

Farmer Managed Natural Regeneration in Kenya

A trainer's guide for farmers, pastoralists and other land users



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The information is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up-to-date and to check currency of the information with the appropriate agricultural or forest officer or an independent advisor.

Cover Photo: FMNR farmer in Baringo, Kenya practicing pruning.

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List of abbreviations and acronyms

ADRA	Adventist Development and Relief Agency
ASALs	Arid and Semi-Arid Lands
CBOs	Community-Based Organizations
FMNR	Farmer Managed Natural Regeneration
NGOs	Non-Governmental Organizations

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About this guide

This FMNR guide has been prepared through the Regreening Africa project to support grassroot actors such as non-governmental organizations (NGOs), community-based organizations (CBOs), forestry and agriculture sectors' extension staff, local institutions, farmers and pastoralists in Kenya to successfully establish trees on degraded lands. The information provided here has been largely adapted from the “farmer managed natural regeneration in Kenya: a primer for development practitioners”, alongside the authors' experience.

Users of this guide will find information on (i) understanding the FMNR concept, (ii) FMNR in practice, (iii) other practices that make FMNR successful, (iv) the practice of FMNR in different land categories in Kenya and (v) keeping FMNR records and tree measurement. The guide does not provide specific advice on appropriate species for each region. Instead, it provides a synopsis of how farmers and pastoralists can be guided to identify, select and sustainably regenerate and manage useful trees on their land to serve the needs of households and society.

MODULE 1

UNDERSTANDING THE FMNR CONCEPT



1.1 What is farmer managed natural regeneration (FMNR)?

FMNR is an approach whereby you as a landowner decide to grow trees on your land without direct planting. It is based on regrowth of existing trees or seeds that germinate from the soil by themselves. FMNR is possible wherever there are living tree stumps with the ability to re-sprout or seeds in the soil that can germinate into a forest. A living tree stump represents a well-developed support system for tree establishment under the soil that only needs a little effort to bring back to life as demonstrated in **Figure 1** below.

“ FMNR is an approach whereby you as a landowner decide to grow trees on your farm without direct planting. It is based on regrowth of existing trees or seeds that germinate from the soil by themselves



Figure 1 A big tree before cutting (left); all its roots still living after cutting and supporting quick regrowth from its stump (right) Source: Tony Rinaudo / FMNR Hub

FMNR is a rapid, low cost and easily replicated approach to restoring and improving agricultural, forest and pasture lands. Broadly, FMNR can enable trees to regrow over large areas of land where trees have been completely removed or to increase tree cover where few trees remain. This approach, however, requires a change in the way people think so they understand that trees do not always have to be planted to be useful to the community.

FMNR can be practised in all parts of Kenya ranging from humid areas to arid and semi-arid lands (ASALs). However, it is more suitable where tree planting faces difficulties such as lack of tree seeds and seedlings and drying of planted seedlings due to low rainfall. In practice, FMNR is generally more suitable for dry areas because they face severe shortages of water, food and pasture for animals. These challenges are exacerbated by unsustainable practices such as overgrazing.

1.2 Why FMNR?

- i) Some areas such as the drylands of Kenya are too harsh for successful tree planting because they receive little rainfall most of the year. FMNR provides an opportunity to re-vegetate the land through caring for trees that naturally sprout from living tree stumps, roots and/or seeds that are stored in the soils. The regenerated trees are mainly of species adapted to the conditions of the area.
- ii) FMNR can be applied in all types of land, including croplands, pasturelands, unused bushlands and lands considered as 'common use fields' (these are lands used in common by everyone but with no one directly responsible for managing them).
- iii) FMNR helps overcome cultural biases that exist in some communities such as those that make it difficult for some members to plant trees, especially women. FMNR provides such women with the opportunity to establish and benefit from trees even without directly planting the trees from seedlings.
- iv) FMNR is farmer-centred and community-driven since farmers take the lead in regenerating trees that serve their interests, either on private or communal land.

1.3 When is FMNR appropriate and to whom?

FMNR is more appealing and appropriate in the following conditions:

- i) Community members recognize their environment is deteriorating because trees have disappeared especially indigenous species; they appreciate that their actions have contributed to the poor condition of the environment; and they are willing to do something towards bringing the land back to its original state.
- ii) Community members and groups have an interest in, and are well organized to benefit directly from, the labour they invest in improving their land and environment over many years (see Box 1).
- iii) Community leaders can mobilize members towards conserving and managing the environment both for themselves and their children.
- iv) People's attempts to plant trees have faced difficulties such as: (a) little rainfall that causes planted seedlings to dry; (b) lack of good tree seeds or seedlings for planting; or (c) planting of trees is expensive (because it might require big holes, watering and other supports).
- v) The land has tree stumps, roots or naturally growing wildlings that can be nurtured to become new trees.
- vi) Farmers are exposed to a severe shortage of forest and tree products (both wood and non-wood) necessary for their lives such as when women are faced with shortage of firewood.

1.4 What are the main advantages of FMNR?

- i) FMNR is based on what the local community already knows in terms of tree growing management and uses. It builds on what many farmers/herders already possess, such as land with stumps of trees that have known value and uses.
- ii) FMNR is not expensive to practise because farmers can use locally available tools. Some form of tree protection may be needed such as fencing to prevent destruction by free-range grazing livestock, but this can be achieved using locally available materials rather than expensive wires. Creating local bylaws respected by all community members has also helped protect trees in some communities, thus rendering physical fencing unnecessary in such areas.
- iii) Farmers can easily train each other and learn together on how best to practise FMNR in their community, especially where they are sure of land ownership and the laws of the land allow them to utilize their trees freely.
- iv) FMNR provides a wide range of benefits to the land user from the same land unit and contributes to collective benefits to the larger community (see the list in Box 1).
- v) FMNR application is simple and adaptable by people of all ages whether women, men, children and/or the old, including people with special needs.
- vi) Community members have the freedom to adapt FMNR to meet their own needs, leading to a greater chance of successful adoption.

Box 1 Benefits of FMNR

- i) Improved environment due to increased tree cover.
- ii) Soil fertility through organic matter from trees, which leads to improved crop yields.
- iii) Increased fodder/pasture for livestock from tree leaves and pods, as well as grass underneath trees, which improves livestock productivity and survival.
- iv) Increased income through more farm enterprises, which include tree products such as medicine, firewood, timber and construction posts, among others.
- v) Higher incomes and diversified livelihoods, which result in better opportunities such as medical treatment, children's education, nutrition and clothing.
- vi) Less distance travelled by women and children to collect firewood.
- vii) Reduced loss of soil by erosion.
- viii) Reduced drying of the soil because trees provide windbreaks, shade and organic matter that covers the soil (also called mulch).
- ix) Improved water flow resulting from increased infiltration of water, which recharges streams and boreholes.
- x) Increased number of plants on land, which improves the environment and helps bring back useful birds, insects and animals.
- xi) Increased adaptation to climate change and associated disasters such droughts and floods.
- xii) Enhanced participation of women in tree growing/land restoration.
- xiii) Reduced conflicts due to demand for natural resources such as pasture in the semi-arid regions.



Plate 1: Harvested gum and resins by women in Laisamis, Marsabit County - Photo credit: World Vision Kenya

1.5 How do you establish and manage trees with FMNR?

There is no fixed way of practising FMNR. You have the flexibility to carry out the practice in the way that satisfies you most, depending on the state of your land and the benefits you would like to derive from the trees. Some guidelines are given in Module 4 of this training guide as to how you can be more specific when applying FMNR in different land categories.


However, you need to create favourable conditions for success of FMNR in your land by observing the following simple land management principles when farming:

- i) Avoid burning of trash on the land, whether crop residue or other cut vegetation, including trees that have been pruned or felled.
- ii) Avoid uprooting tree stumps.
- iii) Allow sprouts to grow from stumps of trees left on the land.
- iv) Minimize soil disturbance through practices such as excessive tillage (digging and ploughing) to allow seedlings of trees to germinate from the soil.
- v) Be careful during weeding to spot germinating tree seedlings and let them grow.
- vi) Apply soil and water conservation measures to enhance moisture content in the soil, which supports regrowth of trees, especially in ASALs.
- vii) Control livestock grazing since livestock easily destroy or deter growth of young trees.
- viii) Avoid over pruning since it weakens the trees threatening its survival.



MODULE 2

FMNR IN PRACTICE



When you have observed the principles outlined in 1.5 above, you can successfully practise FMNR using the three steps listed below.

1. Selection of tree species and stumps.
2. Pruning and management of selected trees.
3. Maintenance and utilization of growing trees.

The diagram below (**Figure 2**) summarizes seven points that guide tree establishment through FMNR. They are grouped into the three steps that are explained later in this module.

“ Select trees that provide products useful for your household and community, such as timber, poles, medicine, firewood and wild fruits. It is, however, important to include as many species as possible even some that you do not see as immediately useful.

A. Select species and stumps of trees



1. Survey land for sprouting stumps or seedlings and identify what species of trees are present.
2. Select the species and stumps to be regenerated.

