

# Farmer Managed Natural Regeneration Evidence Gap Analysis

INTERNAL DOCUMENT – WORLD VISION AUSTRALIA

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An *Evidence Gap Analysis* was commissioned by the Evidence and Learning team at World Vision Australia to document the existing evidence for the Farmer Managed Natural Regeneration project model and identify the evidence needed in relation to donor market needs and program improvement.

This Evidence Gap Analysis has focused on five key **project outcomes** as identified by the project model, with additional efforts to assess gender outcomes.

For efficiency purposes, it is not a comprehensive review of all positive outcomes from Farmer Managed Natural Regeneration. Refer to *'The social, environmental and economic benefits of Farmer Managed Natural Regeneration'* (Francis et al. 2015) for additional insights.

## Evidence Gap Analysis Form

### Model Summary sheet

Project Model	Model development			External Evidence Base			Internal Evidence Base		
	Status	Application	Comment	Strength	Relevance	Comment	Strength	Relevance	Comment
<b>Farmer Managed Natural Regeneration</b>	Model approved and under revision	Extensive	Extensive, in more than 20 countries, supported by WVA and others. Countries include Senegal, Chad, Mali, Ghana, Ethiopia, Kenya, Tanzania, Uganda, Timor Leste and Indonesia. See 'Application' and Table 1 for more details.	Medium	Good	A growing evidence base, with some key papers (approximately 12) specifically related to FMNR. To date, published literature all relates to the African context. This review also draws on agroforestry research more broadly.	Medium	Good - excellent	Mixed, as FMNR is usually programmed as an integrated approach with other livelihood interventions. Furthermore, previous evaluations have sought to assess the effectiveness of the project as a whole, and were not framed to test the effectiveness of the project model <i>per se</i> .

## FARMER MANAGED NATURAL REGENERATION (October 2016)

### Model development

#### Introduction and Status

## Farmer Managed Natural Regeneration (FMNR) Overview

### Project model status

The FMNR model was approved in 2011 and well established in World Vision programming. It is currently being reviewed and updated, led by the World Vision Global Centre.

The project model was documented by Tony Rinaudo using a template provided by the WVI Global Centre and finalised in 2011. References were provided and some materials including a sample log frame and technical guidelines to practicing FMNR which had been developed earlier. The approach had been well trialled with Rinaudo drawing on existing FMNR projects and 30 years of FMNR experience, both outside of, and within, World Vision.

### Description of FMNR

Farmer Managed Natural Regeneration (FMNR) is both a **community mobilisation approach** for landscape restoration, and a **specific technique** to regenerate trees.

As a natural resource management intervention, FMNR is a rapid, low cost and easily replicated community-led approach to restoring and improving agricultural, forested and pasture lands (Place *et al.* 2016b). FMNR consists of encouraging existing tree stumps or self-sown seeds to re-grow into usable trees by pruning and protecting them. It can be used wherever there are living tree stumps with the ability to coppice (re-sprout) or seeds in the soil that can germinate.

Regeneration of trees (which is generally faster and less expensive than planting trees) restores and builds natural assets and makes agricultural activities more productive, increasing income and food and water availability.

FMNR can be considered in any agricultural, livelihoods or development project where increased tree cover will contribute to an improvement in long term well-being and where the physical ability to conduct FMNR exists.

FMNR is also an empowering form of social forestry or agroforestry. It gives individuals and communities responsibility for the care and nurture of naturally occurring woody vegetation and rewards from the sustainable harvesting of wood and non-timber forest products. Even in a poor policy environment, regenerating trees may still provide fodder, shade, and soil nutrients, but securing the right to use prunings and wood products, and the ability to sell these, increases adoption.

## Key elements of the FMNR project model

The specific practices of FMNR will vary, based on the needs, resources and goals of those implementing it. Any of the suggested procedures should be adapted to meet the goals of the farmer or other practitioner. Facilitating the implementation of FMNR will typically include the following:

- **FMNR awareness creation and training:** A workshop is organised for all stakeholders (men, women and youth of the community including majority and minority ethnic groups, sedentary and nomadic residents, local government representatives, agriculture and forestry department representatives, local partners, and other non-governmental organisations). Women and children are particularly crucial because in most societies, women are responsible for fuel wood collection and children are often required to clear and burn all trees in agricultural fields before planting time. Children are also more receptive to new ideas and they are the next generation of farmers. The workshop includes hands-on training in pruning and management techniques and facilitated discussion of how to select potential trees.

Once a community decides to practice FMNR, discussion and promotion moves beyond stakeholders who attended the workshop, to include the wider local society: local partners, community members, schools, religious leaders, local media, and traditional and administrative authorities. At this point, the wider agricultural community needs to develop some form of enforceable social contract to protect tree regrowth and respect regrowth on their neighbours' land.

- **Advocacy for a favourable policy environment:** The primary motivation for an individual or community to practice FMNR is the belief that practitioners will benefit from their labour. In many countries, individuals and communities do not own trees or do not have user rights. For FMNR to succeed it is important to have a legally-binding agreement with the government that individuals and communities will either own the trees they care for outright, or have user rights to use or sell wood and non-timber forest products. Getting policies changed is not easy. However, in countries where World Vision (WV) has established good relations with high-level government officials, they can be exposed to the benefits of FMNR through video presentations, workshops and visiting successful project sites.
- **Organisational structures:** Cooperatives can be identified and strengthened (or established if none exist) and appropriate mutually agreed by-laws for the management of trees can be developed. This group may be a part of a working group that was formed at the outset following awareness, or they may be identified and are collaborating with a working group. A member of the working group may serve as a coordinating partner.

- **Adequate follow-up and encouragement:** New concepts invariably encounter early problems and it takes time for them to become normal practice. It is important for WV and the coordinating partner to provide adequate follow-up and encouragement during the formative stages of uptake.
- **Advocacy for enhanced market access:** Steps may be needed to create an enabling environment to facilitate the sale of wood and non-timber forest products. In many countries it is illegal to sell firewood despite 90 percent of energy needs being met by fuel wood. Tree cutting may be legal if a permit is obtained, but the process can be very difficult for someone living in a remote area. Often this is open to corruption. When a community decides to practice FMNR, it is possible to establish local by-laws and set up a coordinating partner or management committee. Scouts can then monitor tree cutting and certify that the wood comes from sustainably-managed FMNR stands. At a later stage, when the community is ready, consideration should be given to facilitating the establishment of certified wood markets that only sell wood produced through FMNR.
- **Additional training for the community in natural resource management and capturing non-wood forest products:** FMNR is often just one prong in a broader approach to improving natural resource management, and training may also include erosion management (for example gully reclamation), tree planting, tree pruning, fencing, nursery, and land conservation where appropriate. Training on non-wood forest products (for example, bee keeping, forage harvesting, animal fattening, etc) can help women and men derive additional livelihood benefits from the implement of FMNR (World Vision 2012).

All these activities aim to improve the natural resource base for sustainable livelihoods. The FMNR model is being used as a strategy within World Vision's Resilience and Food Security Technical Programs. Some Area Programs within World Vision National Offices are more advanced in implementing FMNR project, with integration into income generation activities.

## FMNR theory of change

Whilst FMNR is often programmed with other interventions, particularly food security and economic development, the underpinning theory of change is presented here.

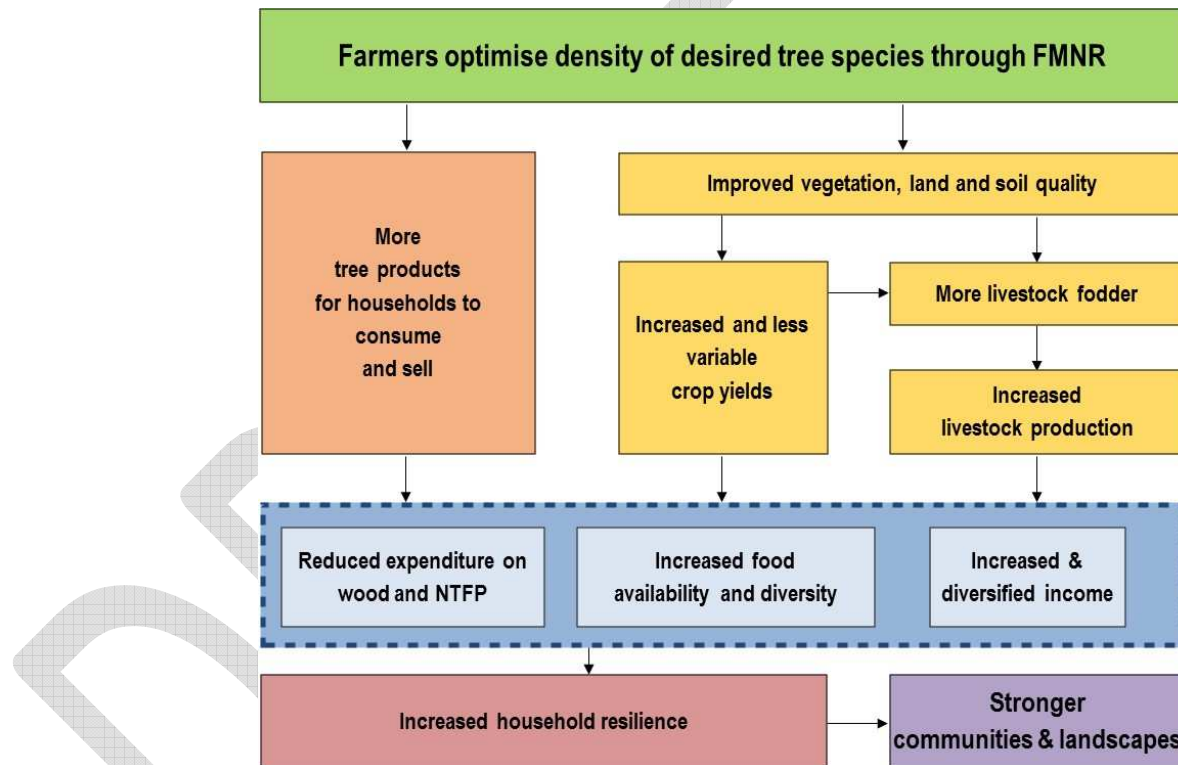


Figure 1: Simplified Theory of Change for Farmer Managed Natural Regeneration (FMNR)

(Source: C. Kabore, *pers. comm.* 2015)

## The role of FMNR in natural resource management

Farmland and grazing land has been severely degraded over much of the developing world, undermining smallholder farm productivity. About 2% of global terrestrial net primary productivity of vegetation is lost yearly due to dryland degradation (Zika and Erb 2009). Some two billion people depend on ecosystems in dry land areas, 90% of whom live in developing countries (United Nations, undated). A downward spiral is created in many underdeveloped countries due to a range of reinforcing issues. Overpopulation causes pressure to exploit marginally productive drylands for farming, leading to overgrazing, deforestation, reduced soil fertility, soil erosion and overuse of groundwater. Poor land management practices due to cultural practices, limited knowledge, inadequate extension services and low infrastructure further exacerbates natural resource challenges. Short-term economic imperatives can also play a key role, such as deforestation or over-reliance on mineral fertiliser. In turn, the degradation of the natural resource base results in greater poverty. Climate change, with increased frequency and severity of droughts is likely to exacerbate this further.

Farmer Managed Natural Regeneration (FMNR) is the practice of actively managing and protecting non-planted trees and shrubs with the goal of increasing the value or quantity of woody vegetation on farmland, woodland, forest or grazing areas (Haglund *et al.* 2011, Weston *et al.* 2015). The technical practice of FMNR involves; a) selecting and protecting the most vigorous stems regrowing from live stumps of felled trees; b) pruning off all other stems and; c) pollarding the chosen stems to grow into straight trunks (Weston *et al.* 2015). Given some contention about its exact definition, a simple, inclusive description is where there is a combination of both *protection* and *management* of trees (Haglund *et al.* 2011).

*FMNR is distinct from most afforestation and agroforestry efforts in that it does not require the planting of either seeds or trees but instead makes use of the living rootstocks of previously felled trees that remain in the landscape (Haglund et al. 2011, p. 1697).*

As outlined above, the FMNR project model involves awareness creation and behaviour-change components, along with the physical practice of restoring and managing tree growth on degraded land.

The practice of FMNR is extremely flexible and one of the keys to its successful spread is the emphasis on it being 'farmer managed' or in some contexts 'community managed' rather than prescriptive and project directed. World Vision can guide and give advice, but in the end stakeholders need to be given the freedom to decide for themselves on what species to leave, when and how to prune, how to share the proceeds, what to do about infringements on agreed rules, the respective roles of and benefits to women, men, vulnerable groups etc.

FMNR has been promoted as a movement to keep naturally regenerating woody vegetation on agricultural land, and has reported success with increasing tree cover especially in Niger and Burkina Faso (Sendzimar *et al.* 2011, WRI 2008). FMNR began in Niger in 1983, promoted by the international aid and missionary organizational, the Society of International Ministries, as part of its development programming, and later as a component of the Food for Work program during the drought and famines of 1984 and 1988 (Rinaudo 2007, Haglund *et al.* 2011). It rapidly expanded across five million hectares or 50% of the country's farmland (Tougiani *et al.* 2009, Sendzimar *et al.* 2011). On the back of its success, FMNR has since been introduced to countries in Sub-Saharan Africa, southeast Asia and Pacific and the Caribbean. FMNR is being applied on grazing land (eg Tanzania, Uganda) and in communal forest land (eg Ethiopia, Tanzania, Indonesia). Its widespread adoption has been attributed to its affordability for even the poorest farmers (Francis *et al.* 2015).

*An important international champion was Australian agronomist Tony Rinaudo who pioneered farmer-managed natural regeneration. His leadership and passion were adopted and sustained by non-governmental organisations such as Serving in Mission, World Vision and others (Buckingham and Hanson 2015, p.4)*

## Application

### Application of the Farmer Managed Natural Regeneration project model

Given the broad definition of FMNR and how responsive it is to local contextual factors, World Vision's National Offices have implemented a number of innovative, environmentally sensitive FMNR approaches. FMNR as a promoted practice targets improved management of indigenous trees and shrubs – by individual and/or groups of land users – on farmland, woodland, forest or grazing areas. Rapid regeneration of degraded land with suitable species is achieved with some training and using farmers existing tools and resources. World Vision FMNR projects typically also include interventions that target farm production and/or income earning opportunities. Some examples are beekeeping, cash crops, high value timber supply, fruit trees and vegetable enterprises (Fortnum, Flowers and Kabore, 2015).

Farmer Managed Natural Regeneration (FMNR) is practiced in over twenty countries in which World Vision operates, in climates ranging from the semi-arid Sahel zone from West to East Africa to tropical zones in the Philippines and Indonesia. Examples can be found from flat, arid Middle Eastern deserts to very high rainfall, mountainous regions of East Timor. Countries with World Vision Australia support (Grant, sponsorship and HEA) for FMNR include Ethiopia, Kenya, Tanzania, Uganda, Rwanda, Senegal, Niger, Ghana, Chad, Mali, Indonesia and East Timor (Table 1).



FMNR is most extensively programmed in Africa. The National Offices and ADP<sup>1</sup>s currently implementing FMNR include the following<sup>2</sup>: Malawi (43), Ethiopia (40), Uganda (45), Zambia (10), Swaziland (2), Ghana (4), Rwanda (6), Tanzania (28), Lesotho (8), Kenya (14) and Zimbabwe (4).

FMNR is often incorporated into projects that have other elements of Resilience and Livelihoods programming, such as improved agricultural technologies, agroforestry, food security and natural resource management. Related project models include:

- **Savings Groups:** a widely used approach to facilitate savings and credit in a small-scale and sustainable way. By facilitating savings and access to micro-credit, savings groups enable community members to plan ahead, to cope with household emergencies and to develop their livelihoods.
- **Citizen Voice and Action (CVA):** mobilises and equips citizens to monitor government services, and facilitates an advocacy methodology that results in the improvement of inadequate government-provided services. CVA is often used as a component of other projects to improve relevant government services for the well-being of children. Key services, such as health and education, are delivered effectively and contribute towards the well-being of children, due to the impact of CVA in improving relationships between citizens, government and service providers.
- **Local Value Chain Development (LVCD):** uses the value chain approach in a participatory way, helping vulnerable producers and farmers to analyse markets, gain information, build relationships and act collectively to overcome market barriers and increase profits. Producers have their capacity built through forming groups, through training to improve quality and productivity, by gaining understanding of market systems and through forming relationships with buyers.
- **Business Facilitation:** aims to support poor and vulnerable people with no regular employment to develop their livelihoods through establishing a community business council with local stakeholders to provide carefully targeted business advice and build up the local business infrastructure. The model increases the income, assets and confidence of poorer families, through developing their skills and knowledge, building relationships with other business stakeholders and enabling a diversity of enterprises to develop in the target area.

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<sup>1</sup> World Vision has used a model called an Area Development Program (ADP) when working in community-based development to address the issues of poverty, such as food insecurity. An ADP operates in a geographical area that is large enough to have some regional impact, but small enough to make a major impact on the individuals and communities in that area. Typically an ADP may cover an area with a population of between 20,000 to 40,000 people. ADPs typically run for 10 to 15 years, and are designed to be sustainable.

