favourable legal and policy environment in which they work and live; and
- share their experience and knowledge with others to ensure the spread of FMNR and its benefits.

This level of community understanding, empowerment, confidence, innovation and sharing is the result of ongoing, intentional engagement with all stakeholders in the community. In any FMNR project, this process starts with the taking stock assessment described in **Chapter 3** and continues through the following components of an FMNR project:

1. Working with the FMNR community.
2. FMNR action planning.
3. Building capacity.
4. Supporting FMNR champions.
5. Identifying, creating and implementing bylaws.
6. Advocating for change.

These components may be represented in different ways across different FMNR projects. The purpose of each component is described below; suggestions for ways to approach these are based on our experiences from many different projects.

Examples of community engagement activities

Whether you have worked with the community in question for a long time or are new to the area, a good entry point is to learn from people's key concerns uncovered in the taking stock assessment. Generally, people will engage with topics of vital importance to them. Ask questions – lots of questions. People love to be heard; and, by asking the right questions, your audience will be forced to think creatively, come to conclusions and devise solutions they may have never considered before. A self-generated solution has much more power than one provided by an outsider.

Engagement can come in many forms. If you are introducing FMNR to a community unfamiliar with the concept, engagement may include meetings to explain the benefits, asking elders key questions in front of a wider audience and conducting an exercise that explores what the environment was like in the past, what it is like in the present and what is likely in the future. Engagement could also involve storytelling through theatre or film, or by telling the right story at the right time. Exchange visits are another powerful form of engagement, giving the floor to an 'outsider' who has lived and overcome the same difficulties experienced by the audience. At the right time, an FMNR demonstration and full training, with timely and regular follow-ups and encouragement, will be required.

Where the community is already practising FMNR, or fully committed to it, engagement might take the form of helping with bylaw creation, troubleshooting problems or providing capacity building for changing policies that impede the success of FMNR. Maintaining relationships through regular visits to encourage, correct (if necessary) and to advise on dealing with obstacles is important. What separates a good FMNR facilitator from the rest is the ability to make genuine friendships, to have empathy and to be a good listener. Attending weddings, funerals and birth ceremonies may not seem like working (to a Western world view, at least), but this type of engagement can spell the difference between successfully introducing FMNR and simply trying to.

Here are some activities that are frequently undertaken to introduce, or further support the community, in the development of the FMNR movement:

- Wide-scale awareness creation, including practical field demonstrations of FMNR techniques and use of local media, such as radio and posters, to inform the public of its benefits.
- Consultation meetings and stakeholder planning, preferably working towards creating a shared vision for the future. Community ownership and commitment will make the difference between merely having plans and having plans that work.
- Vulnerability and capacity analysis (VCA) – see tools for this **here**.
- Facilitation of community-led action planning, implementation, monitoring and adaptation to ensure the best outcomes from the efforts of land users.
- Facilitation of open dialogue and exchanges at the community level through workshops and community meetings. All stakeholders, including minorities and marginalised groups, need to be heard, because when aiming to sustainably manage a shared natural resource base, everybody's needs must be accommodated to the degree possible.
- Engaging children through school programs or environmental club activities. Children can also be a powerful force for change, and should be included appropriately.
- Survey of potential FMNR fields and development of preferred FMNR species list with the community (see **Chapter 4**)
- Stakeholder analysis to identify potential partners and important stakeholders within and beyond the community, such as identifying traditional and religious thought leaders. See following section for more information on one way of doing this.
- Facilitation of exchange visits with existing FMNR practitioners. This is a powerful way to demonstrate the benefits of FMNR.
- Strengthening of existing governing structures, through training, mentorship, networking, etc; or, if they are not already present, facilitating their establishment. These structures can include FMNR committees, task groups, associations and similar organisational structures, according to the community's culture and needs.
- Creating workable mechanisms for dealing with threats and obstacles. Usually this includes development of bylaws around tree use and management; establishment of volunteer patrollers; and a sustainable and appropriate means of enforcing regulations, such as fines, community service or other approaches as agreed by the community.
- Advocacy for government recognition and formalisation of rights and responsibilities of those practising FMNR.

Working with the community

Engaging the community in the right way from the beginning will be foundational to the success of any FMNR activities going forward. FMNR involves change: not just in the landscape, but often in the ways that people interact with each other. Understanding traditions, traditional roles and the dynamics of people in the community is an important part of engagement. Key principles of FMNR, such as inclusion and ensuring that women and minorities have equal rights and access, may require the community to carefully think through their values and norms. This is a valuable outcome, but it requires courage and openness. The following sections will describe some of the things to keep in mind when engaging with the community to achieve these objectives. It is also important to remember that these activities should occur throughout an FMNR project, not simply as part of initial activities.

Encouraging community involvement

It is important that decisions about land use involve all the different groups in the community; including women and men, elders, young people and children, people with disabilities and those who may not work the land, as well as any minority groups. In FMNR, the more people involved the better. Having people from all backgrounds share their experience and collaborate to improve their environment makes everyone more successful.

If there are both settled and nomadic populations using the land, it is ideal to involve both in discussions and planning if possible. Herders may think reforestation means they will no longer have access to traditional grazing grounds. Take time to involve them and explain benefits; they too can bring knowledge, experience and valuable

contributions to regeneration work. **Chapter 7** includes more information on how to involve herders and other groups such as charcoal makers, woodcutters and representatives from other industries who may feel their income source is at risk because of FMNR.

Traditional leaders and land owners are particularly important to involve. Where possible, include extension staff from departments of environment, forestry and agriculture, as well as local authorities, across both FMNR planning and decision-making.

Stakeholder analysis is a tool that can be used to identify these different groups or key individuals, and examine their power to influence the outcomes of the FMNR project. This information is valuable for identifying who to engage, and how best to involve them. For example, in northern Ghana a 'power analysis' was conducted to identify who the key influencers were in the community. This enabled project staff to initially focus their efforts on this group, which included local government, traditional chiefs and the tindaama or 'land custodians'. Once they had convinced this group of the benefits of FMNR, the rest of the community readily followed their lead. As a result, this project became very successful in a short period of time. A stakeholder analysis template can be found in **Annex 3**.

The value of including community leaders

When you are engaging with the community, don't forget the community leaders – these people can make or break the success of FMNR! Leaders, for our purposes, come in many different forms:

- **Traditional leaders** often determine how land is used, and they have a significant impact on the attitudes of the community. By engaging with traditional leaders first, you may find their support ignites the interest of the community as a whole.
- **Faith leaders** play an important and often influential role in the lives of the community; they need to be invited into FMNR efforts too.
- **Group leaders** in cooperatives, as well as farmers', women's and other community groups, are important allies.
- **Natural leaders** are influencers in their community, and it is important to know who they are and include them in FMNR efforts. Natural leaders are people that others trust and look to for direction.

Leaders can support the FMNR movement by reinforcing positive messages about FMNR, leading by example through their own FMNR practice, helping to mediate conflicts over FMNR plots and communal resources, enforcing bylaws, and enabling access to the community for a project facilitator.

Involvement through FMNR groups

While FMNR can be practised by individuals as well as whole communities, it is helpful to work with others when possible. Two heads are better than one when problems come up, and groups of people can exert greater influence than individuals alone. Working as a group is also very important when tackling landscape-scale challenges. Making changes at the scale of a whole watershed or catchment area requires those at the top of the hills to work with those further down.

Belonging to a group can provide mutual support, shared learning, collective action when needed and a united front to approach government entities, NGOs and donors. Common relevant community groups that FMNR operates through include:

- women's groups;
- youth groups or clubs;

- farmers' and producers' groups;
- cooperatives and collectives;
- savings groups; and
- groups existing for the purposes of mutual support and collective action, which have an interest in FMNR.

Where a community does not have existing groups able to fill this role, committees and groups can be formed exclusively for the purposes of the FMNR work. While people are more highly motivated to practise FMNR on their own private land, as opposed to group work on communal land, the benefits of belonging to a group still apply.

Building community agreement and ownership

FMNR involves decision-making, therefore community ownership of the process is essential. The physical practices that are part of FMNR activities are important, but they will not succeed unless the people who use the land more broadly are in agreement on how to manage it, as well as the regeneration of the trees.

Every man, woman or young person who uses the land should decide together how the community will treat the trees being regenerated, and what benefits each will get from the FMNR work.

FMNR succeeds best when everyone who uses or accesses the managed land is engaged in the process from start to finish. This way, FMNR plots are more likely to be protected from damage by competing land uses, such as grazing, and conflicts over the use of resources are avoided.

Building relationships and trust

Any type of change, even good change, can be frightening. Not everyone in the community may be convinced that the changes brought about through FMNR will be good. They may worry trees will compete with their crops, or that their herds will be permanently kept from traditional grazing grounds. Or they may simply worry about changing the way they work their land.

Project success is not just about managing projects

We are dealing with human beings and we need to foremost make connections on the human level. So, as agents of change, we need to show genuine interest in the things that are important to the people we work with – births, marriages, deaths, cultural and religious events are the big events of many rural people's lives. To act as if they weren't important and to restrict your dealings with people to FMNR issues would limit our own growth as human beings, the richness of our experience and the making of genuine friendships, just as it would limit the degree to which communities trust us.

FMNR thrives when people trust each other and when there is cooperation to reach their shared goals. It is important that everyone has the opportunity to understand and become comfortable with FMNR in their own way. For some, this will take longer than for others; and for the majority, this often happens once a critical mass (a convincing number) of people are already practising it. Ideally, initial FMNR workshops, training and capacity building meetings will facilitate a learning journey for the community, where people grow to associate their current challenges with deforestation. Developing their aspirations for regreening will culminate in the creation of a shared vision for the future.

For an FMNR initiative to be adopted, considerable time needs to be invested into promoting an environment of open dialogue and exchange of ideas. This is especially true when someone external to the community is introducing FMNR. It will probably be necessary to conduct several meetings before people are convinced to

experiment with FMNR. After all, FMNR may challenge practices that go back many generations; practices which, to their way of thinking, are rational and good.

Community engagement will also look different depending on whether it is facilitated by members of community or someone from the outside, like a program manager for a development organisation or a government extension worker. If you are not a part of the community, a critical piece of your work is learning as much as you can about the community before you engage them in FMNR. You need to build relationships and trust, so the community has a reason to hear what you say.

The key to FMNR success is that the community doing the FMNR work has full ownership of the process. If FMNR is promoted by anyone from outside that community, it's critical they know how to work in a way that does not take over, but leaves decisions, responsibility and power firmly in the hands of the people. Liberal use of questions and allowing time for people to make their own conclusions goes a long way towards empowering and enabling the community.

It is wise to expect some resistance and even opposition. Be prepared to make visits and spend time with people one-on-one and in small groups. Most importantly, join people on their farms or communal FMNR sites and **work with them on pruning,** explaining the benefits as you go. When extension agents do not engage in physical labour, it conveys conceit and puts distance between themselves and the people they are trying to teach; who, in most cases, earned everything they own through manual work. Above all, always **listen**; listen for what people know already, listen to their concerns, and listen to their hopes for the future.

Remember these points when engaging the community to build agreement and trust

1. Be inclusive of everyone, regardless of their role, gender, ethnic group and age.
2. Respect and encourage thoughtful, civil debate.
3. Discuss every person's concerns and work together to find solutions that help everyone. There is nearly always a locally appropriate solution; give people the opportunity to suggest it.
4. Always start with the assumption the other person has positive intentions and respond to misunderstandings and mistakes gently.
5. Whenever possible, invite people already practising FMNR to share their experiences and knowledge with your community.
6. Listen and learn. By listening you will develop the knowledge necessary to support the community. It is the only way for you to find out what might be the best way to introduce FMNR. Listening will help you become aware of threats to success and it will win you many allies.
7. Share what you know and what you don't know. Admit when you don't know the answers.
8. Talk about values. Don't lecture or preach, just share your values, listen to others' and walk your talk. Then, when you make suggestions, connect them to shared values.
9. Make sure that everyone knows they can try FMNR in their own way, on as much or as little land as they are comfortable using.
10. Do what you say. If you promise things you can't do, people might like you, but they won't trust you.

Case study

Inspiring communities to act in Ghana

FMNR champion Norbert Akolbila is telling a success story under moonlight in Ghana's Bong District.

Norbert is the late founder of Movement for Natural Regeneration (MONAR), a Ghanian organisation dedicated to teaching tree and land regeneration techniques to communities in West Africa.

Under the bright moonlight – supported by generator-powered electricity – the MONAR team shows videos and pictorial presentations on FMNR to the Ayopia community, while drawing attention to local environmental and degradation issues.

More than 600 community members have shown up, including the chief and assemblyman as well as women, men and children.

Figure 1 Norbert Akolbila, facilitating an FMNR event in Bongo District, Ghana (May 2015).
Photo: T. Rinaudo

Norbert, a passionate advocate of FMNR, encourages everyone to join a discussion after the presentations. As he speaks, people become deeply moved. They share their knowledge of past, present and future conditions of their environment.

An older man joins the conversation.

"The good thing I know of the present is that there are now schools for our children to attend, as [formerly] we did not have any. All other things about the environment is getting worse every day."

Community members recount the good old days when their streams provided water year-round for their animals and households; the environment was green and filled with trees; and their farms provided good yields. But within the past three or so decades, they say their situation has changed, due to inappropriate land use and management practices. Some people, who've heard of the progress FMNR is making to restore degraded lands in Talensi, say they hope to introduce the concept into their community as soon as possible.

As the meeting draws to a close, Norbert addresses the community.

"I have never met such a large crowd at an outreach program at night. Even if a quarter of you people take this story seriously and practise FMNR, it will make a difference."

From engagement to practice: FMNR action planning

Once the community has decided they want to change their environment and that FMNR is an appropriate method for addressing many of the issues that concern them, they are in the right frame of mind to implement FMNR.

Together, they can now formulate a vision statement that answers the question, "What do we want to achieve?" They can also outline a goal or goals for their work. Once done, it will be very important to jointly formulate an action plan that turns their vision and goal into reality.

This action planning may take place at an FMNR workshop. This workshop should include representatives from all groups in the community that are affected by the FMNR project. Necessary participants will have been determined from work completed while getting to know the community and the stakeholder analysis. Ensure that key influencers such as local leaders are present as well as stakeholders, such as officers from environment or agriculture ministries. See the FMNR Hub's **Guidelines for Facilitators** for more information.

Establishing a vision statement and community goals

The vision statement is a description of what changes the community would like to see as a result of adopting FMNR. Visions can be a short, written statement – for example, evoking a productive landscape or a community free from poverty and hunger – or a drawing or map of the area, showing how the community would like their landscape to look in the future.

When forming a vision statement, it's a good idea to look ahead at least five to 10 years. Vision statements are also useful to bring together a group of people and motivate collaboration around a common mission. Facilitation techniques, such as vision mapping or development of a 'rich picture', based on current asset and social maps[1], are useful here to help people establish a common understanding of the current situation, and a common vision for the future.

Good FMNR goals tend to include one-to-three-year action statements such as "increase tree cover from 10 to 50 trees per hectare over three years". These goals should be specific, measurable, actionable, realistic and time-bound (SMART). It may be easiest to start with only one or a few goals to begin with. Ensure these goals are aligned with the vision statement already created.

Developing an FMNR action plan

The FMNR action plan should cover:

1. What work will be done.
2. Who is responsible for doing it (if more than one person, list them all).
3. When each action will be completed by.
4. What materials and funding are needed.
5. Where the work will take place.

The action plan should be recorded in a simple table, with columns for each of the four types of information needed, so everything is remembered for future use.

Action plans can be developed by small groups, perhaps according to geographic area or organisation, if they are a mixed group. Groups can also complete the FMNR action plan template, either in one go or step by step (see **Annex 2**). Where communities are fortunate enough to have a secure meeting place, it is good to pin the vision statement and action plan to the wall for them to refer to, and to keep before them during subsequent meetings.

A good plan won't limit itself to local communities and government agencies. It will also include a communication strategy for any organisations represented by participants, such as NGOs or government departments. Participants might return to their organisations full of excitement for FMNR, but they face the challenge of

[1] These tools are commonly used in Participatory Rural Appraisal and Rapid Rural Appraisal approaches. An overview of these tools by FAO can be found **here**, or here from the **Catholic Relief Services**.

convincing their busy colleagues about the importance of implementing it, and they need to be prepared for this. The reality is that organisations usually already have set ways of doing things and goals they are working towards. Most are blind to new opportunities, and so participants will need to return warned and armed with a plan.

Keep in mind:

- For the action plan to work, you will need to engage everyone involved with or affected by the implementation of FMNR in the community.
- Take the time needed to come up with a workable plan (usually one to two hours).
- Make sure everybody has a chance to contribute, and that not just leaders and outspoken people make the plan. It may be necessary to separately consult marginalised groups, such as women or ethnic minorities, so they feel free to express themselves, and then to combine the plans at the end of the session.
- The plan does not have to be perfect, and good plans are always reviewed and modified regularly.
- Agree on a time to meet again and regular meeting times so that progress against the plan can be monitored. This way, if blockages have prevented tasks from being accomplished, the whole group can address the issues.

Capacity building

Capacity building activities seek to equip people with the knowledge and skills to not only successfully practise FMNR, but also to work together to do it: to negotiate, observe, experiment and share their experiences with others. Capacity building aims to help communities develop the skills and structures needed and to have the capacity to organise and manage the work, communicate about what they are doing and deal with problems. Capacity building should enable and empower participants to take full ownership of and responsibility for their FMNR practices.

Topics for capacity building

Undertaking some form of capacity needs assessment will assist in planning what topics to cover in capacity building activities, as well as identifying the best methods to use. This assessment should be based on the FMNR action plan, and any stakeholder assessment activities that were undertaken.

For a community with no experience with FMNR, capacity building activities will cover the physical and technical practice of FMNR, such as tree selection, pruning, protection and maintenance. See **Chapter 4** for this information.

When some form of FMNR has already been used in the area, learning about these practices will help identify the best techniques for a community to start with. Building on and perhaps adapting a traditional system is more likely to work than presenting something entirely new.

In addition to the technical components, there are many other skills a community may need to sustainably spread the FMNR movement. These include:

- Creating and using bylaws.
- Advocating for greater support of FMNR from local leaders, other leaders and government officials. This may include advocacy for favourable policies or simply for visits from agricultural or forest agents. **Citizen Voice and Action** is a powerful advocacy tool taught to communities by World Vision.
- Experimenting with new methods of FMNR and documenting and sharing that learning. (See **Chapter 10** for monitoring and evaluation of FMNR.)
- Teaching others about FMNR. The **FMNR Online Training Academy** has courses available for facilitators working with the community to spread FMNR, while more information about FMNR champions can be found in the next section. This training is currently only available for World Vision staff.
- Finding and improving markets for FMNR products (wood, fodder, wild foods, traditional medicines, dyes, seeds, etc.) to increase and diversify incomes. Methods such as **Business Facilitation** and **Local Value Chain Development** are useful for this (See **Chapter 4**.)

Methods of capacity building

Training can take different forms according to the community's needs. It could include workshops, field trips, use of demonstration sites, field schools, multi-day courses and even online training. Training may be held for large groups, farmer groups or individuals. Peer-to-peer learning is one of the most common ways that FMNR spreads, so focused effort should be put into training land users and enabling and empowering them to share their knowledge.

It is important to think about how to design these training activities so that community members are able to participate. Consider timing, distance from home and access, particularly to ensure groups such as women and people with disabilities can participate.

For FMNR practice, training should include a practical component in the field so that land users can see and practise pruning activities for themselves. Regular follow-up and field visits to boost skills and troubleshoot problems will also improve the success of FMNR.

It is important to remember that FMNR is not a standard practice, and so its actual form will vary from land user to land user. While teaching the principles of FMNR, trainers should be encouraging trainees to also experiment and learn by trial and error: to be observant, and to make adjustments to their methods accordingly.

Capacity building isn't only about bringing in new knowledge!

Capacity building also involves identifying existing knowledge and skills, and providing a forum for sharing. This is especially important when FMNR is being promoted by an outside agency. The facilitator may have FMNR experience in a wide range of contexts, and be able to address numerous questions and concerns, but communities and individuals are experts on their local context; they have learned a lot through intuition, trial and error, and observations. Recognising and valuing existing skills and capacities is important for fostering community ownership of FMNR activities.

Capacity building resources

There are many resources available for assisting in building FMNR capacity at the FMNR Hub.

Some notable examples include:

- a pictorial poster developed by World Vision in **English** and **French**, which describes the process and outcomes of FMNR;
- the **FMNR quick guide** on how to do FMNR; and
- the **FMNR Hub YouTube channel**, which has many instructional videos, such as:
  - **How to prune for natural regeneration**
  - **FMNR income generation**
- other video resources such as:
  - **Sustainable land management practices: Farmer Managed Natural Regeneration**
  - **Gestion durable des terres: Régénération naturelle assistée**

FMNR champions

FMNR champions are women and men who, after adopting and practising FMNR successfully themselves, have become passionate advocates. They have very good skills for managing trees and finding ways to make FMNR more effective for them, but they also have a heart for people. They have the skills to work with, support and teach others to adopt FMNR for themselves. FMNR champions also play an important role in FMNR projects and the spread of the FMNR movement more generally, due to the position of trust and influence they hold in the community.

As a Nigerien land user once explained to Tony Rinaudo in the 1980s:

If you as a foreigner convince me to try a new innovation and I implement it, but it doesn't work, I will suffer; but you can fly home with no consequences. Even if your Nigerien project staff shares this information with me, I will be sceptical because that person is paid to give those instructions, while it is me who bears the risk and the consequences. However, if another land user tells me to try something, I know it is genuine because their livelihood also depends on the efficacy of what they are promoting.

FMNR champions are valuable due to their ability to:

- share their knowledge and experience;
- teach others how to practise FMNR;
- provide encouragement and advice to other practitioners;
- help to monitor practice and troubleshoot problems; and
- work with their community to resolve conflicts, change policies and advocate with leaders and government.

Unlike most extension agents, champions live in the community and practise FMNR because it contributes to their well-being, not because they are paid to – hence they have enormous credibility. The majority of FMNR champions are members of the community they work in. By helping neighbours and family members, while drawing others in as they go, champions help establish a foundation of sustainability for FMNR practice.

The most effective FMNR champion may also be an extension worker or project manager from a development organisation. This is not always the case, of course, and even those who are not passionate and dedicated champions can still do an excellent job of training and supporting communities to practise FMNR. However, it is always helpful when paid staff have the heart of an FMNR champion.

Either way, as the community adopts and adapts FMNR to their context, and sees the benefits that it brings to their lives, more FMNR champions will be created. One goal of the FMNR movement is that each community will contribute to the spread of FMNR by teaching and supporting others to do it.

Identifying FMNR champions

Firstly, it is very important that a potential champion is practising FMNR on their own land, and that they have experienced and been rewarded by the benefits of FMNR. FMNR champions need to teach others from personal knowledge, and have enough experience so they can answer questions and anticipate potential problems.

Not all good FMNR practitioners are natural FMNR champions, however. Champions are people who are excited about the changes they see and have an inborn desire to share the good news with others. Communities will usually know who these people are. These are often the people chosen by a community to represent them during training or some other activity, because they will freely share what they've learned, and have the necessary communication and training skills to do so effectively.

External organisations seeking to hire FMNR promoters should seek candidates who share the qualities of champions. If possible, hire staff with existing FMNR expertise, who are practising FMNR on their own land. If this is not possible, don't worry: it's easier to learn the skills of pruning and troubleshooting than to have a generous heart for people, and natural teaching skills. Where practical, link staff who have limited FMNR expertise with existing FMNR champions and other experienced practitioners in the communities for FMNR training and mentoring.

Qualities of good FMNR champions

- **Excellent FMNR practitioners** who monitor their progress and experiment to solve problems with their trees.
- **Good citizens** who are respected in the community because of their behaviour and moral standards.
- **Passionate about spreading FMNR** and seeing people succeed. Rather than counting the hours while working on FMNR or teaching others, they'll be energised by what they are doing.
- **Natural teachers** who communicate patiently and clearly, willing to correct students when they are wrong, encourage them when they struggle and celebrate with them when they succeed.
- **Willing and able to regularly visit with community practitioners** and participate in meetings and discussions about practising FMNR. They love people and truly enjoy visiting them, spending time with them and listening to their problems. They are the people who can be counted on to stand by you when trouble comes. They are also not already too busy with other commitments, and are therefore practically able to spare time to share FMNR. Be aware these people are often in high demand, and so may already be quite busy.
- **Able to inspire others**. Some are extroverted and comfortable leading a crowd, while others, in their own quiet way, inspire the ones and twos – both are effective, they just work differently.
- **Patient and persistent.** They understand that people may take time to adopt a new idea, and are willing to continue the dialogue without getting discouraged or angry.
- **Forgiving and tough-skinned** when they are the object of jokes and derision, sometimes even abuse, as they practise and promote what may seem to some unusual at first.
- **Leaders who take initiative**. Not waiting for others to tell them what to do, but testing out new ideas and making use of opportunities.

Case study

Meet two FMNR champions

Nagueyeh

Nagueyeh grew up in Awdal district of Somaliland, and has worked with World Vision Somalia since 2009.

Nagueyeh first learnt about FMNR in 2012, through an Australian-funded project. At first, he thought it was only a farming intervention, but later came to see it as a means of fighting climate change, environmental degradation and building livelihoods.

"When we started the project, people did not value trees," he says. *"Cultivators asked, 'how can we leave trees on our farms? Our crops won't grow because of the shade', and pastoralists said, 'we need to cut trees down in order for our livestock to have fodder!'"*

Figure 2 Mohamed Nagueyeh Amin, FMNR champion at World Vision Somalia. Photo: T. Rinaudo

Nagueyeh's journey had begun. He read widely to learn all he could about FMNR, and took the attitude of learning together with the community as they developed a form of FMNR suitable for Somaliland. Demonstration plots were set up at regional and farm-scale levels, and progress was monitored jointly with the land users. Any small bushes present were pruned, and water harvesting structures were dug to trap water.

In six months, grasses started growing on previously bare ground. In two years, trees had increased in height by one to two metres, providing firewood and boosting honey production to supplement women's incomes.

From the outset, Nagueyeh engaged with government personnel. The ministry of the environment helped with creation of bylaws and assisted communities in enforcing them.

Nagueyeh's dream is to see all programs in Somaliland, no matter what sector they address, have an FMNR component.

"We need to put all our resources into protecting and restoring the environment through FMNR."

Amina

Amina is a 27-year-old mother of three and an FMNR champion. I met her while visiting a community-designated FMNR site in Somaliland.

I didn't notice her in the beginning. But as we began examining some of the regenerating shrubs, the community rushed around one of the plants. Once there was silence, Amina walked up to the plant and began explaining its importance to the community and what it meant to be an FMNR champion.

I was a little taken aback. Having already spent a few days in Somaliland, the confidence that Amina exuded in the presence of men many years her senior was, I must admit, unexpected. But as she explained the many uses of the plant and its importance to the community, there was silence and heads were nodding in agreement.

Figure 3 Amina, a respected FMNR champion in Somaliland (2017). Photo and story: M. Munyeki

Coaching FMNR champions

Although champions will already have many suitable natural qualities, all can benefit from training and support to make their efforts more successful. Champions are critical to the success and spread of an FMNR project, so investing in them pays valuable dividends well beyond the project period.

Coaching is not primarily about teaching the skills of tree management – these will likely be skills in which the person is already very knowledgeable – but will usually focus on helping champions to increase their ability to teach, guide and lead others by example. Coaching should ensure FMNR champions have support and skills to:

- listen to others with a focus on understanding;
- facilitate discussions in a way that gives all participants a voice;
- expect and be ready to counter opposition;
- identify and resolve problems and conflicts;
- teach not only FMNR techniques, including managing trees, but also skills around working together, solving problems and advocating for change;
- gently and encouragingly correct errors in technique to help improve tree management;
- identify and share lessons to improve land users' practice;

- work with government staff and engage on policy issues;
- promote FMNR to a wide audience through media and events; and
- work with interested stakeholders, such as school management boards and faith-based groups, to embed FMNR more broadly in the community.

Ensuring sustainability

One important thing to remember is that even the most passionate person can become overwhelmed or discouraged. This is something we do not want to happen to FMNR champions!

Most champions will work in their own communities on a voluntary basis, on their own time, at their own pace, since communities usually cannot afford to pay them for help. Simply being recognised as an FMNR champion often gives status to a community member, but it is important to recognise the contributions these dedicated people make, and ensure that they know their work is seen and appreciated. Depending on the community context, and the personality of the champion, it may be appropriate to publicly acknowledge and thank them as part of a community FMNR meeting or other ceremony, or to provide them with a certificate or other acknowledgement of their contributions.

On some occasions, a project or extension service may wish to ask excellent FMNR champions to assist in additional FMNR work outside their own community. In this case, it is particularly important to ensure that these requests, which champions may not feel comfortable refusing, do not overburden the champion, or compete with their own responsibilities and livelihood. Champions who work outside their communities deserve recognition and gratitude, and should be compensated for any extra expenses associated with their help, such as travel, time away from the farm, meals and incidental costs.

If a project or organisation wishes to work with a champion beyond what's realistic for a busy person to sustain on top of their own obligations, then hiring that person as a regular staff member, at a salary which enables them to meet their other obligations while dedicating their time to FMNR promotion, is appropriate.

Identifying, creating and agreeing on bylaws

Bylaws are rules or laws established by a community or group of people to regulate itself. Bylaws are essential to the success of FMNR. The most effective bylaws are created through community-wide consultation, so that everyone who uses the land understands how the changes required for FMNR will affect them, and is willing to work with FMNR instead of against it.

When establishing an FMNR project, the community will need to create bylaws and decide what the consequences are for those who do not abide by the agreed rules. Bylaws come under the law of the government authorities, so local officials and leaders should be part of the process of creating and supporting bylaws for FMNR. This lends greater weight to the community bylaws, and opens the possibility of referring difficult cases to a higher authority.

Bylaws are created out of community discussions about goals, concerns and needs related to practising FMNR. Below is a list of issues that are often covered by bylaws, but be sure that your bylaws include any concerns or special situations important to your community.

Common questions for bylaws to address:

- How should the community organise FMNR work? For example, as a cooperative, an association, simply through their traditional management structures, or by individuals on their own land?
- Who is to be included in the bylaw?
- Who will have user rights to the resources from regenerated trees (wood, grass, wild foods, medicines, etc.)?
- When and how can resources be used?
- Who has user rights when a person practises FMNR on their own private land?
- Who has user rights when FMNR is practised on communal land?