B. Prune and manage selected trees



3. For each stump, select three to five stems to keep and prune away the unwanted stumps.
4. For each selected remaining stem, prune off side branches up to halfway up the trunk.
5. Protect the stems while they are growing.

A. Maintain and utilize growing trees



6. Prune unwanted emerging shoots every two to six months as needed.
7. Utilize tree for planned purposes: harvesting branches, portions of wood or the whole tree as necessary.

Figure 2. Seven step demonstration of initial selection and pruning of shoots identified for establishment
Source: Rinaudo et al. (2019).

2.1 How do you select species and stumps for managing with FMNR?

In principle, you should select trees that provide products useful for your household and community, such as timber, poles, medicine, firewood, fodder, gums, resins, charcoal (sustainable production) and wild fruits. It is, however, important to include as many species as possible even some that you do not see as immediately useful. The more tree species you have on your land, the better your environment gets.

You may later come to know some uses of those trees either from elders (who have a lot of knowledge on various uses of trees) or visitors from other communities (where some of these trees are known to have important uses). Having many species in the community also helps improve the presence of useful insects or animals that pollinate your crops, provide honey and serve other purposes.

The following points can help you decide which trees to manage:

- i) As much as possible select tree species that occur naturally in your locality because they are adapted to the local climate so they will easily survive.
- ii) Select tree species that easily sprout from stumps.
- iii) Pay attention to local beliefs and values ascribed to each tree species.

-
- iv) Consider uses of the tree species (the more benefits you can get from the tree, the better).
 - v) Pay attention to characteristics such as thorniness, competitiveness with crops and growth rate among other factors that affect your tree production goals (see Box 2 for quick guidance on some characteristics of trees for various uses).
 - vi) Ask forestry experts whether the tree species is invasive. Invasive species occupy land very massively and in a way that makes it difficult for other species to grow or for landowners to use the land for other uses such as grazing. Some invasive tree species have some good uses so may not need to be completely removed. However, you should watch out to ensure the numbers remain manageable.

Box 2 Primary uses and characteristics of agroforestry/FMNR trees and shrubs

Intercropping with food crops

- The tree has a relatively open canopy that minimizes shading of crops (this can also be managed through pruning and lopping).
- It has nutrient rich leaves for mulch and/or nitrogen fixing ability for enhancing soil fertility.
- It does not suppress growth of surrounding plants.

Timber & firewood

- The tree has strong wood content that burns well and slowly when used as firewood or for charcoal.
- It does not dry when its branches are cut.
- It grows into a long straight stem (if timber is the product you want).

Honey

- Bees like its flowers.
- It produces flowers for a long period, particularly during dry seasons when seasonal plants have dried up.

Fodder

- Its leaves, pods or bark are liked by livestock and are nutritious.
- It grows easily after branches are cut.
- It can withstand regular pruning/browsing.

Fruit & non-timber tree products

- The tree produces fruits or other known non-wood products (medicines, gums, resins, fibre, etc.) useful at home or for sale at known markets.
- Storage, transportation or other value addition services for products are available.
- Good form for tree seed collection to qualify as superior quality 'mother' trees where tree seeds and seedling business is established.

When selecting tree species to manage on community land, you should work together as members of the community who will use the land and benefit from the trees, with guidance by leaders that you have selected. For your own private land, you can do the selection alone or even better with your family since men, women and children would have unique interests for specific trees on farm. It is additionally important to involve other farmers and/or community members because you will likely benefit from each other's knowledge.

The following steps are useful in selection of species and stumps:

- i) Individually, as a household or jointly with fellow community members, survey the field on which you wish to practise FMNR and identify existing tree stumps or wildings (young trees) – some stumps might be difficult to identify if cut very low so look out for sprouts.
- ii) Generate a list of preferred tree species based on the six points listed in section 2.1.
- iii) For each stump you identify for management, choose and mark between three and five of the healthiest (tallest and straightest) shoots you will leave to grow into mature tree trunks.
- iv) If there is bush encroachment, mark the desired trees and cut out the rest. If the thickets are too dense, you may be unable to see all stumps clearly. In that case, you may need to make the selection as you clear the thickets, removing unwanted plants and leaving the desired ones for management.

2.2 How do you prune and manage the selected trees for good growth form?

The following steps will be useful:

- i) Remove unwanted or weak sprouts and side branches that may come up later (after initial selection) to allow those selected to grow into strong trees.
- ii) If the selected sprouts are weak, tie them together so they can grow into strong trunks. Alternatively, you can prop the weak stems/trees with firm poles or stakes to keep them in position until they are strong enough to stand on their own (see Box 3 on propping).
- iii) Protect the selected branches from browsing by livestock, fire and competing weeds by weeding and, if necessary, constructing a small fence around them with pruned sticks.
- v) Keep coming back to the growing trees from time to time to remove any new unwanted stems and side branches that may come up.

Box 3 Propping

Propping means to support thin and weak stems or young trees from falling by either tying the stem to a strong adjacent tree or by use of props (firm poles or stakes used as temporary support to keep the weak trees in position until they are strong enough to stand on their own). Propping protects the growing trees from wind damage and helps them to grow into straight stems. This practice is especially necessary for seedlings that have naturally germinated from the soil, either as a group or in a crowd of surrounding vegetation. Such seedlings did not develop strong stems because of competition. Once the surrounding vegetation has been removed, the selected tree needs support for some time before it gains strength to grow on its own.



A drawing showing a sapling (small tree) supported with a stake (left); Scholastica, an FMNR farmer in Mogotio, Baringo County propping a sapling (middle); a farmer tying together stems of a coppiced acacia tree with a rope in an FMNR plot (right) Photo: ICRAF.

2.3 How do you maintain and utilize the trees you have established with FMNR?

There are three practices that you need to maintain your regenerating trees in good growth form: thinning, pruning and pollarding. How often you undertake the practices depends on the end products you wish to get from your trees.

- a) **Thinning** is the removal of weak trees to allow the stronger ones to grow to maturity. When tree seedlings germinate naturally from the soil, they usually germinate in clumps (groups) of many seedlings. Being very close to each other leads to competition for light, water and nutrients and some trees become much weaker (less healthy) than others. You need to remove the poorly formed trees together with unwanted plant species so that those that remain can grow vigorously. Carry out thinning from time to time to maintain good spacing between trees, depending on the products you wish to get from the trees and any other products being produced from the land parcel such as crops or pasture grass.

Whether the trees have sprouted from stumps (on which you have retained three to five stems per stump as earlier guided) or from seeds, ensure a spacing of 7–10 metres between individual trees for good tree growth and to open up space for crops or pasture grass.



Figure 3. Thinning of crowded trees. Source: World Vision/FMNR hub.

b) Pruning is the removal of undesirable branches from a tree to improve the growth of the stem and remaining branches by allowing better penetration of light and air to all branches. You are encouraged to prune trees with an objective to:

- i) Reduce competition for light between trees and crops or other plants that grow underneath the trees.
- ii) Create conditions for fast growth to produce taller, straighter and more useful tree stems.
- iii) Enable early utilization of wood of the cut branches as firewood, fencing or other purposes.

“How often you prune depends on how you want to use the trees. For instance, if you want to produce firewood you may want to retain more branches on the crown and a smaller stem than timber production. In that case, you would prune trees meant for firewood less often than those grown for timber.

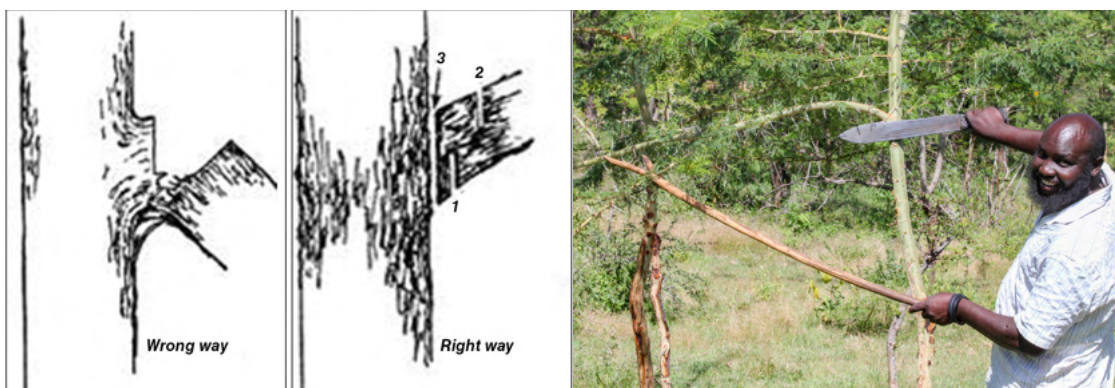


Figure 4. The wrong way to prune trees – cutting from the top (left); the correct way of pruning – cutting from the bottom (middle); Justin, an FMNR farmer in Mogotio, Baringo County pruning trees correctly in his FMNR field (right). Photo: Tengnas, 1994 and ICRAF.

c). **Pollarding** involves cutting all branches of a tree at a height of 2–3 metres above ground level so that fresh shoots can sprout at a height where animals cannot browse. You can pollard regularly as a way of harvesting wood from the trees and to open up space for light to reach the crops or pasture underneath the trees. Pollarding encourages growth of many shoots or branches but should only be done with tree species that can tolerate frequent cutting. Ensure you only carry out pollarding during the dry season when trees are not actively growing to avoid drying.