<sup>2</sup> Data correct as at 13/10/16. At this time data was not available for Niger or Senegal, amongst other countries.

- Other approaches related to fuel-efficient stoves, conservation agriculture, soil and water erosion control interventions, forestry and agroforestry models, or sustainable agriculture models.

**Table 1: FMNR projects funded through World Vision Australia**

Country	Project Name <sup>3</sup>	Duration	Elements included
<b>Ethiopia</b>	Humbo Community Managed Natural Regeneration Forest Project	2005-14	FMNR, agroforestry, livelihoods, carbon finance & cooperatives
<b>Ethiopia</b>	Soddo Community Managed Natural Regeneration Forest Project	2005-14	FMNR, agroforestry, livelihoods, carbon finance & cooperatives
<b>Senegal</b>	Senegal Food & Livelihood Enhancement Initiative	2007-11	FMNR, agroforestry, agricultural livelihoods, natural resource management
<b>Chad</b>	West Africa NRM Management Project	2009-12	FMNR, agroforestry, natural resource management, livelihoods, food security
<b>Mali</b>	West Africa NRM Management Project	2009-12	FMNR, agroforestry, natural resource management, livelihoods, food security
<b>Mauritania</b>	West Africa NRM Management Project	2009-12	FMNR, agroforestry, natural resource management, livelihoods, food security
<b>Niger</b>	West Africa NRM Management Project	2009-12	FMNR, agroforestry, natural resource management, livelihoods, food security
<b>Ghana</b>	Talensi Farmer Managed Natural Regeneration Project	2009-13	FMNR, natural resource management, improved cookstoves, livelihoods

<sup>3</sup> Note, FMNR is also included in World Vision ADP programming. The projects listed in this table are considered to be 'key' FMNR projects to which some World Vision Australia support has been provided and for which evaluations have been available to allow inclusion in this evidence gap analysis.

<b>Myanmar</b>	Improving Livelihood Status through Capable Community Based Organisations project	2009-13	Food security, livelihoods, FMNR awareness
<b>Senegal</b>	Beysatol Economic & Environmental Enhancement Project	2009-12	FMNR, natural resource management, livelihoods
<b>East Timor</b>	Building Resilience to a Changing Climate and Environment (BRACCE)	2011-16	FMNR, natural resource management, agroforestry, energy, climate change awareness and advocacy
<b>Indonesia</b>	Increased Food Security within the Community through Sustainable Livelihood and NRM System (INFOCUS)	2011- 15	Food security, natural resource management, FMNR, resilience and community organisation
<b>Senegal</b>	Beylene Sen Tol Project	2011-15	FMNR, agroforestry, natural resource management, advocacy
<b>Ghana</b>	FMNR-Ue Ecological Restoration Project	2012-14	FMNR, natural resource management, livelihoods
<b>Kenya</b>	FMNR for East Africa	2012-17	FMNR, livelihoods
<b>Rwanda</b>	FMNR for East Africa	2012-17	FMNR, livelihoods
<b>Tanzania</b>	FMNR for East Africa	2012-17	FMNR, livelihoods
<b>Uganda</b>	FMNR for East Africa	2012-17	FMNR, livelihoods
<b>East Timor</b>	Bobonaro Acts on Climate Change (BACC)	2013-17	FMNR, natural resource management, agroforestry, energy, climate change awareness
<b>Ghana</b>	Talensi FMNR Phase II	2013-17	FMNR, natural resource management, improved cookstoves, livelihoods

<b>Ethiopia</b>	Drydev (DGIS / ICRAF)	2013-18	FMNR, land restoration, livelihoods, food security
<b>Kenya</b>	Drydev (DGIS / ICRAF)	2013-18	FMNR, land restoration, livelihoods, food security
<b>Somalia</b>	Awdal Environment Conservation and Livelihood Project	2013-15	FMNR, natural resource management, agro-pastoralist livelihoods, community resilience
<b>Indonesia</b>	Indonesia Rural Economic Development Project	2015-18	FMNR, agroforestry, natural resource management, Local Value Chain Development (LVCD)
<b>Somalia</b>	Enhancing Resilience in Somaliland through Farmer Managed Natural Regeneration	2016-17	FMNR, livelihoods

### Implementation costs for FMNR

FMNR is frequently described as being a rapid, low cost approach to restoring and improving agricultural, forested and pasture lands (eg Cunningham and Abasse 2005, p.5; WRI 2008 p. 43; Place *et al.* 2016b p. 35). *'By definition, FMNR does not require the effort to acquire germplasm or to propagate seeds or cuttings and nurture them into seedlings. In some cases, the cost of regenerating a tree is essentially zero—new trees emerge from the soil without need for nurturing or protection. However, establishment and maintenance costs may be required.'* (Place *et al.* 2016b, p.35).

For most contexts and most species and communities, FMNR will be cheaper and faster because of the utilisation of existing root stock which can access soil and water resources for growth. Calculations using data from the SFLEI project in **Senegal** (Kabore 2012) estimated an initial cost of \$1.27 per living tree through FMNR, and \$2.22 per living tree using tree planting, within the life of the project, with the cost per living tree regenerated through FMNR declining over time as the technique continued to be applied. Calculations included input costs such as equipment, training, promotion and management.

Note, however, that it is not useful to pitch FMNR against tree planting as a single choice. Both have their place and provide unique benefits that cannot be filled by the other. For example, FMNR will not regenerate valued species which are not there naturally such as certain high value trees or fruit trees. And tree planting alone will not cover large areas of land

quickly and at low cost. Good project designs will assess the context and facilitate both FMNR and agroforestry as appropriate. The main context where FMNR will not work is where there are few tree stumps or tree seeds in the ground.

#### Link to model materials

1. *Save all final EGA forms in  
W:\Public & Private Partnerships\Program Development\5 - Evidence & Learning\8- Evidence Gap Analysis\Final EGA forms)*
2. *Save all documents reviewed in  
W:\Public & Private Partnerships\Program Development\5 - Evidence & Learning\8- Evidence Gap Analysis\Evaluations and journals for EGA  
Please save reports and other documents reviewed with the following format:  
'Author's Last name, (date published) "Title – journal or book title (if applicable)'*
3. *Save all model related materials in  
W:\Public & Private Partnerships\Program Development\5 - Evidence & Learning\8- Evidence Gap Analysis\Model materials*

### Literature review - Internal and External Evidence

#### Expected Outcomes from FMNR

This review of evidence focuses on the most likely outcomes of FMNR being:

- increased tree cover
- improved soil fertility
- increased crop yields
- increased household income and assets
- empowered communities

Specific attention is given to gender outcomes for FMNR, particularly the role of women in community decision-making (empowered communities) and increased opportunities for women's income generation. Consideration is also given to inclusion and child well-being.

For each outcome, evidence is documented from internal and external sources. Internal sources include mid-term and final evaluation reports of World Vision projects, as well as several journal papers (Brown *et al.* 2011, Weston *et al.* 2015). External evidence includes all journal papers and reports that make specific reference to FMNR, as well as some additional supporting literature from forestry and agroforestry.

This analysis is based on a literature review of 21 internal evaluations and analyses and more than 30 external sources<sup>4</sup> (academic articles and grey literature), including 12 journal articles specific to FMNR. The evidence is based predominantly on WV evaluations from projects in **Timor-Leste, Senegal, Ethiopia, Ghana**, and to a lesser extent **East Africa**, with a few particularly useful evaluations, notably the final evaluation of the SFLEI project in **Senegal**, the Talensi FMNR project in **Ghana** and the mid-term review of the FMNR project in Humbo, **Ethiopia**.

**Table 2: Overview of core FMNR evidence base**

Region	Journal articles	Reports
West Africa	9	12
East Africa	3	7
Southern Africa	-	-
SE Asia & Pacific	-	2

### ***Increased tree cover***

There is both internal and external evidence that FMNR has contributed to increased tree cover, as measured by changes in tree density (the number of trees per hectare) and/or extent of reforestation. Evidence for increased tree coverage is more extensive for Africa than south-east Asia and Pacific, reflecting the greater number of FMNR projects that have been implemented.

#### **Internal evidence**

- In **Senegal's** Food and Livelihood Enhancement Initiatives (SFLEI) project there was an increase in the area that FMNR was practiced from 742 ha (2008) to 9124 ha (2011). Tree density increased in FMNR areas from 0 trees to 33 trees/ha over this time, with approximately

<sup>4</sup> 17 external sources for the gender analysis

264,000 trees regenerated (extrapolated) (Kabore, 2012). Beylene Sen Tol, a further World Vision project in **Senegal**, recorded an increase in the area in which FMNR was applied from 39 315 hectares to 63 286 hectares from 2011 to 2014 (Caddel Consulting 2015).

- An end-of-project evaluation of World Vision's Talensi FMNR Project in the dryland north of **Ghana** recorded that FMNR-adopting communities added 396,000 trees to their landscape on over 500 hectares, over a three year period. FMNR was applied both on farmlands and community-managed reforestation sites (Weston *et al.* 2013a). They recorded a tree density of 2343/hectare in community managed forest and 57 trees/hectare in crop land, compared with 5 trees/hectare for both forest and crop land at the start of the project.
- FMNR projects in southern **Ethiopia** (Humbo and Sodo) reported the restoration of 2728 and 503 hectares of biodiverse native forests respectively (Thiede 2014, Szava 2015). Community members identified benefits of reforestation over subsequent evaluations such as increased rainfall, air quality, and water availability.

*"Before there were no trees, it was bare degraded land and temperatures were very high. After protection, the trees started growing fast, wild life started coming back, the temperature has gone down, and rainfall is getting better."* [Child Members of Environment Club, Humbo, Ethiopia (Kabore *et al.* 2010 p.67)]

*"After the project began, this very degraded land started being protected ... and trees were planted and it's now almost restored to its original state, with grasses... The benefits of the project are reduced soil erosion, labour opportunities in nursery, training and agricultural inputs to some very poor people..."* [Male Community Elder, Humbo, Ethiopia (Kabore *et al.* 2010 p. 66)]

*"After the project, we have got good rain, good crop production, fresher air, and water for livestock. All of the weather conditions for humans and animals have become good."* [Farmer (male), Humbo, Ethiopia (Thiede 2014, p. 40)]

*'Initial field studies recommended 500 ha of tree planting (exotic and indigenous) based on the expectations of regeneration, but only 50 ha were necessary – a testament to the power of natural regeneration even in sites where it may seem unlikely'* (TetraTech 2014, p. 9).

- In the mid-term review of the East Africa FMNR project, the tree density on farms in **Kenya** rose from 9 trees per acre (approx. 22 trees/hectare) to 30 trees per acre (approx. 74 trees/hectare) over the three years from 2013 – 2016, a significant ( $p < 0.001$ ) three-fold increase (Odwori *et al.* 2016). 62% of household survey respondents reported an increase in tree cover during the time of the project.

*"FMNR has increased tree cover on our farm. Before FMNR our farm had about 10 trees but now we have over one hundred trees. We now enjoy the benefits of FMNR and my husband and children are happy".* [Woman, FGD Kenya (Odwori *et al.* 2016 p. 36)]

A similar change was recorded in **Rwanda** as part of the same project, with tree density on household land increasing from 13.5 trees per acre (approx. 33 trees/ hectare) to 80 trees per acre (approx. 198 trees/hectare) over the same time period (Jean and Medard 2016). Comparable tree density data was not reported for Tanzania and Uganda.

- In East Sumba, **Indonesia**, FMNR was applied to 68 hectares of land across 7 villages during the INFOCUS project (Lauranti 2015, p.46)

*“In the beginning we really thought that WVI has gone mad to ask us under the sun for a whole day to do trivial things. We couldn’t comprehend what they wanted from us... But, it was amazing to see the result after two years. We couldn’t believe that the trees that were nothing could grow and became taller than us. Now we see all the benefits from doing FMNR. It is really outstanding to see them growing. Now, we have green land, something that we never dreamed of before. We believe it gives good impact to the environment, more water preserved, less erosion, less risk of floods and strong winds. We are happy and have strong hope of better future for our children.”* [Community member (female), East Sumba, Indonesia (Lauranti 2015, p.22)]

*“Who would think that in a very hot and dry place like Wunga, people could see a forest? It was impossible. But now we have to open our eyes very wide to finally see and be proud that it is possible. We do have trees taller than us, giving us green shade in the village. We are very surprised. It gives us hope that one day our village can be prosperous and we can live a great life in Wunga... FMNR is really an eye-opener that we could do something bigger together for the better environment in our own village. For the future of our children, nothing is impossible really!”* [Village leader (male), East Sumba, Indonesia (Lauranti 2015 p. 49)]

- In **Timor Leste**, FMNR has seen the regeneration of 54 hectares of community forest, but changes in tree density was not recorded (Anda, 2016).

*When we manage trees using FMNR we can still cut some branches and get new ones. When we protect the forest and plant trees – the land becomes more green and holds more water.* [Women’s FGD participant, Timor Leste (Anda 2016 p.29)]

#### **External evidence**

- The greening of **Niger** through FMNR is widely reported to be 5 million hectares (eg Reij *et al.* 2009, Tougiani *et al.* 2009, Sendzimir *et al.* 2011). Sendzimir *et al.* (2011) examined secondary data from Niger and applied a modelling approach to confirm the central role of FMNR promoted by NGOs in the eventual greening of a large proportion of Niger.
- In Zinder, **Niger**, though natural forest had completely disappeared during the 20th century, FMNR tree cover is now the dominant form of land cover, on over one million hectares. Tree densities per hectares varied from 20 to 120 trees (Larwanou *et al.* 2006).
- A study by Larwanou and Saadou (2011) across three regions of **Niger** found that in most cases, over 30 years, lands shifted from having almost no mature trees to around 100 per hectare, with huge increases in tree species diversification. Sites with FMNR showed a higher number of sprouts (density/ hectare) ( $p < 0.001$ ).



- In Maradi, **Niger**, farmers who adopted FMNR had higher tree densities and species diversity (42 trees/hectare, 9 species) compared with those who had not adopted the practice (29 trees/hectare, 7 species) (Haglund *et al.* 2011).
- In Augie, **Niger**, through the Desert Community Initiative, farmer action led to 130,000 hectares of land being managed under FMNR, and fields which were practically treeless in 1984, covered with 103-122 trees per hectare (Tougiani *et al.* 2009).
- A further study in the **Niger** regions of Maradi and Zinder sought to evaluate the impact of FMNR on reforestation (Baggnian *et al.* 2013). Increases in tree density were recorded between 2005-2012 from 146 to 151 trees/ hectare in Dan Saga, 60 to 109 trees/hectare in El Guiéza, and 32 to 79 trees/hectare in Zinder. These sites all had an FMNR oversight committee or leadership by the village head. Tree density decreased over the same time period in another site (Ara Sofoua) lacking leadership or a committee from 360 to 65 trees/ hectare.
- In **Burkina Faso**, farmers applying FMNR together with zai pits has resulted in rehabilitated fields averaging 126 trees per hectare, compared with 103 trees per hectare on control plots (Reij *et al.* 2009).
- In a review of six potential tree systems suitable for the **Sudano-Sahel** (traditional agroforestry-parklands, FMNR, Acacia Senegal plantations, Sahelian Eco-Farm, bio-reclamation of degraded lands and dryland fruit tree plantations), Pasternak *et al.* (2010, p.196) concluded that *'the Farmer Managed Natural Regeneration (FMNR) process that is spreading in eastern Niger is perhaps the easiest, cheapest and most sustainable option for augmentation of the tree population in the Sudano Sahel.'*
- A study sought to characterize the population dynamics for *Faidherbia albida* in northern **Ethiopia**, which occurred in parklands under FMNR. Adult tree density was almost three times higher in the Zongi agroforest (19.9 +/- 2.9 trees/hectare) where the species has been conserved and managed for a longer time (since the 1980s) compared to the Abraha-atsbeha agroforest which has been managed and conserved for about 8 years (7.9 +/- 2.5 trees/hectare) (Noulekoun *et al.* 2016). Whilst these tree densities may appear low, *Faidherbia albida* is a valued tree species providing benefits such as livestock fodder, bee forage, fuel wood and the sale of woody products by local farmers, and the densities reflect farmer management choices that balance other land uses.

*'In agroforestry system, where there is a combination of woody perennials and crops in a given spatial and temporal arrangement, trees are kept and managed in farmland by farmers in such a way to derive environmental and economic benefits from them'* (Noulekoun *et al.* 2016, pg number not yet available).

## ***Improved soil fertility***

FMNR has been repeatedly reported to increase soil fertility, especially in areas where trees border fields. Whilst the improvement is widely noted, biophysical data supporting changes in soil fertility is difficult to obtain, as analyses are expensive and difficult to undertake in a developing country context.

### **Internal evidence**

Farmers have commonly reported an increase in soil fertility following the establishment of an FMNR project in their community:

- 85% of farmers in **Senegal** observed an increased soil fertility as a result of the SEFLEI project (Kabore 2012).