- How should communities share the income and benefits from FMNR activities on communal land?
- What responsibilities will different members of the community have?
- How will they protect the FMNR work? For example, from theft, fire, livestock or vandalism?
- What regulations are needed around livestock? For example, around designated grazing areas and arrangements to harvest grass?
- What are the consequences of not complying with the agreed bylaws, and who has the responsibility to enforce them?
- What avenues can be taken when designated authorities do not prosecute offenders? (This may be the case where family ties, abuse of power and position or bribery are in play.)
- How will the community engage with government agencies and ministries?
- How should the community be represented to local government?
- What specific roles should government agencies have with respect to FMNR activities? What about development, community or other agencies already facilitating FMNR work?
- How often will agreements and bylaws be reviewed to see if changes are needed?

Most communities don't employ the services of a lawyer, but for very complex projects, such as carbon projects requiring high levels of transparency and accountability, working with one may be beneficial. An external facilitator may also assist in the process of developing bylaws, especially to ensure all voices are heard and agreement is secured from all those involved.

Developing and implementing bylaws

The development of bylaws involves many discussions with the community, seeking to shape the proposed bylaws into something everyone is comfortable with. These discussions are critical, because FMNR will be most successful when everyone who uses the land agrees to support the work in the most appropriate way. The example provided in the Talensi case study on page 81 describes the process that four communities in northern Ghana used to develop management plans and bylaws for their FMNR work.

During bylaw development, some community members may have concerns about whether a bylaw will restrict them from meeting their needs, or they may disagree with certain bylaws. Minority members of the community may be especially concerned that their rights and needs will be overlooked by the majority. These concerns should be acknowledged and managed by those who are facilitating the process.

When the community has identified and agreed to a set of bylaws, the roles each person has in enforcing them, and the consequences for not complying with them, people will have much more confidence that any FMNR work they do will be protected, and that they will benefit from their work. This is very important for motivation.

Including government

Forestry and agricultural government departments, or individual government officers trained in traditional top-down management of forestry or agricultural resources, may resist the idea of 'community-managed forestry', or integration of trees into agricultural land. They may believe that, if communities have control over the trees on their land, they will destroy all remaining vegetation. Advocacy and awareness creation is needed to reassure them that greater diversity and increased trees will result from the practice of FMNR. It is vital to build relationships with and influence forestry staff to ensure they are exposed to successful FMNR models. Safeguards against over-exploitation (or, to put it more positively, towards sustainable tree management) may be more likely when forestry personnel are invited to participate in bylaw formulation.

Including charcoal makers and other commercial interests

Those involved in the commercial use of natural resources, or in activities such as illegal charcoal making or poaching, may oppose community or individual user rights, ownership or management of trees. Advocacy may be required to restrict their exploitation of the land. Alternatively, charcoal makers could become your greatest allies

if convinced that their own livelihoods would be more sustainable and less laborious through the practice of FMNR.

Community members who do not support the FMNR work may also steal or destroy trees pruned by FMNR practitioners. Community-wide consultation and agreement on bylaws and consequences for infringements needs to occur early in the process.

Reviewing and changing bylaws over time

In the early stages, it will be necessary to review the bylaws, and how they are being interpreted and implemented. Ensuring that all users are compliant, and that any infringements are dealt with quickly, will help the community to respect the bylaws and reduce conflict and infringements.

It may be necessary to experiment with bylaws, just as you experiment with physical FMNR work. This involves agreeing to test a set of bylaws for a period of time, then discussing whether any changes are needed.

As the community learns from their experience of practising FMNR, bylaws may need to be added or adapted to better meet the needs of all. Everyone affected must agree to any changes to the bylaws, and this too may require multiple discussions before agreement is reached. As FMNR work progresses, the community may decide to add activities which require advocating outside the community, such as working with government authorities to create more helpful policies, or creating certified markets for wood produced through FMNR. This is discussed further in the next section.

Case study

Community bylaws at work in Talensi, Ghana

An FMNR project in Talensi in northern Ghana worked with four communities to develop bylaws related to fire, forest management and land use.

An external organisation skilled in community facilitation was engaged to support the communities through the following processes:

1. Community entry, planning meetings and stakeholder consultation.
2. Identification of key stakeholders.
3. Engagement meetings.
4. Sensitisation and training workshops.
5. Drafting of fire and forest management plans.
6. Validation and adoption of **fire and forest management plans**.
7. Community dialogue on land ownership.
8. Development of land use bylaws.
9. Validation of **land use bylaws**.

Here are some bylaws that were developed through this process:

1. Land owners must seek advice from FMNR members before giving lands out for farming purposes.
2. Land owners are to survey the land with prospective land users to identify what trees are not to be cut.
3. The agreement between land users and land owners should be documented and witnessed by a third party.

4. Both land users and land owners are to be responsible for the maintenance of trees on a piece of land. Thus:
   a. Land owners are to select some trees to be owned by land users as a way of motivating them to protect the trees in the farms; or
   b. Land users and land owners should alternatively harvest or enjoy tree produce from time to time; or
   c. Land users are to gather some produce from trees for the land owner if they are unable to harvest tree produce from the land.
5. Land users must create fire belts around the farm for tree protection.
6. Successive land users must be informed about rules and regulations given by a land owner.
7. Fire volunteers are to help women select forest trees to cut and prune. These women can collectively trim shrubs, gather excess stems and prune dry branches for personal use.
8. When collectively harvesting tree branches, women should not destroy the trees.
9. All bylaws about forest protection and preservation are applicable to every land user in the community.
10. There should be a community-wide sensitisation on agreed land use arrangements and best practices in tree maintenance.

A detailed report that describes the process outlined above and additional bylaws for each community can be found **here** on the FMNR Manual website. Another example of bylaws from Niger (in French) can be found **here**.

Advocating for policy change

FMNR is most successful when there are government policies that give the tree and land users rights or ownership of their natural resources. FMNR also benefits from policies that allow for organisational structures, such as cooperatives and development groups, to exist and use a defined set of bylaws created and agreed upon by all stakeholders.

In countries where similar favourable policies already exist, they still may not be implemented, enforced or even known about. Where communities are not aware of their rights under these policies, development agents can play a critical role in raising awareness. Such a case occurred in Mali, where communities were exploited by middlemen claiming to have the right to harvest any trees they wanted even after forestry laws had changed. An NGO working in the area began broadcasting what the law actually stated, and this knowledge emboldened communities to stand up against the middlemen and prevent them from plundering the trees on their land.

In some situations, community bylaws may be sufficient to support FMNR work in the local policy environment. At other times, it will be necessary to work with local and/or other relevant authorities to change policies or agree upon formal rights that protect the work of FMNR practitioners, to ensure they benefit from their labour. Effecting policy change can take time and much effort. Don't be surprised if it doesn't occur within a three-to-four year timespan!

In some cases, it is possible to agree informally with authorities on user rights and policies to support FMNR implementation, but at other times it may be necessary to work towards changing official policies.

Potential legal issues

Because every community has different laws, histories and cultures, there is no 'typical' legal scenario across different communities, but there are some issues that occur frequently in FMNR projects.

Lack of land ownership

In many places, citizens don't own the land where they live and work. The land may belong to the government, a community leader or another land owner, and the users may only be tenants. Similarly, women or ethnic and religious minorities may be barred from owning land. People in this situation have little incentive to invest in improvements such as regenerating trees, because of the risk that the land or resources will be taken away from them.

While there are immediate benefits from FMNR, the big benefits are medium to long term – over three to five years. In order for practitioners to feel confident they will benefit from their efforts, it is necessary to work with government and land owners to create binding agreements on user rights or, where possible, land ownership.

Such agreements benefit everyone involved, not just the community members, because FMNR improves the entire landscape.

Case study

Impact of land ownership rights

A series of studies undertaken by the World Agroforestry Center (ICRAF) in 2016 examined what factors affected the uptake of FMNR in Tanzania, Uganda, Kenya and Rwanda. In these first three countries, land tenure arrangements were variable. Some farmers owned their land, and held the title deeds, some had customary ownership through inheritance or local knowledge, but with no title deeds, and some were reliant on communal land or leased land. In Rwanda, 90 percent of participants held title deeds to their land.

In all three countries with variable tenure arrangements, land tenure was not only raised by the community as a concern and barrier to adoption, it was also found to be a statistically significant factor in defining if a household was more or less likely to adopt FMNR. For example, in Uganda, 59 percent of farmers in the study owned land (without title deeds), but those who did not (eg. farmers on communal and rented land) were 123 percent less likely to take up FMNR. In Tanzania, 82 percent of farmers reported managing trees on their privately-owned land while 91 percent would not manage a tree on communal land.

Reasons identified for this include:

- The uncertainty created by lack of title deeds could also have discouraged investments that are considered long term in nature, such as tree planting or in this case managing trees for future benefits.
- Communal land is a common pool resource, where usually no-one is responsible for the state of the resource, yet everyone wants to gain maximum benefits from it. Although some communities have formulated local rules/bylaws that govern land management and tree regeneration, economic forces such as poverty and famine force them to compromise existing bylaws.
- Culturally, all trees belong to the land owner and these are usually men or household heads. Tenants or squatters do not own trees and this discourages them from participating in FMNR programs.
- The security and survival of trees planted or regenerating naturally on communal land is questionable and this may discourage people from investing in tree planting and management.

References

Swamila, M., Sererya, O.G. and Kimaro, A. (2016) Status Survey on Adoption of Farmer Managed Natural Regeneration in Tanzania ICRAF Country Program, Tanzania July 2016

Kegode, H., Wafula, L. and Muriuki, J. (2016) Status survey on Farmer Managed Natural Regeneration (FMNR) adoption in pilot project implementation sites in Kenya ICRAF Country Program, Kenya, July 2016

Mukuralinda, A., Ndayambaje, J. D., Musana, B.S. and Ndoli, A. (2016) Adoption of Farmer Managed Natural Regeneration of Trees in Rwanda Status survey report ICRAF Country Program, Rwanda, July 2016

Buyinza, J., Okia, C.A., Kegode, H. and Muriuki, J. (2016) Famer Managed Natural Regeneration (FMNR) Project Status Survey Report for Uganda ICRAF Country Program, Uganda, July 2016

Inequalities for women and minorities

In situations where one ethnic group or one gender dominates natural resource use, there may be a strong need to advocate for inclusiveness. In some countries, women still do not have the right to own land, or to make decisions about resources, or even to benefit from their own labour. But women are critical stakeholders in FMNR and need to be assured that they will benefit from the work invested in FMNR. (See section on ensuring FMNR is inclusive for women.)

Women are amongst the greatest harvesters and users of wood and other tree products and, along with children, they are often responsible for the daily task of firewood collection. Women also need the security of knowing that they will have equal decision-making power in how resources and incomes from FMNR work will be used. This is especially important for women-headed households.

If child-headed households exist in the area, it will also be necessary to ensure that these community members have adequate access and rights.

The same may be true of ethnic or religious minority groups. Like every other member of the community who uses or has access to the land, these groups must have equal assurance that they will benefit from the investment of protecting trees in order for FMNR to be fully successful.

Rights of nomadic and settled herders

Herders with large livestock herds may oppose FMNR, fearing that it will deny them access to traditional dry-season grazing lands. It is important to include them in early consultations and exchange visits to clearly demonstrate that the net gain in fodder that will occur with the return of trees will also benefit them. Assure them that FMNR will not exclude them from traditional grazing areas, except perhaps temporarily in areas where trees are still small and could be damaged.

Clear laws and bylaws governing the interaction between herders and farmers will also reduce the conflict between different groups, who may traditionally see themselves as being in competition for resources.

Tree ownership and use

In order to protect disappearing forests, many governments have made it illegal to cut trees, or to cut certain species of trees, or to sell charcoal or firewood. Unfortunately, these regulations rarely work as a deterrent, because most governments do not have enough resources (including finances and staffing) to protect forests efficiently and to monitor trees on farms.

This type of regulation also encourages a mentality of non-responsibility:

> *"If it is not my tree, why should I risk my life protecting it from theft?"* or,
>
> *"If it is the government's tree on my land, it's better if I cut it now and benefit myself than risk having somebody else steal it and me not benefit at all."*

When it is illegal to use or sell wood and non-timber forest products, there is no economic incentive for people to invest in FMNR. For FMNR to be successful, practitioners need to be confident that they will be able to benefit from their work. So laws or formal agreements need to be made that allow FMNR communities formal user rights, or even ownership of trees, and the right to use and sell them. In countries where laws prevent the cutting or use of trees, FMNR practitioners have worked with local governments to establish markets that allow the selling of wood only from 'certified' regenerated trees. This can be a significant incentive to practise FMNR.

Changes to forest policy in Ethiopia to encourage land restoration

In January 2018, Ethiopia enacted the National Forest Law, revising the previous 2007 law to better recognise the rights of communities and their role in restoring and managing natural forests and plantations. In particular, the law recognises participatory forest management as a method of enhancing the role of communities in sharing responsibilities and benefits of managing natural forests in accordance with agreed management plans. The changes proposed will allow communities to improve their livelihoods through forest restoration and the socio economic benefits that can come from better forest management where previously access and rights to forest areas were limited.

For more information see the article **"Ethiopia's new forestry law: A win for landscapes and livelihoods?"**

Carbon ownership

Most FMNR projects are focused on the benefits from the trees themselves, but one type of project requires a more complex legal framework: carbon sequestration projects.

In projects where communities seek to earn carbon credits from their FMNR work, it is very important to establish from the outset who owns the carbon. If the individual or community does not have legal ownership of the carbon, then their claim to receive carbon credits can be disputed and they will have no incentive to regenerate trees for carbon trading. Many countries do not have laws for this as it is a relatively new concept, so be sure to address legal title to carbon before embarking on carbon trading projects.

Chapter 6

Managing fire and other potential problems

Summary: Managing fire and other potential problems

- Problems can occur at all stages of an FMNR project, from misconceptions during its introduction through to issues faced when practising FMNR for the first time or managing fire and other threats. Anticipating these problems can help an FMNR facilitator prevent them before they occur.
- Training, support, good bylaws and communication are the pillars of FMNR problem solving; strong leadership is the foundation.
- Social problems related to FMNR can generally be solved by following these steps:
  1. Engage with the community and stakeholders to jointly understand the problem.
  2. Identify everyone's best interests.
  3. Brainstorm possible solutions with the community and all stakeholders involved.
  4. Guide the process of evaluating possible solutions.
  5. Provide support and guidance as communities choose the best solution(s).
  6. Agree on the way forward.
  7. Create a written agreement.
- Technical problems can be solved through:
  - experimentation and learning from different methods available or those already used;
  - seeking external advice from local experts or other FMNR practitioners;
  - careful observation of outcomes that result from different practices;
  - mentoring;
  - exchange visits; and
  - research.
- Preventing and managing fire is critical in most FMNR projects. This generally involves:
  - understanding the cause of fire and the damage it does;
  - committing the community to fire prevention; and
  - creating a community fire plan.

Resources

- The **FMNR Troubleshooting Guide** is a shorter, printable version of the information available in this chapter.
- **Sample fire management plans** from existing FMNR projects are available on the FMNR Manual website.
- Video: **Preventing Fires**

Based on many years of experience, and many thousands of conversations with people practising FMNR, we have identified several regularly occurring problems.

These can include:

- misconceptions about FMNR, which may prevent people from adopting the practice;
- problems establishing an FMNR plot and pruning for the first time; and
- problems related to managing threats to FMNR, such as competition for tree resources.

In general, all problems can be easily solved with some combination of training, support, bylaws and communication. Fire is a particular problem for FMNR, which requires greater management. We have dedicated a little more time to discussing how this can be approached later in the chapter.

Solving problems

The two types of problems most commonly encountered in FMNR are:

1. Technical problems involving difficulties managing trees, such as selection, pruning and tree management.
2. Social problems involving confusion, misunderstanding or conflict.

The seven-step resolution process described in Figure 1 can help to solve problems related to people in particular, or at least start you on the path towards a solution.

More technical problems may be solved through:

- experimentation and learning from different methods available or those already used;
- seeking external advice from local experts or other FMNR practitioners;
- careful observation of outcomes that result from different practices;
- mentoring;
- exchange visits; and
- research.

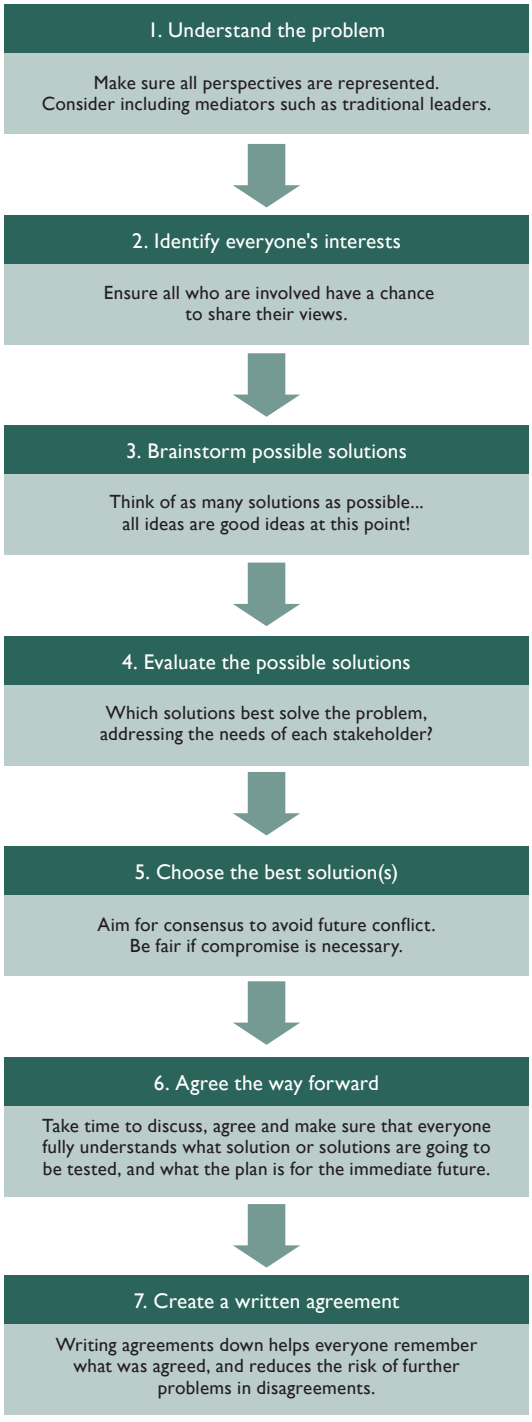


Figure 1 Seven steps for solving threats to FMNR adoption.

Problems and misconceptions when introducing FMNR

Anyone working hard for their living in degraded landscapes cannot afford to invest time, effort or land into any practice they are not confident will bring a good return on their investment.

Some of the most common concerns about FMNR are misconceptions. Before launching into the practice, land users must feel confident that it isn't going to make life harder, and that it is in their best interests to proceed. Ensuring people understand the reality of FMNR – and are empowered to make all decisions regarding what tree species to use, and how many to leave – helps to reduce concern and encourage experimentation.

In any context, but especially where there are fears about adopting FMNR, it is wise to encourage land users to start small and pilot the concept. This greatly reduces any perceived risks while providing first-hand learning experience in FMNR.

Other common misconceptions you might hear, and some suggested responses are outlined below:

"FMNR has a standard approach and technique"

Some people wrongly believe that FMNR is about following a set of rules – how to prune, what trees to keep, how to keep out livestock, etc. This is not the case.

FMNR practices vary greatly from region to region and even from land user to land user. It is this flexibility, and the freedom of land users to choose how they will implement FMNR, which allows them to take the risk of experimenting with FMNR for themselves. The emphasis of FMNR is on 'farmer managed' regeneration: the final form the practice takes is not determined by anyone except the land users themselves. While practitioners should follow the basic principles outlined in Chapter 1, no-one should be a slave to a particular way of doing FMNR.

Chapter 4 describes some of the wide variety of ways FMNR is practised in different contexts around the world.

"FMNR is so simple – it cannot be as good as tree planting"

FMNR almost sounds too good to be true: it's easy, low-cost and doesn't depend on external resources. This makes people wonder if FMNR can really be as effective as growing nursery-raised, exotic tree species and using expensive, high-tech solutions.

In fact, FMNR is generally much more effective, and requires fewer resources, than methods of reforestation based on nursery seedlings. This is especially the case in arid and semi-arid environments. This is because FMNR practised on native tree stumps takes advantage of a mature existing root system. When FMNR is practised on native seedlings, it has another advantage: the seedling is already adapted to the environment, and is strong and healthy enough to sprout with no help. Most of what the FMNR practitioner does is simply support nature to do what it does best. As with most things in FMNR, however, whether FMNR or tree planting is 'better' is not the right question. The right question is: What is appropriate and cost effective for the goals of the community managing the trees?

There are times when tree planting is required. If there are no tree stumps left in the landscape, tree planting may be the speediest and most appropriate way of re-establishing trees. Or, if the land user wants to grow a particular tree species that does not occur naturally in the area, or large numbers of a certain species need to be grown in rows, then tree planting may be the only option.

On the other hand, tree planting is usually very expensive compared to FMNR, and planted trees do not have as strong a chance of survival as regenerated trees. If restoration of the land as quickly and inexpensively as possible is the goal, then FMNR is the better path. When water is scarce, or resources are limited, FMNR is usually the best option, as long as living stumps or natural seedlings exist. FMNR also requires far less work than maintaining nurseries or nursery trees, so it is more practical for many communities.

In the 20-year period prior to the rediscovery of FMNR in Niger Republic, tens of millions of dollars were spent and some 60 million trees were planted. Officially, there was a 20 percent survival rate; after funding was withdrawn, there was no evidence of a tree-planting movement. In contrast, investment in FMNR in the 20-year

period following was very low (perhaps less than $10 million by all organisations), but it experienced a 100 percent survival rate. The movement continues to spread to this day.

There has been some resistance to FMNR from mainline disciplines of agriculture and forestry. In defence of FMNR, Dr Richard Stirzaker, Principal Research Scientist at CSIRO's Division of Land and Water, wrote:

> *FMNR is a counter-intuitive idea. Traditional agroforestry has always tried to specify the ultimate tree-crop combination and arrangement that maximises complementarity … I do not think that any research program, no matter how well funded, would have come up with the idea, because it expertly combines the subtleties of location specific tree selection with land user specific opportunities and constraints.*

A growing body of scientific evidence is validating the efficacy and benefits of FMNR. Our recommendation is to make FMNR the starting point of your work, then to remain open to other complementary technologies that meet additional needs.

"Local indigenous trees are not as valuable as exotic trees"

This misconception has various sources. In some cases, European perceptions and the introduction of so-called 'superior' exotic species have imbued communities with the perception that these trees are superior. In other cases, perhaps large-scale exotic tree planting programs have made an impression on mindsets. The characteristics of the exotic trees themselves, such as hardiness, suitability for coppicing, longevity (eg. eucalypts) and product value (eg. grafted mangoes), have in no small measure contributed to biased attitudes. Far too often, indigenous species are considered 'useless bush'. This completely ignores the fact that indigenous forests had long been the supermarket, pharmacy, hardware store, water and temperature regulator and soil builder of past generations, and many indigenous species possess outstanding properties of value to this day.

Some exotic trees might indeed be a great addition to the fields of communities you work with, but we encourage you to have a good look at what is available locally first. Remember to consider:

- what species are already regenerating?
- what characteristics of these indigenous trees might be valuable to the community?

Native trees tend to be adapted to the soil types and water availability of the area, and may be well adapted to resist local diseases and pests, so they usually require less care and fewer resources than exotics and thrive under local conditions.

If the community is considering planting introduced species instead, ensure it has very good reasons to do so. FMNR is far cheaper and more efficient than planting exotic trees.

"Trees grow slowly"

The belief that trees grow slowly tends to discourage people from starting FMNR, because they feel it's going to take many years to reap the benefits of their efforts. "Is it worth it?" they ask. For communities living on the edge of poverty, focused on where the next meal is coming from, it may seem a waste of time to invest in cultivating trees. In the early days of FMNR development, an incredulous land user asked, "Why should I do this? Perhaps my grandchildren will benefit, or perhaps my children, but I never will!"

While some species do grow slowly, others grow surprisingly quickly. Regenerated trees, in particular, benefit from mature root systems, which allow them to grow fast. Often there are tangible benefits even in the first year; one or two metres annual growth is very common.

"Trees will overshade crops and compete for water"

This is a deeply and widely held view, and one of the most common impediments to FMNR uptake on farmland. It is true that some trees compete with crops through heavy shading, or shallow roots that draw up moisture and nutrients normally available for crops. Other trees release chemicals into the ground that inhibits the growth of other species.

Generally, communities are well aware of any trees that compete heavily with crops, and will avoid regenerating them in their fields. This is why the people managing the trees should also be the ones who choose what species to leave on their land, how many trees to leave, and how often and how severely those trees are pruned. All these management factors have an impact on crop yields. For example, crops stop growing in the middle of the day because it is too hot, so a light shade can increase crop yields by about 50 to 70 percent. [1]

Some trees, such as *Faidherbia albida*, are extremely valuable on agricultural land. These trees fix nitrogen, and in the rainy season they shed their leaves, improving the soil and providing a light dappled shade, which protects crops from extreme temperatures without reducing harvests.

There are many other naturally occurring species with traits that benefit crop production. Often, but not always, the local community knows which are which. It's very important to encourage experimentation, as there is so much to be gained by trial and error. FMNR land users are great observers, who will modify their practices according to their experiences. Facilitating exchange visits where new FMNR practitioners can learn from others who are more experienced can be a very important way to increase tree knowledge and confidence. When discussing the known impacts of various local trees on crops, use photos and explain research findings in an understandable way.

Figure 2 The beneficial effect of this *Faidherbia albida* for crop growth can be clearly seen (2010). Photo: P. Weston

"Trees harbour birds that attack crops"

In the early days of FMNR promotion in Niger Republic, communities explained they had cut down the trees so grain-eating birds would have no place to nest and perch. They feared that by bringing trees back, bird damage to their crops would increase.

In the 30 years since then, average tree density in Niger has risen from four to 45 trees per hectare, with more than six million hectares of land regenerated. The authors are not aware of any reports of increased bird damage. This does not mean there has been no damage but, if significant damage had occurred, then almost certainly those land users would have cleared their trees again, especially if facing regular food shortages. Instead, in many situations, birds reported to reduce insect damage to crops have been seen in the regenerated trees.

The Niger case does not mean that bird damage can never happen, but it does demonstrate the importance of challenging assumptions which may not always be true. If a bird pest problem did arise as a result of FMNR, communities should analyse the situation, identify underlying causes and experiment to work out sustainable solutions at a level and in a way they feel comfortable with, until their concerns are resolved.

"More trees will bring more snakes to our area"

It may be true that increased tree cover will result in an increase in the snake population. Each community needs to weigh up the pros and cons of an increase in snakes, particularly if venomous snakes are endemic to the area. Will the benefits of FMNR outweigh the perceived and real disadvantages of an increased snake population?

The authors know of no examples where a community chose not to implement FMNR because of the possibility of an increased snake population. Incidentally, we do know of two cases where land users have happily accommodated snakes on their land. In Talensi, northern Ghana, community members were very proud of the fact they now had a resident python in their regenerating forest.

Figure 3 Boomslang snake found living in an FMNR tree in Chad. Photo: T. Rinaudo

[1] Bunch, R. 2012, "Oxfam's Savings for Change-Plus Agriculture Pilot Program in Mali: Final Report", Oxfam, Cowley, United Kingdom

The boomslang snake (pictured) is actually very venomous. Even so, the farmer whose land it resided on said, "We respect each other. I leave it alone and it leaves me alone!" The farmer valued the services rendered by the snake, such as control of pests including rodents, birds and insects.

Snakes play a very valuable ecological role in the environment, both providing pest control services and, in turn, becoming food for their own set of predators. This fact notwithstanding, we have also heard of at least one death from snake bite, so those promoting FMNR have a duty of care to warn of the dangers. To be forewarned means you can be forearmed. With knowledge in advance, land users can be prepared to take precautions such as avoiding thrusting their arm into bushes without a clear line of sight and, if possible, by wearing boots, long pants and gloves.

Tips for preventing problems

Remembering these points in any FMNR project may help to prevent problems before they begin.

- Include all stakeholders in the process of designing, implementing and monitoring FMNR work.
- Build on the wisdom and experience the community has with its land, and with any traditional practices related to FMNR.
- Build the capacity of women, youth, minority groups and others who have not traditionally held power in the community, so they can share equally in the decision-making processes and benefits of their work.
- Ensure the community retains the power to make and implement all decisions about where and how to practise FMNR.
- Encourage land users to experiment with FMNR and find what works best for their specific needs – don't prescribe 'one way' to practise it.
- Build the capacity of the community to manage both trees and problems that affect their work on FMNR.
- Support and work through farming committees, producer groups, women's groups, forestry, agricultural and environment departments, schools, churches and other faith communities, media, and other partners to share FMNR and help ensure the sustainability of your project.
- Build the capacity of the community to advocate for a policy environment that ensures they can profit from their tree management efforts.
- Build the capacity of the community to teach others how to practise and benefit from FMNR.
- Work with the community to link their FMNR practice to profitable markets for wood and non-wood products and services, to increase profitability and sustainability.
- FMNR projects in most cases should not provide tools or other inputs to communities. FMNR works best when successes depend on a community's own efforts and resources.[2]
- Follow up regularly to help solve problems until FMNR is working successfully and sustainably.

[2] One exception might be when FMNR is used as part of a food- or cash-for-work project during an emergency response. But here, too, making the project as locally sustainable as possible is the best option. The danger with providing tools is that they can encourage dependency and depress self-reliance and innovation. The spread of FMNR in Niger, one of the world's poorest countries, was not a result of providing tools.

Problems when practising FMNR

	Problem	Solution
When establishing FMNR	**Loss of access to resources (grass, land, firewood) in early stages of FMNR, when small trees are being protected before producing benefits.**	• Prepare ahead of time for this brief period of less productivity. Think through potential concerns and make plans for how to get through the early stages. • Consider using cut-and-carry to ensure animals have fodder, and perhaps practise FMNR on a smaller portion of land until the trees are mature enough to bring benefits, expanding FMNR practice as you go. In Senegal, alternative cooking fuels were provided to households in the short term, as the trees were growing. While this helped people accept FMNR, it is by no means necessary in all cases.
	The inherent dangers of working in the physical environment.	• Whenever working on trees and shrubs, clearing firebreaks or digging, be aware of poisonous scorpions, spiders and snakes, as well as potentially dangerous animals. • Always take care when using sharp tools, and watch children carefully around them. • Recognise that, while beneficial animals may return with the regenerated forest, less desirable animals may also return. Make a plan to ensure they do not become a problem, or that they are manageable.
While pruning	**Poor techniques, such as using dull tools or cutting downwards instead of upwards, damage tree bark or lead to disease or insect attack.**	• Always use sharp tools for pruning, and maintain their sharpness while in use. Less energy is expended when using sharp tools, and the practice of FMNR is easier. • Remember to cut with an upward instead of downward motion whenever possible to further reduce damage to tree bark.
	Regenerating stems are weak and prone to breakage due to overpruning, for example after leaving a single stem or limited side branches.	• Use FMNR champions to demonstrate and promote pruning practices that leave young trees strong enough to grow well. • Work with land users to clear up any concerns they have about trees overshading crops, or other concerns that lead them to overprune. • Demonstrate the differences in growth rate between severely and sustainably pruned trees.
	Pruning during times that are too wet or too dry causes excess stress for regenerating trees, exposing them to infection, while pruning during very busy seasons creates too much work for the land user.	• When possible, plan your pruning for a time of year when regenerating trees will have the best conditions. • On farmland, trees pruned just before the farming season will be protected from animals, as communities usually keep livestock away from their crops. This is also usually a slower season on the farm, allowing land users to avoid extra work during planting or harvest.