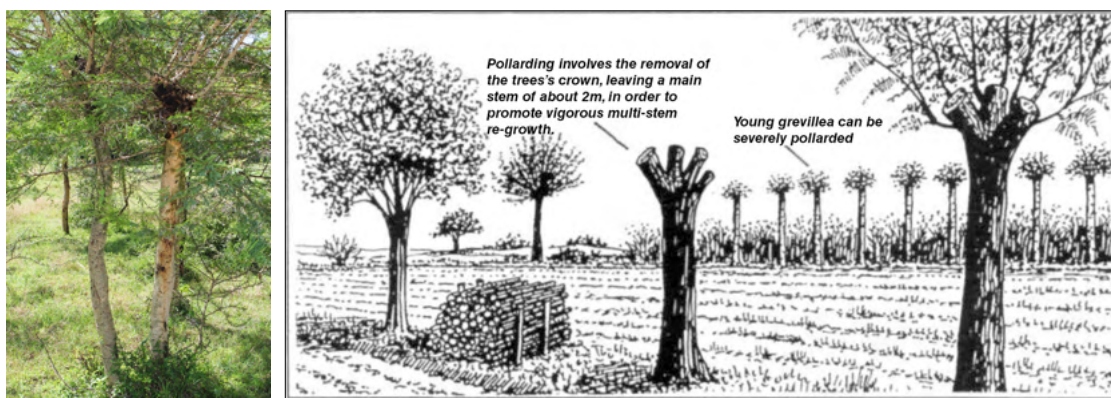


Figure 5. Pollarded Acacia tree in a field managed with FMNR in Baringo (left); Artist's drawing of pollarded trees in a cropping field (right). Photo: ICRAF and Tengnas, 1994



MODULE 3

OTHER PRACTICES THAT MAKE FMNR MORE SUCCESSFUL

Although establishing trees is the primary practice of FMNR, it might take a long time to bring your land back to productivity if you only rely on natural regeneration of trees without doing anything else.

This is because some lands are either extensively degraded and cannot support quick growth of trees by themselves. In addition, if your land is left open, livestock will destroy the growing trees and take you back to zero.

Another problem is that all the trees that sprout on your land may not meet some of your tree product needs. As a result, you might need to bring in new tree species to realize your vision for your land.

You therefore need to do some additional practices to complement and make FMNR more successful. These include fencing the FMNR field; enrichment planting of trees; soil and water conservation; and rehabilitation of denuded lands. These practices are explained below.

“To make FMNR more successful, there is need to adopt some additional practices. These include fencing the FMNR field; enrichment planting of trees; soil and water conservation; and rehabilitation of denuded lands.”

3.1 Fencing the field for site enclosure and livestock management

Fencing your FMNR field reduces chances of destruction of the land under regeneration by activities such as livestock grazing that could slow tree and grass or crop growth. When the field is fenced, natural regrowth of grass, herbaceous plants and trees is accelerated. Therefore, in addition to fencing, you should change the way you feed your livestock from the field.

Instead of letting livestock graze freely all over the land, you can cut grass from the fenced area and carry it to feed livestock that is tied at home or in another field as regrowth continues. Once the regrowth is mature, livestock can be allowed back to graze in pasture lands in a managed way. Fencing does not have to be done with expensive materials such as barbed wire. You can use locally available materials such as branches pruned from thorny trees and/or plant live fences with local species such as sisal, euphorbia or cactus.

If the FMNR field is a large community land as is common in rangelands and fencing is not practical, you can use a method called social fencing. This is possible when you have strong environment champion groups and effective community leadership structures (e.g., chiefs and village elders) who lead the community in passing bylaws that are respected by everyone. You can prohibit access to the land parcel under FMNR by either humans or livestock with these bylaws by agreeing on how those who violate the agreement will be punished and involving the local administration to enforce the measures.

3.2 Enrichment planting of new trees

The word “enrichment” means to add or make richer. Sometimes after allowing trees to sprout from the stumps and/or natural seeds in the field, you may not achieve the level of tree cover that you desire. In other cases, some species you desire to meet your tree products needs may not be among the sprouts. You can introduce more trees on such a field by planting species that meet your needs, either high value trees for timber, fruits, firewood and construction wood or good flowering trees for honey. This is called enrichment planting. Given the trees that sprouted naturally improve the conditions for new ones to grow, the survival of the planted trees is likely to be satisfactory.

Enrichment planting is recommended where:

- i) The existing stumps on the land are not enough to achieve your plans.
- ii) The kind of trees (species) that sprout naturally on the land do not adequately meet your tree production goals.

For you to succeed with enrichment planting, you require good quality tree seedlings for planting. You can either buy these from a nearby nursery or you can set up a nursery for yourself or your community and produce the seedlings directly. Having your own tree nursery helps improve your income by selling extra seedlings. However, you need to consult forestry extension staff or experienced tree nursery operators in your locality to learn how to manage the nursery well and produce good quality seedlings.



To succeed with enrichment planting, you require good quality tree seedlings for planting. You can either buy these from a nearby nursery or you can set up a nursery for yourself or your community and produce the seedlings directly.

3.3 Rehabilitation of denuded lands

Sometimes land that has been depleted of trees becomes very bare, especially after other vegetation is destroyed by livestock and soil erosion. The land develops brown hardened patches where no vegetation can grow, and these patches keep expanding as vegetation disappears. Such lands are called denuded lands and can get completely eroded to the extent of developing rills and/or gullies.

When your land becomes unproductive to the point of being denuded, you may be tempted to abandon it because there is little hope for recovery through natural processes. You can, however, rehabilitate such land and accelerate FMNR on it through grass reseeding and soil conservation practices that are explained below:

a) Grass reseeding/improving ground cover

This involves scattering grass seeds on the denuded lands at the beginning of the rainy season. If the denuded land's surface is too hard for the grass to settle and grow naturally, use hand hoes or ox-drawn ploughs to loosen the soil before reseeding. The loosened soil also captures other grass seeds that are carried along by the wind, which speeds up the reseeding process.

When the grass covers the land, it improves the condition for tree establishment. It is also available for you to cut and feed your livestock or sell to other livestock keepers. You can harvest seeds for sowing or broadcasting on the land from native grasses available locally. You could also buy seeds of high value and fast-growing grass varieties. Consult agricultural and/or livestock extension officers in your locality on the most adaptable grass species in your area if you choose to buy.



Plate 2: Unproductive rocky landscape in Baringo, Kenya (left); FMNR farmer showing unproductive rocky land that was converted to productive state through grass reseeded (right). Photo: ICRAF.



Plate 3: Grass reseeded of FMNR site provides enough pasture for livestock in Mandera. Photo: ADRA Kenya.

b) Soil erosion management

Soil erosion is one of the main causes of land denudation. Erosion not only destroys remaining vegetation but also sweeps away seeds that fall on the bare land that could have germinated into new trees.

Ask your local agricultural extension staff for advice on the best approach to control soil erosion on your land. **Box 4** gives a light description of a few soil conservation approaches that can be applied to denuded lands. Your agricultural adviser can help you decide which method is best for you.



Plate 4: Women in Kitui County digging terraces in a denuded field marked for restoration – the huge patches on the land that are brown earth with no vegetation on them are called denudation. Photo: ADRA Kenya.

Box 4. Soil and water conservation approaches to enhance FMNR on denuded lands

Digging trenches/terraces:

A trench is a shallow excavation dug across the slope to reduce erosion by surface water runoff. It encourages infiltration of water in the denuded field, moistening the soil and accelerating growth of the ground cover plants such as grasses, herbs and eventually shrubs and trees. Many trenches can be dug in one field at intervals to create terraces on the field.

Mulching:

Mulching is the practice of covering soil surface with leaves, branches, grass or other organic matter from plants, including small branches. Mulching increases the organic matter in the soil, controls splash erosion, conserves soil moisture and improves the condition of the denuded land. This, in turn, improves the chances of new plants sprouting in the field.

Treating gullies:

Gullies are small valleys created by running water and which grow big over time if not treated. They are treated by placing gabions (wire woven baskets filled with stones), check dams (small walls of stones), and sandbags (bags or sacks filled with soil, sand or small stones) across them to prevent further spread. Small gullies can be treated by planting vegetation in strips across them to slow the velocity of water, trap silt and prevent further erosion.

Use of micro-catchment water harvesting techniques:

Micro-catchments are water harvesting structures that are dug to trap surface water runoff and make it settle down at a small enclosure from where it can feed a plant. They include half-moons or semi-circular stone bunds, micro-basins, V-shaped bunds and Zai Pits, among others. These structures are usually made by hand.