*Falling leaves contribute strongly to the organic enrichment of the soils, which contribute towards improved yields similar to when chemical fertilizer are used on a small scale. [FGD men, Senegal (Kabore 2012 p.50)]*

*Facilitator: Are there better crop yields?*

*Respondent: We cannot measure the difference but the soil is more stable so the crops are now getting to grow rather than being blown away. The wind also blows away manure – it can all end up on someone else's farm [Senegal farmer (Kabore 2012 p.32)]*

- A change in soil fertility was also noted in the Beylene Sen Tol project, **Senegal**.

*According to communities, the plots of land subjected to FMNR are more productive than those without FMNR. These focus group results are confirmed by the surveys which reveal that 61% of the heads of households surveyed assert that FMNR allowed them to enrich their fields. (Caddel Consulting 2015 p. 23)*

*Thanks to FMNR, my land has become more fertile. Since 2012, my production continues to increase year after year and has even reached 1.5 tons in 2014. This increase in production has impacted on my income which has significantly improved. [Male farmer, Malem Senegal (Caddel Consulting 2015 p. 25)]*

- In a survey of FMNR adopters in Talensi, **Ghana**, 94 % reported an increase in soil fertility (against 26 % among the comparison group) (Weston *et al.* 2015, p.1410).
- 74% of farmers in Humbo, **Ethiopia** stated that soil fertility had increased in the past 5 years, compared with 37% of households in the non-project area (Thiede 2015, p.40).

*82.9% of household survey respondents in the project area reported decreased on-farm soil erosion over the past 5 years; and 74.0% reported increased on-farm soil fertility over the same period. These findings contrast with the non-project area, where only 36.9% of*

*respondents reported an increase in on-farm soil fertility over the past 5 years. Perceived changes in erosion and soil quality in the project area also mark an improvement from both the baseline and midline studies. (Thiede 2015, p.40)*

- 99% of respondents in the BRACCE project (Aileu, **Timor Leste**) who were aware of FMNR identified soil fertility as a benefit (Anda 2016, p.23).

*Respondents who were aware of FMNR were also asked what they thought the benefits were. The most frequent responses were increased soil fertility (99%), decreased erosion (92%), and increased water supply (72%). The least mentioned benefits were increased supply of fodder (45%). (Anda 2016, p.23)*

### **External evidence**

Depending upon which woody species are used, and how they are managed, their incorporation into crop fields and agricultural landscapes may contribute to bolstering nutrient supply through nitrogen fixation and nutrition cycling as well as generate greater quantities of organic matter in soil surface residues (Garrity *et al.* 2010). For example, a review of maize-based cropping systems in **East and Southern Africa** found that fertiliser trees such as *Gliricidia* and *Faidherbia* add more than 60 kg N/ha per year through biological nitrogen fixation; nutrient contributions from fertiliser tree biomass can reduce the requirement for mineral N fertiliser by 75%, translating to huge savings on mineral fertilisers; and that fertiliser trees were also shown to substantially increase crop yield (Akinnesi *et al.* 2010). For *Faidherbia albida* systems, spacing and time to maturity need to be considered for optimal impact.

### ***Increased crop yields***

The overall effect of woody vegetation on crop yields is mediated through multiple processes and shows both positive and negative effects (Sinare and Gordon, 2015). The highly variable results could be due to the multiple processes (temperature and moisture, soil structure, infiltration, soil nutrient concentration, erosion or deposition) affecting crop production that woody vegetation influences in various directions and to different degrees, and few analyses are conducted at a scale larger than for individual trees (Sinare and Gordon 2015). Microclimatic improvement through agroforestry (trees grown with crops) has a major impact on crop performance as trees can buffer climatic extremes that affect crop growth, such as air and soil temperature, wind and solar radiation, although further scientific research is required to further substantiate these claims (Mbow *et al.* 2014a).

Crop yields in small holder and subsistence farming systems are notoriously difficult to measure using a household survey tool which relies on respondent recall of volumes of crop harvested in the past season, an approach commonly used by World Vision. However, these recalled values are indicative of the situation and do help reveal patterns between baseline and endline, or between different groups.

Given the mixed evidence for increased crop yields reported below, broad statements that 'FMNR increases crop yield' should be avoided, rather, providing context specific guidance such as the inclusion of 'fertiliser trees'<sup>5</sup>, for example, *Faidherbia albida* or *Gliricidia*.

#### Internal evidence

- In a comparative study looking at the effects of FMNR (at 40 trees/ hectare) and mineral fertilizer on annual crops in **Senegal**, *Philostigma reticulatum* was found to increase the grain yield per hectare of the local millet variety by approximately 70% (692kg grain/hectare compared with 410kg grain/hectare). All three varieties of millet tested performed better than without FMNR, although the use of mineral fertilizer had the highest results (ISRA 2012).
- Increases in crop yield were noted in a study in **Senegal** (Kabore 2012) despite difficulties of measuring the impact of FMNR in isolation of weather effects. 59% of farmers noted increased crop yields as a benefit following the implementation of FMNR (note, perception not actual crop measurements).

*"Cereal production has actually increased... we can provide cereal stock for an additional two to three months compared with before".*  
[FGD men, Senegal (Kabore 2012 p.34)]

*"The increase in production helped shorten the lean period... we note two to three more months of coverage compared with the situation prior to FMNR".* [FGD women, Senegal (Kabore 2012 p.34)]

- 61% of respondents reported an increase in agricultural productivity (mostly millet, maize, peanuts) due to FMNR in the **Senegal** Beylene Sen Tol project (range across ADPs of 26-85%) (Caddel Consulting 2015). This concurred with earlier findings by Kabore (2012) above.

*This effect is more perceptible in the region of Kaffrine and the ADP of Mbellacadio where 70% and 65% of the heads of households surveyed assert having noticed an improvement in their agricultural productivity thanks to FMNR, respectively. 70% of producers from the Kaffrine region say that their agricultural productivity has improved thanks to FMNR, whereas only 35% of producers said this in 2011. (Caddel Consulting 2015, p. 24)*

*"Before FMNR, I had low agricultural yields which did not exceed 1 ton of millet on an area of two hectares. But since I started practicing FMNR in 2012, my millet production reached 2.5 tons on the same land. In addition to ensuring the food security of my family, I have been able to sell the surplus production and buy new farm equipment and build a small house. Now I am an FMNR trainer and the money I make from this is invested into the education and health of my children. I can say unequivocally that vulnerability in my family has decreased considerably thanks to the BLST Project." [Farmer (male) Malem Senegal (Caddel Consulting 2015, p. 24)]*

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<sup>5</sup> 'Fertiliser trees' are those species which can capture atmospheric nitrogen and contribute it to the soil through their roots and falling leaves, thereby improving soil fertility. They are commonly used in agroforestry to improve the condition of soils used for farming, particularly in cropping systems.

- Farmers reported increased crop yields as one of the major benefits of FMNR in Talensi, **Ghana** (Weston *et al.* 2013a, p.37), yet this was not quantified nor translated into a decrease in the ‘hunger months’.
- Improvements to food security following increased crop yields were observed, but not measured, in Humbo, **Ethiopia**.  
*“After the project, we have got good rain, good crop production, fresher air, and water for livestock. All of the weather conditions for humans and animals have become good.”* – Male farmer, Humbo (Thiede 2014, p. 41)
- In Sodo, **Ethiopia**, improvements in crop yields were also noted (Szava 2015, p. 76):  
*Group discussion participants reported sizeable growth in crop yields. Some farmers suggested a growth from five to nine measures<sup>14</sup> in barley and wheat. Others reported similar change:*  
*Two or three years ago the yield was two-three quintals per timad, now it is four quintal per timad. Barley used to yield three quintal per timad, now six quintal per timad (FGD cooperative members, men).*  
*According to an agricultural development agent yields increased tenfold:*  
*Better yield now: before the project people used to get one quintal of maize per ha, now up to 10 quintals (KII kebele agricultural development agent).*
- The mid-term evaluation of the East Africa FMNR asked farmers about changes to crop yields over the past three years, as a result of growing crops with trees in farmland. Results were as follows:
  - **Kenya** 44% increased, 17% decreased, 38% no change (Odwori *et al.* 2016)
  - **Rwanda** 36% increased, 27% decreased, 37% no change (Jean and Medard 2016)
  - **Tanzania** 24% increased 41% decreased 36% no change (Masanyiwa and Safari 2016)
  - **Uganda** 69% increased, 14% decreased, 18% no change (Alexander 2016)

Note, this data was not disaggregated to account for those actively applying FMNR to trees on their farm in comparison to those who were not.

#### External evidence

- In an overview of FMNR in **Niger**, Reij *et al.* (2009) estimated that farmers are producing an estimated additional 500,000 tons of cereals a year, which they equate to covering the needs of 2.5 million people. This increase is largely attributed to the uptake of FMNR. FMNR also has an indirect impact on food security through tree crop products, which farmers can harvest and sell in local markets. Moreover,

despite a near-doubling of the population since 1980, Niger has been able to maintain per capita production of millet and sorghum, which make up more than 90 percent of the typical villager's diet. Per capita production remained at approximately 285 kilograms between 1980 and 2006 (Reij *et al.* 2009).

- In the Maradi region, **Niger** Haglund *et al.* (2011) noted that there was no discernable impact of FMNR on the yields of cereal crops, but there was an increase in the value of crop production, probably as a result of increased yields from other crops such as cowpeas and groundnuts, as well as increasing crop diversity. Gross income per capita was 86,104 CFA (US\$167) for adopters and 62,996 CFA (US\$122) for non-adopters.
- In an assessment of FMNR in the Sahel, modelling was applied to a large household survey data set to understand the effects of trees on crop yields. Results showed a significant effect of mature fertilizer trees on crop yields in the range of 15-30 percent of observed yields for **Niger** and **Mali**, and sorghum in **Burkina Faso**. *'This is a significant contribution, especially since most farmers have fertilizer trees on their cereal plots whereas very few apply fertiliser'*. (Place *et al.* 2013, i).

### ***Increased household income and assets***

Smallholder farmers have traditionally maintained trees and bush areas as a source of energy, nutrition, medicine and construction materials, and to provide a buffer to crises such as crop failures or income shortfalls. Tree products also play an important role in assuring food security, especially in the 'hunger months' when grain stores are low and farmers are waiting for the next harvest (Faye *et al.* 2010). For Sahelian countries, the gathering of agroforestry tree products is one of the few livelihood activities that hold great potential for income generation and poverty reduction among resource-poor households (Faye *et al.* 2010, Binam *et al.* 2015b). When farmers perceive the potential market value of products such as fruits, fodder or shea butter, they are more likely to invest in the protection and regeneration of trees and shrubs (Faye *et al.* 2010). If FMNR increases tree cover, then it follows that opportunities for increased household income can arise.

A small empirical evidence base is emerging on the benefits of FMNR. Economically, small-scale farming families can experience income growth as a result of improved crop yields, the sale of tree products and improved livestock production as well as the growth of assets such as high value trees. For some World Vision projects, income for community has also been derived through the sale of carbon credits. In some contexts there might be a time delay before income benefits from FMNR are accrued (for example, if there is no market for fodder or firewood). This is being addressed by program designs which include other economic development activities to provide short-term income wins.

Our review has identified that FMNR can increase opportunities for women's income generation, and this is specifically addressed in a subsequent section, 'Gender outcomes for FMNR', in order to allow for substantive analysis and consideration.



### Internal evidence

- Brown *et al.* (2011) demonstrated the income earning potential of FMNR from carbon sequestration. The Humbo Community-based Natural Regeneration project in **Ethiopia** regenerated 2,728 ha of degraded forests, which is expected to generate about 760,000 USD in the first ten years of the project through the Clean Development Mechanism. In the final evaluation, 68% of respondents reported 'less' or 'much less' poverty in the community compared with 5 years previous (midline evaluation 8%, endline non-project area 43%) (Thiede 2014, p.60).
- In Sodo, **Ethiopia**, 57% of respondents thought that poverty had decreased in the community, which they frequently attributed to the project. 16% thought that poverty had increased, but none attributed it to the FMNR project (Szava 2015, p.15).
- A Social Return on Investment<sup>6</sup> calculated for households in Talensi, **Ghana**, indicated that the livelihood impact/household ranged from USD 655-887 per annum (Weston *et al.* 2015). The top four greatest contributions to these returns were: creation of tree stock assets for individual households and communal stocks, increased access to wild/natural resources, carbon sequestration due to net increase in tree growth and improved health due to improved diet (Weston *et al.* 2013a, p.57).

*'The third most significant improvement perceived by target stakeholders is a cluster of psycho-social benefits consisting of joy and peace-of-mind from the enhanced beauty and comfort of the now greener landscape, enhanced leadership confidence and experience for women and men who took part in FMNR groups, improved attitudes towards environmental management and greater optimism for the future of their farms and communities (Weston et al., 2015, p. 1414).*

*Furthermore, according to the focus groups, community collaboration necessary to share FMNR farmer-to-farmer and to establish collective protocols among land users improved social capital in Talensi, which can also enrich and secure the livelihoods of individual households. (Weston et al. 2015, p. 1414)*

- 73% of respondents (N=752 of 3300 direct beneficiaries and 15500 indirect beneficiaries) in the **Senegal** SFLEI evaluation who applied FMNR reported that their income had increased over the span of the project, although the size of the increase was not quantified (Kabore 2012 p.63). There was a significant association between gender (female headed households, 8% of respondents) and experiencing improved income (Pearson Chi-square test, significant at 95% level). Associations between being a project participant and observing increased income, and for practicing FMNR and observing increased income were both significant (P<0.001).

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<sup>6</sup> A Social Return on Investment (SROI) uses methodology to understand the aggregate value of changes brought about by a project. The SROI approach is founded on social accounting and cost benefit analysis and expresses important project outcomes as equivalent monetary values so that they can be compared with the cost of inputs (in-cash and in-kind).

*Even women and children can benefit in the short term by collecting fruit. With *Ziziphus mauritania* (Chinese date) you can eat it but with a bit of luck you can sell it and get some pennies. [Lead farmer, Senegal (Kabore 2012 p. 50)]*

*Improved yields from FMNR had a positive impact on our revenues... this enables us to cover our expenditures particularly those related to child education and health. It has also enable us to assure food needs for our families... [FGD women, Senegal (Kabore 2012 p.62)]*

- Farmers reported increased income in the household survey and focus group discussions undertaken in **Senegal** (Caddel Consulting 2015).

*The improvement of household incomes thanks to the BLST Project was asserted by 66% of the heads of households surveyed. However, this effect is more visible in Kolda and Kaffrine where 86% and 66% of the heads of households assert having improved their income thanks to economic activities developed by the Project. Only 41% have noticed an improvement in their income in the ADP of Mbellacadio. (Caddel Consulting 2015, p.25).*

*In the opinion of communities, income-generating activities such as beekeeping, the transformation of fruit tree products (wild fruits, *Zizyphus mauritiana*, baobab etc.) and the transformation and marketing of *Acacia colei* seeds constitute significant income sources (Caddel Consulting 2015, p.25).*

*"The sale of zizyphus wild fruit and baobab give me 1 500 to 2 000 F CFA every day, which is a monthly income of 45 000 to 60 000 F CFA. With this additional income, I am able to pay for the tuition and health of my kids. This activity works well for me and my children even help me with it. Currently, my children sell wild fruits to pay for their school supplies and clothes at the start of the new school year." [Farmer (male), Nguer Senegal (Caddel Consulting 2015, p. 28)]*

*"Before the Project started, I used to buy firewood. But since 2012, don't need to buy wood anymore thanks to the technique of pruning trees in my field where I practice FMNR. Now I have wood available regularly. In addition, thanks to the reforestation of eucalyptus, I can also sell wood. Revenues from the harvesting of wood increased from 25 000 to 100 000 F CFA between 2012 and 2014." [Farmer (female), Mbella Senegal (Caddel Consulting 2015, p. 26)]*

- The recent mid-term evaluation of the East Africa FMNR project in **Kenya** noted the following:

*'Among the households interviewed, 47% make an income from tree and non-tree products such as charcoal, firewood, fruits, medicine, and bee-keeping. This is higher compared to 31% reported in the baseline survey.'* (Odworu et al. 2016, p.15).

*"As a result of adoption of FMNR practices there is availability of enough grass for livestock and this has increased milk production enough for domestic use and sale". [Farmer (male), Wema Kenya (Odworu et al. 2016 p. 42)]*

- In the BRACCE project, **Timor Leste**, 47% of households reported incomes of less than \$100 per year at the baseline. In the endline survey only 18% of households reported incomes of less than \$100 per year, although 30% of female headed households still fell into this lowest



income category. This increase in income was in part due to FMNR and agroforestry, and also to other livelihoods programming within the community (Anda 2016).