	Problem	Solution
While managing trees	**Livestock (or those caring for them) damage or destroy trees that are being regenerated.**	• Ensure that trees are pruned correctly to have the best chances of survival. • Restrict livestock access until trees are established through: - 'Social fencing' created by the community after developing and enforcing bylaws, which govern when and where livestock can graze. (Enforcement sometimes requires community scouts and fines per animal, but these are rarely needed.) - Temporarily ceasing all livestock access to regeneration areas, and using the cut-and-carry system of grass harvesting. - Grazing animals on a rotational basis, moving them from one designated area to another before damage occurs, while trees are regenerating on protected areas. This allows land users to benefit from having animals on the land while still protecting trees. - Allow young livestock (calves, lambs and kids) to graze in regenerating areas, as they are less likely to cause major damage. • If excluding animals is not practical, try other options, including tying thorny pruned branches around trees after pruning. The thorns make it harder for livestock to cause damage.
	External parties, and even community members, steal or destroy trees pruned by land users.	• Early in the process, ensure there is community-wide consultation and agreement on bylaws and consequences for infringements. • Consequences should be enforced fairly and consistently, but enforcement should also include additional education and discussion. It may be necessary for community members to act as scouts to make sure bylaws are respected. • Ensure neighbouring communities and nomadic groups are notified of any bylaws that have been set. Preferably include them in the process of bylaw development.
	Resistance or conflicting information from forestry staff or other government officials.	• Partner with forestry staff from the beginning of the project. Include them in trainings and visits to successful sites, where communities have managed forest resources sustainably and where the practice of FMNR has resulted in a net gain of forest resources. Sharing information can help to build positive relationships and secure powerful allies when working towards policy changes.

Case study

Conflict resolution through sustainable tree management in Ghana

Figure 4 A pastoralist tending his cattle. Ghana (2015). Photo: F. Gumah

In Ghana, nomadic herders and farmers are working together to reach common goals.

As part of a World Vision FMNR project in Bawku West District, over 300 traditional leaders, herders and farmers came together for training on conflict management and resolution strategies. Participants were equipped to deal with conflicts around natural resources management, and to promote peaceful co-existence between farmers and herders. Activities such as role playing helped illustrate the benefits of tolerance and working together for common goals.

Abu, a 57-year-old Fulani herdsman, describes how FMNR has *"promoted peaceful co-existence between we the Fulani herdsmen around Akara and the people of the Akara area in Garu".*

"Previously we had to travel long distances in search of fodder for our cattle. This caused daily disputes between us and farmers … as a result of our cattle destroying crops as we search for fodder. Humiliation was like our daily food, as insults kept pouring on us which sometimes led to a fight with the farmers.

"But now, we are glad to have abundance of fodder at [FMNR field] Akarateshie Natinga, where we can easily move our cattle to graze without destroying crops from people's farms and picking up quarrels with them."

Bringing people of various ethnic groups and interests together for dialogue has become a springboard for many other development outcomes. In exchange for grazing land, the Fulani are supporting other community members by taking care of their animals as well. This initiative from the Fulani has encouraged other community members to involve them fully in working in and using FMNR fields. As a result, their futures are looking brighter.

"Incomes from the sales of our cows have also increased tremendously, as the presence of the fodder has help[ed] to increase the sizes of the animals we now take to the market to sell," says Abu.

"All I can say to this person called World Vision is thank you and God bless you for touching the lives of my family and I indirectly with your project."

Fire management

It is very difficult to practise FMNR if your fields are regularly burnt. Fires can destroy trees, fodder, crops, property and lives, so any community practising FMNR needs to plan ahead to minimise fire damage.

There may be occasions for judicious use of fire, such as to create strategic firebreaks or to reduce hazardous fuel loads or biomass to protect lives and infrastructure from destructive fires. However, routine burning of fields is harmful to soils, trees and the uptake of FMNR. When taking stock of and engaging the community (**Chapter 3** and **Chapter 5**), it's important to understand attitudes towards fire and its uses in the environment. In many communities, annual burning is seen as a normal, acceptable occurrence – it has always been that way, and it is rare for anybody to question the validity of this practice. In many other cases, people recognise that burning is a serious issue, but they have resigned themselves to accepting it because it is an intractable problem and trying to stop it will likely lead to conflict and frustration.

For FMNR success, the community must:

1. Understand the cause of fire and the damage it does.
2. Commit to fire prevention.
3. Create a community fire plan.

Step 1. Understand the cause of fire and the damage it does

Unintentional fires may result from:

- accidents – such as overturned kitchen fires, engine sparks, children playing with fire, etc;
- carelessness – such as burning cigarettes tossed away, honey collectors not being careful with bee smokers, etc; and
- lightning strikes.

Fire may be used intentionally for a number of reasons:

- **To trap rodents and other wildlife for bush meat**
  Some communities use fire to lure out pests and wildlife for food. Alternatively, rats and other rodents can be managed using ecological approaches such as **trap barrier systems**.
- **To encourage grass growth**
  Many communities still believe that burning fields is an effective way to encourage new grass growth on grazing land, or to clear 'rubbish' from fields. Grass may quickly regrow after fire, but it is short-lived: the soil loses fertility and the ability to hold water, so future crops or grass will not grow as well. Also, only fire-tolerant species are likely to grow back if the field is burnt year after year, and these species of grass are harder for animals to digest. The best grass species might eventually be killed off completely, so that only inferior grass species remain. Burning also destroys trees and damages the habitat of useful plants, animals and insects, so these take longer to return to the area.
- **To cause harm to other people or their FMNR work**
  It's a sad fact that people sometimes use fire as a weapon or to purposely destroy others' crops or trees.

When illustrating the damage of fire to communities, it may be helpful to emphasise that regenerating trees can also increase the grass available for animals, and it does this without the destructive side effects of fire. It may be helpful to demonstrate the monetary and yield benefits of not burning fields through FMNR demonstrations and field trials, or to facilitate land user forums and exchange visits to promote the benefits of not burning. The following case study can be used for this purpose.

Case study

Farmers are putting an end to forced burnings in Uganda – and reaping the rewards

Dratele, a proud land user, leads his herd to graze in this carefully tended FMNR plot in Offaka, Uganda.

Now thick with trees, the land was cleared and burnt annually before FMNR was introduced in 2010. Back then, finding fodder was a struggle.

These days, the land user not only has an adequate fodder supply for his animals, but harvests his own firewood and doesn't worry about his livestock wandering into other people's fields – a regular problem in the past. In just four years, thanks to better pastures and fodder, his herd grew dramatically: from 15 goats and five cows in 2010 to 65 goats and 17 cows in 2014.

Proceeds from animal, wood and honey sales have enabled him to pay secondary school fees for his children and to build a new house.

Figure 5 Open woodland restored from wasteland, now managed through FMNR. Offaka, Uganda. Photo: T. Rinaudo

Step 2. Commit to fire prevention

Once fire is recognised as a problem, the next step is to convince the community that it's their problem – not the government's, not the neighbouring village's and not God's. Nothing will change unless communities accept responsibility for fire management themselves. If a community can believe that it is within their means and power to change something as damaging as fire, then more than likely they will succeed. But if they don't believe it, no amount of incentives, training or encouragement will change the situation.

Additional steps include:

- Stakeholder creation of bylaws addressing fire management issues (for example, with community, local government, traditional and religious leaders, and youth).
- Engagement with local fire authorities, if they exist. They can help reduce the risk of fire, stop fires burning and provide valuable experience and knowledge.
- Creation and execution of a community-owned fire plan (see Step 3 on page 99).

Case study

Tony Rinaudo on changing mindsets about fire

As people embrace FMNR on their own, they become passionate about stopping fires.

In Ghana's Tongo Beo community, Biliya-mnamaltenga told me about a recent fire in his community.

"I just came out from my bath wrapped in a towel and saw a fire on the hill. I ran out as I was and started fighting it. Seeing my concern, my people followed me and put the fire out."

This is from a community that witnessed the burning of the whole landscape every year, which they believed was beyond their control to stop, as fires were always lit by 'that neighbouring village'. In 2009, I was told *"it would be impossible to stop bushfires occurring, because they were such an entrenched part of the culture and there were no mechanisms to stop it, even if communities wanted to."*

The cornerstone question I asked of the community was, *"What future do you want for your children?"*

"You have a choice," I said. *"You can continue with things as they are (since no other entity is powerful enough or rich enough to intervene), or you can do something about it yourself."*

Fortunately, these Ghanaian communities rose to the challenge, and decided that they would do something about 'their' problem. Once they made this decision, others rallied to support them.

- World Vision provided awareness creation in schools and communities.
- The district commissioner offered any community that remained 'fire-free' for three years a prize: a development project of the community's choice, such as electricity, water, a school or clinic.
- The local fire brigade provided professional training.
- World Vision also helped train over 100 fire-fighting volunteers, providing t-shirts and equipment.

If there was any doubt on the part of the communities, it was dispelled within one season.

"Our cattle used to wander far in search of grass," they told me. *"They were always being stolen and they were so skinny the traders wouldn't even look at them. Now they only walk a few hundred metres from the village. They are fat and sleek and we get a good price."*

In 2012, an evaluation of FMNR activities in the area found:

- 2,760 farmers and fire stewards had adopted FMNR in 37 communities;
- about 1,000 hectares were under FMNR forest cover, with an average tree density of 2,334 trees per hectare;
- 600 hectares of farmland were under FMNR management, with an average tree density of 57 trees per hectare; and
- 90 percent of FMNR communities reported zero record of bushfires over five years.

In Senegal, farmers who had visited FMNR farmers in Niger and learnt from them were leading by example and had stopped burning.

"The Nigeriens told us that they stopped burning when they realised that this organic matter was fertiliser and burning it was a waste," they said.

In East Sumba, Indonesia, the whole island burns every year – partly because of negligence (throwing burning cigarette butts in the grass, etc), but mainly in order to stimulate 'green grass growth'. One chief created a law that anybody who lit a bushfire would be fined the equivalent of two years' wages. After setting aside a 'no burn' area, the community found there was more grass available than if it were burned.

Convincing and equipping land users and communities to take responsibility for fire management is difficult – but should not be impossible. Often, burning has become a social norm and nobody questions it; nobody thinks they have the power to stop it and nobody thinks that there is a better alternative.

It often takes an outsider, a change agent, to be a catalyst for positive change.

Step 3. Create a community fire plan

A community fire plan includes:

- an introduction to the dangers and negative impacts of fire, why it's important to take action to prevent fires in the first place, and how to control them quickly when they do occur;
- a vision of what fewer fires and an increased capability to stop fires means for the community;
- bylaws clearly outlining what is and isn't permissible, and a fines system for infringements;
- partnerships with organisations such as local fire services for community volunteer training;
- roles and responsibilities for preventing, spotting and fighting fires; and
- when, where, how and what action needs to be taken.

Agreed actions to be taken to reduce fire risks may include:

- replacing slash-and-burn practices with 'slash and mulch', and stopping all other unnecessary burning in fields or forests;
- identifying likely sources of sparks and flame that need to be monitored;
- clearing fire breaks – narrow strips of land without grass or trees – so, if there is a fire, it stops there;
- reducing fuel for wildfires through regular pruning of trees, heavy targeted grazing and/or harvesting and removing dry grass;
- enlisting the help of children and educating them and others about the dangers of starting even small fires, which can get out of control, and about the causes of accidental fires;
- creating, equipping and empowering community-level fire volunteers; and
- establishing any necessary early warning systems. For example, a warning bell might be installed and rung by the first person who sees a fire. On high fire-danger days, scouts can be appointed to keep watch over an area.

Implementing the fire plan requires ensuring that each of the actions are taken, and that all agreements are respected and enforced, to reduce the risk of fire destroying the work of those practising FMNR. As with other FMNR activities, this is best done in collaboration with FMNR and other community groups and committees, as well as forestry, agriculture and environment departments where possible. The fire plan should also involve all stakeholders in raising awareness, decision-making and follow-up.

An example community fire plan can be seen in the **assisted regeneration project of Humbo, Ethiopia**.

Chapter 7

Ensuring FMNR is inclusive

Summary: Ensuring FMNR is inclusive

- Everyone in the community has something of value to offer FMNR work. Including minority groups can contribute to the success of FMNR by eliminating problems before work begins, such as land use conflict or competition for tree resources.
- Often there are ways to resolve problems that benefit all stakeholders, but making FMNR inclusive requires intentional planning to allow for the active engagement of different groups with different needs.
- Particular efforts should be made to include groups such as:
  - people who do not own land
  - women
  - pastoralists
  - people living with disabilities
  - children and young people
- Managing trees isn't possible or suitable for everyone, possibly due to different abilities to access or manage land or trees, for example. There are many other roles available that still contribute towards FMNR, including:
  - providing insight and assistance at all levels of FMNR, such as monitoring and coordination roles;
  - developing enterprises such as beekeeping and the sale of firewood, fodder, medicine and fruit;
  - providing tourism or ecotourism services;
  - providing services such as pruning and harvesting of wood and non-timber forest products;
  - patrolling fields and reporting infringements, acting as fire wardens, etc, in return for payment or voluntarily;
  - communication and promotion of FMNR to others; and
  - advocacy for improved policies and government support.

Resources

- Manuals from Uganda and India for including children and youth in FMNR through school programs and environmental clubs:
  - **Children's Handbook: Exercises for Learners**
  - **Activity book for children**
  - **Handbook on Our Environment: A Guide for Teachers**

Involving everyone who uses or has access to the environment being regenerated by FMNR has a direct impact on the success of the work in two ways:

1. It is right that FMNR is available to everyone.
2. Including everyone is the way that FMNR works best.

A well-designed project will involve all stakeholders, from the most powerful to the most vulnerable, and ensure information on FMNR and its implications is made accessible to all. The workshops and training activities described in this manual intentionally include everyone who uses and has access to the land: women, men, youth, ethnic and religious groups and other minorities, as well as people from all livelihoods and stations in life.

Ensuring all groups are included and empowered to influence decisions, and make FMNR work fair and profitable for their needs, requires intentional planning on the part of anyone facilitating FMNR in a community. Remember to:

- Involve all stakeholders in early consultations and in the establishment of community-owned procedures and bylaws. This includes women, men, youth, elders, crop farmers, pastoralists, non-timber forest product users, nomadic groups, ethnic groups, religious and social groups, minority groups, vulnerable people and people with disabilities.
- Give all stakeholders equal access to information.
- Ensure those entitled by the community have a share in and benefit from the management of trees on communal land.
- Recruit members from all stakeholder groups for activities and decision-making roles, such as training for FMNR champions.
- Respect and actively seek local and indigenous knowledge about farming systems and natural resource management, including any FMNR-like practices traditionally used to manage trees. (This can also increase the participation of elders in FMNR discussions.)
- Support all participants to gain access to land, benefit from home consumption or sale of FMNR products, and to share decision-making rights over the use and harvest of trees and other resources.

Different stakeholder groups may require different approaches of engagement to ensure they are given adequate opportunities to participate. This chapter provides some suggestions around approaches to engage different groups in FMNR projects, and the important roles these groups play in the success of FMNR.

People who do not own land

Community members who do not own or have secure access to land can still benefit from and support FMNR.

Where there is communal land, the landless should have at least the same participation and access rights as the rest of the community. There are examples from Tigray, Ethiopia, where community leaders have granted plots of communal land to female-headed households, landless youth and people living in poverty to manage, use and benefit from.

In projects without communal land, those without land can support FMNR in different ways, including:

- Providing insight and assistance at all levels of FMNR, such as monitoring and other support services.
- Developing enterprises such as beekeeping and selling firewood, fodder, medicine and fruits; or filling employment opportunities created through increased tourism or ecotourism.
- Selling services such as pruning and harvesting of wood and non-timber forest products, patrolling fields and reporting infringements, or acting as fire wardens.
- Utilising the availability of wild fruits and traditional medicines to contribute towards nutrition, health and income. While private property needs to be respected, community consultation may result in special allowances enabling the most vulnerable members of society to have agreed levels of access to certain products.

Women

In many communities around the world, women are the primary harvesters and users of firewood and many other tree products. They are also often the custodians of unique knowledge on plant uses for health, nutrition, religion and culture. Women are most frequently responsible for the majority of childcare, and for the health of family members – through preparing food and providing care during illness or injury. These roles make women key stakeholders in FMNR processes, and critical to the achievement of many of FMNR's outcomes for household resilience and health.

Women are often strong allies in the promotion of FMNR, due to their social networks within the community and potential for influence. Women often have skills in negotiating, advocating, solving problems, resolving conflict, planning and monitoring progress, which are valuable for working with groups of people to achieve a common goal. Because women are not always included in community initiatives or given priority access to resources and information, a well-designed FMNR project provides an opportunity to rectify these inequalities.

The physical practice of FMNR is completely accessible to women, who can manage trees, harvest and market wood, keep bees, gather wild fruits and other forest products, as well as pursuing other activities associated with FMNR. In some communities, cultural norms may suggest that women cannot adopt some of these roles, such as harvesting and marketing timber, however it is important to identify and challenge these ideas to allow for fair distribution of benefits where possible. For example, while some women may not be able or want to manage trees, they can still manage shrubs, which can provide an entry point for producing more valuable products such as timber and fodder.

Because women and children provide a disproportionate amount of household agricultural labour, FMNR can become a strategic liberating mechanism that improves their quality of life. While pruning and management of trees requires some labour, this is often offset by the time saved having firewood and fodder close to home. This potentially increases women's time for other activities such as caring for children and pursuing businesses. Increases in women's income and assets also translate into better quality of life for children, which can boost their health and help them develop, learn and succeed in life. FMNR provides particular value to vulnerable female-headed households, due to increased availability of domestic products and income opportunities close to home.

Ensuring women take an active role in FMNR activities may require some of these strategies if barriers exist:

- Ensure there is the participation of both women and men in groups, trainings and as FMNR champions.
- Consider the timing of meetings and trainings. Will women be able to attend or will other responsibilities, such as childcare or meal preparation, prevent this?
- Encourage and facilitate sensitivity to gender-based needs. For example, FMNR can greatly decrease the burden of firewood collection, which normally falls on women. If this does not happen automatically, programs need to be designed to assist men and women to cooperate.
- Arrange for a crèche or childcare to be provided at community meetings or trainings to allow women with children to fully participate.
- Recognise that multiple nights away, or long travel distances to meetings, trainings or site visits, may prevent some women with small children participating. If travel overnight cannot be avoided, consider allowing babies or carers to attend too!
- Provide opportunities for women to hold leadership positions in FMNR practitioner groups, or in other project and community organisations. A rotating chair, which changes each year, is a good way to provide opportunities for many people to build their skills and confidence in these roles.
- Ensure all monitoring and evaluation data collected is gender disaggregated.

Case study

How FMNR is uniting women in Kenya

"Another woman in our village said to me, 'You have been blessed with many trees on your farm.' 'I have not been blessed,' I said. 'I take care of the trees that I have.' So then the other woman returned home and her farm looks the same now too."

Nancy is an FMNR champion and leader in her Taking Care of Home women's group in Mogotio, Kenya.

For the past three years, Nancy's group has worked with World Vision's FMNR project in the area, although the women's group was established earlier. It started the same as many have in Africa: as a 'merry go round' savings scheme, which allows women to eventually receive the benefit of a lump sum to invest in farming assets or pay school fees. From there, they moved into skills development, including poultry, mango farming and dairy farming. While they trained as a group, they operate independently.

Figure 1 Nancy with her niece, who she also cares for. Kenya (2016). Photo: A. Crawford

From small beginnings, Nancy has become a leader in her community and the go-to farmer for implementing FMNR, new technology and piloting innovations.

"FMNR has taught us the knowledge of taking care of trees but now we have [also] gained from increased pasture and milk production. I am happy as a farmer, having been recognised. I am able to pay school fees for my children without panic."

Nancy's work has not gone unrecognised.

"Through FMNR, I have also been chosen as committee member in the Ngusero water project committee [and] to represent Baringo County women in development matters in my village. I did not ever think I could be chosen for such [a project]. I am proud of FMNR, as it has moulded me as community leader. FMNR has changed my life."

FMNR has been so successful that Nancy is now selling excess grass that her cattle do not need.

"FMNR has improved the pastures. After clearing the bushes and the thorns, the landscape now looks very smart. The thorns used to harm the livestock so clearing the understory has improved animal health and even the cows are happy now!"

After the women's husbands started seeing the benefits, they started to join and help with the pruning too. While the community is currently experiencing drought, FMNR has enabled women like Nancy to cope well.

"During this drought we are cutting the lengne [Acacia seyal] tree and feeding the bark to the livestock. Without these acacia trees, the livestock would be suffering."

Always looking for new opportunities, Nancy and her group are growing vegetables in a kitchen garden and are starting out with beekeeping, establishing 15 hives.

The women's group also now runs a table banking scheme to provide loans to its members. Women pay 10 percent interest on their loans, which they use as 'emergency funds' to help vulnerable individuals, providing a safety net for their community.

Members feel they are more respected in their community now too, as others have seen the results of their efforts.

"There is more time to speak and our views are heard," says Nancy. *"We are allowed into the leadership of public meetings. We're challenging each other, too – for example, if one of us is producing less milk than the others, then we will work harder to encourage and support them."*

Nancy and her group plan to continue to create awareness about FMNR and improve agricultural practices in the community. They're always looking for the next opportunity.

Pastoralists and livestock herders

In many communities, there is conflict between crop farmers and pastoralists. This is unfortunate, because by working together these two groups can realise much greater benefits than they can by working against each other. Since most FMNR work so far has taken place in areas where both farmers and herders use the land, collaboration between these two groups has been very important.

Many farmers have had the frustrating experience of losing some crops, or young trees, to livestock. It is all the more frustrating when the animal belongs to someone else! The benefits that livestock bring to farms and forests are often overlooked. In fact, fields visited by livestock can provide more than twice the crop yields of those left alone.

Livestock seek shade in hot weather and are attracted to trees bearing edible leaves and seedpods; in the process, they fertilise the soil with their dung and urine. Livestock are also valuable in areas where there are no remaining stumps or self-sown seeds. By breaking up hardened soil with their hooves, and providing tree seeds along with natural fertiliser in their dung, livestock can be important partners in regenerating barren areas. At the other end of the spectrum, livestock can provide 'grazing services' to clear firebreaks of vegetation, and keep regeneration areas free from weeds.

FMNR also brings gains to herders and their animals, because as the trees regenerate, the amount of grass, leaves and seedpods increases, so more fodder is available year after year. Water may also be more available after reforestation through the recharging of groundwater and rejuvenation of springs, wells and streams. Animals are also less stressed by heat and wind. All of these benefits can increase meat and milk production, lead to more successful birthing and survival rates, and increase herd health.

As it is in the mutual interest of both farmers and pastoralists to collaborate in reforestation efforts, time should be invested in breaking down animosity and in winning the trust of pastoralists and farmers so they can work together. This can be encouraged by:

- Including both pastoralists and farmers in early FMNR consultations and exchange visits to clearly demonstrate the net gain in fodder that will occur with the return of trees, the benefits of free fertiliser and of harmonious co-existence and collaboration.

- Adapting FMNR communications to suit the context of any nomadic stakeholders. For example, by using SMS and radio to announce meeting times and communicate information. (Here's an example of **how SMS is being used in Tanzania**.)
- Ensuring FMNR agreements and bylaws do not exclude pastoralists from traditional grazing areas, except perhaps for a short period while trees are still small and easily damaged, and then only by mutual agreement.
- Encouraging pastoralists to manage stock in ways that do not destroy emerging trees, and to use trees sustainably rather than destroy them for one day's worth of fodder.
- Encouraging communities to establish mechanisms to ensure fodder is available, risks to trees are reduced, and animals are seen as an asset to the FMNR work, such as:
  - pruning trees in a way that livestock cannot easily break them;
  - creating temporary fencing to protect trees in the early stages of regeneration;
  - harvesting seedpods and leaf fodder for animals to eat;
  - establishing cut-and-carry agreements to make sure that grass is available to herds;
  - cutting grass for hay to use when green grass is not abundant; and
  - encouraging livestock to spend time on farmland during the off-season to contribute to soil fertility for the next set of crops.
- Considering whether to institute agreements to use herds for fertilising and breaking up ground, 'cutting' firebreaks and other tasks that herds accomplish more efficiently than people.

Pastoralist Managed Natural Regeneration

Much degraded grazing land is only ever visited by pastoralists, so they are best placed to make the changes needed to reverse that degradation. Managed natural regeneration of trees, in the hands of pastoralists, could transform large areas of barren landscape.

In 2015, World Vision **Tanzania** facilitated a workshop to promote the idea of Pastoralist Managed Natural Regeneration (PMNR), which mirrors FMNR while also encouraging pastoralists to adopt planned grazing practices. In collaboration with national park staff, cultural leaders and others working with pastoralists, 65 pastoralists were challenged to think about ways they could help solve degradation. This radical idea surprised and inspired the pastoralists, since they had long grown tired of being told they were a problem and cause of rangeland degradation.

Participants rapidly understood the value of managed natural regeneration of trees to not only restore rangelands, but increase fodder, tree products, infiltration and retention of rainfall in the soil, as well as building social capital and reducing conflict. After the workshop, work began to develop appropriate bylaws and agreements and collaborate more widely.

In **Swaziland**, the importance of 'herd boys' to the success of FMNR was recognised. Efforts were made to create herd boy associations and provide training to lift both the skills and status of these boys. Imagine the possibilities of not only enlisting herd boys as allies to protect FMNR regrowth, but empowering them to practise FMNR wherever they take their herds. Pastoralists can be with their livestock 12 hours or more a day, and practically all pastoralists across Africa are equipped with a machete. The number of trees that a single herder could prune in a single year while going about their normal business is quite staggering.

People living with disabilities

Figure 2 Philemon, Tanzania (2013). Photo: T. Rinaudo

"I am a disabled farmer. I grow crops and keep animals, but harvest very little. I am fully involved in FMNR even though physically it is a challenge. My message to other disabled people is 'you should participate, no matter what, according to your ability'." – Philemon

Those with disabilities or debilitating illness may be concerned that they will be unable to practise FMNR, but there are roles for all members of the community when regenerating their land. Some disabilities will have no effect whatsoever on a person's ability to manage trees, so depending on a person's disability and capacities, they can participate in any aspect of FMNR.

It is important to ensure that certain community members like elders, people living with HIV and AIDS or with disabilities are not marginalised because their physical contributions are less; these community members are still able to contribute significantly to the overall process of FMNR.

For anyone whose health or disability status limits their ability to manage trees, dig, haul wood, etc, there are many other activities that are part of the FMNR movement that may be preferentially reserved for their participation, such as:

- marketing;
- record keeping;
- acting as a fire scout, or as a look-out for unauthorised activities;
- contributing to the creation of bylaws;
- observing and understanding the environment;
- negotiating, advocating, solving problems and resolving conflict; and
- planning and monitoring progress.

Those who have lived with illness or disability for any length of time will have valuable insights into how the environment can be managed in a way that reduces their disability and increases their ability to contribute. Many who live with disabilities are also very skilled in adapting, and can provide innovative solutions for challenges the community will face.

Plots of land may be managed by the community for the benefit of those whose disability status or other illness keeps them from physical labour, either as a free-will service or in exchange for other roles that the disability does not affect.

Children and youth

Figure 3 Community FMNR field day, Aileu district, Timor-Leste (2013). Photo: T. Rinaudo

FMNR holds particular benefit for children, as restoring degraded land today will help to create not only a secure present, but a resource-filled future.

Children should not be worrying about the future. Include them in your FMNR programming to help build confidence in what lies ahead.

"If our parents kept destroying the environment at the rate that they were, when we grow up we would not be able to have children of our own, because we would not be able to feed them." – school boy, Senegal

For children, ongoing land degradation means more time collecting cooking fuel and fodder, longer periods herding livestock in search of fodder and water, increased incidence and impact of drought and heavy rain, crop failure, malnutrition, poverty, reduced education prospects, absent parents, increased conflict over scarce natural resources and, eventually, migration.

However, with FMNR, firewood and other resources become more plentiful. Children can spend more time at play or studying, and are more likely to be allowed to attend school, rather than being used for their labour on the family farm.

Children benefit when FMNR increases their parents' and guardians' income, making more resources available for school fees and expenses. They can learn better when increased quality and quantity of cultivated and wild foods improve their nutrition.

Increased access to wild foods also reduces children's hunger and malnutrition in poor communities. The authors have seen regenerated trees filled with laughing children, eating their fill of wild fruits. In existing FMNR communities, instances of children creating their own income-generating projects, harvesting wild fruit from the regenerated forests and selling it at local markets have been noted.

Children can also contribute a great deal by being involved in FMNR activities. There are opportunities for children to:

- Become part of the processes of community engagement and advocacy for change. This provides children with critical skills for their futures, as well as the opportunity to improve the physical and policy environments which they inherit from their elders.
- Learn from being active participants in decision-making and community development, and by seeing the processes of inclusion, cooperation and community engagement that are inherent in FMNR.
- Help create environment clubs in schools, providing an opportunity for them to not only learn about the function and importance of the environment, but also how to manage it better. Children are also powerful advocates for these messages at home and elsewhere in the community.
- Help establish FMNR plots in schools, which provides children, school staff and their families with opportunities to see FMNR in practice, as well as its outcomes. Schools, which are often resource poor, are also able to benefit from products such as firewood and fodder, as well as an improved environment for play with less wind, more shade, cooler temperatures and less dust. (Note: it is also important to ensure that children who are not in school can also participate in FMNR training.)

Youth receive the same benefits from FMNR and can contribute in the same ways that younger children do, but there are additional ways for them to connect with FMNR through:

- Opportunities to begin to make an income and build savings.
- Opportunities to diversify livelihoods through the many businesses that become available with reforestation.
- Working within their community without having to seek work elsewhere – as FMNR restores the fertility and function of the land, both children and youth can have realistic hopes for productive futures.
- Productive activities that reduce the risk of youth getting into trouble, or losing hope about their ability to succeed in life.