The first two pictures on the left show a gabion and sandbags constructed across a gully; the next three pictures show micro-site water harvesting structures – half-moons (left), Zai pits (middle) and micro-basins (right) Photo: Addis et al 2015 (a&b), Shaxson & Barber, 2003 (c), Mark Tran, 2011/The Guardian(d)

Contour stone lines/bunds:

These are lines of stones placed across the field (along the contour) and are permeable (meaning water can pass through them). This allows water to flow through them but at reduced runoff speed and leaving soil behind. They are referred to as stone bunds when built up to a height of 25 cm and about 35–40 centimetres wide; when they are shorter and less wide, they are called stone lines.

Retention ditches:

These are trenches that are dug at the highest boundary of the field to collect runoff that is coming from outside the field, including from nearby roads, if any. The ditches are usually about 50 cm deep, 50 cm wide and constructed along the contour.

Retention basins:

Retention basins collect runoff from roads, footpaths, sharp hills or small streams running near the field. Unlike retention ditches, basins are not continuous trenches but may be rectangular or square, surrounded by small earth bunds.¹

¹ <https://www.theguardian.com/global-development/gallery/2011/sep/13/kenya-small-farmers-development-in-pictures>

MODULE 4

PRACTISING FMNR IN DIFFERENT LAND CATEGORIES

4.1 How do you successfully practise FMNR in croplands?

Cropland is the area that you use for crop production on a continuous basis, whether it is your private land or communal land.

You are likely concerned about the competition between trees and crops for light, moisture and nutrients and therefore you remove trees to get maximum crop production.

While this is good thinking, removal of trees exposes your land to soil erosion by wind and water and quick loss of soil fertility due to less humus accumulation. This means that your crop yields keep on reducing as years go by. Eventually, your land cannot yield much even with fertilizer.



“ You can reverse soil fertility decline with FMNR by allowing a reasonable number of trees and shrubs that are compatible with crops to regrow on the land

You can reverse this condition with FMNR by allowing a reasonable number of trees and shrubs that are compatible with crops to regrow on the land. This will restore soil structure and fertility, while reducing erosion and evaporation of water from the soil. The points below guide you on how to practise FMNR on your cropping fields.



Plate 5: Croplands with trees raised through FMNR. Photo: World Vision Kenya.

Step 1. Encourage natural regeneration of trees in the farm

- i) Fence off the farm (if not already well fenced) to minimize disturbance, such as animals during the dry season. This creates conditions for tree seedlings to germinate from seeds stored in the soil.
- ii) Avoid burning of trash on the cropland, whether crop residue or other cut vegetation.
- iii) Avoid uprooting tree stumps.
- iv) Carry out careful weeding to allow emerging tree seedlings or sprouts from stumps to grow.
- v) Nurture all sprouting vegetation including shrubs and tree species – from both soil and stumps – especially those with known uses.
- vi) Minimize intense mechanical tillage since this tends to destroy young trees and stumps.

Step 2. Carefully select tree and shrub species to retain in cropland

- i) Walk through the farm, identify all tree species that are sprouting. Be extra observant not to dismiss sprouts as weeds, shoots of tree stumps that are cut very close to the ground. Take note that leaves of small shoots may look slightly different from their mature relatives. Mark them either with some paint or a piece of cloth loosely tied on a branch for ease of identification and protection. This also helps in monitoring progress.
- ii) Consider compatibility of the species with crops and how the species is likely to affect farm work (e.g., thorniness) to decide whether to keep or remove it.

-
- iii) Consider keeping only a limited number of trees in a cropping field (spacing of about 10 metres between trees is recommended). Rank the priority trees you want to keep guided by the characteristics listed in **Box 5** below.

Box 5. Characteristics of the tree and shrub species that are good for croplands

- i) It has relatively open canopy that minimizes shading of crops (this can also be managed through pruning).
- ii) Crops around the tree look healthy and produce better yields than crops far away from it.
- iii) Most roots grow vertically into the soil and below the crop root zone.
- iv) It does not produce chemicals that prevent other plants from growing nearby.
- v) It sheds leaves preferably towards the end of dry season, which provide good mulch.
- vi) It re-sprouts quickly upon cutting whether by pruning, coppicing or pollarding.

Step 3. Tree management in croplands

- i) Do enrichment planting if desirable species do not sprout sufficiently from the soil or stumps.
- ii) Undertake pruning and pollarding during the dry season to reduce competition with crops when rains come.
- iii) Do root pruning for trees that have roots that spread horizontally near the crop root zone if you have retained such species because of some benefits they provide.
- iv) Space trees at a minimum of 10metres from each other to maintain an average density of about 100 trees per hectare.

4.2 How do you successfully practise FMNR in unmanaged bushlands?

In some areas, especially the drylands, farmers cultivate a part of their land and leave other parts uncultivated and covered with trees, shrubs or other natural vegetation. These fields are usually not fenced and not well utilized, serving mainly as grazing fields and as a source of firewood and other tree products. These are the fields referred to as unmanaged bushlands. If you have such fields on your land, you can practise FMNR on them as well and improve their productivity. The 10 points below guide on how to practise FMNR on unmanaged bushlands.

- i) Fence off the land to minimize disturbance and to allow tree seedlings to germinate naturally from the soil.
- ii) Assess the land for any signs of erosion and consult the local agricultural officer or trained technicians in the village to advise on the best soil conservation structures to put in place.
- iii) Carefully clear thickets on the land to spot emerging seedlings of useful trees and allow them to grow.

- iv) Allow sprouts to grow from stumps.
- v) Nurture all vegetation sprouting on the field, including grass, herbs, shrubs and trees, and other trees whose uses you may not know. This helps increase biodiversity that can support honey production, provide organic soil cover and improve soil productivity.
- vi) Carry out enrichment planting if desirable species are not among those sprouting. You may want to introduce fruit trees or trees in the legume family that fix nitrogen and help restore soil fertility faster and are good forage for livestock.
- vii) Undertake pruning, pollarding and other management practices regularly to improve tree growth or to harvest products such as firewood and livestock fodder. Ensure that at least the lower branches and thickets are cleared to facilitate growth of good quality grass beneath the trees.
- viii) Space trees between 5–10 metres depending on how big the tree canopies (branch volume) are and whether you just want to produce tree products or to produce pasture underneath. If you want good grass to grow, then increase space between trees.
- ix) Undertake grass reseeding with good quality grass and introduce other enterprises such as beehives on the trees to improve the income coming out of the land.
- x) Feed your livestock away from the site (you can cut grass and fodder from field and bring them to the livestock) until you can do controlled grazing if necessary.



Plate 6: Unmanaged bushland in Baringo County and managed bush land in Homabay Photo: ICRAF and World Vision Kenya.

4.3 How do you successfully practise FMNR on communal land?

You can also practise FMNR on land whose interest goes beyond a single household. The land might be under communal ownership or it could be public land whose ownership is held by the government (county or national) in trust for the people. Examples of such land include hills, riparian lands and land set for public utilities such as cattle health management (e.g., crushes, dips etc.), schools and health facilities and churches, among others.

Everyone wants to benefit from such land by either grazing livestock or cutting trees there. People are, however, afraid to practise sustainable land management that will ensure such lands remain productive because they fear that others may come and reap benefits without contributing labour. As a result, the fields get degraded, become bare and denuded, and are then abandoned.

You and your fellow community members can restore communal or public lands to a productive state with FMNR and soil conservation practices. This, however, requires good community leadership groups such as environment committees, community land management committees, catchment committees and others that may be established with support from governments.

This leadership supported by local administration will start by leading community members to develop enforceable community bylaws. Such laws will guide community members on how to work on the land, as well as how to share benefits from adopting FMNR. Such benefits may include harvesting of pasture, honey, fuelwood, gums and resins, medicinal and aromatic products, and others.

The 12 points below offer guidance on how to practise FMNR on communal lands:

- i) Ensure a community leadership is in place and is respected by members.
- ii) Prepare bylaws to guide FMNR work and benefit sharing, and register the bylaws with authorities.
- iii) Fence off the land to minimize disturbance and to allow natural germination of seedlings and sprouting of tree stumps (if the land is too large for fencing you can include a clause in the bylaws that restricts access to the land or can apply FMNR progressively in a manageable section of the Land until the whole parcel is restored).
- iv) Assess the land for any signs of erosion (or denudation as explained in section 3.3) and consult the local agricultural officer or trained technicians in the village for advice on the best soil conservation structures to put in place.
- v) Carefully clear thickets on the land to spot emerging seedlings of useful trees and allow them to grow.
- vi) Allow sprouts to grow from stumps.