#### External evidence

- Haglund *et al.* (2011), based on a survey of 410 households participating in FMNR in the Maradi region of **Niger**, found that FMNR increased crop production values by up to 60%, annual gross income of the region rose by 17-21 million USD, and annual household income grew by 18-24%, compared to non-adopters (~166 USD for adopters, 121 USD for non-adopters). A case study of the Maradi Integrated Development Project also found that incomes from wood sales were substantially higher amongst those that intensively applied FMNR (>150,000 CFA franc) compared with average farmers (17,465 CFA franc) (Cunningham and Abasse, 2005).

*'It is estimated that FMNR raises the annual gross income of the region (42,000 km<sup>2</sup>) by between 17 and 21 million USD and has contributed an additional 900,000 – 1,000,000 trees to the local environment.'* (Haglund *et al.* 2011 p.1696)

Larwanou and Adam (2008) calculated for three regions in **Niger**, that with an average of 40 trees per hectare, a conservative estimate of the additional value from FMNR would be \$56 per hectare/year (from improved soil fertility, fodder, fruit, firewood, and other produce).

- The value of products harvested from trees increased by approximately one-third across the Sahel and smallholder farmers who adopted FMNR were more likely to be food secure and have a greater capacity to cope with droughts and floods. The diets of participants for instance diversified significantly by 10-14% in **Burkina Faso, Mali, Niger and Senegal**. Tougiani *et al.* (2009) also concluded that income, food security and community resilience to drought was enhanced in Niger as a consequence of FMNR adoption as part of the Desert Community Initiative. Wood sales alone generated 46-92 USD a year, which represents significant income growth for an area where average yearly incomes are 200 USD. These additional revenues were critical for enabling participants in the FMNR project to cope with a drought and locust plague in 2005, which caused one-third of Niger's population to experience famine. Sales of FMNR timber and other tree products resulted in participating villages avoiding "...tragedy and reliance on famine relief" (Tougiani *et al.* 2009, p. 385).

Increased productivity of the trees is reflected in an increase in both domestic consumption and sale of tree products in the Augie district of **Niger**:

*One bundle of firewood sells for around US\$6 and the annual per capita income to villages from wood sales alone ranges between US\$46 and US\$92, a significant contribution to household budgets given that the average annual income in Niger is less than US\$200 per person. Sale of firewood and non-timber tree products in 2005, when over one-third of Niger's population suffered from famine*

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<sup>7</sup> FMNR is considered to have started in 1983 in the Maradi region, so over a time period of some 30 years.

*induced by drought and locust attack, meant that farmers involved in the Desert Community Initiative project avoided tragedy and reliance on famine relief. (Toungiani et al. 2009 p.385).*

- A more recent study by Binam *et al.* (2015a) supports these findings on the positive effects of FMNR on household incomes. A multivalued treatment framework was used to assess the effects of FMNR on 1080 households across the Sahel (**Mali, Niger, Burkina Faso, Senegal**). The average household increased their annual gross income by 72 USD by adopting FMNR continuously, meaning that a community of 1000 households earn an additional gross income of 72,000 USD. Noticeable changes are also observed on the value of tree products, with an observed significant increase in the value of the products harvested from trees by about 34-38% among those actively practicing FMNR. The authors also reported additional benefits for participating households.
- A study by Faye *et al.* (2010)<sup>8</sup> of the contribution of parkland trees to farmers' livelihoods in **Mali** found that native species of trees and shrubs contributed significantly to farmers' livelihoods by supplying food, medicinal products, fodder and wood. The contribution of farmers' annual revenue varied from 26% - 73% (up to USD \$650/annum) for households for which agroforestry products were the primary source of revenue.

*Evidence shows that when farmers perceive the potential market value of such products, they are more likely to invest actively in the protection and regeneration of parkland trees and shrubs. (Faye et al. 2010, p. 433)*

*The total annual revenue gained from selling parkland tree and shrub products ranged from US\$ 110 to US\$ 4411 among the villages surveyed, and the surveyed households obtained between US\$ 20 and US\$ 646 per year. This revenue contributed as much as 73 per cent of the annual household income. The income gained from parkland tree and shrub products was mainly used by men to cover wedding expenses, purchase agricultural equipment, and repair or purchase transportation equipment; whereas women spent their income on food, clothing, and children's school fees. (Faye et al. 2010, p. 431)*

- Iiyama *et al.* (2016) noted a positive association of FMNR with cereal and pulse farm income, and off-farm income from rent in a review of household survey data in **Ethiopia**.
- Noulekoun *et al.* (2016) also noted the positive benefits of *Faidherbia albida* to livelihoods in the drylands of northern **Ethiopia**, stating that '*the species has been conserved and managed by communities in agroforestry parkland over decades to increase its cover and sustain the different benefits derived from it*' (pg number not yet provided).
- A return on investment analysis for FMNR has been completed for **Mali** and **Niger** (Place *et al.* 2016b) to analyse costs and benefit streams per hectare over a 20 and 30 year timeframe. Two benefit streams were included – the value of direct tree products (wood and nonwood)

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<sup>8</sup> Note, whilst this paper does not specifically refer to FMNR, it refers to the practice of farmers protecting and regenerating trees, in a 'parkland' landscape, typical of West Africa.

and the value of improved crop yields, in this case, millet. Data from previous studies (Place *et al.* 2013) was used, and results are presented in Table 3 below. The 'investment' is to practice FMNR up to the average level in these countries, and costs included the establishment of FMNR, and annual costs related to tree products (upkeep and harvesting) and crop production. In all cases there was a positive return from FMNR for farmers, however break-even point was not until year 9 at a 10% rate, and a year or two later for higher discount rates.

**Table 3: Private economic returns from FMNR.**

US\$/hectare	Mali		Niger	
	20-year time period	30-year time period	20-year time period	30-year time period
	<i>NPV</i>			
10% discount rate	133.57	178.11	442.80	568.99
15% discount rate	66.82	82.46	253.94	298.24
20% discount rate	29.89	35.71	149.18	165.66
<i>BCR</i>				
10% discount rate	2.43	2.66	6.78	7.47
15% discount rate	1.94	2.09	5.40	5.83
20% discount rate	1.52	1.60	4.19	4.43

Source: Place *et al.* (2016b, p. 40)

Two areas require further insight – the significance of tree location (forest or farmlands) in accruing income benefits, and whether these benefits are shared equally with the most vulnerable groups in the community. Sinare and Gordon (2015) noted that scattered woody trees and shrubs that exist on agricultural land, that is, on fields, pasture lands and in fallow, can have higher cash or consumption value than products from forests, highlighting their contribution to rural livelihoods. Few studies explicitly discuss who benefits from woody vegetation (Sinare and Gordon 2015). A study of woody vegetation outside forests in **Burkina Faso** showed that that it was a significant source of income for the poor (28% of household income) but only contributing 13% of income for the better-off households (Pouliot *et al.* 2012), indicating the specific benefit of FMNR as a pro-poor intervention. Income can accrue from specific products such as shea butter or spices, which might be gendered in terms of whether it is seen as men's or women's work.

## ***Community empowerment***

A significant outcome for implementing FMNR is community empowerment. The term ‘empowerment’ has different meanings in different socio-cultural and political contexts, grounded in local value and belief systems<sup>9</sup>. At its broadest level, empowerment is the freedom of choice and action. Community empowerment is fundamentally about ensuring that people have the opportunities, information, resources and capacities to play an active role in developing and shaping their collective futures<sup>10</sup>. It is about creating spaces and opportunities in society so that people can lead – not only participate in – the creation of their futures, and as such, is both about processes and outcomes<sup>11 12</sup>. For FMNR, an important cornerstone of community empowerment is the agreed bylaws or regulations that underpins collective action to rehabilitate the landscape.

The World Bank defines community empowerment as ‘the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives. An empowered community is one that is confident, inclusive, organized, co-operative and influential (CDX 2008). The Community Development Exchange nominate four elements of empowerment: access to information; inclusion and participation; accountability; and local organisational capacity, which are used to frame this review.

Our review has identified that FMNR has provided an avenue for women to have a greater role in community decision making, and this is specifically addressed in the subsequent section ‘Gender outcomes for FMNR’.

### **Internal evidence**

#### ***Access to information***

Access to information through training and engagement with farmer groups underpins the FMNR project model. Examples include:

- In a review of **West Africa** FMNR projects (**Chad, Mali, Mauritania, Niger**) it was noted that ‘*in high performing communities, lead farmers selected by the project were active in experimenting with their own agriculture and income generation, and visiting others*’. (Weston *et al.* 2013e, p.6)
- In the Humbo Community Managed Natural Regeneration Forest Project, **Ethiopia**, many community members participated in training in FMNR techniques, carbon stock and biodiversity monitoring.

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<sup>9</sup> World Bank (2002) Empowerment and Poverty Reduction. A Sourcebook. (Edited by D.Narayan)

<sup>10</sup> Burkett, I. (2013) Editorial. Practice Insights Spring 2013 – Community Empowerment. International Association for Community Development

<sup>11</sup> Community Development Exchange (CDX) (2008) What is community empowerment?

<sup>12</sup> Community Development Exchange (CDX) (2008) Empowering evaluation: evaluating empowerment.

*"We have... got the training, knowledge, and skill. We have seen the whole land changed and covered with forest. As we manage the trees on our own homestead, so can we manage the forest as our own."* [Cooperative member (male) Humbo, Ethiopia (Thiede 2014, p. 32)]

*'According to the Transition Phase Terminal Report and interviews during the evaluation, the activities in this phase led to essential capacity and institution building, including the formal institutionalization of the forest cooperative union and training on carbon stock and biodiversity monitoring. These actions enhanced cooperatives' ability to protect the forest and capitalize on potential income streams into the future. Therefore, this relatively small additional investment is likely to have high returns with respect to achieving project objectives and realizing future benefits for the community.'* (Thiede 2014, p. 30)

*... the extensive time and money spent on training and awareness creation has led to marked increase in environmental knowledge and concern in the community... This knowledge and related practices have not only promoted compliance with forest regulations (a main objective of this training), but also have spurred conservation practices throughout the area in which direct beneficiaries live.* (Thiede 2014, p. 32)

- The **Senegal** SFLEI project embodied the principles of community participation and farmer-to-farmer extension in the technology promotion process. Both farmers and officials testified to a new spirit of 'unified management of collective resources' that did not exist before the project, increasing confidence in the sustainability of the project (Kabore, 2012).

*I trained six people after coming back from Niger. If you ask me today how many people I have trained, they would fill this room (about 20).* [Female lead farmer, Senegal (Kabore 2012, p.40)]

- Training for farmer groups in the FMNR technique was a significant part of the BRACCE project in Timor Leste (and elsewhere).

*Women made up 46% of the farmers group members engaged in the FMNR demo plots and also participated in FMNR training.* (Anda 2016, p.8)

*Women need to know about FMNR to and not just leave it to your husband. What if your husband passes away? We need to know what to do.* [Women's FGD participant, Timor Leste (Anda 2016 p.25)]

### ***Inclusion and participation***

- In the Humbo Community Managed Natural Regeneration Forest project (**Ethiopia**), cooperatives were formed to manage the approach to forest management and income through carbon credits. In an earlier review of the project, Brown *et al.* (2011, p.329) noted that *'Empowering local communities through the cooperative with both the governance structure to effectively manage the forest on behalf of the entire community, as well as the authority to undertake management actions, has the potential to unlock significant benefits in the management of natural resources in Ethiopia'*. In the final evaluation Thiede (2014, p.27) reported that there were improvements in trust and mutual understanding among community members, capacity of neighbours to work together to achieve collective goals and overall

optimism for the future of children in the community. 91% of cooperative members trusted their cooperative's decision making processes. 45% participated in the decision making processes 'often/always', and 36% 'sometimes', with only a small minority (18%) rarely or never participating. 85% of cooperative members were 'satisfied' or 'very satisfied' with the cooperatives' use of carbon income.

- Focus groups noted that the community collaboration necessary to share FMNR farmer-to-farmer and to establish collective protocols among land users improved social capital in Talensi, **Ghana** (Weston *et al.* 2015).
- In **Timor Leste**, the project facilitators worked with community leaders to strengthen traditional natural resource management processes, allowing communities to participate in, and influence, decision making. In the Timor-Leste cultural context the traditional mechanism for regulating human-environment interactions is called '*Tarabandu*'. *Tarabandu* is recognized under Timor-Leste law as a central element of governance at the community level and the government actively supports its implementation. A key element of these *Tarabandu* was restrictions on cutting and burning forest and grazing animals. The project made effective collaborations with communities to establish or strengthen *Tarabandu* in the villages it was operating in as this is essential to the sustainability of FMNR. In the household survey, 96% of respondents reported a decrease in the incidence of burning forest lands since the project began, and this was corroborated by focus group discussions and observations (Anda 2016, p.6).

#### **Local organizational capacity**

- Community empowerment was a significant feature of the Humbo Community-Managed Forest Project in **Ethiopia**. From the beginning, cooperative structures were established to coordinate forest protection and management, and oversee the future distribution of carbon income for community needs.

In an earlier review of the Humbo project, Brown *et al.* (2011) noted the following:

*The establishment of seven local forestry cooperatives, one within each of the villages which had historical tenure over the project site, has helped the participant communities to establish management and user rights over the forest land, and engendered within each of the communities motivation and momentum to manage their forest resources... Most community members have joined the cooperative and share in the management, benefits of forest products and decision-making processes. Empowering local communities through the cooperatives with both the governance structure to effectively manage the forest on behalf of the entire community, as well as the authority to undertake management actions, has the potential to unlock significant benefits in the management of natural resources in Ethiopia (Brown et al. 2011 p. 329)*

*'In Humbo, the establishment of legally robust land user rights and registered cooperatives laid a foundation for community user rights for this project... as communities begin to harvest firewood, fodder and wild fruits, a deeper level of confidence and trust in the user*



*rights agreement is emerging. Since the forest is now effectively “theirs” (ie the community’s) and not “the government’s”, there is a very high incentive for protecting it and managing it in a sustainable manner’ (Brown et al. 2011 p. 331)*

*‘Establishment of user rights and local cooperatives has generated community ownership and enthusiasm for this project – empowering the community to more sustainably manage their communal lands’ (Brown et al. 2011 p. 322)*

In the project’s final evaluation (Thiede 2014) the following observations were made:

*‘The (Humbo) project was also associated with perceived improvements in three domains: trust and mutual understanding among community members; capacity for neighbors to work together to achieve collective goals; and overall optimism for the future of children in the community. These perceptions—and the actions they drive—are likely to fuel motivate continued participation in the project and other development interventions in the area’ (Thiede 2014, p. 11).*

*‘The cooperatives appear to constitute durable and democratic institutions, and are likely behind observed perceptions of increased social cohesion and capacity for collective action. The democratic nature of the cooperatives ensured that carbon credit revenue would be allocated to projects prioritized by the community’ (Thiede 2014, p. 12).*

- The development of a ‘Circle of Friends’ in the INFOCUS project, East Sumba, **Indonesia** was shown to be an effective community empowerment approach, with 71% believing that there was ‘improved’ or ‘highly improved’ capacity in the community to make changes together (Lauranti 2015, p.48).

*‘What has been done by World Vision in Haharu is one of the best example on how the community is mobilised to then be able to mobilise themselves throughout the process of community work. INFOCUS project has established this commitment through their project design where in each stage of the project, assessment, planning, implementation, monitoring and a little bit of share in the evaluation stage; the community has to be involved actively to determine what should be done for the community. This was done through what they called as Circle of Friends (CoF) meeting. Initially, facilitators introduced the community on how they can use the CoF meeting as the medium of ideas, discussions and resolution where all the stakeholders in the village present and contribute for the development of their own village. There was no enforcement, the process took years for World Vision to gain trust from the village and encouraged the community to work for their own benefit... This practice provides a stronger moral reference point to empower the community, to do what is best for them and how they can contextualise their rights and needs within particular cultural and organisational locations. The CoF meeting has been very cost efficient, effective to the implementation of the project and consistent in the community development principles to address social and environmental justice in the community. All in one package: participation, empowerment, valuing the local wisdom and process principles are found in the practice of CoF.’ (Lauranti 2015, p. 51).*

### **Accountability**

To date, there has been no direct measure of accountability *per se*, beyond the standard World Vision reporting of good governance in project implementation.

### **External evidence**

- In **Niger** Tougiani *et al.* (2009) noted that the Desert Community Initiative (Niger) has increased social capital and equity through giving women and sedentary Fulani herders a voice in decision making and by facilitating inter and intra village dialogue. Through promotion of FMNR and providing an enabling environment for its maintenance and expansion, the initiative has enhanced community resilience to adverse conditions. Over six years (2001 – 2007) 170 villages became involved in the Desert Community Initiative, and 53 village committees were established, each encompassing three or four villages. These new organisational structures had approval from government and traditional authorities, with communities fully involved in programming, implementing, monitoring and participatory evaluation of their own natural resource management activities, resulting in some 130,00 hectares of FMNR, and fields covered with 103-122 trees per hectare (previously practically treeless in 1984). Inclusion of all stakeholders (women and men, village residents and sedentary Fulani herders living outside the villages) in decision making has been pivotal to the successful adoption and spread of FMNR. With increased confidence in their committees and the dramatic increase in wood available for home use and sale, villages have piloted rural wood markets to increase local control and reduce exploitation by middlemen who pay low prices.