Any project that involves children should also incorporate principles to protect children from injury or abuse. In FMNR projects this means:

- Supervising younger children carefully when they are using sharp tools or spending time in the fields.
- Ensuring any FMNR exposure visits for children are of limited duration and primarily for education, exposure and participation – not for carrying out extensive practical work such as tree pruning. (Although it may not always be possible, as in the case of child-headed households, projects should aim to ensure that while children are exposed to FMNR activities, they are not required to be part of the labour force, and are able to go to school.)
- Ensuring that activities involving children should not leave them alone with a single adult, but with a group of responsible adults including parents or guardians.

Special situations: youth- and child-headed households

If there are youth- or child-headed households in the community, it will be necessary to support these households with extra training to safely and successfully practise FMNR. If they do not have land, they should be supported either by being allowed to regenerate nearby communal land, or given a space on which they can practise FMNR. Communities may also set aside other roles, such as marketing FMNR products, to provide options for young heads of household.

Case study

FMNR in schools in Kenya and Ghana

World Vision promotes FMNR to land users, but also to children and youth. Why would children need to know about regenerating trees? So that the leaders of the next generation understand the links between caring for the environment and having enough food for the future!

Promoting FMNR in schools involves a range of creative approaches, including group discussions, poetry writing, essay competitions, dances and drama performances. Through these activities, children increase their understanding of trees, crops and the environment, and they return home to teach these lessons to their families.

Figure 4 Signs around Kenyan schools remind children of the importance of trees (2016). Photo: S. McKenzie

In Kenya, FMNR has been taught in many schools for the last three years with some exciting results coming from the community. For Kibe, a primary school student, learning and implementing FMNR has had a whole range of benefits for his family.

"FMNR has brought many blessings in our home," he says, emphasising the importance of readily available firewood. *"We have enough firewood at home that can take us [through] the whole term and I cannot therefore miss classes, as I do not have to go to look for firewood from the forest, which is five kilometres away.*

"I no longer come home as early as 2pm to fetch firewood but stay in school until 4pm studying."

Kibe's family is also prospering through increased milk production.

"Our two dairy cows used to produce four litres of milk per day but since practising FMNR they now produce 10 litres per day. I now drink enough milk in the morning before going to school. I am happy because of this project."

As head teacher of a primary school in Kenya, Dickson Changwony saw how FMNR offered new opportunities for his school and community.

"I learnt about FMNR through a sensitisation meeting of head teachers by World Vision. I had non-economical shrubs growing on the school compound and was planning to slash them to make the compound tidy. I once tried to plant exotic tree species in the school but none survived because of the harsh weather conditions in our locality. One teacher from our school was also trained by World Vision as the FMNR site three months into the project and the school management leased out the grass to farmers and we received 3,000 shillings from

the site. We used the money to repair desks and buy revision papers for the pupils. Our school has become an FMNR learning site where farmers come and learn from it. We are proud as a school. FMNR is real."

In Ghana, World Vision has facilitated 10 school clubs in the Garu-Tempane District and trained their members in FMNR to help scale up children's interest in environmental issues. Children can be good agents of change; by introducing FMNR to them early, they can help share the concept beyond their communities. It is also good to catch them young with this initiative as they are the ones who will suffer the consequences most from the hazards of environmental degradation in future. As FMNR has been adopted in the area, land users have noted the benefits to their land and production. The schools have also been able to benefit, with children picking fruit from regenerated trees whenever they are hungry.

Figure 5 School environment club in Garu-Tempane District, Ghana, whose members have been trained in FMNR (2016). Photo: World Vision Ghana

Resources for teaching FMNR in schools

Many resources have been developed to support the establishment of environmental clubs at schools or for teaching FMNR in schools. You can find several of these manuals on the **FMNR Hub website**, which may be able to be adapted for your project.

The International Tree Foundation have also published a teaching resource aiming to inspire children about the vital importance of trees locally as well as globally.

Chapter 8

FMNR partnerships

Summary: FMNR partnerships

- The community is your most important partner, and is central to any FMNR project. However, to make FMNR sustainable and extend it beyond your project area, it is necessary to partner with other organisations.
- Educating potential partners on FMNR empowers them to become supporters of your work and reduces the risk of their work harming your project, or of conflicting messages reaching the community.
- Other agencies and groups can support, enable and enhance the FMNR work of the community. They may also be able to provide other services that can combine with FMNR effectively. FMNR projects may also have a lot to offer potential partners to assist them to reach their goals.
- Partnerships that are likely to be valuable to FMNR projects and the spread of the FMNR movement more generally include those with:
  - traditional leaders and local government authorities;
  - faith communities and religious leaders;
  - schools and education departments or ministries;
  - universities and research institutions;
  - state, county and national governments; and
  - non-government and civil society/community-based organisations.
- Partnerships can be bilateral, local or regional. Even national networks of partners can be established, or if relevant networks already exist, these can be harnessed to further support your FMNR work.
- These partnerships are critical for supporting the spread of the FMNR movement, and have already played a significant role in raising the profile of FMNR to where it is now.

Resources

- A stakeholder analysis template (**Annex 3**) can be used when identifying potential stakeholders in an FMNR activity, and guide how best to engage with them.
- The **FMNR Hub website** and social networking sites are good places to find relevant partners or networks in your area.

"If you want to go fast, go alone. If you want to go far, go together." – African proverb

It is possible to regenerate and protect trees alone, but FMNR works best in partnership – from community collaborations that build awareness and win support to collaborations with government, universities and international organisations. Partnerships help us improve the outcomes from FMNR work while fuelling the spread of the movement.

Because community members are the main practitioners of FMNR, and stand to benefit the most from its success, FMNR will not work without them. Engaging and supporting the community has been discussed extensively in Chapter 5 and in the section on designing FMNR projects. If potentially important partners have not yet been identified, tools such as stakeholder analysis can assist with this. A template is provided in Annex 3.

Building successful partnerships

Partners should represent a diverse mix of entities and contribute to projects in a range of different ways. For example, partners can come from government, research or private sectors, international organisations, NGOs, community organisations, education institutions, faith-based organisations or civil society. Successful partnerships often have the following characteristics:

- Partners are included as early in the process as possible.
- Partners are considered based on shared values and contributions, not on traditional stereotypes.
- Information between partners is shared regularly and transparently. Transaction costs of working together are low.
- The capacity of partners to promote and support FMNR is built over time.
- Where possible, partners benefit from decisions and activities.
- Partnership agreements are documented as necessary. Note: it is not always necessary to formalise a partnership, particularly if neither party requires it. However, even a simple informal agreement document can be useful to set out common goals and agreed working relationships to prevent any confusion.

Important FMNR partnerships

Important partners have the ability to contribute towards the success of FMNR. They can also take a strong interest in the community or the land and trees being managed in this way. Stakeholders that are both influential and interested should be managed closely, but those who are influential may not initially be interested. These partners should also be engaged and shown how FMNR may be relevant to them.

Some groups that are often important FMNR partners are described below, alongside suggestions on how to engage them.

Traditional leaders and local government

Although traditional leaders and local government officials may also be members of the community, they hold additional roles beyond their personal practise and support of FMNR that make them important partners.

Benefits of partnership

- Endorsing and encouraging FMNR activities: their support sends a strong signal to local communities on the importance of FMNR.
- Working with the community to create a favourable policy environment for FMNR: they can help create bylaws and, where possible, assist in market chain development and establishing authorised FMNR product markets. This is essential to efforts to scale up FMNR work.
- They can be a powerful ally in advocating and communicating progress and successes to local- and national-level government.

- They provide authoritative intervention during disputes and breaking of bylaws, and technical assistance when monitoring, following up and encouraging FMNR practitioners.
- By adopting FMNR into annual planning, budgeting and their standard suite of agricultural and forestry activities, they can increase the impact and sustainability of the project far beyond what the community themselves, or another partner organisation, can achieve.

Community leaders are very influential and can make or break an FMNR initiative by lending or withholding their support. Chief Biliya-mnamaltenga, of Tongo Beo village in Ghana, explained how *"the arrival of FMNR in my village has enabled me to fulfil the meaning of my ceremonial name, which is 'Tintuug Lebge Tii', meaning 'the small shrub becomes a tree'."*

Chief Biliya-mnamaltenga has led by example on his own land and used his authority to ensure that FMNR is widely adopted. His leadership has contributed significantly to the rapid uptake of FMNR in and beyond Tongo Beo.

Figure 1 Chief Biliya-mnamaltenga of Tongo Beo, Ghana, is an influential FMNR leader (2015). Photo: T. Rinaudo

Faith communities and religious leaders

In the quest to ensure that FMNR is sustainable, churches, mosques, synagogues, temples and other centres of worship can be ideal partners. These centres have existed in most communities long before the arrival of any government office or development organisation, and they will remain long after any project ends. As a result, they are very influential.

Benefits of partnership

- Faith communities can provide mutual support and build the foundations of community, which is essential for successful FMNR.
- They may be very aware of the challenges their congregations struggle with and are able to contribute to a greater understanding of the community context.
- Religious leaders are often strong influencers of opinion in a community. By adopting the FMNR movement early, they can encourage their community to experiment with its practices.
- Faith communities may be able to provide space for FMNR meetings, trainings and even demonstration plots on the grounds of their place of worship.
- Faith provides a theological foundation for creation care, opening up discussions regarding appropriate care and improvement of the environment.

FMNR and faith

Throughout all major religions of the world, and their sacred texts, there is a common thread about care and compassion for the natural world. Resources to support natural resource management or environmental messages from major faith groups can be found on the **FMNR Hub Resources Page** or at these links:

- **Environmental Protection in Islam**
- **Alliance of Religions and Conservation**
- **GreenFaith.org**

Schools and ministries or departments of education

Schools and ministries or departments of education are also important partners in FMNR. Like places of worship, schools tend to be central locations for communities to come together. Schools are a physical reminder of the future that communities seek to build for their children, and are places where people are accustomed to learning and to accepting new ideas.

While we adults may be resistant to change, children often find it exhilarating; they can be passionate activists who inspire adults to test new concepts. At the start of the FMNR project in Humbo, Ethiopia, some community members feared their grazing rights and freedom to harvest wood and make charcoal would be permanently lost. But after the project partnered with local schools, their children told them to be patient and explained the importance of regenerating the forest. Because those adults agreed to try FMNR for one year, the community now has more fodder and firewood than they imagined possible from once barren, rocky land.

Benefits of partnership

- Children exposed to the benefits of FMNR take these knowledge and skills into adulthood, when many will be in positions of influence.
- Children are powerful advocates for FMNR to parents and adults in general, so school projects on FMNR can help shape the whole community.
- Children will grow up to be additional practitioners of FMNR.
- Environment clubs or FMNR lessons can increase opportunities for children and youth to learn, and to use that knowledge to improve their lives.
- Schools may have open space available that can benefit from FMNR and related projects, and can provide space for community discussions or even act as FMNR demonstration sites.
- Ministries or departments of education can adopt FMNR into their science, environment and life-skills curricula, increasing knowledge of FMNR across their areas of influence.

Resources for including FMNR in schools can be found in **Chapter 7**.

Community-based and non-governmental organisations

CBOs and NGOs, or community-based and non-governmental organisations, are important allies for FMNR work, particularly those working in natural resource management, agriculture, micro-enterprise, development and similar fields.

Benefits of partnership

- CBOs and NGOs can promote FMNR in additional communities.
- They can support joint FMNR initiatives, increasing collective capacity and strength.
- Building the awareness of other CBOs and NGOs around FMNR helps to avoid other activities undermining FMNR efforts.
- National and regional implementation can occur more quickly than it would with only one community or organisation promoting it.
- Other organisations provide additional types of capacity needed in an FMNR project.

Universities and research institutions

By partnering with universities and research organisations, an FMNR project can contribute towards more outcomes, explore more innovations and increase the evidence base for their work. For example, partnering with a university may allow a project to measure important data that they would not have the staff, time or technical expertise to measure on their own.

Benefits of partnership

- Universities and research organisations can assist with monitoring and evaluation, which can increase a project's evidence of impact and provide research to guide promoters and managers on the most cost-effective forms of intervention.
- They may help to generate data to influence policy makers, or adapt FMNR in the best way for the local needs and context. Increasingly, donors are demanding quantitative impact studies to justify funding requests.
- They can assist in testing the value of innovations or integration with other interventions.
- Skilled interns may be available to support FMNR projects as part of their research.
- By building FMNR into curriculums, universities can help increase knowledge and adoption of FMNR by future program staff, leaders and government officials.

State, county and national governments

Relevant institutions include government departments responsible for policies related to land and tree ownership and rights to use and benefit from FMNR products. Departments or ministries of environment, forestry and agriculture are particularly relevant, but it is often also wise to engage with departments related to community development, finances and social welfare. These departments will value both the outcomes that FMNR can produce and its high return on investment. They can be strong allies in gaining support for FMNR.

A good way to engage partners at this level is by establishing national FMNR networks or working groups, where representatives of different departments, NGOs and research organisations can all come together to share experiences and formulate joint plans.

Benefits of partnership

Raising awareness of FMNR within governments can:

- promote FMNR as a low-cost, effective method of meeting many government objectives;
- secure support for FMNR through government departmental staff on the ground, reducing the likelihood of conflicting information reaching land managers and increasing accessibility of FMNR knowledge and skills throughout the country;
- lead to the inclusion of FMNR in national and regional investment plans and strategies, such as national targets and commitments to restoration or climate change mitigation or adaptation strategies; and
- increase access to funding for FMNR through national and international investment and financing programs available to governments, such as the Green Climate Fund.

Case study

Uganda FMNR Network

On 4 June 2015, the Uganda FMNR Network was officially launched. The network was born out of a national FMNR conference hosted by World Vision Uganda, held a year before. A wide range of NGOs, the World Agroforestry Centre and government departments were represented at this conference, and the need for a mechanism to work together to more effectively scale up FMNR across the country was clear.

Network members are exceptionally committed and have worked closely together to develop a five-year strategy and work plan to roll out FMNR nationally. With no allocated budget for the network, they have devised ways to share the resourcing needs, such as by rotating which organisation hosts meetings.

This approach successfully shares costs and responsibilities, and in the process, draws in managers of participating organisations who may not normally attend meetings or be involved with the network. It builds the sense of ownership and responsibility amongst member organisations in a way that individual participants may not be able to alone. Each organisation has committed to covering individual task force members' costs and supporting the appointment of an intern to assist with network liaison and coordination tasks.

Tony Rinaudo, FMNR pioneer, was present at the network's launch event and addressed the audience with these words. *"I only know of three other FMNR networks in the world and they struggle financially, motivationally and structurally. Even though the Uganda FMNR network is new, from the work the task force has done you have laid a firm foundation for a successful network.*

"By forming the network you have pronounced that by working together we can achieve much, much more than by working alone or in competition with each other."

Since its launch, the Uganda FMNR Network has continued to grow. In 2017, 25 organisations were represented including government, research institutions, teaching institutions, civil society organisations and NGOs. Network members have established a workplan, logframe and monitoring program which tracks their combined FMNR contributions and achievements. The network has also facilitated training sessions for farmers, cultural leaders and community facilitators beyond the current FMNR project areas.

Benefits for partners

Since building successful partnerships requires all partners to gain from their combined work, let's also consider the benefits FMNR projects can offer potential partners.

- The process of implementing FMNR can help strengthen and build capacity for weak or inexperienced organisations, or those new to the area.
- Working with FMNR can improve a partner's knowledge of sustainable management of natural resources.
- The environmental outcomes of FMNR can help governments and other organisations achieve any goals that depend on a healthy natural resource base.
- The community engagement and empowerment outcomes of FMNR help organisations achieve goals that depend on the knowledge, capacity, social capital and prosperity of the community.
- Improved governance structures and collaboration can decrease conflict between communities and government ministries, decrease illegal tree use and poaching, and potentially reduce community need for emergency support.
- The community becomes an ally, not an adversary: the technical expertise of land users, FMNR champions and project managers can contribute to the capacity building of government staff, outreach, training of instructors and extension needs.
- They can reduce conflict over use of resources and breaches of forestry regulations, which allows ministry staff to focus more of their attention on other priorities.
- They can increase program integration and sustainability of outcomes.
- Opportunities for increasing staff capacity and knowledge around both regeneration and community engagement can be created.
- They provide opportunities to empower faith communities: many religions include a strong sense of responsibility for the natural world, or include mandates for their followers to ensure the well-being of the most vulnerable; FMNR helps faith communities better fill these stewardship roles by improving forest and agricultural production, as well as income generated from these sources.
- Wood, forest products or income resulting from FMNR can contribute directly to supporting the needs of partner groups, places of worship, schools, etc, through income-generating projects and immediate use.
- By increasing the availability of firewood and food for the school kitchen, more time may be available for teaching and learning.
- FMNR can also be incorporated across the educational curriculum, providing practical exercises in arithmetic, science, language, agriculture and most other subjects, as well as providing valuable life skills.
- FMNR projects may provide research and internship opportunities for university students and faculty members.
- Universities and research organisations benefit by building connections and gaining easier access to locations of interest to them, as well as access to the experience and knowledge of the community, and to sources of data relevant to their research interests.

Chapter 9

Designing FMNR projects

Summary: Designing FMNR projects

- FMNR projects should be catalysts for ongoing, self-replicating FMNR movements. As such, building the capacity of the community and partners to continue to support FMNR beyond the project period is key.
- Projects should focus on the community's goals and needs, and should avoid top-down approaches of imposing a solution, or providing inputs or external incentives for communities to accept the project.
- Because FMNR contributes to a number of important global priorities, and a wide range of programming, there are several ways to secure financial support for projects.

Resources

- The **Online FMNR Training Course** is designed to build the capacity of staff to design and support FMNR projects. The course is currently only available for World Vision staff. Please check the FMNR Hub website for updates.
- **Annex 7** contains examples of FMNR logframes.
- **Workshop facilitator guidelines**

Now we've discussed everything that goes into making FMNR successful, let's briefly cover key FMNR-specific aspects of formal project design. In this section, we won't cover general project design principles, but instead will focus on principles of successful FMNR projects – from the initial scoping of an FMNR concept to planning for the implementation of a funded project.

The FMNR project approach described in **Chapter 2** provides a general framework for any FMNR project. Complementary interventions, such as tree planting, market development, agricultural practices, and soil and water conservation practices, can also be incorporated into the project design where appropriate.

Community ownership of the process and results is foundational to FMNR, as the bulk of the work and investment of time and resources is done by the community and individuals practising it. Following inception, the project should not be the primary motivating force in the adoption of FMNR. Once FMNR is being used in an area, practitioners should teach others how to practise it. Include activities that support the promotion, advocacy and spread of FMNR at a local and national level where possible.

FMNR projects should catalyse self-replicating FMNR movements. To do this, a project should not prescribe 'one right way' to do FMNR; rather, it should engage the community, and build upon the community's own goals and efforts, to make changes. Projects should aim to adhere to as many of the FMNR principles as possible.

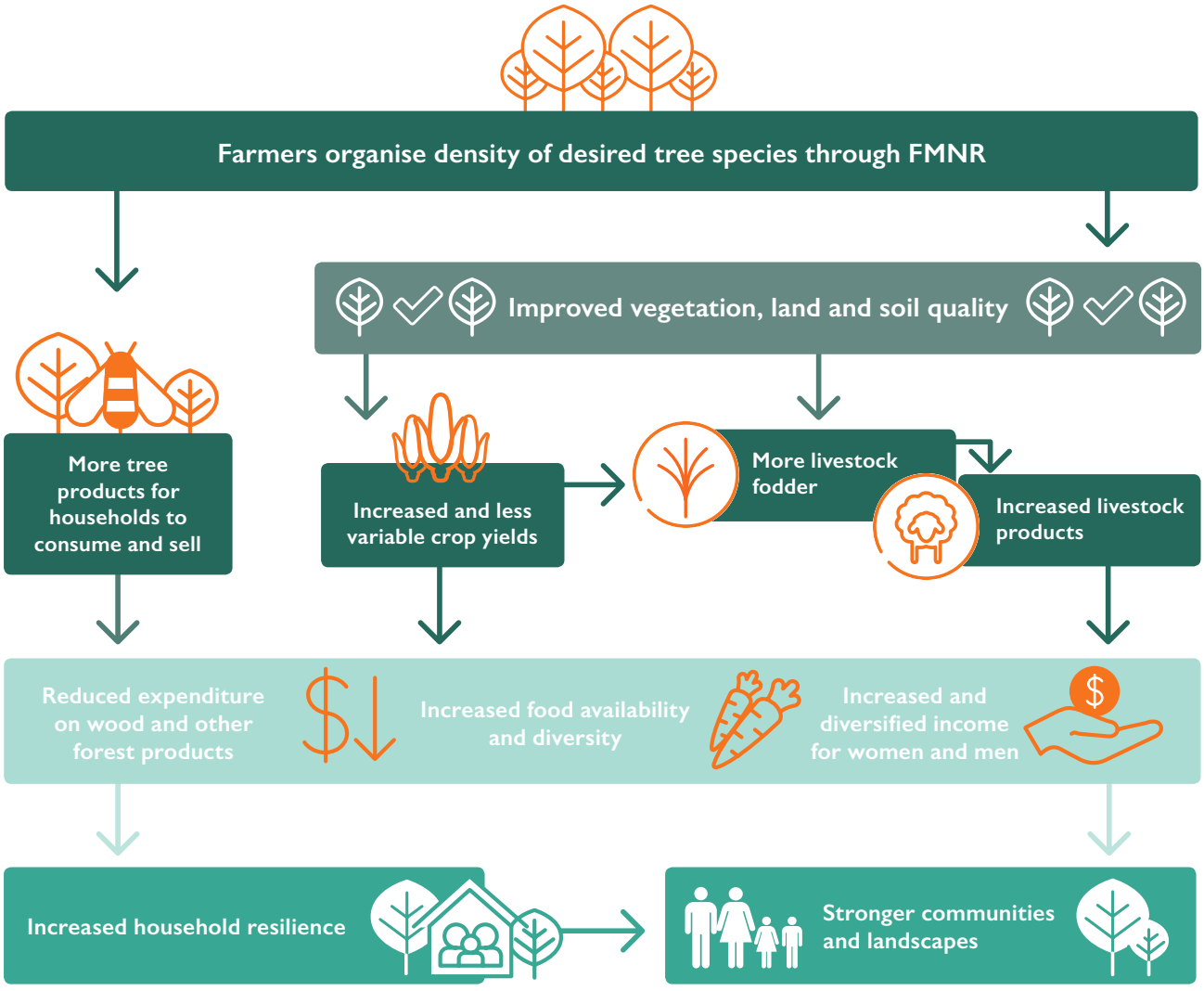
Even though a project must be set up as such – with a defined start and end date, budget, activity plan, indicators and targets – it's important never to lose sight of the fact that one of your major objectives should be to create an enabling environment for the birth of an FMNR movement. This is something that does not have a well-defined start and end point, is not dependent on external resourcing, and does not have set targets or geographic limits.

Theory of change

A project theory of change describes how you expect changes to occur as a result of your activities, and what outcomes and impacts are expected to result. Theory of change diagrams or descriptions are useful for communicating and explaining your project to the project team and other stakeholders, as well as for guiding the monitoring and evaluation of expected outcomes and impacts.

The FMNR theory of change describes the physical, social and environmental outcomes of FMNR. This theory of change may be useful when explaining FMNR to other stakeholders, or as a starting point for defining your project's own theory of change. As FMNR is usually one of a number of activities in a project, your own theory of change may also include other causal pathways or outcome chains.

Figure 1 Simplified theory of change for FMNR. Source: C. Kabore pers. comm. (2015).



Concept notes

A concept note can be a very useful tool for focusing and clarifying your thinking about a new project. It provides a clear and simple outline of the proposed project for further development, as well as for creating the full project proposal, and can be easily translated into other brief marketing and informational material. Concept notes can also help introduce the project to potential partners and other stakeholders, and are useful when proposing FMNR as an innovation to existing projects where environmental or livelihood degradation has been identified as a fundamental issue to be addressed.

Preparing a concept note for FMNR does not differ significantly from other types of programming. What is different with FMNR is that, due to its versatility and inclusion of both environmental and social components, FMNR may appeal to a wider variety of donors than more specific interventions.

Potential FMNR donors include those focused on:

- development
- environment
- natural resource management
- agriculture
- disaster risk reduction
- climate change adaptation and mitigation
- building social capital
- indigenous rights and empowerment
- women's rights and empowerment
- minority group rights and empowerment
- resilience
- sustainable livelihoods
- youth livelihoods
- economic development and income generation
- water, sanitation and hygiene
- conflict reduction
- numerous other fields affected by the economic capacity of communities, such as education and healthcare

The concept note will need to be tailored to the focus of the donor, describing the whole process of FMNR while highlighting the activities and outcomes most directly relevant to donor interest.

Simple ways to make your concept note effective

- Concept notes are very brief, so don't include lots of detail, but make sure that what you do include is clear, confident and well stated.
- Make it positive. You want to make a difference, so make sure your reader can see what can be achieved in what you submit. Describe your vision for the future!
- Your concept note should fit the donor. Do some research if you don't know the donor, and tailor your concept note to their interests and areas of focus.
- Make sure your concept note is easy for an outsider to understand – avoid jargon and acronyms unless you define them. Simple, clear language and strong, clearly described ideas make friends of busy readers!
- Always check your final document to make sure it is error free and easy to read – make sure the text is large enough and cleanly spaced, and all information is correct.

Logframes

Logframes are now widely accepted means of organising project information and are required by many donors. Logframes include project activities, timelines, the targets to be achieved, who will be involved and how this will be tracked. A logframe is a simple way of summarising a project plan.

Because FMNR projects vary enormously – from a community group starting FMNR with no outside funding, to a large-scale carbon sequestration project supported by a consortium of NGOs – there is no one right way to build an FMNR logframe. Nor is there one standard template; often a donor will require you to work with a specific logframe template. However, the basic information you will need to design a logframe for any of these projects or donors is similar. This chapter will not cover all possible template formats, but focus on the basic logic of FMNR.

FMNR project logic

The underlying logic of FMNR is:

IF we **encourage** the systematic regrowth of existing trees or self-sown seeds,

and manage the resulting mature trees in a way that suits the practitioner's individual needs,

according to a set of bylaws and governance structures agreed by all stakeholders and implemented communally,

and working with leaders and government to ensure a policy and law enforcement environment in which individuals can profit from their work,

THEN

Communities can restore the productivity of their natural resources and take control of their livelihoods to progress out of vulnerability and poverty.

FMNR is therefore promoted by supporting the community's own efforts and empowerment rather than by a top-down mechanism of imposing a solution, or providing inputs or external incentives for communities to accept the project. Empowered and enabled communities then reach out to others and teach them the skills they have learned.

FMNR logframe considerations

A key priority in FMNR is to link all actions and evaluation to the conditions and problems identified by the community. It is important that the logic of your project clearly demonstrates this, and ensures that, throughout the life of the project, the community is able to exercise their ownership over the direction of their work and resources.

Because FMNR always requires both environmental and social components to succeed, the project logframe needs to appropriately identify and explain all components.

Social equity is also a priority for FMNR, so indicators should be disaggregated by sex and, where relevant, possibly by ethnic, religious or vocational group as well. FMNR objectives, activities and indicators should also track the degree to which women and other minority or vulnerable groups hold positions of power in the FMNR work.

A sample logframe can be found in **Annex 7** showing how FMNR project goals, outcomes and activities can be structured. The next chapter, on **monitoring and evaluation of FMNR**, will go into more detail about indicators and how different types of indicator may be useful for different projects, so be sure to review that section as well.

Budgeting

It is quite possible for a community to practise FMNR with no funding at all, and without the knowledge or intervention of government or NGOs – this is exactly how the people of Niger reforested some six million hectares!

However, to spread FMNR quickly involves more cost, as this requires building awareness and movements in countries and regions where it is not known. The cost will vary widely, depending on the approach and the scale of the project. There is no typical FMNR project size.

An FMNR budget might be as little as US$10,000-$20,000 per year, for such costs as training, exchange visits and follow-up. On the other hand, a budget of $100,000-$300,000 per year may be needed for a project involving advocacy, district-wide promotion and follow-up, assistance with cooperative formation, registration and policy engagement, etc. If other components are involved, such as improved agricultural methods, market chain development and livestock rearing, costs will increase accordingly.

The major costs of FMNR promotion include:

- staff salaries for promotion, workshops, training, field visits and follow-up, facilitation or establishment of organisational structures, bylaw creation and stakeholder buy-in;
- transport;
- exchange visits and residential training events;
- monitoring and evaluation; and
- advocacy for favourable policy environment. (Good use of funds will always involve an advocacy component so that favourable policy environments, which encourage individuals and communities to sustainably manage their natural resources, are created.)

At the most basic level, FMNR projects can be implemented within existing budgets through government extension or development program staff with FMNR training, or via partnerships with government agriculture, environment or forestry officers and community-elected FMNR promoters. Complex or large-scale projects, especially those requiring rigorous evaluation, such as carbon projects, would require dedicated staff with extensive FMNR experience and additional technical experts at intervals throughout the project life. If the project includes work at a national level to influence policy, then advocacy staff or technical input may also be needed.

Keeping the end in sight

The aim of an FMNR intervention is for communities to own the entire process of managing their natural resources, so field staff should focus on building capacity of community leaders who will become the main promoters of FMNR in the area. This means that the costs of an FMNR project should not be ongoing , but should involve a specific exit plan through which the community is able to take over full responsibility for their well-being and lands.

Staffing

FMNR promotion staff should ideally have a natural resources, agriculture or forestry background. FMNR experience, of course, is preferred; commitment and skill are more important than number of diplomas. The explosive spread of FMNR to date has been largely because of (mostly uneducated) practitioners talking to their neighbours – this shows that the most important assets in promoters are people skills and passion for FMNR.

Staff should be outgoing, friendly, good networkers, encouraging and able to persevere in the face of setbacks. Staff should be enthusiastic about FMNR, understand it in-depth and be genuine in promoting it. Field staff with their own farms should lead by example and practise FMNR extensively themselves.

Whenever possible, staff should be employed long term. Adoption of FMNR takes time, therefore rapport, consistency and commitment of staff are important. To this end, field staff and volunteers should be local.

Training and support

For staff completely new to FMNR, close supervision and support during the first six months will give them a foundation for success. It is recommended that new staff undertake the online FMNR training course. One visit per month by an experienced practitioner or, at the very least, somebody with good experience in rural development is advisable. It is also valuable to have a visit from an external FMNR champion at least once a year for the first three years.

We highly recommend that in-country FMNR staff have an external mentor they can talk to about specific problems. For example, while a technical advisor visits World Vision's FMNR for East Africa project once a year, country project managers consult their peers in neighbouring countries regularly, learning from each other when issues arise and during annual cross-country meetings.