-
- vii) Nurture all vegetation sprouting on the field, including grass, herbs, shrubs and trees, and other trees whose uses you may not know. This helps increase biodiversity that can support honey production, provide organic soil cover and improve soil productivity.
 - viii) Carry out enrichment planting if desirable species are not among those sprouting. You may want to introduce fruit trees or trees that fix nitrogen and help restore soil fertility faster or and are good forage for livestock.
 - ix) Undertake pruning, pollarding and other management practices regularly to improve tree growth or to harvest products such as firewood and livestock fodder. Ensure that at least the lower branches and thickets are cleared to facilitate growth of good quality grass beneath the trees.
 - x) Space trees between 5–10 metres depending on how big the tree canopies (branch volume) are and whether you just want to produce tree products, or you want to produce pasture underneath. If you want good grass to grow, then increase space between trees.
 - xi) Undertake grass reseedling with good quality grass and introduce other enterprises such as beehives on the trees to improve the income coming out of the land.
 - xii) Feed your livestock away from the site (you can cut grass and fodder from field and bring them to the livestock) until you can do controlled grazing in the field.

A close-up photograph of a woman's hands holding a piece of honeycomb. She is wearing a white headband and a white beaded bracelet. The background is slightly blurred, showing a wooden structure and some greenery.

MODULE 5

HARVESTING PRODUCTS SUSTAINABLY FROM FMNR FIELDS

The joy of working comes when you can get fruits out of your labour. Likewise, you can only be motivated to continue practising FMNR or encouraging members of your community to do it if you can produce (and even sell) products from your FMNR field, whether you practise it on your private land or on communal land.

Some of the products you can harvest from your field include construction materials (posts, roofing materials and, in some cases, thatch grass), firewood, fruits, medicinal plant parts, gums and resins, livestock fodder/pasture and honey.

The critical issue in harvesting these products is to ensure the land does not return to the degraded condition it is coming out from because of practising FMNR. This is called sustainable harvesting where you collect materials without destroying the resource, whether it is land or trees. This module provides a few tips to help you harvest your products sustainably.

“ *The critical issue in harvesting these products is to ensure the land does not return to the degraded condition it is coming out from because of practising FMNR. This is called sustainable harvesting where you collect materials without destroying the resource, whether it is land or trees.*



Plate 7: Firewood (left) and charcoal (right) in Baringo County/ Photo: ICRAF/KEFRI.

5.1 How can you harvest firewood from FMNR fields?

After ensuring that you have grown trees that have strong wood and burn well, you can harvest firewood to use in your kitchen or to make charcoal from your FMNR trees as follows:

- i) For standing trees, do not fell the tree but cut only branches for firewood and charcoal through pruning or pollarding.
- ii) For trees grown from stumps with three, four or five stems per stump, selectively cut one or two stems per tree for firewood and leave the others standing on the stump.
- iii) To produce charcoal, cut the biggest stem on the stump (unless you want it to mature for use as timber or poles) and leave the smaller ones to grow.
- iv) For every cut stem, ensure you allow another one to grow in its place so that the stump always has stems growing on it.

Note: If you want to produce charcoal for sale, ensure you have alerted the administration so that they can accredit that you are producing charcoal from your own trees. We recommend that you use improved kilns when producing charcoal to get maximum volume of charcoal out of the harvested wood. You should also ensure that as few trees as possible are harvested for charcoal. You are also likely to get better prices for your charcoal if you work as a group (called charcoal producer group) that is affiliated to a charcoal producers' association. Producers can also use twigs for commercial briquette making instead of cutting the whole tree for charcoal.

5.2 How can you harvest honey from FMNR fields?

Honey is a good FMNR product because it does not require cutting of trees. To get good income by producing honey from your FMNR field, we recommend the following:

- i) Ensure diverse trees and shrubs that flower very well grow in the field across the year. This might require enrichment planting because not all trees are good forage for bees. Consult the local experts on bees on which trees to increase in your field.
- ii) Ensure several herbal plants grow underneath the trees (together with grass if you are also feeding livestock from the field) to increase the variety of flowers.
- iii) Ensure you have a water source – river, pond or dam – near your field so that bees do not go very far from the field in search for water.
- iv) Place beehives in the field in a fenced area to minimize danger to children and livestock.



Plate 8: Beehives hanged on trees under FMNR (left); and locally processed honey in Kapkuikui Location, Baringo County (right) Photo: ICRAF.

5.3 How can you harvest medicinal products from FMNR fields?

Many trees and shrubs have medicinal value and have their parts harvested by community members to prepare remedies for different ailments. To get medicinal products for use at home or sale, you should:

- i) Be completely sure about the safety of the remedy you wish to prepare (consult experts in your locality if not sure).
- ii) Try to use plant parts that are easily replaceable by the tree such as leaves or branches because roots and bark are more difficult to replace.
- iii) Ensure that where roots and/or bark are used, only a small portion of the tree is cut to minimize harm to the tree. Afterwards, allow sufficient time for the tree to heal before cutting from the tree again (you might need to consult herbal medicine experts such as traditional healers).
- iv) Increase the variety of medicinal plants in your FMNR field through enrichment planting.

5.4 How can you harvest fodder and pasture from FMNR fields?

For good quality fodder and pasture production through FMNR, you should do the following:

- i) Ensure that trees that provide fodder from the leaves, pods, seeds, flowers and/or bark are retained in the target field at the start of FMNR. You can discuss with fellow community members, especially those with livestock husbandry experience, to identify these species.
- ii) Reseed the area with good quality grass – consult livestock experts in your locality for best varieties (such as *Cenchrus ciliaris*, *Chloris roxburghiana*, *Enteropogon macrostachyus* and *Eragrostis superba*) and to know where to get the seeds.
- iii) Feed livestock at a stall or a tethered area with grass cut from your FMNR field to avoid overgrazing. If you must bring the livestock to the field, make sure you encourage light grazing that does not destroy the soil (through trampling), trees or grass.
- iv) Do enrichment planting to introduce trees that provide high quality fodder. Those from the legume family are good because they are rich in proteins and easily re-sprout after cutting. These include acacias, leucaena, calliandra (although this does not do well in dry conditions), *Morus alba* (mulberry), *Gliricidia*, *Sesbania* (although it dies after a few rounds of cutting) and others.
- v) Cut fodder trees through pruning or pollarding and carry the leaf material together with grass to feed your livestock at the stall to improve the nutrient content of the feed.
- vi) Only return to cut materials from the same tree after sufficient recovery and regrowth of foliage.



Plate 9: *Cenchrus ciliaris* (African foxtails grass) growing in an FMNR field (left); and hay made from the same grass (right). Photo: ICRAF.



Plate 10: Seeds and flowers of *Acacia tortilis* used as livestock feed critical in drought season in Laisamis, Marsabit County. Photo: World Vision Kenya



Plate 11: *Acacia Senegal* bark being prepared for use as livestock feed during dry spell in Baringo County. Photo: World Vision Kenya

5.5 How can you produce a variety of high-quality fruits with FMNR?

Fruits are important for household diet and sale because they are rich in vitamins and micronutrients. To produce a variety of high-quality fruits with FMNR, you can do the following:

- Allow indigenous fruit tree species to sprout from the soil or stumps (you may not know some of them but if you involve other community members in selecting species that you will allow to grow, your knowledge of these might improve and you could get to grow very good fruit trees). Some indigenous species with high nutrient value include *Balanites aegyptiaca* (desert date), *Dacryodes edulis* and *Tamarindus indica*, among many others.
- Monitor flowering and fruiting pattern to see if you can harvest fruits from various tree species every month of the year. Together as a community group you can discuss, in consultation with local fruit experts, and come up with a fruit tree portfolio for your area as shown in Figure 6.
- Do enrichment planting to introduce high value exotic fruit trees such as mangoes, guavas (be careful on this one as it becomes invasive in humid environments), especially using grafted seedlings that do not grow very big before starting to produce fruits.
- Regularly prune your fruit trees to improve air flow across branches to reduce incidents of pests and diseases; otherwise, consult local experts on specific pest and disease control measures.

The portfolio approach recommends the optimum number and combination of ecologically suitable tree species to provide for household food and nutrition gaps year round

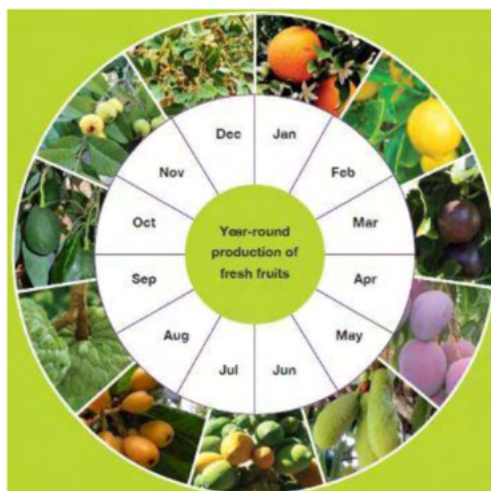
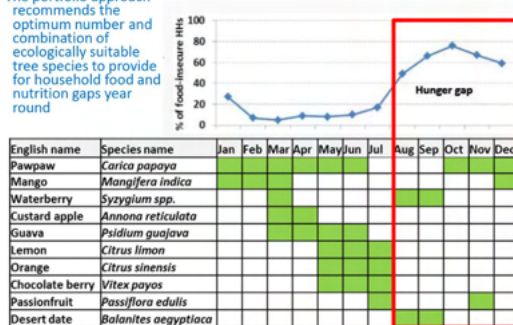


Figure 6 Fruit tree portfolio developed for Machakos County. Source: ICRAF.