FMNR contributed to increasing the resilience of households in **Niger** during the 2005 famine through greater natural (wood biomass and fodder) and social (autonomous local governance) capital (Tougiani *et al.* 2009).

*'by bringing villages together through village committees representing three or four villages, common district wide problems have been tackled and solutions found collaboratively. Working on a district level means that all stakeholders can be informed, have opportunity to provide input and be involved in solutions. Consultation facilitates consensus about the nature of problems, how they will be tackled and how infringements will be dealt with.* (Tougiani *et al.* 2009, p.387).

This is in contrast to prior to the initiative when each village and ethnic group worked in isolation and marginalized groups were not include in village decision making – a competitive climate of mutual mistrust and hostility. *'The DCI has succeeded largely because it was inclusive of all stakeholders. It built on local knowledge, skill and experience and generated a consultative and cooperative climate which has overcome fear of failure and subsequent ridicule amongst innovative farmers.'* (Tougiani *et al.* 2009 p. 388)

- Sendzimar *et al.* (2011) noted that a political vacuum in **Niger** between 1987 and 1999 reduced colonial and national oversight, allowing farmers and communities to take ownership of trees and the ways in which they farmed. Freedom to experiment and improve farmer-managed natural regeneration was amplified by establishing the organisations to monitor, discuss and enforce tree management in



villages. *'Resilience increased as a wave of innovation based on farmer-managed natural regeneration progressively reestablished woodland tree cover for over 5 million hectares, and local communities relearned-by-doing how to successfully manage their own people and landscapes'* (Sendzimir *et al.* 2011, p.16). Establishing woodland ecosystems required more than the better tree cultivation practices offered by FMNR – it also required changes in mentality and field practices and in the institutions by which communities managed resources. Farmers require freedom to experiment and improve FMNR, supported by the establishment of organisations to monitor, discuss and enforce tree management in villages (Sendzimir *et al.* 2011).

- Hansen *et al.* (2012) examined the management of trees in two locations in northern **Ghana**, including Yameriga (Talensi), where World Vision implemented the Talensi FMNR project, through an approach of interviews with community members (40), focus group discussions (4) and key informant interviews (13), as well as a systematic survey of the woody vegetation. They noted that *'farmers demonstrate skills, knowledge, and interest in actively managing the naturally regenerated trees in the cultivated land, deliberately protecting desirable trees within bush and compound fields'* and recommended that the FMNR approach championed by World Vision was more appropriate than tree planting as advocated by other organisations in the area (Hansen *et al.* 2012, p.250).

## Other outcomes from FMNR

### **General biophysical benefits of FMNR**

Ecosystem services can be used as a lens to integrate knowledge about how woody vegetation (trees and shrubs) affect ecosystem processes and contribute to livelihoods (Sinare and Gordon 2015). They include provisioning (eg medicinal uses, contribution of fodder for livestock) and regulating (eg soil nutrients, soil water content) services.

Trees and shrubs also support crop cultivation by enhancing water infiltration, providing shelter from winds, moderating local temperatures and supplementing organic matter in soils with leaf fall and litter (eg Cameron, 2011; Haglund *et al.*, 2011, Place *et al.* 2016b). As such, the trees and shrubs can increase soil fertility, soil moisture and crop yields, and decrease the erosive effects of wind and heat on crop and grazing lands (Francis *et al.*, 2015).

### **Climate change mitigation**

Agroforestry, as well as reforestation, is often considered a cost-effective strategy for climate change mitigation. Tree-based farming systems store carbon in soils and woody biomass and they may also reduce greenhouse gas emissions from soils (Mbow *et al.* 2014b p.63). Studies have shown that trees from FMNR sequester carbon at the rate of about 50 percent of wood biomass above ground (Place *et al.* 2016b).

### ***Increased assets, wellbeing and dietary diversity***

A case study of a World Vision project in northern **Ghana** (Weston *et al.* 2015) reveals that participants value additional benefits of FMNR most, beyond increased crop yields and household incomes. Such non-economic benefits of FMNR have not been adequately evaluated to date (*Ibid*). Most valuable outcome categories identified in the SROI study were: 1) increased assets in the form of tree stocks and improved livestock 2) increased wild resources (especially wild foods and construction inputs) for households consumption and sale and associated dietary health benefits; 3) improved psycho-social wellbeing as a result of a more aesthetically pleasing and comfortable community and work environment, enhanced leadership capacity of FMNR group members and a more positive outlook; and 4) improved soil fertility and crop yields. A 'Social Return On Investment' approach calculated benefits of USD655-887 per annum/ household.

### **Gender analysis – introduction**

This analysis examines the gender outcomes in FMNR projects, considers gendered barriers in FMNR interventions and identifies critical considerations for a more intentional gender approach to FMNR.

The current FMNR model does not include explicit gender outcomes and, to-date, WV has not programmed for gender in its FMNR projects. As a result, the evidence on gender outcomes in FMNR is limited. The available internal evidence is heavily reliant on anecdotal data with limited sex-disaggregated quantitative data. A significant amount of the gender content in internal evaluations is articulated in generalised language (about women's empowerment, participation, engagement etc.) with limited detail, making it difficult if not impossible to draw out gender evidence for the purposes of this EGA. Few of the external sources reviewed provide substantive gender content or analysis to draw upon, and those that do often reference the same limited number of original sources. Nonetheless, the surveyed evaluations and analyses have provided some valuable gender content and analysis with some important and exciting findings from a gender perspective.

This analysis is based on a literature review of 21 internal evaluations and analyses and 17 external sources (academic articles and grey literature). The gender evidence is based predominantly on WV evaluations from projects in Timor-Leste, Senegal, Ethiopia, Ghana, and to a lesser extent East Africa, with a few particularly useful evaluations, notably the final evaluation of the SFLEI project in Senegal, the Talensi FMNR project in Ghana and the mid-term review of the FMNR project in Humbo, Ethiopia.

### **Gender outcomes of FMNR**

The surveyed literature identified a number of broad but significant gendered empowerment outcomes from FMNR relating to enhanced voice, value and respect. In a WVA literature review of FMNR implementation globally, Francis, Weston and Birch noted that 'FMNR provides a platform for women to take increasingly important roles in agriculture production and community decision making' (2015, p. 16). The final

evaluation of the INFOCUS FMNR project in **Indonesia** found that community ‘participation was strong and had empowered the community, especially the women’s group’ (2015, p. 7). An assessment of the Desert Community Initiative FMNR project in **Niger**, found that ‘The DCI has increased social capital and equity through giving women and sedentary Fulani herders a voice in decision making and by facilitating inter and intra village dialogue (Tougiani et al., 2009 , p. 385). An article for Agrilinks about FMNR in **East Africa** described how women’s perceived value and contribution within the community can be enhanced through their knowledge and practice of FMNR; according to an FMNR champion from Mogotio, **Kenya**, ‘*I have a voice in the family and I am respected in the community because of the knowledge I have on FMNR, which I share and practice*’ (quoted in Karimi 2016). Two commonly cited external sources on FMNR are Reij 2006 and Diarra 2006, both of which, according to other sources, reported that women’s role in FMNR has improved their social status in the Sahel region of Africa.<sup>13</sup>

Beyond these broad empowerment outcomes, this analysis has identified a range of more specific gender outcomes based on the available gender content and analysis in the surveyed literature. The evidence consolidated here does not provide conclusive evidence of FMNR as an approach but rather indications of specific gender outcomes that FMNR can achieve, based on experience in a number of FMNR projects.

### **1. FMNR collective structures provide an avenue for women to have a greater role in community decision-making**

A number of evaluations have identified FMNR collective structures as a particular avenue to enable women to have a greater role in community decision-making. According to the final evaluation of the Talensi FMNR project in **Ghana**, ‘[p]articipation in the FMNR groups constitutes an informal leadership role in the community’ (Weston *et al.* 2013a, p. 58). The final evaluation of the Building Resilience to a Changing Climate and Environment project (BRACCE) project in **Timor-Leste** referenced women FGD participants who observed that ‘prior to the project men made decisions on their own but with the farmers groups there is more shared decision making now...Participation of women in the groups appears to have been extensive and women members report increased confidence in their participation in group activities and decision-making’ (Anda 2016, p. 8, 48). In **Indonesia**, the INFOCUS project (Increase Food Security within the Community through Sustainable Livelihood and Natural Resource Management System) used the Circle of Friends (CoF) collective structure as a critical mechanism for community participation and empowerment and this served as an important avenue for women’s decision-making. According to a female CoF member quoted in the final evaluation of INFOCUS,

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<sup>13</sup> Original sources not found. Reij, C. (2006). More success stories in Africa’s drylands than often assumed. Conference Proceedings, Forum sur la Souveraineté Alimentaire, Niamey, 7-10 Novembre 2006. Réseau des Organisations Paysannes et de Producteurs Agricoles de l’Afrique de l’Ouest (ROPPA), Ouagadougou, Burkina Faso; Diarra, M (2006). Restauration de l’Environnement et Changements Sociaux de Genre. Report part of Etudes Sahéliennes, Papers presented at Conference of Study Results of Natural Resource Management Investments from 1980 to 2005 in Niger, Sept. 20–21. Comité Permanent Inter-Etats de Lutte Contre La Sécheresse Dansle Sahel.

*What is interesting here, CoF also allows the women's group to be more involved. Some even takes important roles in the CoF structure. We have this opportunity through election and then work for two years. We learned this from World Vision and now we use CoF to settle most of our problems in the village. No one left behind. Everyone now has a place to say their piece'* (Delila K. Wandal, quoted in Lauranti 2015, p. 52).

In **Senegal**, participants in two different ADPs attributed improved sharing of decision-making to the Senegal Food and Livelihood Enhancement Initiative (SFLEI) FMNR project: in the words of one FGD with women,

*'Responsibilities are shared between men and women in terms of sustainable management of the environment...It is the same in the power of decision-making between men and women. Thanks to the project SFLEI, there is equality between men and women in decision-making powers [FGD with women]* (quoted in Kabore 2012, p. 82).

In the words of one lead farmer interviewed for the SFLEI evaluation, *'In my association of farmers in the whole ADP there are some positions for women, treasury account supervisor and secretary and they are now part of the decision-making process'* (quoted in Kabore 2012, p. 81). In **Ghana**, the FMNR project prioritised equal participation, and according to Weston, *'[h]aving half of all members women, in a region where women traditionally have very low rates of decision-making participation, is, therefore, a significant contribution by the project'* (2013a, p. 58).

The establishment of community by-laws in support of FMNR practice is another avenue for enabling women's participation in decision-making. According to the mid-term evaluation of the FMNR project in **Kenya**, a woman respondent from an FMNR CBO stated *'We have formulated 19 by-laws on FMNR but 4 are currently adopted. These are: Protecting water catchment areas, protecting communal land, use of 10% of land owned to practise FMNR and All women must be fully involved in decision making'* (quoted in Odwori *et al.* 2016, p. 81).

## **2. FMNR reduces the time required by women to collect firewood, though short-term constraints to firewood access are faced by some women**

In their WVA literature review of FMNR implementation globally, Francis *et al.* stated that *'FMNR increases wood supply and reduces the time required by women to collect firewood'* (2015, p. 16). In an internal report for WVA, Weston similarly states that one of the *'livelihood benefits of using FMNR to regrow indigenous trees into crop fields'* is *'Increased volumes of firewood on-farm (saving hours of time, especially for women)'* (2011, p. 4). More recently, a mid-term evaluation of FMNR across East Africa stated that *'[o]ne of the greatest gendered benefits of FMNR is the increase in firewood which means people don't have to travel great distances to source this fuel. This is a particularly positive impact for women and girls'* (World Vision Australia 2016, p. 19).

Based on surveyed internal evaluations, there is a clear trend in reduced firewood collection time. According to the mid-term evaluation of the FMNR project in **Kenya**, *'Women and children now spend less time on collecting firewood and finding grass/fodder for livestock'* (Odwori

et al. 2016, p. 85). Similar reductions have been noted to varying degrees in **Rwanda, Uganda, Timor-Leste, Ghana** and to a lesser extent in **Tanzania**. However, interestingly, the evidence for this gender outcome for women is, in most cases, more suggestive than conclusive (see Appendix A). No internal evaluations have provided sex-disaggregated quantitative data indicating reduced firewood collection time for women (or girls), with clear comparative sex-disaggregated baseline data. Instead, the evaluations make general statements about the positive impact on women. By the lack of data and specificity, there is also an assumption made in many evaluations that the ability to source firewood from one's own land means that it does not require any time to collect: it is still work that should be measured.

The lack of conclusive language in the internal evaluations stands in contrast to some external sources focused on FMNR in the Sahel, which have quantified the reduction in firewood collection time more clearly and conclusively. Reij (2006), an external source frequently referenced on this topic, reported that the 'average time spent by women collecting firewood has fallen from 2.5 hours to half an hour' in **Niger** (iii, referenced in WRI 2008).<sup>14</sup> A related point originating from the same source is that 'In villages that adopted FMNR, women spent on average just half an hour collecting firewood, compared to 2.5 hours in villages that did not adopt FMNR (referenced in Stickler 2012, p. 6) (see more in Appendix A).

#### *Short-term constraints to firewood access faced by some women*

Evaluations of FMNR projects in Senegal and Ghana documented that some women faced short-term constraints to firewood access in the early stages of FMNR, due to FMNR management of tree regrowth. According to the final evaluation of the **Senegal** FMNR project (SFLEI), the majority of survey respondents 'said access to firewood had decreased in the last 4 years' (Kabore 2012, p. 8). The same evaluation reported that 'the majority of women observed both a decrease in the amount of firewood and in the number of woody trees...So for women and children who collect firewood for the household, the initial impact on FMNR can be negative' (Kabore 2012, p. 51). Some women respondents described their situation has 'worsened', since they were unable to harvest wood in FMNR protected areas (Kabore 2012, p. 6). In the words of one FGD with women:

*Today the research for fuel wood is quite difficult. Because the forest is now protected and cutting trees is forbidden. Earlier the access to the forest was not restricted and we could cut wood in a chaotic manner...[FGD with women] (quoted in Kabore 2012, p. 60).*

Citing focus group discussions, the final evaluation for the Talensi FMNR project in **Ghana** noted that 'even for FMNR households, seeking firewood from the forest can still be a major time burden on women', though the burden 'may be greater for households that do not participate in the FMNR forest reserves' (Weston 2013a, p.40). The Talensi final evaluation also referenced that the 'protection of trees and shrubs on FMNR areas resulted in some women having to walk further to get firewood' (Weston 2013a, p. 49). In the words of one female

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<sup>14</sup> Noted earlier, haven't been able to find original Reij 2006 source.

respondent: *'We might leave to search for firewood at 7am and return at 2pm. In these hills, in the past, when they would burn and kill trees, there would be plenty of dead trees to harvest firewood and it would take one hour'* (Wakii women) (quoted in Weston 2013a, p. 49).

Despite the constraints, comments from FMNR participants in Senegal and Ghana indicated that an increase in firewood collection time may be tolerated given the longer-term benefits of FMNR. The SFLEI final evaluation for **Senegal** observed a 'recognition by all respondents that once trees had returned to the landscape the firewood situation would improve for everybody' (Kabore 2012, p. 6). In the words of a women's FGD, *'There are difficulties in finding firewood but the advantages of restricting access to wood outnumber the inconvenience...'* (quoted in Kabore 2012, p. 60). Similarly, the final evaluation for the Talensi FMNR project in **Ghana** quoted a female respondent who did not view the time as a burden given the benefits accrued by FMNR: *'We do spend a lot of time looking for wood. But it does not worry us because the benefits of the project for future generations are enormous. [...]'* (quoted in Weston 2013a, p. 40).

#### *Implications of saved time from reduced firewood collection time*

Though the evidence is limited, surveyed literature from both **Ghana** and **Kenya** suggested that women use the time saved from the reduced firewood collection time for educational activities and attending to their families' health (Weston 2013b, p. 21; Odwori *et al.* 2016, p.15). The MTR of the FMNR project in Kenya also noted that girls have more time for school as a result of saved time from firewood collection (Odwori *et al.* 2016, p. 42).

### **3. FMNR increases opportunities for women to generate income from marketing raw and processed non-timber forest products harvested from regenerated trees**

While men and women generate income from selling excess firewood and timber from regenerated trees<sup>15</sup>, surveyed literature indicated that FMNR increases opportunities for women to generate income from marketing raw and processed non-timber forest products. Women are ideally positioned to directly benefit from the income opportunities presented by FMNR regenerated trees because 'collection or harvesting of AFTPs [agroforestry tree products] such as leaves, fruits, pods is time consuming and labour intensive and in some places women and young children are the ones mainly involved in that activity' (Binam *et al.* 2015b, p. 525). In fact, women are expected to have a 'higher propensity to participate in marketing of AFTPs than males' (Binam *et al.* 2015b, p. 513).