Technical expertise

For most FMNR projects, external technical assistance may only be required for troubleshooting, evaluation and research. Carbon projects, however, will almost certainly require additional external expertise and oversight.

Case study

A day in the life of an FMNR facilitator

Dodoma, the capital of Tanzania, was a woodland and game reserve 80 years ago. Over the past 30 years, deforestation has accelerated to the point where the Dodoma region is now a semi-arid zone where people struggle to eke out a living from previously fertile soils. The main contributor to this deforestation is a combination of poor farming practices and the production of charcoal for urban centres.

Figure 2 Andrew Jones (left) and Nassoro deliver training on FMNR in Tanzania (2015). Photo: A. Jones

Andrew Jones has worked with the Anglican Church in Tanzania to deliver an FMNR training program to 60 villages in the Dodoma region, with Tanzanian friend and FMNR facilitator Nassoro. Here, Andrew shares some of the day-to-day workings of the project.

Each village receives five visits and the cost of the entire program is only US$3,500 over a 12-month period. I have been providing encouragement and accountability, and contributed to the initial training design. Nassoro has called the program *'Ufufuaji wa miti'* which means 'Resurrection of the Trees' in Swahili. The acronym he uses is 'UMI', which means 'life' in the local KiGogo language.

Nassoro heads out on his motorbike for village visits three-to-four days per week. His methodology is to dig the hole of felt need on his first visit to the village. Usually an older person is selected (to start the discussion) from the participant group. We find they remember better times when the rivers ran all year round; when wild animals lived nearby, trees were abundant, crops were more successful; and when they used to forage for forest fruit. Following this sobering remembrance, Nassoro will explain five key functions of trees in the environment and then explain the good news: that an existing rootstock of felled trees can be regenerated. A single laminated page of notes and pictures written in Swahili is circulated, and villagers are challenged to train those who are not present at Nassoro's workshop in FMNR. He finishes his first visit by pruning a number of trees with his audience, making sure that several villagers have a go, before he leaves them with their homework of pruning 10 trees each for 10 days.

Nassoro's subsequent visits are to provide encouragement and accountability, as well as to provide training for other business opportunities that villagers can exploit, such as raising chickens or pigs for market.

Figure 3 Nassoro demonstrates and then calls a volunteer to prune a tree, Tanzania (2015). Photo: A. Jones

Through our work, we are essentially asking people to stop cutting trees down and making money from charcoal sales to urban markets. In order to gain traction with tree regeneration activities, we need to help them to explore and begin alternative money-making business activities.

So far, Nassoro has visited 30 villages – some of them twice. He has been warmly accepted by most and given a hard time by a few. The challenge, as always, is in the follow-up; and helping villagers to see the relatively quick benefits of tree regeneration in their village environment.

Typical components of an FMNR project

Some of the following activities are often included in projects promoting and supporting the adoption of FMNR. No one project is likely to include all these activities, so make sure that the activities you do include are well designed to meet the specific needs of your project stakeholders.

FMNR capacity building, mentoring and support

- Training of project staff to understand the relationship between environment, agriculture and livelihoods, if FMNR is new to the organisation or office promoting it.
- Capacity building of staff to implement FMNR and to integrate it with other appropriate activities, such as water harvesting, income-generating activities, rotational grazing and value chain development.
- Training of selected staff and community champions to instruct others in FMNR.
- Awareness creation through workshops and exchange visits in communities and with partners.
- Training of community members to practise and contextualise FMNR.
- Facilitation of visits to and from existing FMNR practitioners.
- Training of men and women in the community to understand the link between FMNR and livelihoods.
- Ongoing follow-up, mentoring and troubleshooting of FMNR practices to increase success.

Exchange visits

Ideally, people taking part in exchange visits to other districts or countries already practising FMNR should include:

- project coordinator;
- male and female representatives from the community;
- field staff;
- one or two government counterparts from forestry, environment or agriculture departments; and
- other identified key stakeholders, such as religious leaders.

If space, social norms and budget allow, it may also be beneficial to include members of local media and influential local leaders.

Numbers must be adjusted according to budget and cost. For example, it would be far cheaper to hire a bus and take many observers to a local FMNR site than to fly even a few observers to a distant country.

Community engagement and support activities

- Connecting with or, if necessary, helping to set up governance and support structures, such as FMNR committees, farmers' and women's groups, children's clubs and cooperatives.
- Supporting the inclusive creation, implementation and enforcement of bylaws for natural resource management.
- Facilitating engagement with government and traditional leaders to create or alter policies so community members have the right to sustainably use their resources (trees, land, fodder, water) and benefit from their work.
- Facilitating FMNR action planning at a community, watershed or landscape scale.

Complementary interventions to support or build on FMNR

- Helping to create links to markets, value addition opportunities or alternative livelihood options, such as beekeeping, that increase the profitability of FMNR.
- Providing training in sustainable agriculture practices.
- Encouraging soil and water conservation practices.

Partnerships and scaling-up activities

- Forming a communications strategy.
- Creating a research plan.
- Promoting and advocating for FMNR practices and outcomes that have been achieved by the community.
- Facilitating award programs and recognition of FMNR champions and their achievements.
- Celebrating relevant national days, such as World Environment Day, to raise the profile of FMNR.
- Establishing or supporting national FMNR networks of government, non-government and research organisations.
- Engaging with government forestry, agriculture and environment departments to share their knowledge and experience, but also for them to be exposed to FMNR.
- Partnering with other organisations and groups in the area who are also working on one or more of the community's development priorities.

A note about paying people to practise FMNR

Projects should not pay communities to practise FMNR, nor provide the tools required, or provide any other financial incentives beyond those that FMNR itself produces. The one exception is when FMNR is added to disaster response and recovery programs, such as food-for-work or cash-for-work programs, where communities would not be able to participate otherwise.

It is important that even these incentives are strictly short term, do not detract from the benefits inherent in FMNR practice, and do not create the impression that future FMNR activity should take place on condition of receiving an incentive. Whenever FMNR is linked to incentives, there should be strong messaging around the purpose and duration of the incentive and the value of FMNR. The benefits of FMNR, combined with the depth of mindset change and motivation experienced by practitioners, should be enough to convince communities of its value.

Customising FMNR projects to community circumstances

As we have discussed throughout this manual, each community is unique and, while they will have some similarities, they will have differences too. FMNR will only be effective for a specific community if it is practised in ways that are effective for them.

FMNR projects are customised by, with and for the community through:

- involving all stakeholders;
- making sure that the needs assessment, goals, concerns and environmental conditions are well understood; and
- tailoring project activities and methods of practising FMNR to address these needs, goals, concerns and conditions.

Projects need to be customised to address characteristics such as when:

- the particular status of women and girls is traditionally not equal with that of men, and/or if women have no decision-making roles or control of assets;
- the status of other stakeholder groups in the community is traditionally not equal with that of the more powerful group(s);
- settled and migratory stakeholders use the same land differently, and/or have a history of conflict;
- different land tenure arrangements exist, or communal land is being included in the project;
- better market access is necessary for FMNR products;
- FMNR is already being implemented, along with other contextually relevant activities, especially those supporting economic development – such as village savings and loans groups, watershed management, beekeeping, etc;
- FMNR is a component of emergency assistance programming, such as food-, assets- or cash-for-work; and
- focus in a specific context will address community key needs and priorities such as agricultural or livestock production, fuelwood and timber shortages, flooding and water shortages, etc.

Chapter 10

Monitoring and evaluation

Summary: Monitoring and evaluation

- Monitoring and evaluation (M&E) of FMNR projects is important for:
  - understanding how FMNR works in different contexts;
  - ensuring the project and FMNR are meeting people's needs;
  - identifying opportunities for improvement in the project; and
  - sharing evidence of outcomes and impacts of FMNR.
- When project M&E is shared, it can contribute to the spread of the broader FMNR movement by:
  - tracking the spread of FMNR in communities and across countries;
  - identifying factors that influence the effectiveness of FMNR in different contexts and for different groups of people;
  - sharing evidence of outcomes and successes on a large scale;
  - showing contribution of FMNR to national and global initiatives; and
  - building a strong evidence base to inform policy and funding decision-makers.
- FMNR M&E activities should involve all stakeholders in the community to be able to understand the project from all perspectives, as well as to enable learning and improvement of FMNR practices.
- Including the nine FMNR core indicators in your project will be a strong start to your M&E design, and will allow projects to be compared consistently around the world.

Resources

- **Collecting FMNR Data to Monitor Change**
- **Annex 8** contains FMNR Core Indicator Definitions
- **Additional FMNR Indicator Definitions**
- **FMNR Evidence Gap Analysis**

Why monitor and evaluate FMNR projects?

Well-designed monitoring and evaluation of FMNR projects is essential for a number of reasons. Project M&E can demonstrate the effectiveness of different methods of promoting FMNR, assess the work of the organisation and staff doing the work, and document the success of FMNR in different contexts and conditions. M&E also provides the necessary data for reporting to donors the outcomes of their investments, such as impacts on income, food security, water availability and other critical outcomes, and for policy makers to make informed decisions.

Evaluation of how well the project met its goals, and what benefits the community and other stakeholders gained from investment in FMNR, is growing in importance as a means of:

- demonstrating value and cost benefits;
- increasing visibility of and interest in FMNR for funding decisions;
- providing data for policy decisions;
- troubleshooting practice and approaches to promoting FMNR; and
- capturing lessons to improve projects in the future and increase the spread of FMNR.

Evaluations are often done by analysing changes identified between the baseline and endline assessments of the chosen indicators. Data to inform these assessments will depend on the indicators selected, but in FMNR projects this often comes from household surveys and possibly satellite imagery to assess tree cover (more on this below).

Evaluation of FMNR projects should also assess the sustainability of the project and what contribution it has made to the broader FMNR movement. For example, is there evidence of spread beyond the project area?

Note that some very structured projects, such as carbon sequestration projects, may have relatively complicated M&E requirements to ensure that agreements between the community and the buyers are met. Detailed instruction on carbon sequestration projects is beyond the scope of this manual. Some resources for those seeking further information are suggested above, but organisations interested in using FMNR for carbon sequestration will require specialised technical capacity or consultation.

Contributing to the FMNR movement

A critical value of monitoring and evaluating FMNR work is generating new evidence to demonstrate the impacts of FMNR. Communities all over the world are aware of the benefits of FMNR, but until recently there hasn't been a great deal of focus on collecting evidence in structured ways. Structured, replicable evidence, however, is important to donors, policy makers, governments and other organisations that can help to increase the momentum of the FMNR movement. More studies and evaluations with strong scientific rigour will enable the movement to expand further, increase access to funding and help us to work toward enabling policy environments at all levels, so that local communities and the global climate can benefit from FMNR.

For this reason, the FMNR movement needs to build a body of evidence that:

- demonstrates its outcomes are not by coincidence;
- shows that change is greater with FMNR than without;
- explains clearly what has been done, so that the same practices can be tried in other environments; and
- objectively explores both positive and negative, successful and unsuccessful outcomes.

In 2016, a review of the existing evidence (**FMNR Evidence Gap Analysis 2016**) was completed to document what we know, and what we need to learn more about with regards to FMNR. A number of gaps in evidence were identified, but many of these can be filled with robust evidence from project M&E. Specific gaps that should be prioritised include:

- Evidence from diverse geographic regions where FMNR has been introduced more recently than in West Africa, in particular:
  - East Africa
  - Southern Africa
  - Southeast Asia
  - Pacific
- FMNR's impact on:
  - community empowerment;
  - improving women's well-being, rights, equality, income and assets;
  - crop and livestock yields, and soil fertility;
  - community income and sustainability of livelihoods;
  - reforestation;
  - carbon sequestration and climate change adaptation and mitigation;
  - increasing biodiversity; and
  - enhancing the hydrological cycle.

Evidence on these topics can sometimes be gathered through good project monitoring and evaluation, such as impacts on community incomes, empowerment, access to income and assets, and even impacts on crop and livestock yields. Some topics are more complex and may not be able to be addressed through normal project M&E, as they require specific technical expertise often held by research institutions, or require longer timelines to identify changes. It may be possible to partner with these organisations on collaborative research activities in conjunction with your FMNR implementation project to gather evidence on topics such as impacts on biodiversity, carbon sequestration or the hydrological cycle.

How to monitor and evaluate FMNR projects

Who is responsible?

FMNR monitoring and evaluation, like FMNR itself, should be **participatory and inclusive**. This means involving all relevant stakeholders in the monitoring and evaluation activities to ensure their perspectives and experiences are included, and that they receive and understand the results in ways that are useful for their needs.

The community implementing FMNR is the primary stakeholder of all FMNR work, and should be actively engaged in all aspects of the project, including M&E. Monitoring should assist the community to improve and replicate their practice, share their learning and experience for the benefit of others, and see clear evidence of their progress.

Key stakeholders in the FMNR process, and their typical use of monitoring and evaluation information, include:

- community members – for continuous improvement and adaptation of technique;
- project staff – for continuous improvement in project design, delivery and reports to donors;
- partner organisations, managers and leaders – as evidence and as an advocacy tool for scaling up FMNR adoption, and for reports to donors; and
- government staff and decision-makers – for continuous improvement and adaptation of technique, evidence building for increased adoption of FMNR, and to influence policy.

How to do M&E?

Many organisations have established project monitoring and evaluation processes and standards. If your organisation or project does not have these already, you may wish to consult resources such as **Better Evaluation** for advice.

Everyone doing FMNR would benefit from monitoring and reflecting on their practices in some way. This can be as simple as keeping records and taking some before and after photographs, and reflecting on how and why the land has changed.

When and what to monitor and evaluate?

In general, monitoring and evaluation involves understanding how things were **before the project** (the baseline), how things are done **during the project** (monitoring) and what has changed at the **end of the project** (the endline or 'end of project evaluation').

As we have discussed previously, the only truly successful FMNR project is one that works for the people managing the trees. Therefore, monitoring and evaluation of FMNR should focus on the **social, economic and environmental** outcomes of the practice for these people. The FMNR theory of change in **Chapter 9**, or your project's customised theory of change or logframe, can be a good way to identify the likely outcomes you are looking for. Indicators should be identified for a range of the changes, or outcomes and impacts, that you anticipate occurring as a result of your FMNR project.

Core FMNR indicators

We use indicators to help determine what data needs to be collected to help assess the progress of a project, and whether it is on track to achieving its goals and objectives. The best indicators for tracking progress will depend on the project goals. Ideally, the nine core indicators listed in the table on page 136 should be included in every FMNR project, regardless of location or goals. By consistently monitoring these indicators across projects, we learn a great deal about the variations and benefits of FMNR around the world. Everyone involved with the FMNR movement can help to continually increase its evidence base.

Many organisations, however, have standardised indicators to ensure their evaluations are comparable across programs or meet specific donor needs; if you are part of such an organisation, you will naturally need to use your required indicators as well.

	FMNR core indicators	Minimum measurement requirements
1	Number of individuals (male, female, total) trained in FMNR.	Project monitoring data – Training records
2	Number of individuals (male, female, total) adopting FMNR.	Project monitoring data – Project participant records
3	Number and proportion of households that have adopted FMNR in the target area.	FMNR adoption records
4	Coverage (hectares) of FMNR in the target area.	Landscape-scale analysis of tree cover (remote sensing and ground truthing) + Project monitoring data (FMNR site assessments) + Baseline and endline household survey
5	Average tree density change in the target area (in hectares). Differentiate between cultivated land, grazing land, degraded forest and other (specify).	Landscape-scale analysis of tree cover (remote sensing and ground truthing) + Baseline and endline household survey
6	Number and proportion of households with year-round access to sufficient food.	Baseline and endline household survey
7	Number and proportion of households (and women) with access to forest products: firewood, timber and non-timber forest products, including honey, fruit, nuts and leaves.	Baseline and endline household survey
8	Total household income (from crops, livestock and FMNR-related products).	Baseline and endline household survey
9	Proportion of parents or caregivers able to provide well for their children.	Baseline and endline household survey

The definition and supporting information for each of these core indicators can be found in **Annex 8**.

Additional FMNR indicators

FMNR work should also be evaluated on how well the community has been supported to implement its social and physical aspects; and the nature and extent of impacts they are experiencing as a result, especially in relation to their goals for FMNR. Community engagement is paramount to any FMNR project, however it can be more difficult to measure than factors like number of trees or hectares of coverage.

A comprehensive list of additional FMNR indicators you may wish to choose from is located in **Annex 9** and many of these have recommended definitions available for download from the **FMNR Hub website**. This contains examples of project activity indicators and possible impacts, and these are aligned to the simplified FMNR theory of change presented in **Chapter 9**. We suggest looking through the list and selecting those most relevant for your community and project. You may need to pick a few indicators to present a robust picture. Ensure that you include indicators across the range of different levels in your theory of change, such as activity indicators, short-term impact indicators, medium-term impact and longer-term impact indicators.

Additional indicators can be added based on the community and project's specific objectives. The lists referred to above are not exhaustive; they're intended to give project managers options to choose from. You may also wish to add your own indicators as needed. The **Indikit website** also provides an excellent range of indicators, with directions on how to use them.

Monitoring FMNR activities

Once you have selected indicators to track your project's progress, you will need to plan how those indicators will be monitored. Monitoring is the collection of information on a regular basis throughout the project. Not all FMNR indicators are suited to regular monitoring; tree cover, for example, is best assessed before and after a project – over a three-to-five year interval – as change is slow and not easy to identify. However, FMNR activities and some short-term outcomes may be suited to regular monitoring, such as:

- participation in training activities;
- participation rates in bylaw development;
- participation rates in community groups or organisations;
- rates of adoption of FMNR – who is doing it, and where; and
- activities of FMNR champions and other extension services.

Monitoring these activities will allow the project team to identify problems early, such as an under-representation of a certain group of people or low adoption rates in a certain area, and make changes to remedy the problem before the end of the project.

Depending on the location and types of FMNR practices being used, some outcomes of FMNR may be quickly identified, such as increased grass cover, or increased fodder or firewood availability through pruning. These outcomes can be monitored during the project. Other outcomes, such as soil fertility or household food security, may take longer to be realised. To ensure M&E activities are not over-burdensome, these are probably fine to assess at project completion.

Monitoring results should be shared verbally and in writing with all stakeholders, for discussion and action for correction of problems and continuous improvement. Discussion and dissemination of monitoring results ensures that knowledge and learning creates a feedback loop that includes all stakeholders, rather than being 'extractive' that is, only taking information away from the project to provide to donors, etc.

Methods of data collection

Data for monitoring and evaluation of FMNR projects often comes from:

- field visits;
- project monitoring tools to record who participated in trainings and project activities, and adoption of FMNR practices;
- focus group discussions with different groups in the community;
- key informant interviews with individuals, such as a sample of participants, FMNR champions, project staff, partner organisation staff, community leaders and leaders from beyond the project area;
- household surveys of both participating and non-participating households;
- literature reviews and research reports;
- tree cover, tree measurements and tree count sampling; and
- fixed point and/or GPS referenced photographic records.

Monitoring trees and tree cover

Many development organisations have well-established methods for collecting social data through interviews, focus groups and surveys. Collecting information about trees may be more unfamiliar. For organisations with less experience in collecting information about trees, monitoring activities are often a great opportunity for partnering with local forestry or environment departments, research institutes or universities. This not only allows these organisations to share their skills and experience in trees and agroforestry with the community, but also exposes these organisations to FMNR and its benefits by seeing first-hand the changes that occur.

It is important these measurements stay focused on the information most useful to the community in tracking and learning about their FMNR activities, and related to the project theory of change.

In-field tree surveys

As communities begin to practise FMNR, data should be collected on what trees, stumps and seedlings are present in the field. Record what species are present, how many stumps or seedlings are being protected, and how existing tree species are being managed and used. Also make sure you record the total size of the farm or area being managed with FMNR in hectares, as this is important when calculating tree density.[1] You can also record other observations such as how the land is being used, and if there is evidence of erosion or poor ground cover or weeds. Using photo points is also a good way of tracking changes in tree cover and the condition of the land over time. See the text box on page 141 for information on how to establish photo points for monitoring.

If you would like to make some calculations about the growth rates of the trees, or the amount of carbon being stored in the regenerated landscape, you may also need to record the height (in metres), diameter of the tree at breast height (1.3 metres above the ground) in centimetres or the diameter of the tree's crown. See the **FMNR Hub resources page** for a guide on how to take these measurements for a carbon project.

Depending on the size or number of land users engaged in your project, it may not be possible to do in-field tree surveys on every participant's land. In this case, a sample of land users can be selected. Depending on how your project is organised, it may be possible to record this information on FMNR champions' farms, or a random selection of 20 percent of land users who are participating in the project. If you are using a sampling technique, ensure that you have sites from all different landscapes in the project area.

Sample plots

If the FMNR sites are particularly large (for example, degraded forest areas or communal grazing land), it may not be practical to try to record all trees and seedlings across the entire site. In this case, you can establish a number of sample plots to monitor that will represent changes in the overall area.

The number and size of the sample plots required will vary based on how variable the site is, and how precise you need the data to be. For measuring tree dimensions, approximately 15-20 trees in a sample plot is recommended.[2] Factors to be considered when locating the sample plot include:

- Plots should not be located on the edge of the site or take in abnormal features (such as dams).
- If trees are on the edge of the sample plot, they are counted as 'in' if the centre of the stem is in the plot.
- All information collected should be checked before leaving the plot.
- Plots will be marked by GPS record at the centre of the circle or the four corner points of a square plot.
- If appropriate, sample plots can also be created by marking paint on rocks or tape on trees.

[1] For properties that are small (<10ha), it is logical to consider the entire farm as being managed by FMNR. We accept this as a land manager who has adopted FMNR, and who has changed their mindset about working with nature, rather than against it. While they may only begin with FMNR on a small area, we regularly see this area increase rapidly, and FMNR principles being applied across the property. Land users with larger properties, or working on large areas of communal land, may more realistically start with a specific area and increase this gradually over time as resources/time become available. As such it is more important to specify the area of FMNR in these cases.

[2] forestry.ac.nz/euan/inventory/plotLayout.htm

Sample plots of various sizes can be established based on the following dimensions. On sloping ground all distance measurements should be horizontal.

Probable stems/ha	Plot area (ha)	Plot radius for circular plots (m)	Plot side for square plots (m)	Plot diagonal for square plots (m)	Plot factor (for conversion to /ha)
80	0.25	28.21	50	70.71	4
100	0.2	25.23	44.7	63.25	5
200	0.1	17.84	31.62	44.72	10

Annex 10 contains some templates to assist in the collection of this data. There are also electronic tools under development to assist with this data collection, which will be accessible on the **FMNR Hub website** once available.

Remote sensing to monitor tree-cover change

To be able to see how tree cover across the landscape is changing, it is necessary to take a birds-eye view. Aerial photography and satellite imagery has such good resolution now that individual trees can often be distinguished, and therefore counted. There are a range of tools that can assist with this process, from powerful Geographic Information Systems, through to simply looking at photographs of an area in the past and comparing with what it looks like currently.

Collect Earth is one such tool developed by Open Foris to facilitate the interpretation of high and medium spatial resolution imagery available in many free online mapping tools, such as Google Earth. The tool helps users to analyse the imagery and map trees, land uses or other points of interest. Collect Earth uses a sampling approach, and therefore allows for very detailed analysis as well as more rapid analysis over larger areas. The tool has been designed to be very user friendly and no qualifications or significant experience in mapping systems are required.

Mapping of tree cover or land use through Collect Earth has been completed through 'mapathons', involving university students mapping large areas over the course of a week. Collect Earth not only allows for the mapping of tree cover from current satellite images, but also historical and contemporary images as they become available. In this way, it is a valuable tool for establishing tree-cover baselines (this can also be done retrospectively if appropriate historical imagery is available), and identifying changes in tree cover at the end of the project. If using Collect Earth to do this, be aware that tree cover changes are not always identifiable from low or medium resolution satellite images (that is, not very detailed imagery) while trees are small. After four or five years, however, many landscapes may have canopies large enough to be identified, depending on how the FMNR trees have been managed, and how good the quality of available imagery is.

To ensure the data being collected through Collect Earth accurately represents the reality on the ground, it is good practice to establish a number of reference sites for ground truthing where in-field tree surveys (see above) have been done. These sites should be selected in a number of different locations, covering the range of different land use types. Record the location of the site using both GPS references as well as a clear description (photographs can help with this) so that it can be revisited throughout the project. At the site, record the number, species and size (diameter at breast height and height) of the trees present. You may also wish to record any other activities or land uses occurring in the area to cross-reference with the mapping that has been done.

Collect Earth and support information can be found here: **openforis.org/tools/collect-earth**

Figure 1 Satellite image of FMNR champion's farm (Year 1 of project) showing their FMNR trial site, photo point location and two photos of the site from ground truthing. Nakuru, Kenya (2018). Photo: A. Muller

A simple guide to photopoint monitoring for FMNR

Taking regular photos at a set point can be a very successful way to monitor changes over time and the effectiveness of projects such as FMNR. Setting up **photopoint** monitoring can be fast, simple and inexpensive.

The most important element of photopoint monitoring is to **keep returning to the same position** and take a photo in the **same direction**, so that comparisons can be made of the physical change at a given location. For a project that is five years long, these photos should be taken at a minimum of every 12 months.

Materials required

- digital camera (a camera with a built-in GPS, such as a good-quality smart phone, is ideal)
- computer for data storage
- GPS (if not included in your camera/phone)
- paint or ribbon to mark photopoint location (optional)

Approach

- Select a location in the landscape that you expect will show some changes as a result of your project.
- Identify two objects that should not move, such as big trees or rocks, or a hillside in the background.
- Stand in front of one object, facing towards the other, and take a photo of the landscape. Make sure that the second object is included in the photo. If you can, mark your location on the first object with paint or a ribbon. Get the land user's permission first!
- If your camera records GPS locations, then make sure this is turned on.
- Return to the same place every 12 months and take another photo. It helps to bring a copy of last year's photo, to make sure you are capturing the same view of the landscape.
- Export your photos from the camera to the computer as soon as you return to the office. Label each file with the location name and date, and save them in a specially created folder. Make sure this folder is accessible from other computers too.
- Repeat this approach every 12 months so that you can build a pictorial record of changes in the landscape.

Hints and tips

- Minimise sun glare by timing the photo when the sun will be behind you – between 9am and 3pm is best, depending on which direction you are facing.
- Taking photos on cloudy but bright days can help avoid strong shadows.
- Photos should be taken at the same point in the season each year.

Figure 2 Comparison photos of a hillside overlooking Yameriga village, Ghana: a. Feb 2010, Photo: P. Akaribo; b. April 2014. Photo: A. Crawford

For more detailed instructions regarding photopoint monitoring, the following resource is recommended: **nrmsouth.org.au/wp-content/uploads/2014/08/Photo-Monitoring-Fact-Sheet-NRM-South.pdf.**

You can also find a copy on the **FMNR Manual resources page**.

Sharing FMNR findings

There are hundreds of examples of communities and land users describing benefits and changes to their land and lives after implementing FMNR. There are also news media and other reports showing how communities live better, or cope with crises differently, after using FMNR to transform their landscapes. These reports are true. The authors have seen these changes with their own eyes, and have heard these reports from trusted colleagues.

However, these types of reports, in the forms of stories, case studies, interviews and testimonials, are difficult for policy makers, donors, leaders and decision-makers to apply. If you don't know the people reporting these stories, and you haven't seen such changes yourself, it is difficult to know what is true – what is definitely because of FMNR, rather than other factors.

One goal for the FMNR Manual is to encourage as many FMNR projects as possible to consider using a minimum set of nine FMNR core indicators, so that more projects across the movement will be able to compare their work and its impacts. Together, these projects will add up to an impressive story!

FMNR Manual users can contribute to building an ongoing evidence base by notifying the **FMNR Hub** of published evaluations, research and lessons learned from their FMNR work.

Systems for tracking the FMNR movement

In order to track the spread of FMNR around the world, tools and systems are under development that will allow projects, organisations and individuals to share how they are supporting FMNR, who is doing the work, how and where it's being practised, and what the outcomes and impacts have been so far. These tools will include a web-based dashboard that can track the spread of FMNR around the world.

Stay in touch with the **FMNR Hub** as mobile apps, interactive maps, training, social media tools and an online dashboard become available.

Case study

Reflections from the field in Timor-Leste: how do we know if our work works?

Anne Crawford, World Vision Australia's Senior Research and Evaluation Advisor (Food Security and Climate Change), describes a typical project evaluation approach.

We lean forward to hear the soft voices of the women and our interpreter over the mid-afternoon tropical downpour. As the rain drums on the corrugated iron roof, I wonder briefly if we will still be able to safely cross the river back to town, before returning my thoughts to the meeting.

We're discussing how our Australian Government-funded FMNR project has benefited the women and men of Fahira village. Today, women have gathered at the home of the farmers' group leader to share their experiences.

Such meetings – or 'group discussions' – are one way that we collect information when evaluating projects as they come to an end. We've chosen to meet with women and men separately to allow them the space to share different project impacts and ensure that there is equal opportunity to speak.

Evaluating a project in the remote communities of the Timor-Leste highlands during the wet season is not without its challenges, but the timing works well for the availability of community members. With the onset of the rains, they are less likely to be working in the fields and our evaluation is less disruptive to their daily lives. Instead, it throws up different logistical challenges for us – of which, 'making it there' is the greatest.

World Vision projects are usually evaluated by an external consultant, with the support of local staff, casual employees and sometimes a representative from an international office – in this case, World Vision Australia. Considerable pre-planning goes on: developing terms of reference for engaging the consultant, agreeing on key evaluation questions, designing the approach, drafting the tools for data collection, finalising the budget and arranging logistics of vehicles, accommodation, village visits and more.

Most projects have a baseline report for us to refer to, which summarises what conditions were like prior to the project starting. This, together with the project design, is important in framing the final evaluation.

Along with the focus group discussions, the consultant will usually undertake interviews with significant partners or stakeholders in the project – for example, local department of forestry staff or village leaders. Village walks provide the opportunity for land users to talk about the changes they have made, and show us their progress in managing the forest using FMNR and planting high-value tree species. Household surveys are also a commonly used tool for any agricultural or natural resource management program, as we seek to unpack the impact of the project with regards to new knowledge and awareness, adoption of improved methods of farming, household income and child well-being.

When used, the household survey is always the most significant undertaking of an evaluation, often involving a number of newly trained survey collectors, fanning out across the project's communities to survey randomly selected households over the space of a week or two. The completion of 400 of these surveys is not unusual, and sometimes it's many, many more. Schedules need to account for local market days, when no-one will be at home, as well as religious holidays and the distance between houses. For this evaluation, enumerators needed to understand the project and the questions, so that when we firstly design them in English, they can read them in Tetun, translate to a local dialect if required, and record the response.