5.6 How can you produce good and quality timber and poles with FMNR?

There is a high demand for timber in the country, but very few indigenous tree species can produce good timber. This makes timber production through FMNR a challenge. However, production of poles and other construction materials is easy and you can make money out of that as well. To produce good timber and poles with FMNR, you can do the following:

- i) Allow a variety of trees with high quality wood to sprout from the soil and stumps.
- ii) Maintain close spacing at the beginning (if not on cropland) such as 2–3 metres between trees to train the trees to grow upwards and straight.
- iii) Keep pruning side branches regularly to maintain good stem form and thin poorly formed trees to enable the trees that show good form to grow into timber logs.
- iv) Do enrichment planting to introduce good timber trees such as *Melia volkensii*.
- v) Allow sprouts to grow from trees that were cut because they can grow to produce good timber if the sprouts are from good parents.
- vi) When harvesting poles from sprouts, keep cutting the biggest and most-formed pole from a stump to leave room for others to grow as guided with firewood production.



Plate 12: An FMNR farmer in Salabani Location, Baringo County managing his *P. juliflora* for timber (left); prosopis poles (centre) and prosopis timber (right). Photo: ICRAF and KEFRI, Baringo Sub-centre.

5.7 How can you gain value from gums and resins produced with FMNR?

Gums and resins are extracts produced mainly by the barks of some trees after injury (accidental or intended cutting). They have been used historically in various traditional practices but are also gaining market value in paper, textile, petroleum, pharmaceutical, cosmetics, food, varnishes, lacquers and soap industries. Gums and resins are important sources of income, especially in the ASALs. The most common gums and resins produced in Kenya include gum arabic mainly produced by *Acacia* species (*A. senegal* and *A. seyal*), gum resins extracted from *Commiphora* species (myrrh from *C. myrrha* and gum hagar from *C. holtziana*), and frankincense from *Boswellia neglecta* among others.

To gain value from gums and resins produced with FMNR, you can do the following:

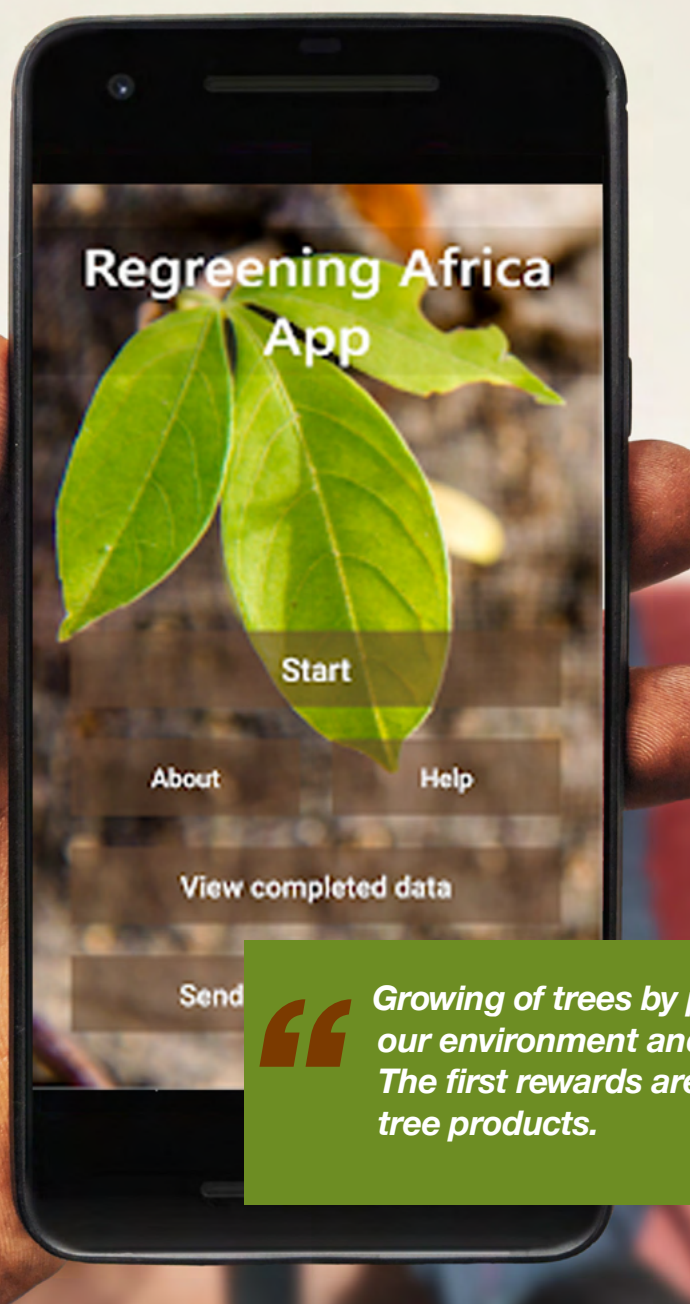
- i) Allow indigenous species known to produce gums and resins to sprout from the soil or stumps (you may not know some of them but if you involve other community members in selecting species that you will allow to grow, your knowledge of these might improve).
- ii) Consult local specialists on the appropriate method of harvesting the specific product (gum or resin) you have invested in.
- iii) Ensure you do not overharvest the product because it might kill the tree. Gums and resins are produced as part of the healing process of the tree after the incision. Hence, a lot of harvesting can overwhelm and kill the tree.
- iv) Work together with other community members as a group to produce sufficient volumes and bargain for good prices since the individual volumes might be too low for buyers to come all the way to your area.
- v) Consult experts (government, NGOs or traders) in your area on how you can locally add value to your gums and resins.



Plate 13: Women producers from Laisamis community in Marsabit with frankincense, a resin from *Boswellia neglecta* (left) and myrrh from *Commiphora holtziana* (right). Photo: World Vision Kenya

MODULE 6

KEEPING FMNR RECORDS AND TREE MEASUREMENT



6.1 Why should you record your FMNR activities?

Growing of trees by planting and FMNR improves our environment and attracts rewards in many ways. The first rewards are the benefits you get out of the tree products. Other rewards include attracting visitors to your FMNR fields and interacting with them, which sometimes can earn money from eco-tourism or from your status as a resource centre.

You can also be contracted to manage degraded lands or offer trainings to communities in other regions based on the records you keep as evidence of your success. In some cases, there are individuals and companies willing to reward tree growing by communities because it benefits the environment that we all live in.



Growing of trees by planting and FMNR improves our environment and attracts rewards in many ways. The first rewards are the benefits you get out of the tree products.

This makes it attractive to keep records of your FMNR work. You can use the records as a reference in several circumstances, including to prove that you established the trees and therefore have a right to harvest and sell products such as timber, firewood and charcoal. It is good to work with local government staff and community leaders at your locality when preparing these records so they can certify your case should that become necessary.

In summary, records may be used for the following:

- i) Show tree species that you manage on your field or fields if more than one.
- ii) Show management practices that you undertake to improve the quality of your trees, which can help especially if you are trying new ideas and want to see results (and learn together with fellow members of your community).
- iii) Show products/benefits that you derive from the trees (e.g., the quantity of carbon stored in the trees to reduce global warming and climate change).
- iv) Quantify benefits you would receive from incentive payments should they become available (which then may also require tree measurements).
- v) Give evidence of your contribution to land restoration, national tree cover and other commitments that may be pronounced by the government.

To guide you on some of the records you can keep for your FMNR practice, we have included a few tables in section 6.3. You may, however, wish to know the size of your trees to help in bargaining with product buyers, estimating how much carbon is stored in your trees or other benefits. Since you may want to include the tree sizes in your records, we first guide you in section 6.2 on how to measure trees.

6.2 How can you measure the size of trees in your FMNR field?

We encourage you to measure the size of your trees to show growth trends about twice every year, especially during the dry season when growth is dormant and farm labour is not very intensive. This is helpful if you wish to quantify the stored carbon and can help if a compensation scheme is in place. The next four pages offer guidance on how you can measure your trees using local materials. You do not have to measure all trees because that takes time, especially if they are many. But you can select some representative trees to measure and estimate the sizes of all the trees in your FMNR field to represent tree groups.

The selected trees should be from the same species and of almost similar size either because you planted them or established them through FMNR at the same time. These groups are called **tree cohorts**.

A cohort is made up of the trees of the same species, size and age classes that you plant or select for managing with FMNR at a specific period. In that cohort, select a tree whose size appears to be average of all the others in the group to represent the cohort measurement and mark it.