Internal sources provided more indicative than conclusive evidence on this point.<sup>16</sup> According to the final evaluation of the **Senegal** FMNR project, '...70% of women said income had increased compared with 61% men which possibly reflects the project emphasis on women's

<sup>15</sup> The literature suggests that men and women tend to sell different forest-related products. According to Buffle *et al.*, men often sell firewood and timber poles (2011, p. 8). Other sources which examine men's income generation from regenerated trees include McGahuey and Winterbottom 2007; Gustad *et al.* 2004; Masters 2014; Kalinganire *et al.* 2007.

<sup>16</sup> According to surveyed evaluations, a number of FMNR projects have included an explicit focus on income-generation for women. The West Africa Natural Resource Management (WA-NRM) Programme in Mauritania has trained women in 'value-adding transformation of local fruit into juice, jam, cordial and marmalade' (Weston 2013c, p. 7). Similarly the WA-NRM Programme in Mali has trained women in processing of *Jatropha* grains into soap and bio fuel (Weston 2013d, p. 5). The impact of this focus on women's income-generation is not yet known.



income generation activities' (Kabore 2012, p. 3). The author later concluded that 'These results suggest that being a direct participant of the project, practicing FMNR and being in a woman headed household means you are most likely to have experienced an increase in income over the last four years' (Kabore 2012, p. 63). The mid-term evaluation of the FMNR project in **Rwanda** noted 'During the qualitative interviews, some of women respondents affirmed that FMNR project contributed to enable them generating income and provide for the households' needs...' (Jean and Medard 2016, p. 21). The final evaluation of the BRACCE project in **Timor-Leste** observed a likely 'positive impact on incomes for [female-headed households]' (Anda 2016, p. 45).

External sources have documented income generation for women through FMNR specifically and the regeneration of trees more generally. Mcgahuey and Winterbottom (2007) noted that in **Niger**, 'For women, widows, and the landless poor, restoring previously degraded lands through improved natural resource management has improved their access to land and increased their income generation opportunities' (referenced in Stickler 2012, p. 6). Reij, Tappan and Smale noted that farmers in Zinder, **Niger**, reported a 'stronger economic position' of women involved in FMNR and a 'better capacity to feed their families a nutritious, diverse diet' that includes more fruits, leaves, and vegetables (2009, p.57). Sawagado et al. described how women in **Burkina Faso** collected baobab leaves, flowers of the kapok (*Ceiba pentandra*), fruit of shea nut (*Vitellaria paradoxa*) and locust bean (*Parkia biglobosa*) trees 'for home consumption and to sell at local markets' (2001, p. 45). Sawagado *et al.* also referenced three wives of a Burkinabe 'farmer innovator' who gained 'a substantial annual income from selling baobab leaves', circa US\$210 (2001, p. 42). Binam *et al.* noted that women in the **Sahel** are on the 'frontline in marketing many of the AFTPs including shea either processed or unprocessed' (2015b, p.252).

The mid-term evaluation of the FMNR project in **Rwanda** highlighted another significant benefit associated with income generation from FMNR: increased social standing for women. According to the authors, women respondents commented that because of the income generation enabled from FMNR, 'they gain more consideration within their respective communities and making them participating in decision making within the community' (Jean and Medard 2016, p. 21).

#### **4. FMNR reduces the time required by boys to herd cattle due to proximity of available fodder, enabling them to attend school**

The final evaluation of the Talensi FMNR project in **Ghana** observed that boys are 'less likely to be removed from school to herd cattle to pastures due to local availability of fodder' (Weston 2013a, p. vii). Specifically, 'when livestock had to be herded far for pasture in the dry season, young boys were taken out of school to herd them on a daily basis. This is, reportedly, no longer necessary, due to the abundance of locally available fodder'. In the words of a female respondent: in the past, '*In each family, one boy might look after cattle...That boy would miss school all year. Now all the boys attend school!*' (Yindure Women) (quoted in Weston 2013a, p. 44). More recently, the **Kenya** mid-term evaluation found that the FMNR project resulted in 'a reduction of time required by boys to herd cattle and, therefore, freed to attend classes or recreation' (Odwori *et al.* 2016, p. 15). In the words of a respondent, '*Firewood is now available on farmland and this has saved time used*

*to collect firewood and distance covered. Our children are now doing better in school since they have ample time to study saved from grazing animals for boys and collecting firewood for girls'* (quoted in Odwori *et al.* 2016, p. 42).

#### **5. FMNR reduces the time required [by women and girls] to collect water (due to re-emergence of springs)**

Though the evidence base for this point is limited, evaluations of FMNR projects in Ghana and (to a lesser extent) Ethiopia indicate that FMNR can reduce the time required to collect water, due to the re-emergence of springs and therefore improved water access. This has particular implications for women and girls who are often responsible for household water collection, though surveyed literature does not specify the impact on women and girls. According to the gender assessment conducted as part of phase 2 of the Talensi FMNR project in **Ghana**, communities involved in FMNR have identified a link between FMNR, increased water access and reduced water collection time: in the words of a female member of a new FMNR community *'I have learnt from a friend that 'Tin-tuug libge tii' [local word for FMNR] can help us get more water because when there are more shrubs, then there is more water, therefore we also need 'Tin-tuug libge tii' so that we can spend less time to fetch water and more time to study'* (quoted in Owusu *et al.* 2014, p. 37). Similarly, though with much less detail, the final evaluation of the Sodo FMNR project in **Ethiopia** quotes a FGD with non-FMNR members who explain *'[With water in the spring] it is easier now than before. In the past we had to travel too far for water'* (Szava 2015, p. 89).

#### **6. FMNR contributes to improved household cohesion**

According to an Agrilinks article (Karimi 2016), FMNR can also contribute to improved household cohesion as a result of enabling especially men to stay close to home rather than leave in search of pasture land or economic opportunities. . Specifically, in the dry season in areas such as West Africa, men are more likely to migrate to urban centres leaving women behind to assume responsibility for many of the core FMNR tasks. The final evaluation of the West African NRM programme in **Mali** referenced leaders who 'spoke of the gendered challenge of rural poverty driving young men to the urban centres, which causes a deficit of farm labour and no-one to support the women and elderly' (Weston 2013d, p. 29). By staying close to home, men are able to provide greater support to the female members of their household and have more family time in general. According to the article about FMNR in **East Africa**, FMNR can lead to 'increased at-home support' for women: '(more grass as a result of more trees means pastoralist men don't leave home as often as they did for grazing and therefore the women receive more support from a present spouse or male relative)' (Karimi 2016). From the same article, in the words of an FMNR beneficiary in **Uganda**, *'My husband ideally would be absent from home many times in the year because he would have to go and ensure the animals get pastures and water...FMNR came as a saviour to us. With the land that we have regenerated, the animals are able to graze as new grass is coming up...I am also able to be home with him, as I don't have to go and look for firewood since we get that from the pruned tress... With my husband home more, I am able to spend more time with him without going to look for firewood, I can't ask for more!'* (quoted in Karimi 2016).



Note: No available sources identified evidence of decreased risk of gender-based violence (GBV) due to FMNR interventions, especially reduced firewood collection time.<sup>17</sup>

## Child-wellbeing outcomes

### *Household and child wellbeing outcomes*

The grey literature (our evaluations) suggests multiple such benefits, including those that have an impact on children. FMNR also teaches children about the link between environmental degradation and poverty, and of the value of trees for farming. This engenders hope and a sense of security about the future amongst children – for example, the introduction of trees to farmland was found to boost the optimism of children about their future compared with children living in places where trees continued to be lost (Weston, 2013a). The increased access to and consumption of wild foods may also provide nutritional benefits for children. These findings have not however been substantiated empirically. There is a particular lack of evidence on the link between FMNR and health outcomes, such as child growth, food consumption and nutrition, and there has been the suggestion that FMNR can increase milk and livestock production through increased land carrying capacity and fodder availability.

In a study of households in **Burkina Faso, Mali, Niger and Senegal** Binam *et al.* (2015a) report that actively practicing FMNR led to a dietary diversity increase of about 12-14%. Ickowitz *et al.* (2014) reviewed correlations between dietary intake for over 93000 children with land cover data for 21 countries in **Africa**, finding a statistically significant positive relationship between tree cover and dietary diversity, fruit and vegetable consumption increases with tree cover until a peak of 45% tree cover and then declines, but there was no relationship between animal source food consumption and tree cover. Findings suggest that children in Africa who live in areas with more tree cover have more diverse and nutritious diets.

*"Before I adopted the practice of FMNR, my agricultural production was not enough for me to feed my family, especially during the lean season. Since starting FMNR in 2010, I've noticed an improvement in my agricultural production. In 2013, my granary lasted 2 months longer than the previous years because my agricultural production had improved markedly. My children are eating better and their health has improved. We are no longer obliged to reduce the number of meals as we used to do before the adoption of FMNR in 2010."* (Farmer (male) Nguer Senegal (Caddel Consulting 2015, p. 25])

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<sup>17</sup> Interestingly, a children's FGD for the final evaluation of the Talensi FMNR project in Ghana suggested that increased vegetation cover caused by FMNR led to an increased risk of GBV: *'The FMNR project has provided cover for thieves and mad people who forcefully collect items when going to and from market. Also mad people rape our women.'* (Yameriga Children) (quoted in Weston 2013a, p. 49). The evaluator, however, 'found that to connect increased trees with increased criminality is a long stretch' (Weston 2013a, p. 49).

## Evidence for inclusion

Evidence for inclusion comes mostly from World Vision project evaluations to date, where reaching the most vulnerable within communities is a key tenet of general WV programming.

As the Project Model states (World Vision 2012, p. 18)

*It is important that all groups, including nomadic herders, non-timber forest product users, ethnic groups, religious and social groups, minority groups, vulnerable groups, and people with disabilities are included in early consultations and in the establishment of community-owned procedures and by-laws. This will clearly demonstrate to them the benefits of FMNR and their own inclusion in those benefits.*

*Evidence from good FMNR practice shows the important contribution that men, women, youth and vulnerable groups, including people with disabilities, all play in creating a sustainable environment, increasing income generation, and in creating healthy families. It is important to ensure that certain community members like elders, people living with HIV and AIDs or with disabilities will not be looked down upon if their physical contributions are less. The working group and coordinating partners should ensure that these community members will also benefit and can contribute at some point in the overall process such as selling product, advising or monitoring.*

The FMNR project model engages with children and youth to ensure sustainability, viewing them as farmers of the future with a significant role in managing and protecting natural resources. In some instances (eg SEFLEI **Senegal**, INFOCUS **Indonesia**) projects have explicitly programmed activities with children and youth such as environment clubs or integration within school curriculum.

*The project ensured that the children were exposed to environmental issues through their school activities. Even though, tree planting was not the main activity in the project (or FMNR project model), it was observed that all the schools, particularly the elementary schools, made sure that the students carried out this activity. The teacher in Rambangaru also told her success story to accommodate this activity in her science syllabus. Her students would earn good additional points at their subject when the trees managed to grow after some time... (Lauranti 2015, p.35)*

Where for some people, active participation in FMNR pruning may be precluded by their disability, the project model encourages involvement in other aspects such as income generation from forest products. It is also usual to see efforts made to include households who may have one or more family members with a disability, such as in **Timor Leste**.

*The HHS indicated that 2.6% of households included at least one person living with a disability... The project appears to have made particular effort to include people with a disability in project activities. For instance, people with a disability were given priority in accessing agroforestry materials. Project staff also visited the homes of people in the project area with a disability and in order to*

*determine appropriate levels of additional support so that they could attend training which allowed increased participation. Four project participants (2 men, 2 women, identified that disability was a difficulty/challenge for their participation. This represents 6.5% of people with a disability in households surveyed indicating that for those with a disability, this was slightly less of an obstacle to participation than sex. (Anda 2016 p. 46)*

In the Humbo FMNR project, **Ethiopia** (Thiede 2014) there were explicit efforts to recompense the most vulnerable – those that would be impacted by the closure of the forest – with support to develop new livelihoods. This was an additional cost for the project, but was seemingly beneficial. Beneficiaries were determined by the newly formed Cooperatives and included the landless who exploit the forest land, female-headed households dependent on fuel wood collection for income, and potters who obtain clay from the area (TetraTech 2014, p.10). They received training in new livelihoods, as well as *‘prioritisation of individuals from vulnerable groups for project-related opportunities (for example, paid labour, grass distribution)’*. (Thiede 2014, p.29).

A similar approach was undertaken in the BRACCE project in **Timor Leste**, where project staff specifically identified vulnerable households (eg with family members with a disability, or female headed households) for inclusion in the project.

There were other examples of the inclusion of the most vulnerable in project designs beyond the specific implantation of the FMNR project model. For example, it was noted in the BRACCE project, **Timor Leste** (Anda 2016, p. 30).

*The project also provided 74 small solar energy systems to vulnerable households. Beneficiaries were selected based on lack of availability of lighting due to poverty. The main rationale for providing solar systems was for a sustainable source of lighting for poor families who had children that were unable to read and study at night. The solar systems were well received as noted by one woman:*

*“Sunny days like today will make good light. The children can study and we can eat dinner by light. We can also charge the telephone. There is also a light in the bathroom and kitchen, which makes it much easier to cook dinner. We’ve had it for a long time now...”*  
(Female community member (28), Aileu, Timor Leste)

However, not all World Vision projects have been intentional or successful at engaging with people with disability or youth and this was noted as a limitation in the evaluation of the Talensi project, **Ghana**. For example:

*The project did not include any strategy or activities to ensure people with a disability participated or benefitted from the project. Given that people with disabilities are often the most marginalised and vulnerable in any community (and especially vulnerable communities), this is a weakness in design and implementation. (Weston et al. 2013a, p.58)*

## Gendered barriers to women's participation in FMNR

Evaluations of FMNR projects in Ethiopia (Sodo and Humbo) and Senegal have pointed to a number of specific gendered barriers that can limit women's ability to benefit from FMNR interventions. These barriers are noted here as key considerations for future FMNR projects. The barriers identified for the FMNR projects in Ethiopia relate to cooperative structures established as part of the FMNR project, however they are presented here given their wider applicability to FMNR collective structures.

### 1. Illiteracy rates are often higher in women, limiting their chances of assuming leadership and decision-making positions

According to the final evaluation of the Sodo FMNR Project in **Ethiopia**, '[t]he obstacle of illiteracy, more common in women than men, further hindered the chances of women occupying leadership positions' in the project's cooperative decision-making structures (Szava 2015, p.87). This link is also made directly by women's cooperative members: 'There are no women in leadership because the majority of women are illiterate; they don't know how to write and read' (Szava 2015, p. 87). Similarly, the final evaluation for the **Senegal** FMNR project reports 'stark differences in levels of literacy between women and men, with just over 50% of women recorded as illiterate compared with 26% of men, and three times higher rate of literacy in Arabic among men compared with women'. According to the evaluation, this has 'implications for achieving gender equity given that participation in project activities and selection for leadership roles often favour those who can read and write (Kabore 2012, p. 223).

### 2. Female-headed households are often poorer than male-headed households, limiting their ability to participate in and benefit from FMNR-related cooperative structures where membership fees are required

The final evaluation for the Sodo FMNR project in **Ethiopia** observed that female-headed households (FHHs) (41.3%) were less likely to belong to a cooperative than male-headed households (60.2%) and suggested that, although women were encouraged to join, this was due to FHHs being 'generally poorer, and less likely to be able to afford the joining fees' (Szava 2015, p. 64).<sup>18</sup> According to one FGD, '*It is more difficult for women to join. The problem is the money...It is more difficult for women to get the money. The men can get jobs away from the household and get cash income, but women have less opportunity*' (FGD non-members, mixed group (quoted in Szava 2015, p.87). This was also identified as a problem for youth (Szava 2015, p. 16). This challenge was also noted in the mid-term review of the FMNR project in Humbo, **Ethiopia**, though women were not differentiated in the information provided (Kabore *et al.* 2010, p. 81).

### 3. Where cooperative membership is based on single household member, women can be excluded and denied benefits

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<sup>18</sup> Based on this finding, the final evaluation recommended that 'Membership by-laws could establish a sliding scale which considers the economic circumstances of potential new members, in particular female household heads, women and youth, or create a special mechanism for them for the purchase of shares' (Szava 2015, p. 23).

According to the mid-term review of the FMNR project in Humbo, **Ethiopia**, women were ‘under-represented’ in the project (Kabore *et al.* 2010, p. 82). One reason given for the gender imbalance was the ‘community-determined [rule]’ that ‘only one member per household could join and men were more prevalent than women as head of household (80% and 20% respectively). Also, the community reasoned that once trained, men would pass on their skills to their wives’ (Kabore *et al.* 2010, p. 82). The MTR made particular note about the challenges of polygamous family structures for ensuring wider dissemination of benefits from cooperative membership noting ‘some wives could not access the benefits’ (Kabore *et al.* 2010, p. 82). According to women members of the cooperative, ‘*Women want to become members even if our husband is a member, because there are additional benefits...*’ [Women members of FDPC, Humbo, March 2010] (quoted in Kabore *et al.* 2010, p. 82).