We're also using tablets for the collection of household data instead of the more common paper-based survey. After some effort setting them up, the wins come at the end when the results are quickly downloaded into a spreadsheet, avoiding the time-consuming and sometimes error-prone process of manually entering all of the survey data.

Once all the data is collected, our consultant will start the task of building the story for this evaluation. Did we achieve the project goal and outcomes? Were the activities appropriate to the goal? What can we learn from this evaluation to inform future project designs? Have we made a difference to the day-to-day living for the families that we work with? Did women and men experience different impacts from the project? Our consultant will do this by methodically reviewing the project plan and proposed outcomes, and draw conclusions by analysing the different forms of data that have been gathered. Sometimes there is conflicting information, which will lead to further questions or hypotheses as to why this might be so.

Outside, the rain eases as the women's focus group discussion draws to a close. We say our goodbyes and, jumping puddles, make a run for the 4WD that will ferry us back to the local office. The time in Fahira has strengthened our understanding of the project and its impact, and sharpens our questions for tomorrow's focus group discussions.

Figure 3 Meeting with project participants during a focus group discussion allows for insights about the project's impact. Photo: A. Crawford

Figure 4 Village walks with project participants provide an opportunity for rich discussion. Photo: A. Crawford

Some tips for FMNR project M&E

- Thinking about how you will assess the effectiveness of your project from the start means you will have the right information at the end.
- Many indicators of change are quantitative in nature, so you'll need to collect quality information about your community at the baseline for comparison at the endline.
- A good M&E plan will ensure that you know who is responsible for collecting what information, and how frequently.
- Indicators are important measures of the change that you wish to see. Don't forget to update your indicator tracking table with baseline values at the beginning of your project – otherwise, how will you know what the extent of change is?
- When collecting data, make sure it can be disaggregated into groups – such as male/female and people with disabilities – wherever possible. This is important to demonstrate the inclusiveness of your project implementation; it's helpful to describe what impacts are affecting who.
- It can be good to report results as both a proportion (such as the percentage of land users and households) as well as in numbers (such as the number of male and female land users), because often donors want to aggregate results to show impact.
- As a final check, it can be helpful to think about five key statements that would interest your donor at the end of your project – and make sure you will have the quantitative data to support these. Donors like numbers!

Chapter 11

Some final thoughts

Globally, knowledge and acceptance of FMNR as a low-cost, rapid and scalable land and tree cover restoration technique is growing rapidly.

- At World Vision alone, FMNR is now being implemented in over 22 countries. A growing number of organisations are including FMNR in their work, and individuals and communities across the world are practising forms of FMNR spontaneously.
- Through the efforts of individuals in the World Resources Institute and the World Agroforestry Centre, major international donors, governments, other NGOs and UN agencies have become aware of FMNR.
- Some of the inspiration for the 2011 **Bonn Challenge** to restore 350 million hectares of land globally, and the World Resources Institute's **AFR100 Initiative**, launched at the 2015 Paris Climate Change conference to restore 100 million hectares of degraded land, comes from the FMNR success stories in West Africa. What has happened in West Africa under very difficult circumstances gives great hope that similar successes will be possible elsewhere.

FMNR is not a project or an approach; it is a movement of people across the world taking ownership of their futures by restoring their lands. The goal of this manual is to support the growth of this international movement, providing organisations and individuals with the knowledge to facilitate effective and sustainable FMNR programming and support communities to improve their lives and lands.

You are ready!

We believe good FMNR facilitators give people hope.

FMNR is not just about regenerating trees, but about regenerating people and communities. By transforming themselves from helpless victims of poverty, climate change and natural disasters to empowered land managers working together with nature, communities become designers of their future. Landscapes that are sustainably managed at high productivity provide not only food, shelter and water for the current generation, but hope for the future and incentives for communities to invest in – and remain in – their homelands.

We are glad that you are joining this movement, and we can't wait to work with you for the future of our globe. We look forward to hearing your success stories, learning, questions, concerns and calls for help at the **FMNR Hub**.

The FMNR movement is a community; the more we share knowledge and experience, the more we all benefit.

fmnrhub.com.au

FMNR Manual Annexes

Tools, templates and additional information for the FMNR Manual

All these resources are available as separate documents on the FMNR Manual resources page of the FMNR Hub website at fmnrhub.com.au.

If you have any additional useful tools or resources you would like to share with others across the global FMNR movement, please get in touch with the FMNR Hub team at **fmnr@worldvision.com.au** or **fmnrhub.com.au/contact-us**.

Annex 1. Questions for taking stock with the community

The questions below are a guide to help you begin your engagement with a community that may be interested in or have conditions suited to FMNR.

The purpose of these questions is to:

1. Engage the community in a discussion about their needs and those of the landscape.
2. Encourage the community to consider how things have changed over time and to analyse why these changes have happened.
3. Ask the community to consider their needs for the future, and how FMNR might be able to contribute to meeting some or all of those needs.

As the discussion progresses, add or change questions to determine what information is most important in the context of the community.

Ensure the information related to each of these questions is recorded. If possible, gather information such as photographs, descriptions from elders in the community and personal anecdotes.

1. What is the current state of the community? What are the goals of the individuals/community who will manage the trees?

Describe the current situation of the community and what its biggest or most urgent challenges might be.

List goals the community has for their land, work and lives that are affected by the health and productivity of their environment. This will help to ensure the best focus for FMNR.

2. What type of land are you working with?

Begin your FMNR planning by understanding what land type you are working with. Describe the environment where you're hoping to implement an FMNR project.

1. What are the main features of the land (mountains, valleys, plains, a combination, etc)?
2. Is the area coastal or inland?
3. Are there large bodies of water in the area?
4. Are there forests, grasslands, deserts?
5. Describe any other important features of the land.

How have these land types changed?

Take note of important changes to the land, such as lakes or rivers that have formed or dried up, forests that are no longer present and any other significant changes in the landscape.

We will cover many of these in the sections below, but a general list now will help to make sure nothing important is missed.

3. How is the land used?

1. How does the community get its food? (Do people farm the land, raise animals, hunt, gather wild foods, buy food, etc?)
2. Does the community use local plants or animal products to make medicines?
3. What materials are used as fuel for fires and other purposes?
4. How do community members make their living? (Enquire about main income sources as well as common side businesses.)
5. Is the land used for crops, herding, forests, other primary uses or a combination of uses?

6. How much of the land is devoted to its different uses?
7. Do community members own their own land, use common land or both?
8. Are there settled groups using the land?
9. Are there nomadic groups using the land?
10. Is there ever conflict between people or groups over how the land is used?
11. What groups or individuals come into conflict over land use?
12. Are any forms of FMNR already being practised in the area? Or have similar practices been used in the past in this community?
13. Are any other conservation or restoration practices being used in the area? Or have similar practices been used in the past in this community?
14. What natural products (firewood, timber, wild foods, honey, etc) does the community use to meet their needs?
15. What natural products (firewood, timber, wild foods, honey, etc) do they sell or trade for income?
16. Are wildfires common in the area? If so, what are the causes of these wildfires? What is the impact of fire on crops, livestock, buildings and people?
17. Does the community burn fields intentionally? If so, what is the goal of burning fields?

How have land uses changed over time?

18. Have harvest yields changed over time? (Is there more productivity or less productivity on the same amount of land?)
19. Does the community have to replant crops within the same season due to wind or other types of damage?
20. Has the productivity of animals on the land changed over time?
21. Have there been any changes in the amount of firewood available, or how far community members have to travel to get firewood?
22. Are wild foods more or less abundant than in the past?
23. Has the level of conflict between community groups changed over time?
24. What are some reasons for these changes?

4. What is the overall climate?

1. How much rainfall does this area normally receive? (If the area also experiences snow or other significant types of precipitation, include those amounts as well.)
2. When do the rains normally come?
3. What is the rain like? Heavy rain? Light soaking rain? What else?
4. If there is more than one rainy season, what differences are there between them?
5. What happens to the rainwater? (For example, does it run off the land, soak into the land or create pools that evaporate?)
6. Does the area have wind or lightning storms? When do these happen?
7. What are the impacts of these storms on crops, farms, forests, grasslands and trees?
8. What other types of storm are common in the area? When do these happen?

How has the climate changed over time?

9. Was there a forest here in the recent past, or even in past ages?
10. Are people suffering because of the impacts of deforestation? (These include erosion, declining crop yields, increased wind damage, loss of biodiversity, increased incidence and severity of flooding and drought, as well as a shortage of firewood, building timber, fodder, wild foods and traditional medicines.)
11. Have temperatures, the timing or amount of rain, or the frequency, timing or impacts from wind or storms changed from the past?

12. If there have been changes, then what is different?
13. What has caused the changes? (List all relevant causes – there are often more than one.)
14. Are wells or other sources of drinking water sufficient for the needs of people and animals?
15. If not, what needs are not being met? Were these needs met in the past?

5. What plants and animals live in the area?

1. What species of trees and other plants grow naturally in the area?
2. What species of living tree stumps exist in the area?
3. How many living tree stumps are present? (Counting these may be something that each prospective FMNR practitioner does on his or her own land, or that the community does together.)
4. How many resprouting tree stumps are available?
5. What types of insects, birds and wild animals are common to the area?
6. What types of domestic animals are commonly kept in the area?
7. What types of wild or cultivated crops are commonly grown in the area?

How have the plants and animals changed over time?

8. Are there more trees, the same or fewer than there were in the past?
9. If the number of trees on the land is different from the past, what is different now? When did the changes take place?
10. Have the types or numbers of insects, birds and wild animals changed from the past?
11. If so, what is different?
12. Has the productivity of plant or animal crops (including wild foods that the community regularly uses) changed from the past?
13. If so, what is different now? (For example, is more or less food grown? Has meat and milk production increased or decreased? Is there an increased incidence of crop replanting due to drought, wind or pests?)
14. How long have the changes been happening?
15. What are the reasons for these changes?

6. Social and cultural characteristics of the community

1. How is the community organised? Who are the leaders? Who are the influential decision makers?
2. What government structures are present in the community?
3. What groups or community-based organisations are influential in the community? (These should be related to the management of trees and the environment.)
4. Who are the key stakeholders in the community related to natural resource management?
5. What is the nature of land ownership? What proportion of land is communal, family title and private ownership?
6. What laws or community agreements are there that affect the management of trees?
7. What traditions are there for managing trees and shrubs? Is everyone allowed access, or do some groups have particular roles?
8. Does the environment/forest play any important social/cultural roles?
9. How is wealth distributed? Would you characterise the community as poor, working class, middle class or affluent? What are the economic prospects of the population in general and/or the population you're concerned with?
10. How does the community manage disasters or challenges? (For example, what community safety nets or programs exist?)

11. How do people in the community relate to one another on a daily basis? (For example, how are (or aren't) problems resolved? Who socialises or does business with who?) Also discuss perceptions and symbols of status and respect, and whether status carries entitlement or responsibility (or both).
12. What are the main religious groups in the community?

How have social and cultural aspects of the community changed over time?

13. How has the population in the area changed over time? Has it increased or decreased?
14. Have there been periods of high migration to or from the area? Who were these people and what were the reasons for them to come or go?
15. Have there been any major changes in the way the community is organised? (For example, to government structures, community groups or religious institutions?)
16. How else has the society or culture changed over time? Why?

Annex 2. Action plan template

Location:

Goals:

Objectives:

1.

2.

3.

Action plan

Date developed:

What will be done	By who	With who	By when	Where (location)	Target area (ha)	Support needed (financial, administrative, technical)

Annex 3. Stakeholder analysis template

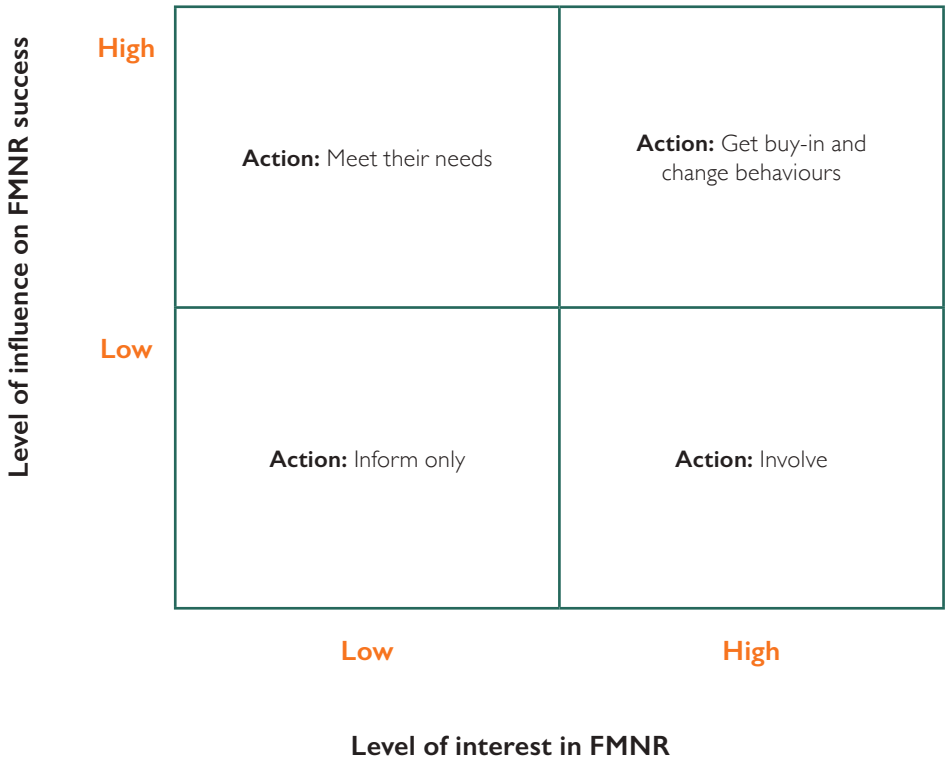
Step 1. Identify the stakeholders who can influence your project

Who are the stakeholders who have the ability to influence the outcome of your project? This influence could be positive (eg. providing additional resources or support, reinforcing appropriate messages to the community or positively influencing policy changes), or negative (eg. sending conflicting messages to the community or blocking policy reforms).

Step 2. Which stakeholders are interested in your project?

Who are the stakeholders interested in your project? Who is not? Interested stakeholders might be engaged farmers in the project area, local leaders, water users downstream or neighbours. All these stakeholders may also be uninterested! Busy policymakers unaware of the relevance of FMNR may also be uninterested.

Step 3. Use the following table to categorise the stakeholders you have identified, based on their levels of interest and influence, to establish a guide for how they should be targeted by the project.



Annex 4. Benefits of FMNR

Just as FMNR projects and the communities who practise FMNR are all different, the benefits of FMNR will vary by location, goals and context. Here is a list of the range of benefits that may come from FMNR activities depending on how they are implemented. You may come across new benefits not previously recognised – if so, please let us know by contacting the FMNR Hub at **fmnrhub.com.au/contact-us**.

Economic benefits	Social benefits	Environmental benefits
• Increased crop yields (often double or triple). • Increased fodder from edible leaves and seed pods, and pasture for livestock. • Higher livestock productivity and survival. • Reduced impact from floods and drought – as trees provide alternative income and livelihood sources, impacts become less severe and recovery is faster. • Increased income generation through diversification and intensification of activities, such as selling tree products. • Economic flow-on effects such as employment and greater purchasing capacity. • Increased economic activity creates opportunities such as the development of new business models including cooperatives and savings groups.	• Increased food security and nutrition (incorporating native fruits, nuts and seeds). • Less distance for women and children to travel to collect firewood. • Community capacity building can help people deal with local, regional and national governments and regulators. • Improved governance through clarification of tree ownership laws and regulations. • Education and training in farming and marketing. • Reduced need for young people and men to migrate to urban areas. • Higher incomes result in better opportunities such as medical treatment, children's education, nutrition and clothing. • Empowerment of community members to live independently with hope for the future.	• Reduced soil erosion. • Reduced soil-moisture evaporation due to windbreaks, shading and mulching. • Increased soil fertility through organic matter from trees. • Improved soil structure through greater quantities of organic matter. • Increased water infiltration and groundwater recharge. • Increased biodiversity, environmental restoration and tree cover. • Enhanced resilience to climate change.

Overall, the main benefits or outcomes of FMNR are:

- improved vegetation cover
- improved soil and land condition
- improved grass/fodder and livestock production
- improved crop production
- improved food security
- improved household incomes
- improved community cohesion

A brief description of how FMNR contributes to these benefits, and some of the key evidence for each of these benefits, is provided below. This information can be used to help explain or justify how FMNR can contribute to these outcomes in project proposals, or with various stakeholders during project implementation.

However, these are only summaries drawn from a large number of studies. More detailed information can be found through the:

- FMNR Hub website at **fmnrhub.com.au**
- The Social, Environmental and Economic Benefits of Farmer Managed Natural Regeneration (FMNR) available at **fmnrhub.com.au**

Improved vegetation cover

Large areas of land can have indigenous tree cover restored for relatively low cost with FMNR. Improved vegetation cover is desirable to provide more organic matter, nitrogen and stability to the soil, for biodiversity conservation and for the timber and non-timber products they provide for neighbouring communities. Increased vegetation cover also captures and stores significant volumes of carbon from the atmosphere to combat climate change.

World Vision's promotion of FMNR in Senegal in the late 2000s led to tree densities being raised from four trees per hectare to 36. This increase, according to Diagne (2012), was seen over 50,000 hectares of cultivated land where FMNR strategies had been implemented.[1] Also, in the mid-term review of World Vision's East Africa FMNR project, Odwori et al (2016) reported that the tree density on farms in Kenya rose from 22 trees per hectare to 74 trees per hectare from 2013 to 2016, which is a significant threefold increase.[2]

A 30-year study by Larwanou and Saadou (2011) across three regions of Niger found that, through the implementation of FMNR, lands shifted from having almost no mature trees to having around 100 trees per hectare, with large increases in tree species diversification.[3] Also, an end-of-project evaluation by Weston et al in 2012[4] of World Vision's Talensi FMNR project, in the dryland of northern Ghana recorded that over the course of three years FMNR-adopting communities added 396,000 trees to their landscape over 500 hectares.[5] In Talensi, FMNR was applied both on farmlands and community-managed reforestation sites.

Improved soil and land condition

As tree cover increases through the implementation of FMNR, soil quality and fertility rebuild. High-density tree cover also helps to reduce the loss of topsoil in fields. This occurs as trees slow down wind speeds, trapping airborne topsoil particles and reducing rainfall run-off. Vegetative cover of agricultural land and greater amounts of organic matter improve soil moisture retention by reducing run-off and evapotranspiration and improving water infiltration.

In an end-of-project evaluation of the Senegal Food and Livelihoods Enhancement Initiative, Kabore et al (2012) found that 85 percent of respondents using FMNR reported an increase in soil fertility, while 62 percent of respondents reported a decrease in erosion and 59 percent reported an increase in crop yields.[6] A study by Bunch (2012) in Mali found that crop fields containing trees approximately 10 metres apart generated around 25 tonnes of organic soil matter per hectare per year.[7] Over five years, this input is enough to increase crop production from 700 kilograms of grain per year to over two tonnes per year.

---

[1] Diagne, M. 2012, "Final Evaluation of Project Beysatol, Dakar", World Vision Senegal

[2] Odwori, P. O., Wachilonga, L. W. and Wabwile, S. W. 2016, "Farmer Managed Natural Regeneration (FMNR) Project – Kenya. Mid Term Evaluation Report"

[3] Larwanou, M. and Saadou, M. 2011, "The role of human interventions in tree dynamics and environmental rehabilitation in the Sahel zone of Niger", Journal of Arid Environments, 75: pp. 194-200

[4] Weston P.I., Hong R., Kaboré C., and Kull C. A. 2015, "Farmer-managed natural regeneration enhances rural livelihoods in dryland west Africa," Environ Manage, 2015 Jun;55(6):1402-17

[5] Weston et al 2012, op. cit.

[6] Kabore et al 2012, op. cit.

[7] Bunch, R. 2012, "Oxfam's Savings for Change-Plus Agriculture Pilot Program in Mali", Final Report, Oxfam, Cowley UK

A study by Garrity et al (2010)[8] explains how the soil benefits from maintaining tree cover year-round include bolstering nutrient supply through nitrogen fixation and nutrient cycling, enhancing suppression of insect pests and weeds, improved soil structure and water infiltration and greater quantities of organic matter in surface soil residues.[9] In Humbo, southern Ethiopia, community members reported that, on hillsides where erosion was once a major problem, FMNR regreening had reduced water and wind erosion and increased soil moisture as water percolated through the soils onto agricultural fields during heavy rainfall, instead of flooding down the hillsides (Kabore, 2010).[10]

Improved crop production

The use of FMNR on agricultural fields has a positive effect on crop productivity. Not only do trees deposit mulch and nutrients into the soil, but they also provide shade cover for exposed soils and reduce erosion, trap airborne topsoil and attract animals and birds that deposit nutrient-rich manure and urine, all to the benefit of crops grown amongst or near trees regenerated by FMNR.

Data from Niger's Ministry of Agriculture and Livestock shows cereal production rising steadily in parallel with the spread of FMNR.[11] In 1980, Niger produced 1,770,700 tonnes of cereals. This rose to 2,093,300 in 1995 and 2,319,800 in 2000. By 2006, when at least a quarter of cultivated land was converted to FMNR, production reached an impressive 4,055,984 tonnes. The amount of additional cereal produced by farmers because of FMNR is estimated to cover the needs of 2.5 million people.

A study by Garrity et al (2010)[12] reported crop yield increases of between 50 and 200 percent in Zambia as a result of FMNR, and up to 300 percent in Malawi, 200 percent in Niger and 115 percent in Burkina Faso.[13] Across Sub-Saharan Africa, a meta-analysis of the impacts of 'fertiliser shrubs' on crop yields found roughly a doubling of yields. Also, following a World Vision FMNR project in Kaffrine, Senegal, Kabore (2012) reported that the volume of millet grown by FMNR practitioners was 238 kilograms per hectare, while non-practitioners produced 194 kilograms per hectare – a significant difference of 95 percent.[14]

Improved grass/fodder and livestock production

FMNR trees on farms and grazing lands provide fodder and shade for livestock and improved pasture growth. This, in turn, increases animal condition and productivity, as well as survival rates during severe drought. With the implementation of FMNR, monthly fodder production stabilises. This allows farmers to manage their herd as they see fit, rather than as a result of weather events, allowing for improved herd management.

In an end-of-project evaluation for a World Vision FMNR project in northern Ghana, participants noted how FMNR – combined with the elimination of burning fields – generated more local fodder and nesting for chickens and guinea fowl.[15] The increased vegetation also helped shield them from predators such as hawks. In the dry season, cattle went from being unsellable to being valued at around US$300. Animal theft also reduced, as the need for livestock to wander or be herded away decreased.

Meanwhile, studies on the effect of agroforestry fodder on dairy milk production in Kenya and Tanzania found that tree fodder adequately replaced commercial feed and labour requirements, and increased milk production by around 10 percent, as well as increasing animal weight.[16] In Ghana, Weston (2013) observed that most boys

[8] Garrity, D.P. and Akinnifesi, F.K.,Ajayi, O.C. et al (2010). "Evergreen Agriculture: A robust approach to sustainable food security in Africa", Food Security. 2, pp. 197-214

[9] Garrity et al 2010, op. cit.

[10] Kabore, C., 2010, "Community Managed Natural Regeneration Forest Project in Humbo Area Development Program, Mid-term Evaluation Report", unpublished, World Vision Australia

[11] Wentling, M. 2008, "Niger – Annual Food Security Report: Current Situation and Future Prospects", United States Agency for International Development, Niamey

[12] Garrity et al 2010, op. cit.

[13] Garrity et al 2010, op. cit.

[14] Kabore et al 2012, op. cit.

[15] Weston et al 2012, op. cit.

[16] Place, F. and Binam, J. N., 2012, "Economic Impacts of Farmer Managed Natural Regeneration in the Sahel: End of Project Technical Report", Free University, Amsterdam/International Fund for Agricultural Development (IFAD), Rome

couldn't attend school because they had to herd cattle to distant pastures to find fodder.[17] But after the adoption of FMNR and resulting abundance of local fodder, boys were able to attend school and receive an education. Also, communities reported their animals were fatter, healthier and worth up to three times more than they were prior to FMNR.

Improved food security

The implementation of FMNR improves the food security and resilience of rural families. FMNR helps to put more food on the table, reducing communities' vulnerability to food shortages and famine. Benefits such as food and income from fruits and nuts of regenerated trees contribute to a diversified diet and improved nutrition, and provide a stable food source.

In Niger, Gubbels (2012) reported that FMNR has produced dramatic results by increasing crop harvests.[18] In some communities, FMNR significantly reduced the annual hungry period (when food supplies are exhausted) from six or more months to two to three months. FMNR also helped reduce seasonal migration in Niger because it required year-round inputs and outputs. In Ghana, households practising FMNR experienced an increased availability of meat and fruit for their diets. By improving access to nutritional food sources, children's health improved – they also reported being able to eat fruit daily.

A study of an FMNR project in Humbo, Ethiopia, suggested that households consumed more main meals including animal protein following their involvement in the project. Also, milk and meat production accelerated because of increased availability of fodder from tree leaves, seed pods and grasses. Spectacular increases in milk production have also been recorded in Kenya and in Offaka, Uganda, farmers have substantially increased their goat and cattle herd sizes.[19] FMNR has enabled children and families to access wild fruit, edible leaves, nuts, fungi, honey and wild meat where none were previously available, or long distances had to be travelled to obtain them.

Improved household incomes

Small-scale farming families can experience income growth as a result of improved crop yields, the sale of tree products, improved livestock production as well as the growth of assets such as high-value trees. FMNR trees on farms and community-managed forest reserves generate a surplus of natural resources that can be sold to diversify household incomes, including firewood, construction timber and non-timber forest products.

Brown et al (2011) reported how the Humbo community-based natural regeneration project in Ethiopia regenerated 2,728 hectares of degraded forest, which was expected to generate about US$760,000 in the first 10 years of the project.[20] In the final evaluation, 68 percent of respondents reported 'less' or 'much less' poverty in the community compared with the previous five years. A baseline study for a World Vision Timor-Leste project reported 47 percent of households living on incomes of less than $100 per year.[21] In the endline survey, after the community implemented FMNR practices, this figure dropped to 18 percent.

Based on a survey of 410 households in the Maradi region of Niger, those practising FMNR reported increased crop production values of up to 60 percent. The annual gross income of the region rose by US$17-21 million while annual household incomes grew by 18-24 percent compared to non-practitioners.[22] Another study by Binam et al (2015) shows how the average household in Niger, increased their annual gross income by US$72 through continuously practising FMNR.[23]

---

[17] Weston, P., Hong, R. and Morrison, V. 2013a, "End-of-Phase Evaluation Report, Talensi FMNR Project", World Vision Australia and World Vision Ghana

[18] Gubbels, P., 2012, Harnessing Small-Scale Agriculture for Resilience and Improved Child Nutrition, Ch 4.2 in Ending the Everyday Emergency: Resilience and children in the Sahel, World Vision/Save the Children, London

[19] FMNR Hub (25 August 2014) "Improved food security through FMNR". Available at: **fmnrhub.com.au/improved-food-security-fmnr**

[20] Brown, D. R., Dettmann, P., Rinaudo, T., Tefera, H., and Tofu, A. 2011, "Poverty alleviation and environmental restoration using the clean development mechanism: a case study from Humbo, Ethiopia", Environmental Management, 48 (2): pp. 322-333

[21] Anda, I. 2016, "Evaluation Report: Building Resilience to a Changing Climate and Environment (BRACCE)", World Vision Timor-Leste

[22] Haglund, E., Ndjeunga, J., Snook, L., and Pasternak, D. 2011, "Dry land tree management for improved household livelihoods: farmer managed natural regeneration in Niger", Journal of Environmental Management, 92 (7): pp. 1696-1705

[23] Binam, J. N., Place, F., Kalinganire, A., Hamade, S., Boureima, M., Tougiani, A., Dakouo, J., Mounkoro, B., et al. 2015, "Effects of farmer managed natural regeneration on livelihoods in semi-arid West Africa", Environmental Economics and Policy Studies, 17 (4): pp. 543-575

Improved community cohesion

The benefits of an improved environment show communities how positive results can be achieved through FMNR. Restoration of tree cover has a significant effect on the psychological and physical well-being of residents and creates advocates for community development. FMNR programs also build durable intra- and inter-community cooperation and collective decision-making. This helps achieve an organised community-led approach to environmental regeneration as well as improved agricultural production.

In Ghana, farmer-focused groups worked together to develop FMNR sites, resulting in an unprecedented level of collaboration between neighbours in the project area. Collaborations included developing community covenants around land and tree management and suppressing fires in the landscape.

During the Humbo Community Managed Natural Regeneration Forest project in Ethiopia, cooperatives were formed to manage the approach to forest management and income through carbon credits. In the final evaluation, Thiede (2014) reported improvements in trust and mutual understanding among community members. Neighbours were better able to work together to achieve collective goals and optimism for the future of children in the community increased.[24]

[24] Thiede, B. 2014, "Humbo Community Managed Natural Regeneration Forest Project: Final Evaluation Report", World Vision Ethiopia, Ethiopia

Annex 5. Priority tree template

Priority needs	Contributions that trees could make to these needs	Required tree characteristics	Known tree species that may be useful
Eg. Fodder for livestock in dry season	- palatable leaves, bark and seed pods - improved grass growth under light tree canopy	- palatable fodder tree - open canopy with light shade for grass growth or the ability to be pruned for light shading	- *Acacia tortilis* - *Acacia nilotica* - etc

Annex 6. Local tree species list template

Location: _____

List compiled by: _____ Date: _____

Scientific name	Local names	Defining characteristics	Photo Insert photo name and file location, or a small image	Current use in community	Potential uses	Restrictions on use
Eg. *Faidherbia albida*	Momona (Ethiopia)	- small leaves and thorns - open canopy - white/cream flowers - dark grey bark - tall - leaves drop in the wet season		Fodder, honey production, firewood collection	Soil fertility improver for crop production	

Note: If not all information is known, record what information you can with the community and fill any gaps from reference books, online resources or expert knowledge later. If the scientific or local names are unknown, a photo and list of defining characteristics will be important to help accurately identify the tree species in the future. Be sure to share any additional information you find with the community!

Annex 7. Sample FMNR logframe

This sample logframe is for a project designed to expand the use of FMNR and increase the productivity of dryland areas in East Africa.