Measure the height, diameter and crown size of the selected tree after every six months (preferably during the dry season) to determine the growth of all the trees in its group. Also, ensure that you count and record the number of all the trees in the cohort every time you measure this tree to ensure they are all growing. Note if any has dried or is deformed or growing in an unusual rate. To determine total tree cover by this cohort, you can multiply the size of the measured tree with the number of the trees growing normally.

For effective tree measurement, you measure the tree height, the stem diameter (measured at a height of 1.3 metres; also called breast height or DBH) and size of the tree crown (the mass of branches and leaves). The crown measurement is important as it helps determine the tree cover on your land.

The following tools are necessary for measurement:

- **Linear tape:** For measuring tree crown diameter.
- **Stem diameter tape:** For measuring the diameter of the tree at DBH (some tapes have been designed specifically for this purpose, but ordinary tape can also be used, and the measured value divided by 3.14 to get diameter).
- **Laminated paper tags:** For tagging trees that have been selected for measurement.
- **Wire:** For fastening laminated paper tags (marks) on trees to ensure they don't fall off and ensure you measure the same selected tree every round.
- **Breast height stick:** A 130 centimetres wooden bar for marking the position to measure stem diameter.

1. Measurement of diameter at breast height (DBH)

- i) Mark a point 130 centimetres or 1.3 metres above the ground on the tree trunk (or use a breast height stick as shown in the pictures below).
- ii) Place the measuring tape around the trunk at the 130 centimetres or 1.3 metres mark.
- iii) Measure and record the diameter in centimetres. If a stem diameter tape has been used, record the reading directly. However, if an ordinary tape is used, convert reading by dividing the tape reading with **3.14**.
- iv) For trees with multiple shoots and/or crooked trunks, growing at an angle or growing on a sloping hill, see pictures F and G in the illustration below on how to determine DBH.
- v) For trees with buttressed stems/deformity, see pictures F and G for how to measure DBH.
- vi) For trees that are forked above or below DBH, see Pictures D and E pictures in the illustration.

Note: Trees usually grow in different forms especially at the base, which may confuse you when determining the DBH point. Hence, the next three points and Figure 7 offer further guidance.

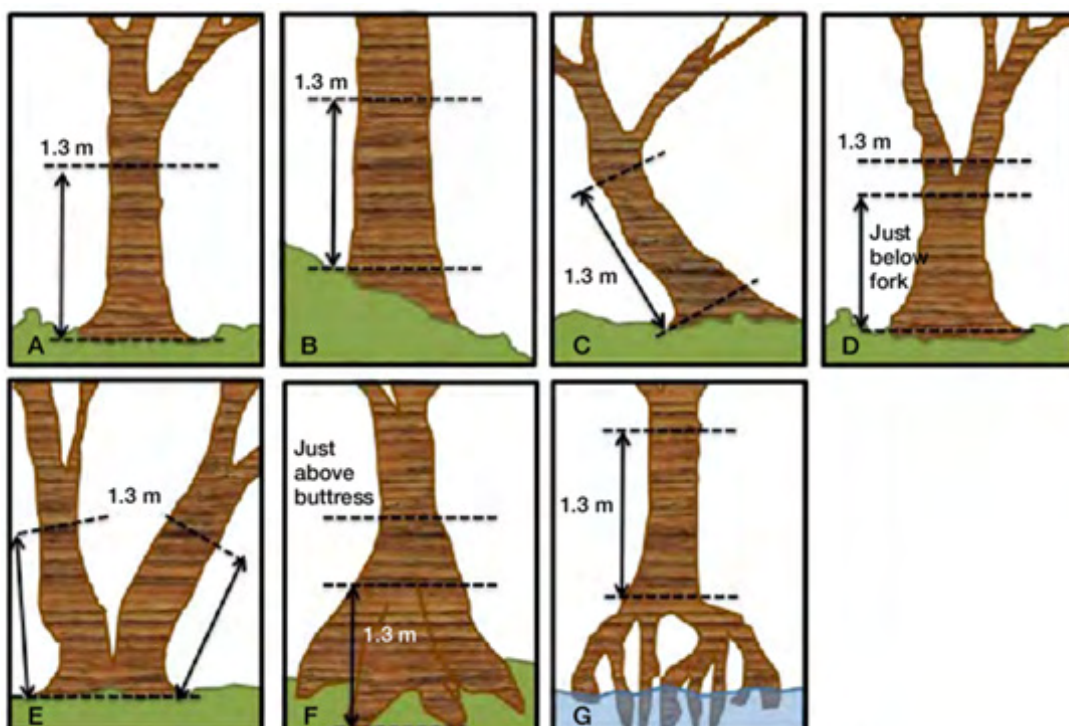


Figure 7 How to determine the breast height of different tree forms Source: Fourqurean et al. 2014



Plate 14: Measuring diameter of trees at DBH. Photo: ICRAF

2. Measurement or estimate of the height of a tree

Tree height normally refers to total tree height defined as the vertical distance from the ground level to the uppermost point. To measure height, hold the height stick against side of the tree.

- i) If the top of the crown is shorter or equal in height with the height stick, mark the point of the highest tip of the tree on the height stick. Measure the length from this point to the marked point on the height stick using the tape. Record the measurement as the tree height.
- ii) When the tree is taller than the height stick, have someone hold the height stick and walk away from the tree to a distance where you can observe both the bases and tops of the tree and the stick. Estimate the number of times the height stick needs to go up to the tree height (including estimate fractions such as half or quarter or three-quarters). For example, if the tree is 1.5 times the height of the height stick, you multiply the total length of the stick by 1.5 and record the figure as the height of the tree.

You can also use a square piece of paper to estimate the height of the tree. Fold the paper into half to form a triangle with one right angle and two 45-degree angles. Hold the triangle in front of the eye pointing the longest side (hypotenuse) at the top of the tree. Move back until you can see the top of the tree at the top-tip of the triangle. Mark this spot and measure the distance from the base of the tree to the marked point. Add your own height to the measured figure to get the approximate height of the tree as shown in **Figure 9** (right).

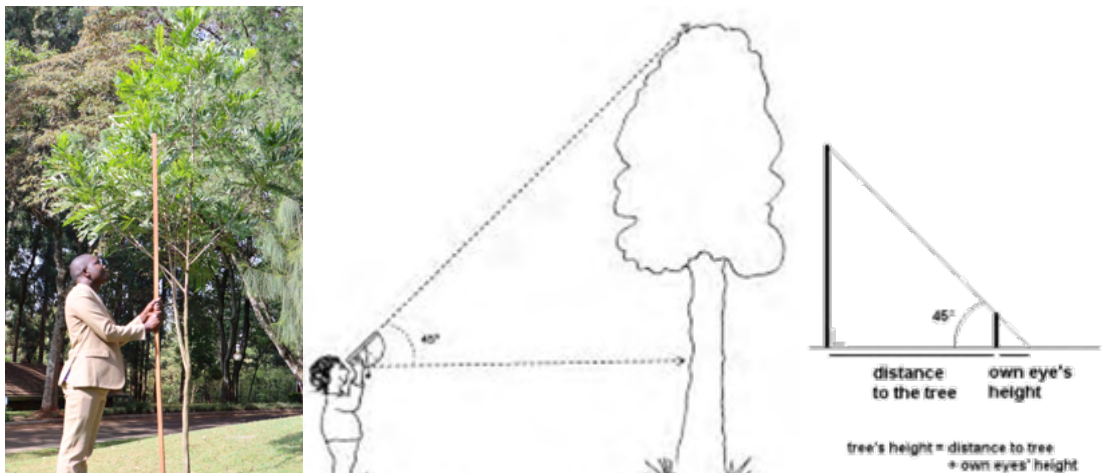


Figure 8 Measuring the height of a tree. Photo: ICRAF, SAPS (n.d) and Monumental Trees (n.d)

3. Estimating the width and length of the tree crown

The tree crown is the area above the stem (whether single or multiple), which has branches and leaves on it. It is rarely of regular shape, especially if the trees are native species. You can estimate the crown size in a simple method using Figure 9 as reference.

- i) Mark the extreme end of the tree branches on the west side (point A) and walk to the east end and mark the end as well (point B). Measure the distance in between with tape (call the measurement crown diameter 1).
- ii) Do the same from north end to south end and measure the distance as crown diameter 2.
- iii) Add crown diameter 1 with crown diameter 2 and divide the answer by 2 to get average crown diameter and record the figure as crown diameter.
- iv) Use the height stick to measure distance between tree base and where the branches start (points C and D in the diagram). Subtract that figure from the tree height estimated above to get crown depth.

6.3 How can you record your FMNR practices?

In the next pages, we present tables that you can photocopy and use for your tree growing and management records.

If this manual is your personal copy, you can even start with filling your records on these pages (after first photocopying blank tables that you will use after these ones are filled).

The page on farmers' and general farm details needs to be completed only once (at the beginning) so you may not need to photocopy that one. The tables with records on tree registration, tree management and tree use should be updated periodically as you allow more trees to regenerate and as you learn more about management practices and uses of trees.