### Final comments

As identified in the FMNR project model, and argued by others (eg Sendzimir *et al.* 2011), establishing woodland ecosystems requires more than the better tree cultivation practices offered by FMNR – it also requires changes in mentality and field practices and in the institutions by which communities managed resources. Farmers require freedom to experiment and improve FMNR, supported by the establishment of organisations to monitor, discuss and enforce tree management in villages (Sendzimir *et al.* 2011). To foster the widespread dissemination and enhance the capacity of farmers to increase, diversify and sustain tree-based production systems, an enabling institutional, technical and policy environment needs to be promoted (Binam *et al.* 2015a). Reducing risk and uncertainty through policy and institutional arrangements is critical to ensure tenure security for people to adopt FMNR (Iiyama *et al.* 2016).

*FMNR is an essential foundational intervention upon which everything that we are trying to achieve through ADPs becomes achievable in a sustainable way, that is, it does not compete with other ADP activities, it is supportive, complementary and very necessary. The reason it is necessary is quite simple. Unless you have a healthy, functioning environment you have no basis for food security, economic development (which depends on production and processing of raw materials), DRR, resilience, peace building, health and education. Without functioning natural resources, and in the face of cyclical patterns of droughts and floods, rural communities will be perpetually in survival mode. In survival mode, the risks of farming are so great that there is no incentive to invest in the necessary improvements that drive productivity gains and economic development. FMNR develops community capacity to restore the land, make it productive again, and build community resilience and opportunity. In addition, the proper application of FMNR principles results in true empowerment of communities, democratisation (participation and representation), gender equity and conflict reduction. This is because, if you manage a shared natural resource sustainably, it requires that all stakeholders come together to discuss how it will be managed, by whom, when, what not to do, and what are the consequences of non-compliance (Tony Rinaudo, pers. comm. June 2016)*

# Evidence Gap Analysis

## Summary

### Summary

### Introduction

This evidence review has established that FMNR is a low-cost pro-poor intervention to restore landscapes and increase household income, especially effective in the dryland regions.

The insights garnered during the process of this review highlight the need to adapt the FMNR project model to the context. At the heart of FMNR is the farmer, making choices regarding which tree species, and where. Whilst there are key elements of the FMNR project model, the promotion of 'one size fits all' technologies are to be avoided.

**FMNR is an approach that increases tree cover, similarly to other agroforestry methods.** Going forward, we must strengthen this message to build on the existing broad literature base that provides evidence of the positive impacts of increased tree cover in rural communities.

Published research findings for FMNR are strongest for **West Africa** (specifically **Niger, Mali and Burkina Faso**<sup>19</sup>) followed by East Africa, especially **Ethiopia**. There are few incidences of FMNR projects being evaluated elsewhere, and no published research.

In recent years, WV evaluations of projects including FMNR have occurred South-East Asia, specifically in **Timor Leste** (Anda 2016) and **Indonesia** (Lauranti 2015). There is a need to strengthen the evidence base regarding FMNR in tropical dryland contexts to better understand the applicability of the project model in these non-African environments to ensure that it is culturally and contextually appropriate.

There is a requirement to strengthen the evidence base for **East and Southern Africa, south-east Asia** and the **Pacific regions**.

Key considerations for program improvement are presented here – firstly, generally, and then specifically to ensure a gender sensitive FMNR approach.

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<sup>19</sup> Note, a proportion of the research for West Africa is published in French.

## Analysis of key outcomes for FMNR

### Increased tree cover

Good evidence exists for the impact of FMNR on tree density for West Africa and parts of East Africa.

Whilst the application of FMNR is farmer-led, there is a need to further explore its application in different contexts, in order to identify optimum tree density and mix of species for local farming systems, as this will assist with the adoption of FMNR. This requires additional work with lead farmers and local research institutes (Kabore 2012, p8). Strong evidence on changes in tree density is important in terms of demonstrating the impact of FMNR on landscape change.

A sub-question would be to consider the significance of tree location (forest or farmlands) in accruing income benefits (Sinare and Gordon 2015), and the influence of farmer preferences for particular species. For example, in Timor Leste, farmers showed a strong preference for applying FMNR to *Eucalytus urophylla* rather than *Eucalytus alba*, reflecting the economic value for the two species (Anda, 2016).

### Improved soil fertility

There is a broad evidence base for the improvement of soil fertility through FMNR, however this is mostly based on farmer perceptions and qualitative data. Conceptually, the addition of additional organic matter through FMNR to improve soil fertility holds, but specific experimental data for changes in soil fertility through time is limited.

### Increased crop yields

Whilst there are examples of FMNR increasing crop yields, most notably through improved soil fertility and some microclimate effects, results are not predictable. Crop yield variation can also relate to rainfall and site quality, and it is important to ensure that farmers are exposed to multiple options that they can test and select from (Bayala *et al.* 2012, p.21). Promoting local experimentation allows for more nuanced and context-specific recommendations, whilst partnering with research organisations (such as ICRAF) will help provide an understanding of the processes and principles underpinning changes in crop yield (Binam *et al.* 2015a, p. 569).

Whole farm trials and additional research on crop effects in local FMNR systems are needed to quantify changes at field level and in terms of food security outcomes. There is good evidence for increased yields when 'fertiliser trees' are incorporated into cropping systems in West Africa, but more detailed evidence is required for different contexts and species mix to ensure that FMNR farming systems are optimised.



### **Increased income**

Whilst FMNR has been shown to increase household incomes, stronger evidence would be valuable, as well as an assessment of the different impacts for women and men.

Whilst some research indicated that benefits from FMNR can have greater impact on poorer households (see Pouliot *et al.* 2012), there is still a broader question as to whether benefits from FMNR are equally shared with the most vulnerable groups in the community (Sinare and Gordon, 2015).

### **Community Empowerment**

Evidence for community empowerment as an outcome of FMNR is strong, but mostly qualitative in nature. A more systematic approach to understanding and better measuring the mechanisms of community empowerment would allow for consistency between FMNR projects and improve the evidence base. This is pivotal to the long-term sustainability of changes arising from the programming of FMNR.

### **Gender evidence gap analysis of FMNR**

Based on the assessment of available gender evidence on FMNR, this analysis has identified four gender evidence gaps. First, there is an overarching need for more consistent sex and age-disaggregated quantitative and qualitative data. This data would help build gender evidence, for example, on the income generation impact of FMNR for women, for which there is more indicative than conclusive evidence. Second, there is a need for more robust evidence of the impact of FMNR interventions on gender norm changes, such as changes in women's status within household and community, resulting from their participation in FMNR collective structures and contributed to increased household income from FMNR.

There are two evidence gaps that relate specifically to the gender outcome on reduced firewood collection time. First, there is a need for clear and conclusive quantitative data at baseline, mid-line and endline demonstrating change in firewood collection time for those responsible. Longitudinal studies of this impact would be especially beneficial to help build the evidence base for this gender outcome. Second, there is a need for evidence of the implications of saved time from reduced firewood collection time and other benefits from FMNR for women, girls, men and boys.<sup>20</sup> This evidence would undoubtedly

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<sup>20</sup> Importantly, the mid-term evaluation of the FMNR project in Kenya noted that the final evaluation will include more analysis to 'assess what women and girls are able to do with time gained from not collecting firewood' (Odwori *et al.* 2016, p. 21).

be appreciated by donors, including DFAT, who are increasingly attentive to issues related to women's workload.<sup>21</sup> This evidence would provide an opportunity to examine nuances around women's firewood collection responsibilities, including, for example, whether there is an attendant reduction in opportunity for socializing and support networks.<sup>22</sup> This evidence would also be beneficial toward building a clearer picture of the impact of saved time for girls and boys from firewood collection and herding respectively. While girls are responsible for firewood collection alongside women in many countries<sup>23</sup>, importantly, there is limited data available about FMNR and girls specifically.

### Detailed

#### Main Areas of Evidence Gap for Program Improvement

#### Recommendations for program improvement

In reviewing the evidence for FMNR, key areas requiring attention were identified. These are aspects of the FMNR project model implementation that underpin the impact of FMNR within a community.

##### Technical practice of FMNR

Some projects have reported that where FMNR was being applied, the technique was not optimal and did not maximise the potential of coppiced shoots (eg **Senegal** (Kabore 2012 p.7)). Further, farmers did not mark trees and pruned the regrowth too hard leaving trees spindly and vulnerable to breaking. Whilst one of the key tenets of FMNR is that it is 'farmer managed', good technical practice can strengthen project outcomes.

##### Cultural attitudes to clearing fields and removal of potentially useful trees

In some countries, there are strong cultural norms of clearing fields – evidence of being a 'good farmer'. Farmers may view trees as competition to crops for nutrients, light and water and extension messages in many countries continue to encourage farmers to 'clean' fields (Place *et al.* 2016a). For example, in **Senegal**, almost all farmers (93%) surveyed said that they removed trees from their crop land, and many of the species removed are valuable FMNR species that have helped transform landscapes elsewhere (Kabore 2012, p.8)

<sup>21</sup> This is now also a target under gender equality goal 5 of the Sustainable Development Goals. Under Goal 5 - Achieve gender equality and empower all women and girls, target 5.4 is 'Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate', <https://sustainabledevelopment.un.org/sdg5>, viewed 2 September 2016.

<sup>22</sup> These final points were raised by the DFAT review of the East Africa FMNR mid-term evaluation.

<sup>23</sup> For example, according to the mid-term evaluation of FMNR in East Africa, 'When it comes to children it is girls who will be asked to collect firewood over boys; (WVA 2016, p. 21). By way of example, 'In Kenya 90% of women are responsible for firewood collection, alongside 55% of girls, compared to only 13% of men and boys respectively' (WVA 2016, p. 19).

The practice of farmers clearing trees, shrubs and grass regrowth from their fields just prior to sowing, can pose a serious threat to the success of FMNR, especially where fire is used to burn collected organic matter.

#### **Establishing tree ownership**

Ambiguity about ownership of trees can reduce the effectiveness of FMNR within communities. In Talensi, **Ghana**, the baseline evaluation established that tree ownership on one's own farmland was not contentious, and farmers were able to harvest and manage their own trees on their own land (Weston 2013a, p.14). The exception was dawadawa trees, traditionally belonging to the Tindana, the community traditional custodians of all community land, but this has not limited people's willingness to plant or regrow these trees in their fields.

Forest policy in a number of developing countries can require permits for the felling or cutting of trees of specific species, and so farmers would remove young trees from their land in order to avoid having to adhere to these rules in the future (Place et al. 2016b). The extensive greening of **Niger** was in part attributed to the relaxation of enforcing policies which banned felling or cutting trees (Sendzimir *et al.* 2011).

#### **Establishing bylaws**

A core component of the FMNR project model is to establish local bylaws which regulate the use of forest products, prohibit fires and control grazing. Through doing such, FMNR can foster tree ownership and land tenure security for farmers (Etongo *et al.* 2016). Alignment between local bylaws and government policy and regulations is also important (Brown *et al.* 2011).

Depending on the local context, establishing bylaws can be easy or difficult. At times, there might be direct conflict with existing regulations, for example, prohibiting the sale of firewood, when firewood can actually be harvested in a sustainable manner from FMNR plots, providing an important source of income. Building off existing cultural land management agreements can be particularly effective. For example, the use of '*Tarabandu*' in **Timor Leste**, the traditional mechanism for regulating human-environment interactions.

However, the negotiations and documentation of bylaws requires skillful negotiations and can be beyond the skills and experience of local FMNR facilitators. In the INFOCUS project, **Indonesia**, the knowledge and experience of the community stakeholders, particularly the village leaders, in policy development, as well as setbacks when there was a change in village officials, made the process of establishing village bylaws more difficult (Lauranti 2015, p. 47).

### **Enabling institutional arrangements**

The importance of enabling institutional arrangements in supporting the uptake of FMNR cannot be underestimated. Many project evaluations (eg Kabore 2012, Anda 2016) and external literature (eg Sendzimir *et al.* 2011, Binam *et al.* 2015a) identified this. *'To foster the widespread dissemination and enhance the capacity of farmers to increase, diversify and sustain tree-based production systems, an enabling institutional, technical and policy environment needs to be promoted'* (Binam *et al.* 2015a, p.569).

Cooperation between community based organisations and existing government and local institutions for forest management, together with local leaders, is essential to ensuring alignment in policies and approaches, overcome threats to tree resources, and motivate better management of land and tree resources. For example, in an early review of the Humbo community forest project, Ethiopia, it was noted that early collaboration with government at all levels was essential to the success of the project, making engagement and implementation simpler and more transparent (Brown *et al.* 2011, p. 331)

### **Programming for short-term income wins**

The incentives to invest in FMNR and tree-based systems is not always obvious to farmers, as the slower growth rates (in comparison to crops) can take years to materialise (Place *et al.* 2016a). For some contexts such as Humbo, **Ethiopia** and Talensi, **Ghana**, access to firewood, fodder and other non-timber tree products such as honey can provide a source of income within several years. Where viable markets for firewood don't exist (for example, parts of **Timor Leste** and **Indonesia**) due to market access, regulations or abundance then it is even more important to ensure that other activities contribute to the alleviation of poverty in the shorter-term. Integrating FMNR programming with other economic development activities can provide income benefits to households within the typical 3 year lifespan of a project.

The Humbo, **Ethiopia** project design specifically considered the mitigation of negative livelihood outcomes for those expected to be seriously disadvantaged in the short term by the closure of the community forest (Kabore *et al.* 2010, p.69). The objective was to ease the pressure on the forest while at the same time providing alternative forms of livelihood to these households. 'Direct beneficiaries' received a range of inputs and training to assist them to diversify their livelihoods, including livestock, tree seedlings, sewing machines and beehives to assist them to develop new enterprises.

Market participation for is also a critical factor to income generation for resource-poor households. This was explored in the context of four Sahelian countries (**Mali**, **Niger**, **Burkina Faso** and **Senegal**) and provides some insights for FMNR partnering with the World Vision Local Value Chain Development model. Binam *et al.* (2015b, p.528) noted the recommendations:

... (1) providing support to producer groups dealing with agroforestry tree products (AFTPs) in the Sahel on improved management and harvesting techniques, (2) developing mechanisms through which value chain actors can easily access market information such as facilitating linkages and interactions through multiple stakeholder platforms and (3) strengthening the capacities of marginalized groups involved in marketing of AFTPs could be some of the strategies for alleviating agroforestry farmers' developmental constraints.

#### **Reduced access to firewood**

The fact that FMNR initially reduced access to firewood was highlighted by community and lead farmer key informants in **Senegal** (Kabore 2012) and Talensi, **Ghana** (Weston 2013a). This can have specific impacts on women, as identified in the gender analysis.

#### **Livestock management**

Implementation of restricted grazing, especially during the early years of FMNR when trees and seedlings are very vulnerable. Heavy grazing pressure from livestock can also result in ringbarking of trees, breaking branches and tree trunks, and the destruction of seedlings (Kabore 2012, p8).

More rigorous measurements of crop yield require detailed data collection at the time of crop harvest.

#### **FMNR may fail to ensure the long-term viability of high value species**

Farmer needs are central at the very core of the FMNR approach. Subsequently there is still the possibility of impacting on the long-term viability of high-value tree species if conservation efforts do not account for a dynamic population distribution. For example, Noulekoun *et al.* (2016) note the impact of farmers on managing mature trees and removing seedlings from fields in northern Ethiopia may threaten the long-term survival of *Faidherbia albida* because the system is under the complete control of anthropogenic interference. The reinforcement of FMNR activities to protect juveniles from human disturbance.

#### **Appropriate community leadership**

Local champions for FMNR have been identified as important to increase the adoption of FMNR within a community. In a review of **West Africa** FMNR projects (**Chad, Mali, Mauritania, Niger**) Weston (2013e, p.6) noted that the high performing communities had active 'lead farmers'<sup>24</sup> who undertook experimentation with their own agriculture and income generation,

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<sup>24</sup> Lead farmers are dynamic farmers within a community encouraged to be involved in project implementation, for example, through membership of the local FMNR Group.

as well as visited others to demonstrate FMNR and coach others. Lead farmers were also pivotal in mobilizing other community members to learn and experiment in Talensi, **Ghana** (Weston *et al.* 2015).

A further study in the **Niger** regions of Maradi and Zinder noted a correlation between increases in tree density over 7 years and the presence of an FMNR oversight committee or leadership by the village heads (Baggnian *et al.* 2013). Tree density decreased over the same time period in another site (Ara Sofoua) which lacked leadership or a committee from 360 to 65 trees per hectare.

Faith-based motivations for rebuilding agriculture and the environment were examined in a study in **Senegal**, with a specific focus on FMNR (Cochrane 2016), and the important role of community leaders in effecting change identified. Tapping into Muslim and Christian beliefs about serving the community and protecting creation and cultural beliefs about shared work and collective progress toward better living standards allows community leaders to motivate the broader community.