East Africa FMNR project logframe – example 1	
Project location	Kenya: Mogotio, Wema, Kiambogo Rwanda: Bugesera and Gatsibo districts Tanzania: Kongwa, Mpwapwa, Manyoni, Same, Hai, Kahama Uganda: Kotido, Abim, Nakasongola, Kibaale
Project goal	Improved food security and climate resilience in smallholder farming systems of the 852,000 households in 12 communities in Kenya, Uganda, Rwanda and Tanzania by 2017.
Project outcomes	1. Increased knowledge of sustainable livelihood practices by 20 percent among 852,000 households by 2017. 2. Enhanced capacity of community members and institutions in the four countries to effectively participate in national and local-level legislative and policy processes on FMNR/NRM by 2017.
Project direct participants	852,000
Project outputs	1.1: Improved community awareness of FMNR and its benefits 1.2: FMNR training and follow-up structures established 1.3: Sustainable agriculture incentive packages customised to each community 1.4: Concurrent research, monitoring and evaluation program 2.1: Institutional FMNR champions are operational 2.2: National and localised catalyst workshops conducted 2.3: East African stakeholders supported with policy and implementation guidance 2.4: FMNR practice mainstreamed in the three targeted area development programs 2.5: Build public and professional awareness of FMNR

Kenya FMNR project logframe – example 2

Goal	**Contribute to improved food security and livelihoods for smallholder farmers and pastoralists (women and men) in Kenya by 2022 through FMNR and other evergreen agricultural practices.**
Outcome 1	**Increased area of land managed with restoration methods including FMNR and other evergreen agricultural practices**
1.1	Smallholder farmers and pastoralists (men and women) adopt FMNR and evergreen agricultural practices for land restoration
1.2	Increased participation of men, women, children and youth, demonstrating FMNR knowledge for land restoration and other benefits
1.3	Increased uptake of environmentally sound practices and energy efficient technologies which complement FMNR
Outcome 2	**Improved food security and livelihoods for male and female smallholder farmers and pastoralists by 2022**
2.1	Increased crop and livestock production for smallholder farmers and pastoralists
2.2	Increased uptake of alternative livelihood options to complement FMNR
Outcome 3	**Favourable gender responsive policy environment which promotes FMNR adoption by state and non-state actors**
3.1	Bylaws and policies are created, and/or modified and operationalised to promote FMNR
3.2	Strengthened partnerships and networks which advocate for wider FMNR adoption
3.3	Research conducted on FMNR to enhance scale-up through policy

FMNR project logframe with indicators – example 3

Hierarchy of objectives		Indicators	Means of verification	Assumptions
Project goal	**Stronger families and communities**	- % of parents or caregivers who are able to provide all the children in the household, aged 5-18 years, with three important items, through their own means without external assistance *Compendium of Indicators* - % of households in target area with one or more 'hungry months' in the previous 12 months *Compendium of Indicators*	Caregiver survey	Parents or caregivers have access to child well-being services such as education, health and protective services.
Outcome 1	**Increased household resilience**	- % of households in target area with access to firewood, building poles, timber and non-timber forest products (NTFP) - % of households in target area that increased their income as a result of FMNR	Household survey (Baseline and endline evaluations)	Supportive markets exist for FMNR products.
1.1	**Communities and individuals implement FMNR practices on household and communal lands** **(Farmers optimise density of desired tree species through FMNR)**	- # and % of households using FMNR in target area - Coverage of FMNR in the target area (ha) - % of households and communities that manage tree cover sustainably	Project monitoring records including participant registers and FMNR site assessments	Stakeholders are not opposed to FMNR and collaborate to implement it.
Outcome 2	**Improved vegetation, land and soil quality**	- Average tree density in target area - Changes in tree density in target area	Project monitoring records FMNR site assessments and tree counts including before and after photos	Those who illegally benefit from tree cutting are controlled. Favourable policy environment exists for FMNR.
2.1	**Stakeholders trained FMNR**	- # of individuals trained in FMNR - # of individuals adopting FMNR	Project monitoring records including training attendance records and participant registers	Stakeholders are not opposed to FMNR and collaborate to implement it.
2.2	**Communities agree on bylaws for natural resource management practices**	- # of agreed-upon bylaws supporting FMNR	Project monitoring records	All-stakeholder engagement for developing bylaws occurs.

Annex 8. Core indicator definitions

Core FMNR Indicator 1	Number of individuals trained in FMNR
Definition	Number of individuals who have received training intended to increase their knowledge and skills in FMNR
Level	Output
What it measures	Training community members in FMNR is an expected output of FMNR interventions. This indicator is based on a simple count of the total number of individuals trained as a result of the project (ie. this count includes individuals formally trained by farmer trainers, local partners, project staff, local teachers, etc) Trainings include all activities designed to build participants' knowledge and skills in FMNR.
How to measure it	Project records and monitoring data such as training attendance records, and participant registration records that include information such as: - Name - ID number - Phone number - Village/district location of farm - Sex and age - Role (eg. farmer, pastoralist, school student, community leader, etc) - Date of training - Length of training event - Training topic - Trainer name and organisation - Location of training
How to calculate it (numerator)	Number of individuals trained
How to calculate it (denominator)	N/A
Information for analysis	Be aware of duplication, when one individual may attend more than one training event. Where possible, try to record only unique individuals trained. Include sex, age and other particulars of the individuals trained plus the source of the training in each case, and the length of the training event (in days).
Disaggregate by	Age group, sex, vulnerable group (households) type, urban and rural
Limitations	This indicator measures the extent to which training has taken place, but training alone does not guarantee practice change. Quality and impact of the training can be explored using qualitative methods at the end-of-project evaluation.

Keywords	Food and livelihoods security, knowledge and understanding, farming and food production, natural environment and climate, disaster risk reduction and resilience, Farmer Managed Natural Regeneration

Core FMNR Indicator 2	**Number of individuals adopting FMNR**
Definition	Number of individuals adopting FMNR Adoption refers to using FMNR on their own or communal land
Level	Short-term outcome
What it measures	Individuals adopting FMNR as a result of training, exposure visits or other project activities is expected. This indicator is based on a simple count of the total number of individuals reported to be using FMNR to regenerate or manage stumps, trees and/or seedlings on their own farms or on communal land.
How to measure it	Project records and monitoring data from site visits, training event follow-up activities, and participant records that include information such as: - Name - ID number - Phone number - Sex and age - Role (eg. farmer, pastoralist, school student, community leader, etc) - Village/district location of FMNR - Approximate area of FMNR (in hectares)
How to calculate it (numerator)	Number of individuals adopting FMNR
How to calculate it (denominator)	N/A
Information for analysis	Count the number of individuals reported to have adopted FMNR and report the breakdown by sex, age, role or other relevant groupings.
Disaggregate by	Sex, age and other relevant groupings

Limitations	This indicator measures the extent to which adoption has taken place. Adoption should be defined as the use or application of FMNR by the individual, while recognising that adoption often happens incrementally. Care should be taken to avoid double counting of individuals reported to be adopting FMNR, for example, through both FMNR champion records and household surveys. Individuals often use FMNR on a small area first, and when outcomes have been seen, this is often expanded over time. Adoption can be recorded through follow ups with training participants and community members by trainers, community leaders, FMNR champions and group members, etc.
Keywords	Food and livelihoods security, knowledge and understanding, farming and food production, natural environment and climate, disaster risk reduction and resilience, Farmer Managed Natural Regeneration

Core FMNR Indicator 3	**Number and proportion of households using FMNR**
Definition	Number and percentage of all households in the target area who indicate they are using FMNR on some proportion of their land
Level	Outcome
What it measures	This indicator shows what proportion of households have some area of land being managed with FMNR. It shows the spread of FMNR beyond the initial project participants into the broader target area.
How to measure it	**Household survey:** Q. Do you, or anyone else in this household, use FMNR to manage vegetation on your farm? **Household survey:** 1. Record farmer reports of FMNR use in the past (before the project). 2. Record farmer reports of using FMNR now on their land. **Focus group discussions and key informant interviews:** Interview relevant groups and individuals about the perceived changes in adoption of FMNR in the target area.
How to calculate it (numerator)	Add up the total number of households reporting using FMNR.
How to calculate it (denominator)	Add up the total number of households in the target area.
Disaggregate by	Sex, age and other relevant groupings of the household head
Information for analysis	Define and document what constitutes adoption of FMNR. This must be determined at the outset and retained for subsequent data collection. Divide the numerator by the denominator and multiply by 100. Report the percentage of households using FMNR. Data should be disaggregated by the sex of the household head to understand if there are gendered differences in the adoption of FMNR. If baseline values are available, compare these with endline values. Also compare 'FMNR households' with 'non-FMNR households'. This indicator could be adapted for different land use areas (farmland, pastoral land, forests, etc).

Limitations	This indicator does not provide any measure of the area of land FMNR is used on by the household, only if they have used the practices at all. It therefore provides a measure of the saturation of FMNR in a community.
Keywords	Food and livelihoods security, resilience, farming and food production, natural environment and climate, disaster risk reduction and resilience, Farmer Managed Natural Regeneration

Core FMNR Indicator 4	**Coverage of Farmer Managed Natural Regeneration in the target area**
Definition	Number and percentage of hectares of the targeted land area (eg. cropland, pasture land, communal forest land, etc) under FMNR management (project-level measurement)
Level	Outcome
What it measures	This is a measurement of the coverage of FMNR in the target area in terms of hectares of land. FMNR involves individuals and/or groups of landholders managing areas of crop, pasture or forest lands (privately managed and/or communally managed land), by reducing threats and regenerating desirable tree species.
How to measure it	Program records and monitoring data to ascertain the total size of the area targeted by the FMNR project and the number of hectares reported to be under FMNR management by project participants and community members adopting FMNR. Project monitoring data should validate a significant proportion of these records through site visits. Additional evidence of the spread of FMNR in the program area could include: - photographic records of the physical changes over time in areas reported to be managed by FMNR; - high resolution aerial photography/satellite imagery analysis showing increases in tree cover in FMNR managed sites; and - qualitative data from focus group discussions and key informant interviews reporting the spread of FMNR in the area.
How to calculate it (numerator)	Number of hectares of land managed with FMNR
How to calculate it (denominator)	Total number of hectares of targeted land area

Information for analysis	Project records should include the total size in hectares of the land being managed under FMNR. Report total hectares under FMNR at baseline and at endline and compare change over time. At baseline, the percentage of area under FMNR would typically be zero although there may be some coverage of FMNR already, eg. in the case where it is the second phase of a project or some individuals already use the practice. FMNR areas recorded by the project should be validated through visits to a sample of FMNR sites, where site areas can be measured using GPS points and FMNR practices can be validated. GIS and remote sensing could be used to estimate numbers of hectares in large areas of communal land being managed by FMNR. High resolution aerial photography or satellite imagery may be useful if resources are available.
Limitations	Typically, the coverage of FMNR at baseline is zero. However, in some areas individuals will be practising it already or using traditional practices that overlap with those of FMNR. Existing practices must be documented at baseline, and at endline there must be an attempt to distinguish between traditional or existing practices and the activities promoted by the project under FMNR. This indicator alone is not reliable without verification of physical evidence that FMNR practices are being correctly applied. Therefore, monitoring data should be validated with site visits to observe evidence on FMNR, such as marking of trees and evidence of appropriate pruning, coppicing, etc. Time series photopoints with GPS coordinates can be used to capture evidence of FMNR usage on the site over time.
Keywords	Food and livelihoods security, resilience, farming and food production, natural environment and climate, disaster risk reduction and resilience, Farmer Managed Natural Regeneration

Core FMNR Indicator 5	**Average tree density in target area**
Definition	Number of trees per hectare on the land area that the project is targeting (project-level measurement)
Level	Outcome
What it measures	Tree density is the number of trees per hectare of land (by land type where appropriate, eg. cropland, grazing land, forest) and should be measured using locally accepted forestry protocols/methods. Achievement of the optimal density and mix of desirable tree species on a given area of land under locally adapted Farmer or Community Managed Natural Regeneration systems will have direct benefits for the local environment, and it underpins sustainable and resilient smallholder/pastoralist livelihoods. An increase in tree density in FMNR areas requires cessation of local practices that prevent existing useful tree and other vegetation regrowing on a given area. Such harmful practices would include theft of trees, branches and fodder, uncontrolled grazing of seedlings and shoots, indiscriminate clearing of all vegetation by slashing and burning, and removal of living tree stumps and roots for charcoal production. These practices are replaced by delineation of protected areas, protection of seedlings and new shoots and training of regrowth into productive trees. The project is expected to result in increased tree density (or at least regrowth of tree stumps) in FMNR managed areas even in the first year.

How to measure it (options)	**Project monitoring site visits:** Count the number of trees and measure the area of land (to calculate trees per hectare) at a significant sample of sites across different land types in the project area. This can be done in conjunction with household surveys or FMNR site assessments if tree counts and areas of land are recorded before and after FMNR activities have occurred. **Landscape mapping:** High resolution satellite imagery or aerial photography can be analysed to measure the average number of trees on different land types in the target area. Free tools such as Collect Earth can assist with this. **Household survey:** 1. Ask respondents if tree density in their local area has changed in the last three years. (Yes/No) 2. Record response as 'Increasing' 'Decreasing' 'No change' or 'Don't know'. Focus group discussions and key informant interviews: Interview relevant groups and individuals about the perceived changes in tree density in their area in the previous three years.
How to calculate it (numerator)	N/A – refer to formal tree density methodology used
How to calculate it (denominator)	N/A – refer to formal tree density methodology used
Information for analysis	Report tree density in trees per hectare for the targeted land area. Compare baseline and endline values. Additional indicators of changes in tree density could include: - photographic recording of the physical changes at field/farm and catchment scale; and - time series photo points to collect data for tree density and vegetation with GPS coordinates recorded. Photographs must be taken from the same position and angle to obtain a good comparison, and at the same time of year to avoid seasonal contrasts. GIS and remote sensing could also be used to collect information for communal lands. High-resolution aerial photography is appropriate if resources are available.
Limitations	Methods for site selection, sampling and tree density measurement should be documented to allow for replication of a standard approach before and after the intervention. These methods can be agreed in consultation with local forestry departments to ensure appropriateness in local contexts. Note that the indicator 'tree density' is best suited to deforested areas where the target is to encourage natural regeneration of desirable species. On crop land, or areas of woody thickening, optimal tree density ranges should be identified with local experts in consultation with local communities' FMNR objectives.
Keywords	Food and livelihoods security, resilience, farming and food production, natural environment and climate, disaster risk reduction and resilience, Farmer Managed Natural Regeneration

Core FMNR Indicator 6	Proportion of households with one or more 'hungry months' in the previous 12 months
Definition	Percentage of households who report that there were one or more hungry months in the previous 12 months where food was scarce or unavailable, ie. empty granary
Level	Outcome
What it measures	Food security has three components – availability, access and utilisation. This indicator measures household food provisioning as a proxy measure of household food access. Household food access is defined as the ability to acquire sufficient quality and quantity of food to meet all household members' nutritional requirements for productive lives. Data for this indicator are collected by first screening out those households that were able to provide for their household food needs throughout the entire year. Those households that were unable to adequately provide for the household then go on to question number two where they are asked to identify in which months (during the past 12 months) they did not have access to sufficient food to meet their household needs. The purpose of these questions is to identify the months in which there is limited access to food regardless of the source of the food (for example, production, purchase, barter or food aid). The questions refer to the food needs of the household as a whole, not any single member of the household.
How to measure it	**Household survey** Q. Now I would like to ask you about your household's food supply during the different months of the year. When responding, please think back over the last 12 months. 1. In the past 12 months, were there months in which you did not have enough food to meet your family's needs? Yes = 1 No = 0 If no, skip to next section 2. Working backwards from the current month, place a one next to the month if the respondent identifies that month as one in which the household did not have enough food to meet their needs. DO NOT READ THE LIST OF MONTHS. Which months (in the past 12 months) did you not have enough food to meet your family's needs? Yes = 1 No = 0 January February March April May June July August September October November December

How to calculate it (numerator)	1. Tally the total number of respondents who said No to Q1 – these are classed as households without a hungry month. 2. Tally he total number of respondents who said Yes to Q1 and listed one or more months in answer to Q2 – these are classed as households with one or more hungry months.
How to calculate it (denominator)	Total number of households surveyed
Disaggregate by	Urban and rural, vulnerable group (households), household head sex, land type (public, private)
Information for analysis	Although the response options start with the month of January, the respondent is asked to think back over the previous 12 months, starting with the current month. Adjust the months according to when you conduct the survey so that the current month appears first.
Limitations	To most accurately capture improvements in household food access over time, the program should collect data for Months of Adequate Household Food Provisioning (MAHFP) during the period of greatest food shortages (such as immediately prior to the harvest). This will increase the accuracy of recall of the months when the household did not have sufficient food. Subsequent data collection (final evaluations, for example) should be undertaken at the same time of year. Measuring the number of hungry months has the advantage of capturing the combined effects of a range of interventions and strategies, such as improved agricultural production and storage and interventions that increase the household's purchasing power.
Keywords	Food and livelihoods security, food access, Farmer Managed Natural Regeneration

Core FMNR Indicator 7	**Proportion of households with access to firewood, building poles, timber and non-timber forest products (NTFP)**
Definition	Percentage of households who access firewood, building poles, timber and non-timber forest products (NTFP) including fodder, honey, fruit, nuts, leaves, herbal, medicinal and veterinary products on private or communal land
Level	Outcome
What it measures	When landscapes transition from poorly managed to healthy and productive agro-forestry systems, household access to firewood, building poles, timber and non-timber forest products increases. This indicator demonstrates the practical outcomes of the successful implementation of FMNR by individuals and communities, who will have new and increased sources of tree, shrub or pasture-related products. These products can be used by households, thereby decreasing expenditure of household income to purchase such items and creating potential for excess products to be marketed for increased household income. The local agro-ecological system, the spread of FMNR, the quality of practice and the length of implementation will all be factors in the time expected to see change in this measurement.

How to measure it (options)	**Household survey:** 1. Record current access to firewood, poles, timber, fodder, seeds, fruit, etc. 2. (Optional if no baseline) Opinions about availability of such products now compared with in the past, and availability of such products in FMNR areas compared with traditionally managed areas. **Focus group discussions and key informant interviews:** In focus group discussions with producer/farmer groups, discuss and record types and quantities of 'FMNR byproducts' and local value of firewood, building poles, timber and non-timber forest products (NTFP) that they access. Discuss also whether this access helps them to earn income or save expenditure. Triangulate with key informant interviews with local project staff and agricultural extension staff. Visit local markets to record local prices for various products.
How to calculate it (numerator)	Number of households that collect timber and non-timber forest products
How to calculate it (denominator)	Total number of households in the survey
Disaggregate by	Sex, urban and rural, vulnerable group (households), FMNR and non-FMNR adopting households
Information for analysis	Divide the numerator by the denominator and multiply by 100. Report the percentage of households accessing FMNR byproducts. Data should be disaggregated by the sex of the household head to understand if there are gendered differences in access to trees and tree products, as well as FMNR and non-FMNR adopting households. If relevant, calculate individual items separately. If baseline values are available, compare change from baseline to endline. Also use this indicator to compare FMNR households and non-FMNR households at endline.
Limitations	Data on the types of FMNR byproducts accessed by households will not be difficult to collect in a household survey. Respondents should also be asked to estimate in local units the volumes and values of the items collected in a given time period. There will be a degree of error in farmer recalled estimates. Where possible, actual volumes/ weights or economic values for all byproducts should be measured in a small sample of households, such as those involved in biophysical field trials or pilot demonstration plots. Alternatively, these hands-on measurements might be done during the pilot phase of the household survey. Project staff or local extension staff should work with individuals to undertake these measurements.
Keywords	Food and livelihoods security, resilience, farming and food production, natural environment and climate, disaster risk reduction and resilience, Farmer Managed Natural Regeneration

Core FMNR Indicator 8	Proportion of households in target area that increased their income as a result of FMNR
Definition	The number or proportion of target households which have been able to increase their income as a result of FMNR's contribution to their farming or livestock system, or FMNR-related products
Level	Outcome
What it measures	The indicator assesses the number or proportion of target households which have been able to increase their incomes as a result of FMNR's contribution to their farming or livestock system, or FMNR-related products.
How to measure it	**Household survey** (with a representative sample of households in the target area): Q: As a result of FMNR, would you say that your combined financial income from farming, livestock and FMNR products specifically has increased, decreased or remained the same? A: a) increased b) decreased c) remained the same d) does not know/does not want to say
How to calculate it (numerator)	Number of households answering: a) increased OR b) decreased OR c) remained the same
How to calculate it (denominator)	Total number of households in the survey
Disaggregate by	Sex, vulnerable group (households), FMNR and non-FMNR adopting households
Information for analysis	Divide the numerator by the denominator and multiply by 100. Report the percentage of households with increased/decreased or no change in incomes as a result of FMNR. Data should be disaggregated by the sex of the household head to understand if there are gendered differences in income changes. Also calculate actual income sourced from individual items separately, if relevant. If baseline values are available, compare change from baseline to endline. Also compare results for FMNR households with non-FMNR households at endline.

Limitations	Income measurement is prone to many complications and biases; therefore, this indicator does not aim to measure exact changes in the respondent's income, but instead assesses only approximate changes, focusing primarily on the nature of the change. A specific percentage change target can be set and incorporated into the target if desired, eg. 'proportion of households in target area that increased their income by 20 percent'. This data can be collected by asking: Q: Now I would like you to compare the income you earned before you adopted FMNR, with the income you earn now. How big is the difference? A: 1) approximately _____ % 2) is not able or willing to say When setting the indicator's target value, be realistic – even a 20 percent increase can be a very good achievement. As income from farm, livestock and FMNR products is likely to be seasonal, ensure that the baseline and endline data are collected at the same time of year.
Keywords	Food and livelihoods security, resilience, farming and food production, natural environment and climate, disaster risk reduction and resilience, Farmer Managed Natural Regeneration

Core FMNR Indicator 9	**Proportion of parents or caregivers able to provide well for their children**
Definition	Percentage of parents or caregivers who are able to provide all the children in the household, aged 5-18 years, with at three important items, through their own means (assets/production/income), without external assistance (from outside the family, NGO or government) in the past 12 months
Level	Outcome
What it measures	This indicator gives some insight into whether or not parents or caregivers can provide the important items for children without outside support. This distinction is important because it measures the sustainability of parent or caregiver support if external assistance was not there. It also gives insight into how well parents or caregivers can provide the things that contribute to child well-being that extend beyond food, water, shelter, education and medical care. These aspects of well-being are measured with other indicators. Without external assistance means through own means (like own income, production or exchange). This indicator is a proxy for poverty and vulnerability. If parents or caregivers are unable to provide important basic items for each child, that child is considered vulnerable. It is a means of measuring whether economic gains at the household level actually translate into provision for children, for their well-being.

How to measure it	**Household survey** (with a representative sample of households in the target area): Q1: In the past year, were you able to provide two sets of clothes for all the children (5-18 years) living in your household, without assistance from family, the government or NGO? *If the respondent is having difficulty, or responds too quickly, probe:* *For the children, 6-11 years? For the older children, 12-18 years?* *Check: does this include any orphans or disabled children in the household?* A: 1 = Yes (with no assistance) 2 = Yes (only with assistance) 3 = No, unable to provide for all the children 88 = Don't know Q2: In the past year, were you able to provide a pair of shoes for all the children (5-18 years) living in your household, without assistance from family, the government or NGO? *If the respondent is having difficulty, or responds too quickly, probe.* A: 1 = Yes (with no assistance) 2 = Yes (only with assistance) 3 = No, unable to provide for all the children 88 = Don't know Q 3: In the past year, were you able to provide a blanket for sleeping for all the children (5-18 years) living in your household, without assistance from family, the government or NGO? *If the respondent is having difficulty, or responds too quickly, probe.* A: 1 = Yes (with no assistance) 2 = Yes (only with assistance) 3 = No, unable to provide for all the children 88 = Don't know
How to calculate it (numerator)	Number of respondents able to provide all three important items for all children aged 5-18 years with no assistance (Q1,2, and 3 = 1(Yes))
How to calculate it (denominator)	Total number of households surveyed with children aged 5-18 years
Disaggregate by	Urban and rural, vulnerable group (households), household head sex, land type (public, private)
Information for analysis	These three basic items are suggested by UNICEF but can be changed to reflect important basic items in the local context. Where the three items above do not represent the most important items, alternative items can be identified through focus group discussions in the community where the project is being implemented. It is recommended that the same three items, where possible, be used across all relevant programs/projects using this indicator, to enable aggregation at the national level and avoid biases.

Limitations	'In the past year…' provides a measure that avoids seasonality. However, the length of time may cause some difficulties with recall and lead to over reporting. This indicator's strength is that it asks for concrete examples of items that have been provided. Its weakness is that there may be response bias because respondents may not want to tell the truth about this issue. Also, the items chosen to represent 'important items' must be chosen carefully and with the specific context in mind. In large households, this question may take some time for respondents, and they may need guiding through each age group and each item for each child, as identified in the demographic section. This indicator does not differentiate intra-household inequalities between age groups or gender, as it is focused at the household level. However, if this is desired, additional questions and analysis can be added to calculate, in addition to an overall percentage for households, within the households the number of children by age group and gender. However, this adds considerable time and data which may not be utilised fully. The household measure does provide a proxy for whether parents and caregivers provide well for their children.
Keywords	Food and livelihoods security, basic needs, VisionFund, household assets, household income, Farmer Managed Natural Regeneration

Annex 9. Additional indicators

FMNR project activity indicators

Indicators of building FMNR capacity

- Number of community FMNR trainers/champions trained in principles of FMNR (female, male, total)
- Number of local extension agents or other advisors trained in principles of FMNR (female, male, total)
- Number of active community FMNR trainers/champions (female, male, total)
- Number of functional FMNR demonstration plots
- Number of individuals participating in peer-to-peer visits (female, male, total)
- Number of FMNR practitioner groups
- Number of participants in FMNR practitioner groups (female, male, total)
- Proportion of FMNR group leadership roles occupied by women
- Number of schools reached with FMNR knowledge
- Number of children and youth reached

Indicators of improving the enabling environment for FMNR

- Number of FMNR bylaws established and approved
- Number and proportion of project communities with FMNR bylaws developed and in place
- Proportion of households with knowledge of local FMNR bylaws
- Number of groups adopting FMNR in their development either of plans, budgets, bylaws or draft policies
- Number of active networks developed at local and national level
- Number of research studies conducted on FMNR
- Number of media items/events promoting FMNR more broadly

FMNR project impact indicators

Indicators of land users optimising densities of desired tree species through FMNR

- Proportion of households with tree densities above 40 trees per hectare of farmland[1]
- Number and names of different tree species in the target FMNR area
- Area of land managed with FMNR (hectares)
- Number of minority/vulnerable group members practising FMNR in the target community (disaggregate by group)
- Most valued uses for trees by households
- Evidence of collective capacity to achieve collective goals
- Evidence that households understand the benefits of FMNR (yes/no)
- Evidence that children and youth understand the benefits of FMNR (yes/no)

Indicators of improved vegetation, land and soil quality[2]

- Proportion of households that observe soil erosion has reduced
- Proportion of households that observe soil fertility has increased

[1] The FMNR Manual has emphasised the variation in tree densities that occur as a result of different contexts, land uses and farmer objectives and confidence. Forty trees per hectare is a low-density level, common in cropping land managed by communities starting out with FMNR. An alternative to using this as a standard is to work with the community to identify their own preferred density, based on their needs and land uses, once they are confidant in the approach and the benefits. Often the preferred density will be higher than 40 trees per hectare.

[2] These indicators have been selected based on their use in a development project seeking to support the uptake of FMNR by many people. If you are working within a research project or can undertake biophysical measurements of these parameters (for example, through various control and treatment plots, with the appropriate scientific measurement protocols), this would be highly encouraged. However, the authors of this manual recognise that measuring these accurately is beyond the capacity of most implementation projects. As such, we rely on the experience of the farmer who knows their land best and current published science to provide the explanation for these observations.

- Proportion of households that observe wildlife numbers are increasing
- Proportion of households that observe local groundwater sources are improving

Crop yield indicators

- Average household production of main staple cereal crop
- Average household production of main cash crop
- Proportion of households that observe staple cereal crop production is improving

Fodder and livestock indicators

- Average time spent herding livestock
- Proportion of households whose livestock numbers decreased during drought
- Proportion of households that observe livestock production is improving

Social and economic impacts

Food availability and diversity

- Proportion of households with year-round access to sufficient food for their family's needs
- Average number of months of food insecurity per year

Increased and diversified income

- Average number of different sources of income in households
- Average annual household income earned from sale of firewood, building poles, timber and non-timber forest products
  - Average annual household income earned by women from sale of firewood, building poles, timber and other non-timber forest products

Wood and non-timber forest products

- Average time spent collecting firewood for domestic needs (number of hours per seven-day week for men, women, girls, boys, total)
- Proportion of households sourcing firewood from different sources (own land, communal land, local markets, other)
- Proportion of households that access traditional human and veterinary treatments from trees

Household resilience indicators

- Proportion of parents or caregivers able to provide well for their children

Stronger communities and landscapes

- Proportion of households reporting harmonious community relationships
- Capacity of communities and neighbours to achieve collective goals around FMNR

Additional indicators

Projects focused on specific goals beyond the standard FMNR outcomes will need to ensure that their monitoring adequately addresses these goals. Some examples include:

- carbon sequestration projects (see Winrock International's Forestry and Natural Resources page at **winrock.org/issue/energy-and-environment/forestry-natural-resources/**);
- pastoralist livelihoods projects; and
- topic-specific agriculture, nutrition, water, sanitation and hygiene, conflict or sustainable livelihoods projects.

Annex 10. FMNR site and tree monitoring templates

FMNR site monitoring template

To be used during the field survey as FMNR plots and activities are selected and planned.

Land manager: Phone number:

Location:

Data collected by: Date:

FMNR area: ha/sqm/acres Farm/total area size: ha/sqm/acres

GPS coordinates: N/S E/W

Land ownership: Communal land ☐ Private land ☐

Land use: Farm/crop land ☐ Grazing land ☐ Forest ☐

What crops are present on the site: (if applicable)

What tree products are collected from this site:

Firewood ☐ Food/fruit ☐ Other:

Fodder ☐ Medicine ☐

Timber ☐ Honey ☐

Has FMNR been done on the site: ☐ Yes ☐ No

If yes: Date first pruned? Date last managed:

What management practices are being used:

Land condition:

Is there erosion present? ☐ Yes ☐ No

What percentage of the ground is covered by vegetation: ☐ 0-25%, ☐ 25-50%, ☐ 50-75%, ☐ 75-100%

Trees and shrubs

How many species are present:

Number of trees: Number of stumps:

Site photo(s): *file names and locations*

Tree record template

FMNR site name: Land manager:

Area of site (if sampled): ha/sqm/acres Area of farm/land: ha/sqm/acres

Location:

List compiled by: Date:

Sample plot location (if applicable)

1.	N/S	E/W
2.	N/S	E/W
3.	N/S	E/W
4.	N/S	E/W

OR

Centre point:	N/S	E/W
Radius:	metres	

Total number of trees/shrubs/stumps on sample plot	Trees:	Shrubs:	Stumps:

TREE NO.	GPS COORDINATES*		DBH (cm)	HEIGHT (m)	LOCAL NAME**	SCIENTIFIC NAME**	PHOTO NUMBER?
	North	East					
1							
2							
3							

* GPS coordinates can be retrieved from a GPS unit or camera/smartphone with geolocation functions activated while taking pictures. ** If you are not sure of a scientific name, you can get assistance from experts you may know through online database research or in reference books with good images. At a minimum, you should be able to obtain names of trees in the local language. For many species, there may be no English name – so don't stress. Try at least to find scientific names for the most common species. Your local forestry service agent should be able to help if you provide them with a small branch with leaves and the local name, as well as photographs.