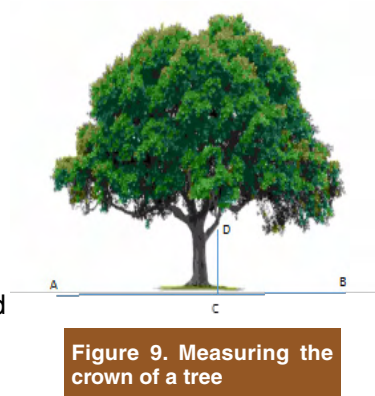


Figure 9. Measuring the crown of a tree

There may be a project promoting FMNR or other land restoration and farming practices where some members of the community have been trained as lead agents. If so, they can help you fill in the tables and connect you to government officers for periodic verification of the information. While we provide these tables as a guide, recent developments have seen projects develop apps that can capture these details through mobile phones.

The Regreening Africa project, for example, developed the **Regreening Africa App** that captures all these details and more through Android phones. You can therefore use these tables to familiarize yourself with details of records that you can keep and then use the app for easier application. We present a pull-out explanation on the app after the tables.

Farmer Background Details

Name of Farmer:-----

Phone:-----

Number: -----

Sub-Location:-----

Village: -----

Ward:-----

Sub-County:-----

County:-----

Farm Details

Farm identification (if there is a name you like giving to your farm e.g., KenLink Enterprise Farm):-----

Total farm size hectares-----

Size of land under FMNR Hectares):-----

GPS coordinates (if available):-----

Main Sources of Technical Support

Names of government officers and department: -----

Names of NGO officers, organization and project:-----

Names of key tree nurseries:-----

Names of key tree product buyers:-----

FMNR TREES ESTABLISHMENT RECORDS

Date ²	Cohort ID ³ e.g., Balanites-03	Common/local name of tree species	Size class Sapling (<1.3 m) 3.0–30 cm 30.0–60 cm 60.0–90 cm	Type of regenerant (wildling or coppice)	Estimate year of regeneration of trees	Number of individuals in the cohort

² The date you write here is either the date you selected the trees sprouting from stumps (coppices) or naturally germinating seedlings (wildlings) and started managing them through FMNR. A cohort is made up of the trees of the same species, size and age classes that the farmer starts managing at a specific period. The word has been explained in more detail in section 6.3.

³ A cohort ID is a specific number you assign each cohort for monitoring purposes e.g., Acacia 02.

Tree planting records

Date of planting	Cohort ID ⁴ e.g., Mango 04	Common/local name of tree species	Nursery source	Where planted in the farm	Number of trees planted in the site	Verifying stamp or signature ⁵

⁴ For trees you have directly planted (such as for enrichment planting), a cohort is made up of the trees of the same species that have been planted at the same time. Hence, they are the same age and expected to grow to about the same size.

⁵ You may wish that the project or government officer advising you to sign or stump against your tree planting record. This may help prove that you planted the trees when you want to cut them or in case someone else wants to claim the trees.

Tree management practices and observations

Date of Practice	Cohort ID e.g. Terminalia 05	Tree species	Practice done	Number of individual trees in the cohort	Observations /Comments

Records on tree cutting or harvesting tree products

Date of harvesting	Cohort ID e.g., Balanites 01	Tree species	Type of product/use	Sections used	Amount of harvest	Units

Regreening Africa App

The Regreening Africa App is a mobile phone-based Android application designed and developed by World Agroforestry to help users collect data at farm level on a range of land restoration practices that allows for robust landscape level monitoring. The app has four modules that focus on tree planting, nursery establishment, FMNR and training, whose objectives are highlighted below.

1. Tree Planting Module

- Record details of farmers and plots under restoration
- Characterize species composition and assess tree planting/management practices
- Map tree planting plots
- Number of trees planted, date(s) planted
- Survival of trees
- Track growth of trees
- Location of trees planted.

2. FMNR module

- Record the targeted households that have adopted FMNR practices
- Record the number of hectares under restoration through FMNR
- Map the FMNR plots
- Record tree species composition of the FMNR plot
- Record management practices
- Track growth of trees by making references and assessing management practices
- Locate selected trees.

3. Nursery module

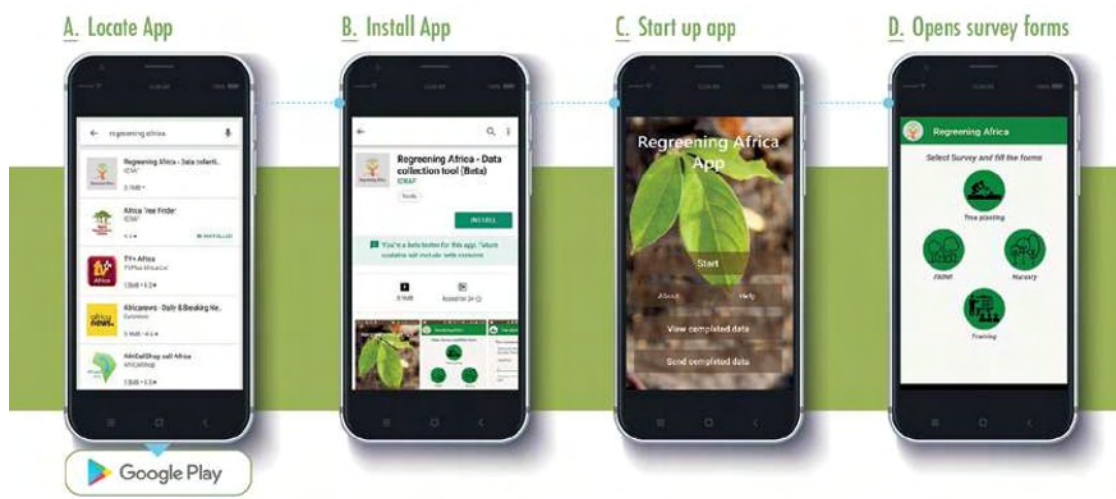
- Record nurseries supported by the project
- Record seedlings production (species composition, production capacity, seedlings quality)
- Record and assess seedling production practices
- Record location of nurseries.

4. Training module:

- Document the trainings carried out: the number, location, topic, etc.
- Connect the topic of the trainings in each location to the practices and issues identified that will guide the training schedule(s)
- Document participation in the trainings in terms of number and gender.

How to access the Regreening Africa App

- i) Go to Google Play store in your Android phone
- ii) Type Regreening Africa data collection tool
- iii) Locate the app
- iv) Install the app
- v) Start up the app
- vi) Open the survey forms (Tree planting, FMNR, Nursery or Training) depending on which module you want to use.



A FINAL WORD

Be a change agent for FMNR in your community

FMNR is a growing movement mainly because once farmers and pastoralists experience the benefits of the practice, they are excited about the change it brings. However, many communities do not know about it. Even where FMNR has been introduced, many farmers are not ready to adopt it at first. They fear that trees will reduce their crop yields or bring birds and snakes to their farms, among other concerns. But once farmers hear from other farmers or see their success, they get over their fears and go on to benefit as well.

We encourage you to be a champion of FMNR in your community and beyond. We understand that not everyone can influence their community. However, if you have read this guide up to this point, your interest to practise FMNR on your land and tell others about it is already aroused. The nine points below show who can be an excellent FMNR champion. See if you are already one or on the way to becoming one.

Qualities of FMNR Champions

- i) An excellent FMNR practitioner, who monitors progress and experiments to solve problems with your land and trees.
- ii) A good citizen who has earned trust and respect in the community because of your behaviour and moral standards.
- iii) Passionate about spreading FMNR, and about seeing people succeed. Does practising good land husbandry or teaching others get you energized, especially by what you are doing?
- iv) A natural teacher, who communicates patiently and clearly, willing to guide those who may not be taking care of land in the right way, encourage learners when they struggle and celebrate with them when they succeed.
- v) Willing and able to regularly visit with community members and participate in meetings and discussions about practising FMNR.
- vi) Able to inspire others. You could be comfortable leading a crowd or you could inspire ones and twos in your own quiet way – either of the two is fine.
- vii) Patient and persistent. You understand that people may take time to adopt a new idea and you are willing to continue the dialogue without getting discouraged or weary.
- viii) Forgiving and tough skinned. Sometimes people who start to do things differently in a community are the object of jokes and derision, even abuse, but this changes as success is more visible.
- ix) A leader who takes initiative. You do not wait for others to tell you what to do, but you test out new ideas and make use of opportunities.

If you possess most of these qualities, you can become a good champion of FMNR. Do not benefit alone, carry your community with you. The more members of your community that adopt FMNR, the fewer chances that your trees can be stolen, burned by arsonists or destroyed in other ways. With FMNR, you are also more likely to get environmental benefits such as increased water in streams and wells, fewer floods and windstorms, and fewer gullies that could destroy roads and foot paths because all land parcels in your community will be sustainably managed.

***As the Chinese say :-
If you want to go fast, go alone but if you want to go far,
go with others.***



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