Annex 11. Glossary of terms

A

afforestation Establishing trees and forests in areas devoid of previous tree cover.

Africa Climate-Smart Agriculture Alliance A collaboration between governments, NGOs and research bodies that aims to empower six million smallholder farmers across Sub-Saharan Africa to adopt climate-smart agriculture practices by 2021. For more information: ccafs.cgiar.org/blog/africa-csa-alliance-path-implementation

agriculture Farming, or the science and practice of cultivating soils for growing crops, forestry and rearing livestock to provide resources to sustain and enhance human life.

agroforestry Integrating trees into agriculturally productive landscapes to provide sustainable benefits such as soil fertility, resilience, food security, timber and non-timber resources, fodder and natural fertiliser. For more information: worldagroforestry.org/about/agroforestry-our-role

alley cropping Planting trees in rows with wide spaces in between, called alleyways, where crops are grown. Alley cropping diversifies farm income, increases productivity and improves biodiversity and the environment. For more information: aftaweb.org/about/what-is-agroforestry/alley-cropping

B

biodiversity The variety of micro-organism, plant and animal life globally or in a specific place. It also includes genetic diversity and ecosystem diversity, ie. the different interactions between organisms, air, water and soil. High biodiversity means a healthy environment.

biomass All organic matter, including living and recently living organisms. In terms of renewable energy, it refers to plants and plant-based materials used as an energy source. Ecologically it means the mass of living organisms in an area or ecosystem.

biophysical natural resource Any material or substance found in the natural (not human built) environment.

business facilitation/development These seek to increase the income of people who are poor through business or enterprise development. Both work with existing producer groups or assist in mobilising new groups to undertake the work of creating a good business environment within the community. There are many models for this type of work. One such approach is World Vision's Business Facilitation Project Model, available at: worldvision.com.au/docs/default-source/seed-docs/business-facilitation

bush encroachment The excessive expansion of bush at the expense of other plant species, especially grasses. Bush encroachment is common in Namibia and parts of East Africa, where it has severe negative consequences on agricultural productivity and groundwater recharge. See also woody thickening.

bylaw A rule or law developed by the local authority or community to regulate the actions of that community. For example, the local authority responsible for the management of an area of communal land may develop bylaws to govern the use of communal resources. Alternatively, a farmer group may have bylaws regarding the membership process of the group.

C

canopy (or crown) The outer layers of branches and leaves of a tree or forest.

carbon dioxide (CO_2) An odourless and colourless greenhouse gas. It enters the atmosphere through respiration by living organisms and the burning of fossil fuels (eg. coal, natural gas, oil). CO_2 is consumed by plants through the process of photosynthesis.

carbon sequestration A natural or artificial process of capturing carbon dioxide and storing it in carbon sinks. This aims for long-term storage to mitigate climate change.

carbon sink A reservoir that accumulates and stores carbon in various forms, including as carbonate and organic carbon. Reservoirs include oceans and forests. See: youtube.com/watch?v=OoW2PlvMpZs

Citizen Voice and Action (CVA) CVA is a community-based methodology for engaging with government. Although the initial aims of CVA were policy enforcement rather than policy change, the methodology is effective for most forms of engagement to help improve the policy environment of a community. More information on CVA is available at: wvi.org/local-advocacy/publication/citizen-voice-and-action-project-model

climate change A global change in weather patterns over a large period of time. This can cause weather extremes such as flooding, droughts or exacerbate other issues such as land degradation and desertification.

Climate Smart Agriculture (CSA) Agricultural practices, systems and approaches that help to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA helps local, national and international stakeholders identify agricultural strategies, including FMNR, suitable for their local conditions. For more information see: fao.org/climate-smart-agriculture/en/ and ccafs.cgiar.org/blog/how-climate-smart-farmer-managed-natural-regeneration-method

compost Decaying organic material used to fertilise growing plants.

compost pit See zai.

conservation The act of preserving, guarding, protecting and sustainably using the environment, including for biodiversity and maintaining natural resources and ecosystem health.

Conservation Agriculture (CA) A variety of agriculture practices based on the principles of minimal soil disturbance, permanent soil cover and crop rotations. For more information: youtube.com/watch?v=ocLu36R6OCE and youtube.com/watch?v=rGqoZNa3eFc

coppicing A traditional woodland management method that maintains trees at a juvenile stage. It involves cutting young tree stems to ground level, ie. a stump or stool, to stimulate growth of new shoots. See: youtube.com/results?search_query=coppicing

crop yield A measurement of harvested seed, grain, etc within the cultivated land. This is usually measured in kilograms per hectare.

cut-and-carry grass harvesting An approach to dairy farming in which grass is cut from the field daily and fed to dairy cows.

D

deciduous A tree or bush that loses its leaves in the winter months.

decomposition The process whereby organic matter is broken down into humus, nutrients, energy, water, carbon dioxide and/or minerals by micro-organisms, fungi and bacteria.

deforestation Clearing land of trees and other plants. This can be due to needing timber or repurposing the land for other uses such as agriculture.

demi-lunes, half-moon pits Small, semi-circular pits with a bund that are built to capture water run-off, reducing erosion and increasing water infiltration. They increase the ability to grow crops and plants in dry areas. See also zai. For more information: youtube.com/watch?v=tRHAGP2Sknc and youtube.com/watch?v=hlUAyY8_i9I

desertification When dry land loses water, vegetation and wildlife. The climate becomes increasingly arid. Arable land becomes unproductive. This is a type of land degradation.

diameter at breast height The diameter of a tree at 1.3 metres, or breast height, above the ground, on the uphill side. The diameter is measured in centimetres and can be used to calculate the volume of timber in a stand. See: qaa.net.au/wp-content/uploads/2016/06/image-set-2.jpg

E

ecology The study of the relationships between different forms of life – animals, plants, and micro-organisms – and their surrounding environment.

ecosystem The complex network of the community of living organisms, plants, animals and micro-organisms, and the physical environment, including air, water and soil.

ecosystem services The capacity of the environment to provide benefits, such as clean air, water, food, oxygen, soil fertility, biodiversity and nutrients, for human benefits and provide a reasonable quality of life.

El Niño The El Niño phase of the El Niño Southern Oscillation is a band of warm surface water that develops on the Pacific Ocean between South America and Australia/Southeast Asia. It reduces rainfall over Indonesia, the Philippines and Australia, while causing high rainfall on the west coast of South America.
See: **bom.gov.au/climate/glossary/elnino.shtml**

environment The natural world, including animals, plants and physical features such as land, water, soil and atmosphere. Environment also refers to surroundings.

evapotranspiration The process of water being removed from the land and transported to the atmosphere. Moisture is removed from soils by evaporation and is removed from plants by transpiration.

EverGreen Agriculture The integration of trees with food crops and livestock to create more sustainable and productive agricultural systems for smallholder farming families. Included trees provide fuel, fertiliser, food, fibre (timber) and fodder. For more information: **evergreenagriculture.net/what-is-evergreen-agriculture/** and **youtube.com/watch?v=-HXy6b206e4**

existing indigenous trees Tree species that originated in a specific area and still remain in the same area.

F

fallow Farmland that has been left without sowing seeds for a period of time so that soil fertility can have time to return or to minimise production surplus.

Farmer Managed Natural Regeneration (FMNR) FMNR is a low-cost land restoration technique that involves protecting and managing regrowth sprouting from root systems and seeds on farmland. This helps restore soil structure and fertility, inhibit erosion and soil moisture evaporation, rehabilitate the water table and increase biodiversity. It is used to combat poverty and hunger amongst poor subsistence farmers and others in land-based livelihoods by increasing food and timber production and resilience to climate extremes.
See: **youtube.com/watch?v=wP0wTNLXKgo&t=292s**

feedback loop A cyclic system where the outputs eventually influence the inputs of the same system. For example, tree leaves that fall release nutrients into the soil when they decompose. The nutrients are then taken up again by plants and cause more leaves to grow and then fall, providing even more nutrients. This is a positive feedback loop. There are also negative feedback loops where the outputs undesirably affect the inputs of the system.

felling The cutting down of a tree.

fertiliser Any natural or synthetic material that is used on soils or plant tissue to provide nutrients for plant growth.

fertiliser tree Fertiliser trees, including *Faidherbia Albida*, *Gliricidia* and others, capture nitrogen from the air and convert it into a form that is useful to other plants. Fertiliser trees can be an environmentally safe and inexpensive means of boosting crop yields.
For more information **agroforestry.org/free-publications/nitrogen-fixing-trees**

fodder Food for livestock, such as dried hay or straw, etc.

Food and Agriculture Organization of the United Nations (FAO) An intergovernmental organisation that focuses on defeating hunger. It also looks at the complex challenge of governing development-related processes that affect food security, nutrition, livelihoods, and the management and sustainable use of natural resources. For more information: **fao.org/about/who-we-are/en/**

food security When all people at all times have access to sufficient, safe and nutritious food that meets dietary needs and food preferences for an active and healthy life. For more information: **fao.org/economic/ess/ess-fs/en/**

forestry The science and practice of caring for, managing, protecting, restoring and using forests.

G

Geographic Information System (GIS) A computer system that captures, stores, manipulates, analyses, manages and presents spatial and geographical data. GIS helps to interpret data to understand relationships, patterns and trends. For more information: **esri.com/what-is-gis/howgisworks**

Geographical Positioning System (GPS) This is a global satellite navigation system that provides location and time information, including latitude and longitude. This information assists with long-term monitoring and comparisons.

grafting A technique where part of one tree is cut back and then a portion of a different tree (scion) is attached (grafted) to the rootstock tree. See: **content.ces.ncsu.edu/media/images/ag396-6.gif**

greenhouse effect When greenhouse gases such as carbon dioxide, methane or chlorofluorocarbons help trap the sun's heat in the Earth's atmosphere.

groundwater Water that has infiltrated below the surface of the earth, to be stored in soils or rock called aquifers.

gully An erosion channel more than 30 centimetres deep.

gully erosion When excessive water run-off from rainfall washes away soil to form gullies.

gully reclamation The process of improving land and stabilising soils that have been damaged by gully erosion. This is achieved by filling with other soil, planting vegetation or constructing a dam-like barrier to trap run-off and sediment.

H

hectare A unit of measurement that equals 2.47 acres, or 10,000 square metres.

holistic management A system of managing resources that considers the complex and mutualistic interactions between people, animals, plants and the land. The aim is to be flexible, adaptable to different conditions and environments, and to take a broad approach to solving problems.

humification The conversion of dead organic matter through decomposition by bacteria and fungi, into humus, a dark substance full of nutrients. The humus is then washed into the soil by rain providing plants with the nutrients they need.

I

indigenous Originally or naturally occurring in one particular place. In reference to plants, it is where they have evolved and grown naturally with no human intervention. In reference to humans, it means having a distinct cultural and historical relation to an area.

inorganic A compound, material, mineral or chemical that is not organic, usually does not contain carbon, and is not from a living being.

introduced species An organism that is not native to an area that has been accidentally or deliberately transported there by human activity.

J, K

L

La Niña The phase of the El Niño Southern Oscillation when surface temperatures of the central and eastern Pacific Ocean experience cooling. This is accompanied by higher rainfalls over tropical Australia, Papua New Guinea and Indonesia. For more information: **bom.gov.au/climate/glossary/lanina.shtml**

land degradation The exploitation of soil, vegetation and/or water which leads to a decrease in quality or viability of those natural resources.

livelihood/livelihoods All of the means – assets, work, abilities, actions, etc – that go into making a living or meeting one's basic needs. The Sustainable Livelihoods Approach/Framework helps to flesh out what is necessary to secure livelihoods for the long term. For more information: **sida.se/contentassets/bd474c210163447c9a7963d77c64148a/the-sustainable-livelihood-approach-to-poverty-reduction_2656.pdf**

Local Value Chain Development See **value chain development**.

M

machete A broad, heavy knife used as a tool. Alternatives: axe, blade, cleaver, hatchet, kapmes, knife, panga.

macronutrient A nutrient that is required in a large amount by living organisms.

managed grazing See rotational grazing.

minimum tillage A system of soil conservation that does not turn soil over or change the soil structure, but instead leaves 30 percent crop residue and minimises soil erosion. Minimum tillage techniques include no tillage, strip-till (only narrow strips of soil are tilled for seed planting), mulch till, rotational tillage (tilling every two or so years), ridge-till and zone tillage (where only a small strip is tilled below the crop row).

mulching Covering or surrounding plants with a protective layer (straw, plastic sheeting, organic matter, etc) against evaporation, freezing of roots, soil erosion and weed growth. Organic mulches can also contribute to soil fertility. See: **4.imimg.com/data4/EO/CU/MY-5549339/plastic-agriculture-mulching-sheet-500x500.jpg**

N

natural resources The materials and substances of the environment that are most useful to humans, providing for basic needs or exploited for economic gain. They include land, water, plants, animals, minerals and energy.

naturalised species An intentionally or unintentionally introduced species that has adapted to and reproduces successfully in its new environment.

nitrogen fixation A process whereby bacteria convert atmospheric nitrogen (N_2) to ammonium (NH_3) making the nitrogen more readily available for plants to use. Nitrogen-fixing trees contain symbiotic bacteria called *rhizobia* within nodules in the roots, which perform this process.

nutrients Substances that provide nourishment that is essential for living organisms and for their growth.

O

organic matter Carbon-based material from animals and plants. It includes fallen fruit, leaves, branches, twigs, stems and any other products dropped by plants or animals. When the organic matter decomposes it improves soil fertility and helps retain soil moisture.

overclearing Clearing too much vegetation for agricultural purposes causing land degradation, and endangering biodiversity and ecosystems.

overgrazing Allowing livestock and animals to intensely graze pastures and rangelands for extended periods of time. This causes land degradation including damage to vegetation and soil compaction and higher susceptibility to soil erosion.

P

pastoralist Livestock owner or grazier working with sheep, goats, cattle, camels or other grazing or browsing species.

permaculture Agricultural systems that are developed to be sustainable and self-sufficient which emphasise the simulation of natural processes.

photosynthesis The process by which plants, and some bacteria, produce energy. Light energy from the sun, water and carbon dioxide is converted to energy stored in the bonds of glucose and oxygen.

planned grazing See rotational grazing (below).

planting pit See **zai**.

pollarding A system of pruning that involves removing the upper branches of a tree to promote a dense growth of foliage and branches. Usually done for fodder (ie. pollard hay) or wood.
See: **heritagearboriculture.co.uk/_webedit/cached-images/111.png**

pollination When pollen from one plant is dispersed by wind, water or animals, such as insects or birds, and transferred to another plant for fertilisation to start producing seeds.

pruning To trim or cut away dead or overgrown branches, stems and leaves, often to stimulate growth and maintain tree health.

Q

R

rainfall The quantity of rain falling in an area in a given time. Rainfall intensity is the rate of rainfall during a specific time, expressed in millimetres per hour (mm/h).

rangeland Open land that is used for grazing or hunting animals. Includes prairie, grasslands, shrub lands, woodlands, wetlands, savanna, tundra and deserts.

reforestation Re-establishing tree and forest cover in previously depleted areas.

resilience The capacity to recover quickly from difficulties. In the context of FMNR, resilience can mean recovery and resistance to shocks such as climate extremes or economic crises.

revegetation The process of restoring plant cover to denuded or degraded land. This can be a natural process, or can be accomplished or assisted by humans, as with FMNR.

rotational grazing (also referred to as planned grazing and managed grazing) Any of a number of systems of grazing that move livestock from one area to another in a planned, intentional manner, to ensure optimum fodder and avoid overgrazing.

S

sapling A young tree with a slender trunk under 10 centimetres in diameter at breast height.

Savings Groups Savings Groups foster social capital, collective action and financial literacy, with the aim of ensuring that income is saved and available for important family or community needs, and for reinvestment in production activities. For more information: sites.worldvision.ca/savingsgroups/

seedling A very young plant that has been grown from a seed, usually under one metre in height.

slash and burn farming A farming method where natural vegetation is cut down and burned to clear the land for agriculture.

soil erosion A naturally occurring process that takes place in agricultural fields, where topsoil wears away from the physical forces of water and wind, or through forces associated with farming activities, such as tilling.

soil fertility The ability of soil to sustain plant life and crops by providing the nutrients and water needed for their growth. This includes good drainage, soil depth for root growth, absence of toxins, balanced acidity, adequate amounts of nutrients, and the presence of biodiversity, such as soil bacteria, fungi and worms.

soil moisture The quantity of water in the soil. Soil moisture is an important factor because it controls the exchange of water and heat energy between the land and atmosphere through evaporation and plant transpiration.

sowing Planting seed for crops or pasture grasses.

subsistence The minimum of maintaining and supporting oneself or a household. This means that surplus for selling or trading is not available. Often involves dependence on natural resources for basic needs, through subsistence farming, hunting and gathering.

sustainable/sustainability The ability to sustain and support over the long term. Sustainable development means meeting the needs of today without compromising the needs of the future. Environmental sustainability is the ability to use natural resources without adversely affecting ecological health and maintaining productivity for the future. In agriculture this involves the conservation of soil, vegetation and water to ensure food supplies and continued productivity and profitability for farmers, herders and other agriculturalists.

sustainable livelihoods See **livelihood/livelihoods**.

T

tassa See **zai**.

topsoil The upper 5-20 centimetre layer of soil. It is usually darker than the subsoil beneath because it has a higher content of organic matter and humus. It is the most fertile, therefore the most important part for agriculture, and needs to be protected.

U

V

value chain development Value chain development helps producers increase their wealth through better access to and engagement with markets, and by building relationships with critical service providers that can help them overcome market barriers. For more information: worldvision.com.au/docs/default-source/seed-docs/local-value-chain-development.pdf?sfvrsn=2

W

water harvesting Capturing rain where it falls or runoff from rooftops or land to be stored for direct use or recharged into the groundwater reserves.

windbreak A dense row of trees planted to provide shelter from the wind, while also reducing wind erosion.

World Agroforestry Centre (ICRAF) A global research organisation that generates science-based knowledge about the diverse benefits – both direct and indirect – of agroforestry (trees in farming systems and agricultural landscapes) and disseminates this knowledge to develop policy options and promote practices that improve livelihoods and benefit the environment. For more information: **worldagroforestry.org/**

World Resources Institute (WRI) A global research organisation that works internationally to focus on critical issues of environment and development, to sustain our natural resources for economic opportunity and human well-being. For more information: **wri.org/**

woody thickening This occurs where species of dense shrubs or small trees replace or increase in density in open forest land or tropical grassland ecosystems. This results in dense thickets of low productivity vegetation in comparison to grassland or open forest with larger trees. See **bush encroachment**. For more information: **landmanager.org.au/managing-tree-layer-woody-thickening**

X, Y

Z

zai, zai holes, zai pits, compost pits, planting pits, tassa A farming technique that involves digging pits about 20 to 30 centimetres deep and 90 centimetres apart during pre-season to catch water and concentrate compost and organic matter. Seeds are planted in the pits. Zai are often used to improve bare soils in drought or low rainfall, or where the soils are hard and difficult to plough. See also: **demi-lunes**. For more information: **c.ymcdn.com/sites/echocommunity.site-ym.com/resource/collection/27A14B94-EFE8-4D8A-BB83-36A61F414E3B/TN_78_Zai_Pit_System.pdf** and **youtube.com/watch?v=FNQeP2P0IbA**

Resources

Chapter 1. Introduction to Farmer Managed Natural Regeneration

fmnrhub.com.au/manual-chapter-1/

Article: The development of Farmer Managed Natural Regeneration	fmnrhub.com.au/wp-content/uploads/2013/09/Rinaudo-2007-Development-of-FMNR.pdf
Video: Everything is connected	youtube.com/watch?v=p-terQL6RO0&feature=youtu.be
Video: Tony Rinaudo: the Niger I came to	youtube.com/watch?v=afjVaehQRxg
Article: Definition of Forest Landscape Restoration	iucn.org/theme/forests/our-work/forest-landscape-restoration
Policy Brief: Partnering with Nature	c.ymcdn.com/sites/www.ser.org/resource/resmgr/custompages/publications/ser_publications/FERI_Brief_FINAL_DOUBLEPAGE.pdf
Website: Food and Agriculture Organization	fao.org/forestry/anr/en/
Website: World Agroforestry Centre	worldagroforestry.org/about/agroforestry-our-role
Website: Evergreen Agriculture Partnership	evergreenagriculture.net/what-is-evergreen-agriculture
Overview: Climate Smart Agriculture	fao.org/climate-smart-agriculture/overview/en

Chapter 2. Using FMNR in a development program

fmnrhub.com.au/manual-chapter-2/

Tool: Restoration Diagnostic tool	wri.org/sites/default/files/WRI_Restoration_Diagnostic_0.pdf
Tool: Restoration Opportunities Assessment Methodology	iucn.org/theme/forests/our-work/forest-landscape-restoration/restoration-opportunities-assessment-methodology-roam
Article: FMNR reconciliation trees in Rwanda	fmnrhub.com.au/fmnr-reconciliation-trees-rwanda/

Article: Conflict resolution through sustainable management of trees in Ghana	fmnrhub.com.au/conflict-resolution-sustainable-management-trees-ghana
Report: FMNR in a refugee context in Uganda	fmnrhub.com.au/wp-content/uploads/2018/07/Building-Prosperous-communities-thru-FMNR-Final-Final.pdf
Website: UN Sustainable Development Goals	www.undp.org/content/undp/en/home/sustainable-development-goals.html

Chapter 3. Taking stock with the community

fmnrhub.com.au/manual-chapter-3/

Chapter 4. How to practise FMNR

fmnrhub.com.au/manual-chapter-4/

Tool: Agroforestree Database	worldagroforestry.org/output/agroforestree-database
Tool: Vegetationmap4africa species selection tool	vegetationmap4africa.org/Species/Species_selection_tool.html
Tool: Promising Agroforestry Tree Species in India	worldagroforestry.org/downloads/Publications/PDFS/B17969.pdf
Tool: Guide on taking photopoints	fmnrhub.com.au/wp-content/uploads/2018/09/FMNR_Collecting-data-to-monitor-change-printable-version.pdf
Report: Socioeconomic attributes of trees and tree planting practices	fao.org/docrep/006/u4375e/U4375E08.htm#TopOfPage
Article: The Botanic Gardens of South Australia website: The eight roles of trees and forests in the hydraulic cycle.	gievidencebase.botanicgardens.sa.gov.au/contents/7-water-management
Tool: Green Water Management Handbook	sswm.info/sites/default/files/reference_attachments/MALESU%202007%20Green%20Water%20Management%20Handbook.pdf
Article: How do you stop the desert? Niger may have the answer	news.globallandscapesforum.org/24278/niger-a-hidden-beauty-in-implementing-forest-and-landscape-restoration-flr-on-the-ground/

Article: The beneficial properties of Piliostigma reticulatum	sciencedirect.com/science/article/pii/S0167880917301263
Website: Farm Tree Services website	farmtreeservices.com/
Training material: Tutorial on zai pits	c.ymcdn.com/sites/echocommunity.site-ym.com/resource/collection/27A14B94-EFE8-4D8A-BB83-36A61F414E3B/TN_78_Zai_Pit_System.pdf

Chapter 5. Community engagement to create sustainable FMNR practice

fmnrhub.com.au/manual-chapter-5/

Tool: Guideline for Facilitators	fmnrhub.com.au/wp-content/uploads/2014/06/FMNR-Workshop-Facilitator-Guidelines.pdf
Tool: Vulnerability and capacity analysis (VCA) tools	ifrc.org/Global/Publications/disasters/vca/how-to-do-vca-en.pdf
Tool: PRA Tool Box	www.fao.org/docrep/003/x5996e/x5996e06.htm
Tool: Rapid Rural Appraisal and Participatory Rural Appraisal	crs.org/our-work-overseas/research-publications/rapid-rural-appraisal-and-participatory-rural-appraisal
Tool: Citizen Voice and Action tool	wvi.org/socialaccountability
Training material: FMNR Online Training Academy	fmnrhub.com.au/fmnr-online-training-registration/
Tool: Business facilitation	wvi.org/development/publication/business-facilitation
Tool: Local Value Chain Development	wvi.org/development/publication/local-value-chain-development
Training material: Pictorial poster describing FMNR process and outcomes (Eng)	fmnrhub.com.au/wp-content/uploads/2014/04/FMNR-Poster-English.pdf
Training material: Pictorial poster describing FMNR process and outcomes (French)	fmnrhub.com.au/wp-content/uploads/2018/09/FMNR-Poster-French.pdf

Training material: FMNR quick guide	fmnrhub.com.au/wp-content/uploads/2014/04/FMNR-Quick-Guide.pdf
Video: FMNR Hub Youtube channel	youtube.com/channel/UCchz_ED2SBWCF8rg_9kGBDQ
Video: How to prune for natural regeneration	youtube.com/watch?v=0xF27ROVrbg
Video: FMNR income generation	youtube.com/watch?v=pTXEYXrEdmI&feature=youtu.be
Video: Sustainable land management practices: Farmer Managed Natural Regeneration	fmnrhub.com.au/wp-content/uploads/2014/05/Farmer-Managed-Natural-Regeneration_Script_ENG.pdf
Video: Gestion durable des terres: Régénération naturelle assistée	http://fmnrhub.com.au/regeneration-assistee/#.XDQaVS1L3UL
Example: Talensi-FMNR BYLAWS_ Process Report Example	fmnrhub.com.au/wp-content/uploads/2018/09/Talensi-FMNR-BYLAWS_Process-Report-Example.pdf
Example: Convention Locale de Gestion des Ressources Naturelles, Zinder, Niger, Juin 2015	http://fmnrhub.com.au/wp-content/uploads/2018/11/ERPB-Convention-Locale-REGISER.pdf
Article: "Ethiopia's new forestry law" A win for landscapes and livelihoods?	forestsnews.cifor.org/57465/ethiopias-new-forestry-law-a-win-for-landscapes-and-livelihoods?fnl=en&utm_source=General+contacts&utm_campaign=d1a6874dde-CIFOR_News_Update_August_2018&utm_medium=email&utm_term=0_282b77c295-d1a6874dde-117615849

Chapter 6. Managing fire and other potential problems

fmnrhub.com.au/manual-chapter-6/

Tool: FMNR Troubleshooting Guide	fmnrhub.com.au/wp-content/uploads/2014/05/FMNR-Trouble-Shooting-Notes.pdf
Example: Sample fire management plans	fmnrhub.com.au/wp-content/uploads/2018/09/070728-Humbo-Fire-Management-Plan.pdf
Video: Preventing Fires	youtube.com/watch?v=ri-kfh35PB4

Article: Trap barrier systems for rodents	researchgate.net/publication/223083194_Integrated_management_to_reduce_rodent_damage_to_lowland_rice_crops_in_Indonesia
Example: Community fire plan	fmnrhub.com.au/wp-content/uploads/2018/11/Humbo-Fire-Management-Plan.pdf

Chapter 7. Ensuring FMNR is inclusive

fmnrhub.com.au/manual-chapter-7/

Training material: Children's Handbook: Exercises for Learners	fmnrhub.com.au/wp-content/uploads/2018/09/Childrens-hand-book-web-and-online.pdf
Training material: Activity book for children	fmnrhub.com.au/wp-content/uploads/2018/09/Activity-Book-for-Children-on-Our-Natural-Environment.pdf
Training material: Handbook on Our Environment: A Guide for Teachers	fmnrhub.com.au/wp-content/uploads/2018/09/Handbook-Teachers-Version-light-for-web-002.pdf
Example: How SMS is being used in Tanzania	fmnrhub.com.au/mobile-solution-mobile-pastoralists-spreading-fmnr-text-messages/
Training material: Teaching resource for children by the International Tree Foundation	internationaltreefoundation.org/tree-power-blasts-off-to-reach-schools/

Chapter 8. FMNR partnerships

fmnrhub.com.au/manual-chapter-8/

FMNR Hub Resources Page	fmnrhub.com.au/resources/
Example: Environmental Protection in Islam	islamreligion.com/articles/307/viewall/environmental-protection-in-islam/
Example: Alliance of Religions and Conservation	www.arcworld.org/
Example: GreenFaith.org	greenfaith.org/greenfaith_religious_teachings#

Chapter 9. Designing FMNR projects

fmnrhub.com.au/manual-chapter-9/

Training material: FMNR Online Training Course	fmnrhub.com.au/fmnr-online-training-registration/
Tool: Workshop facilitator guidelines	fmnrhub.com.au/wp-content/uploads/2014/06/FMNR-Workshop-Facilitator-Guidelines.pdf

Chapter 10. Monitoring and evaluation

fmnrhub.com.au/manual-chapter-10/

Tool: Collecting FMNR Data to Monitor Change	fmnrhub.com.au/wp-content/uploads/2018/09/FMNR_Collecting-data-to-monitor-change-printable-version.pdf
Tool: Additional FMNR indicator definitions	fmnrhub.com.au/wp-content/uploads/2018/09/Additional-FMNR-Indicator-Definitions.pdf
Report: FMNR Evidence Gap Analysis	fmnrhub.com.au/wp-content/uploads/2018/09/FMNR-Evidence-Gap-Analysis-Oct-2016-with-cover-limited-circulation.pdf
Tool: Better Evaluation website	betterevaluation.org/
Tool: Indikit website	indikit.net/
FMNR Hub Resources Page	fmnrhub.com.au/resources/
Tool: Laying out your plot	forestry.ac.nz/euan/inventory/plotLayout.htm
Tool: Collect Earth	openforis.org/tools/collect-earth.html
Tool: Instructions for photopoint monitoring	nrmsouth.org.au/wp-content/uploads/2014/08/Photo-Monitoring-Fact-Sheet-NRM-South.pdf

Chapter 11. Some final thoughts

fmnrhub.com.au/manual-chapter-11/

Bonn Challenge website	bonnchallenge.org/content/challenge
AFR100 Initiative	wri.org/our-work/project/AFR100/about-afr100

FMNR
Farmer Managed Natural Regeneration

World Vision

fmnrhub.com.au | worldvision.com.au