*To implement everything... projects employ another local resource: strong familial and religious networks. Gaining access to these networks and working with respected leaders within them secures a broad base of commitment to any effort. It is also a way to disseminate ideas and build up the trust needed to commit people to an innovation long enough to test its efficacy. (Cochrane 2016, p.47)*

### **FMNR programming with Local Value Chain Development**

To date, FMNR has not explicitly been programmed together with LVCD, although many projects have had elements of economic development, such as inputs and training to support livelihood diversification in Humbo, **Ethiopia** and agroforestry support (high value trees, coffee) in the BRACCE project in **Timor Leste** (Thiede, 2015; Anda, 2016). As WVA is intentionally trialling this integration of FMNR and LVCD in newly-established Indonesia Rural Economic Development project in Sumba, **Indonesia**, it is important that we invest in appropriate evidence gathering from these projects.

## **Program Improvement - Gender**

### **Need for a gender-sensitive approach to FMNR**

The surveyed internal literature has identified a clear need for a gender-sensitive approach to FMNR and presented two main arguments for this approach. Firstly, a gender-sensitive approach is required to ensure that women and men derive equitable benefits from FMNR interventions. Secondly, gender is a significant factor influencing uptake of FMNR. Examples of these arguments are presented below.

## **1. A gender-sensitive approach is required to ensure that women and men derive equitable benefits from FMNR interventions**

Internal evaluations presented a number of significant findings highlighting the need for a gender-sensitive approach to FMNR. The final evaluation of the BRACCE project in **Timor-Leste** recommended that future designs be strengthened ‘to be more inclusive of women’, and by way of explanation, noted that ‘the engagement of women in this specific project was not as high as for men. A gender assessment at the outset would help ensure that activities met the needs of women and men’ (Anda 2016, p. 9). The final evaluation for the FMNR project in **Ghana**, for example, drew a direct link between the project’s ‘active’ promotion of equal participation by men and women and women’s participation in FMNR groups (Weston 2013a, p. 58). Based on its evaluation of the FMNR project in Ghana, Weston encouraged the project to continue its deliberate strategy to include women as active participants in development and ensure it is intentional in all programming to raise the role of women in household and community decision-making processes’ (2013a, p. 74). The final evaluation also highlighted the increased firewood collection burden for women as an example for why an explicit gender strategy is needed in future FMNR projects (Weston 2013a, p.49). A recommendation from the mid-term review of the Humbo FMNR project in **Ethiopia** encouraged an ‘Increased focus on equity of project outcomes for women and poorest households’ and states that ‘WV needs to ensure interventions narrow rather than widen disparities between vulnerable groups and others in the community’ (Kabore *et al.* 2010). The final evaluation of the **Senegal** SFLEI project concluded that the approach taken in the FMNR project had resulted in a ‘shift in the balance of power more towards women which is to be congratulated’ (Kabore 2012, p. 82). The project had a clear intention to engage women and men equitably and this resulted in ‘instilling a sense of pride and expanding opportunities for women’. In the words of one lead farmer (female?), *‘the project has provided equal benefits to women as to men and this has actually increased the social standing of the women. When you take 5 women, you take 5 men and this has given us pride’* (Kabore 2012, p. 81).

## **2. Gender is a significant factor influencing uptake of FMNR**

Recent ICRAF reports from **Tanzania and Uganda** identified gender/sex as a significant factor influencing FMNR uptake/adoption in project sites (Swamila *et al.* 2016, p. 19; Buyinza *et al.* 2016, p. 28). According to the ICRAF survey report on FMNR in **Uganda**, ‘the survey results show that if FMNR is introduced to males, the likelihood to adopt FMNR technologies significantly reduces by 145%. This means that females are more likely to adopt FMNR technologies as compared to males’ (Buyinza *et al.* 2016, p. 28). The authors suggested that ‘this may be because men consider FMNR as a long-term investment that takes long to yield benefits. The women on the other hand are patient enough, always in the gardens and attach more value (such as medicine, fruits and firewood) to trees’ (28). The report concluded that enhancing adoption of FMNR therefore



requires consideration of sex (and other major factors such as land tenure and group membership)' (Buyinza *et al.* 2016, p. 31).

The ICRAF survey report on FMNR in **Tanzania** went a step further and suggested that gender inequality – in particular as it relates to access to land and training – limited uptake of FMNR. Therefore, the authors argued that 'women empowerment initiatives aiming to address gender inequality, especially in accessing land and training on new technologies, may be necessary to improve the rate of uptake of FMNR in Tanzania' (Swamila *et al.* 2016, p. 21).

Along with the Uganda report which observed a greater uptake among women of FMNR, the final evaluation of the BRACCE project in **Timor-Leste** found that women demonstrated greater enthusiasm for FMNR compared to men. The author noted that 'there is a significantly greater improvement in women's knowledge of FMNR compared to the baseline indicating that their engagement in FMNR is more than just supporting men' (Anda 2016, p. 45). In particular, the evaluation found among women improvements in knowledge of 'up to 30% compared to a maximum increase of 17% for men' despite the fact that the 'the design appears to have assumed that more men would have participated in the BRACCE project (tree focussed), whereas more women were expected to participate in the LIFE project (vegetable focussed)' (Anda 2016, p.22). According to the BRACCE evaluation, women in FGDs 'expressed a good understanding and commitment to FMNR and saw it as something they should be doing too, not just their husbands: *Women need to know about FMNR too and not just leave it to your husband. What if your husband passes away? We need to know what to do*' (quoted in Anda 2016, p. 23).

The enthusiasm and early uptake of FMNR by women in Timor-Leste and Uganda encourages thinking about how to tap into this positive and promising behaviour in the design stage, including for example, creating or building on existing women-only farmer groups, and considering the potential of female FMNR champions.

### **Key considerations for a gender-sensitive approach to FMNR**

#### **As the 'chieftains of wood collection', women's participation in FMNR is critical**

Women are the 'chieftains of wood collection' (Weston 2011, p. 7) and a critical source of farm labour in many contexts therefore their participation in FMNR projects is critical. The final evaluation of the West Africa Natural Resource Management Program (Phase 2) (WA-NRM) in **Mali** noted that 'women are responsible for finding firewood, household cooking and helping prepare fields before planting (among many, many other duties). Therefore, women have a greater interest in the farm's wood supply than men' (Weston 2013d, p. 9). The final evaluation of the WA-NRM project in **Chad** recommended 'as NRM or farming groups and committees form, as much as it is in a project's sphere of influence, these committees must have a high quota of female membership in their constitutions and lead farmers/community extension

agents should be 30 to 50% women to ensure NRM practices are understood and shared with men and women in each household' (2013f, p. 8).

Weston identified an important lesson from **Senegal's** FMNR project: when you do not engage women on FMNR practices, they may work against FMNR as firewood collectors. He reflected, 'In the first year of SFLEI, a group of men in Thiappy ADP complained to me that they try to regrow trees in their fields, but the women make it impossible. Those women come through the fields to collect firewood and just cut down whatever is easiest to find. After discussion, we concluded that women, as the chieftains of wood collection, as well as key agents in preparing fields, are central to the FMNR story, but had been overlooked by the project for training, because we focussed on households heads' (Weston 2011, p.7). Based on this experience in Senegal, Weston concluded 'a good FMNR project will always engage female farmers as much as males' (Weston 2011, p.7). Ensuring women's participation as FMNR actors will also reduce the possibility of tension or conflict between men and women that might arise around firewood collection, referenced above.

Beyond recognising the importance of women's participation in FMNR, consistent engagement with women across the project cycle is important to ensure women's and men's different impressions and perspectives on FMNR are captured. This is especially important in cultures where women's and men's days are guided by strict gendered divisions of labour and each group may not be fully aware of the experiences and impact of FMNR interventions on the other. For example, the final evaluation of the **Senegal** FMNR project noted a significant difference in women's and men's opinion on changes in wood trees and firewood in the four years of the project (Kabore 2012, p. 51).

#### **Understanding of gender roles and norms is required from outset**

Gender roles and norms need to be assessed and well understood in the design stage of all FMNR projects since they will influence the ability of women and men to participate in and benefit from FMNR interventions. According to Weston in a lessons learned analysis on FMNR, 'A woman may want to adopt FMNR, but cultural environment does not allow women to attend the training or approach the extension officer to ask for assistance' (Weston 2011, p.9). For instance, the final evaluation of the BRACCE project in **Timor-Leste** found that '8% of women surveyed reported that home duties made participation in the project a challenge and 2% reported that their husbands did not encourage participation. (Anda 2016, p. 45).

According to the mid-term evaluation of the FMNR project in **Kenya**, 'Gender disparity continues to impact on implementation of FMNR where patriarchal culture in some communities in the project areas still regard women as inferior and deny them opportunity in equal decision making. Women embrace this culture and there is need to sensitize and empower women in making household decisions regarding FMNR practices' (Odowri *et al.* 2016, p. 17). The gender

assessment conducted as part of phase 2 of the FMNR project in Talensi ADP, **Ghana**, found that ‘...any project that fails to address these inherent [gender] issues is likely not to benefit women substantially, with any initial benefits eroding over time (Owusu *et al.* 2014, p. 49).

Gender norms relating to women’s access to and ownership of land are particularly significant. Women’s lack of land rights in many communities limits their ability to benefit equitably from FMNR. According to Iiyama *et al.* ‘Traditional land/tree tenure systems often do not allow women to plant trees according to their own preference unless men approve, even though it is the women who bear the burden of taking care of raising trees and collecting firewood (Deininger *et al.* 2009 referenced in Iiyama *et al.* 2016, p. 7). According to the gender assessment conducted as part of Phase 2 of the Talensi FMNR project in **Ghana** ‘...how can benefits to women in FMNR be sustained over a long period of time i[f] the major resource needed for the project, land cannot be owned by them. Women’s access and ownership of land should therefore be a priority issue for FMNR’ (Owusu *et al.* 2014, p. 48).

#### **Short-term solutions are required to mitigate risk of firewood constraints for women**

Given the potential short-term constraints to firewood collection for some women, including women with disabilities, the final evaluation of the **Senegal** FMNR project strongly emphasised the need for ‘accompanying measures’ that ‘enable women to use less firewood (e.g. improved stoves), earn more income to purchase firewood (e.g. small ruminant raising) and affordable technologies to replace wood as the major fuel source for cooking’ (Kabore 2012, pp. 10-11). According to the author, these accompanying measures ‘will be the key to success in the project region’ (2012, p.8). In the words of one male farmer respondent in the evaluation, ‘... since there is now restricted access to the trees the women have trouble finding wood in the beginning. So one of the challenges is to find short term solutions so that people are not tempted to steal wood from the trees. .... [Thiappy lead male farmer]’ (quoted in Kabore 2012, p. 60). The BRACCE final evaluation highlighted the popularity of fuel efficient cook stoves among project participants in **Timor-Leste** and the impact on firewood collection: ‘The stoves were well received by beneficiaries and contributed to reduced time spent collecting firewood compared to households without improved cook stoves’ (Anda 2016, p.29). Also, according to the author, ‘Of those who exclusively used these stoves for cooking, 93%, reported spending less time collecting firewood’ (Anda 2016, p.7).

#### **Careful attention is required to ensure equitable access to and benefits from FMNR training opportunities**

Two evaluations have highlighted a significant imbalance in women’s access to FMNR training compared to men, indicating that concerted attention is needed to ensure women have equitable access to FMNR-related training opportunities. The ICRAF survey report on FMNR in **Tanzania** reported that FMNR training was ‘mostly attended by men’, with women representing just 9% of training participants in one ADP (Kongwa) (Swamila *et al.* 2016, p. 19). The authors suggest that the

'need for women to seek permission from their spouses to attend meetings, seminars and training may account for their comparatively lower representation in the training' (p. 19). Similarly, the mid-term evaluation of the Humbo FMNR project in **Ethiopia** found a 'steep imbalance' in sex-disaggregated data on training: 'men in the CMNR project area have had much greater access to training than women' (Kabore *et al.* 2010, p. 24). Based on this finding, Kabore *et al.* note that 'For progress to be made in Humbo, there needs to be special attention to making training opportunities available to women (2010, p. 24).

Beyond basic sex-disaggregated enrolment and participation data, a gender-sensitive approach to FMNR might also examine the reasons why women do not participate (e.g. domestic responsibilities, lack of permission from husband) or drop out (where this occurs), as well as the impact of their training on FMNR adoption. Given the variations across ADPs, it is important to ensure training data is also disaggregated by ADP in order to develop a clear gendered picture of training opportunities.

#### **Diversity within female population needs to be recognised**

Differences among women need to be considered in order to ensure equitable participation and benefits in FMNR projects. The mid-term evaluation of the FMNR project in Humbo, **Ethiopia** found that 'the benefits of the Humbo project were not distributed equitably between men and women and there were additional inequities within women as a group, for example their status in a polygamous household, or having no husband and being very poor (Kabore *et al.* 2010, p. 83). The evaluation also referenced a concern raised about preferential treatment for wives of male members being selected for training opportunities, rather than women without husbands who are members (Kabore *et al.* 2010, p. 82). According to the final evaluation of the BRACCE project in **Timor-Leste**, the project had recognised the different needs of female-headed households and had 'made particular efforts to ensure women who were heads of households (widows, single mothers) were able to participate in BRACCE training activities, sometimes by scheduling training in their home gardens' (Anda 2016, p. 45).

## Main Areas of Evidence Gap for Relevant Donor Interest

### Main areas of evidence gap for relevant donor interest

There is a need for impact<sup>25</sup> evaluations, underpinned by statistically rigorous designs, to better capture direct and indirect benefits of FMNR.

Internal evidence for **biophysical impacts** requires strengthening, especially to claims of improved soil fertility, reduced runoff, and reduced soil erosion. To date, these impacts, other than some tree data (number, density, biomass) have been measured by qualitative indicators only. Increasingly, donors, researchers and practitioners are asking for information on FMNR impact on the above and biodiversity, species composition (trees, birds,..) ground water recharge, stream flow, water quality, impact on livestock (health, weight gain), human nutrition, income, crop yields, number of hectares under FMNR and tree density. Many of these impacts are difficult and expensive to measure, so caution is required in terms of prioritising evidence needs.

Improved documentation of the **costs of FMNR** in comparison to the alternative of extensive tree planting will also help demonstrate that FMNR is an effective, low cost approach to achieving land restoration.

Impact on **household incomes** also requires further investigation. Evidence is strongest for West Africa (eg Binam *et al.* 2015a, Place *et al.* 2015a, Haglund *et al.* 2011). To date, household income data has been self-reported, usually for the previous 12 months based on recollection within a household survey. Strengthening data collection models, including cash income and bartering, will allow for stronger evidence of FMNR impact. Time-use studies will also allow identification of benefits arising from time savings where they occur for women and children (eg less time collecting firewood), and highlight any additional labour burdens.

Income sources include:

- Improved crop yields
- The sale of tree products (fruit, firewood, honey, traditional medicines...)
- Improved livestock production
- Growth of assets such as high value trees

There is also a particular lack of evidence on the link between FMNR and health outcomes, such as child growth, food consumption and nutrition. There is a need for impact evaluations to better capture these indirect benefits of FMNR.

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<sup>25</sup> 'Impact' in this context requires further consideration. Currently it is commonly used as code for 'statistically rigorous quantitative studies' but these can be limiting if not embedded in a strong mixed methods design which also considers context and enabling mechanisms for change.

Further, many of these biophysical evidence gaps require scientific enquiry (hypothesised experimental designs), which are beyond the scope, time availability and skill sets of WV staff. In that donors are increasingly demanding this type of data, we should consider a budget line item for collaboration with a research partner which has the time and the mandate to undertake this research.

In summary, quantitative data is required for:

- Soil fertility (note, changes in soil fertility take time (years) and might be beyond the scope of our programming). Earlier wins may be obtained from studies on ‘fertiliser trees’ in fields as an alternative to government fertiliser subsidies.
- Soil moisture and water table recharge, water availability
- FMNR impact on crop yield, fodder production, livestock production and farm income. Impact on how much time farmer spends looking for off farm work. Impact on on-farm investment
- Changes to income, for women and men
- Child wellbeing (nutrition, ability to attend school, health, outlook for future...)
- Biodiversity (Environmental donors)
- Temperature (Climate donors, for example, Global Climate Fund)
- Carbon sequestration (for carbon market)
- Policy changes

## Thought Leadership

### Main areas of evidence gap for thought leadership

World Vision is well placed for thought leadership of FMNR whilst the ‘father’ of FMNR (Tony Rinaudo) continues to work at WVA. A compelling narrative of the outcomes and benefits of FMNR are made personally via study tours and in country training, and with supporting documentation on the FMNR Hub<sup>26</sup> and communications activities. However, the use of

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<sup>26</sup> [www.fmnrhub.com.au](http://www.fmnrhub.com.au)

published quantitative data as provided in this Evidence Gap Analysis provides evidence beyond the anecdotal to connect FMNR key messaging to new audiences such as DFAT, government policy makers, academia and donors.

*“People in government I’ve spoken to say that in order to convince policy makers to create favourable policies for FMNR, they need hard evidence such as spread of FMNR in other countries, impact on yields and livestock and farmers income, impact on water, desertification, erosion...”*

*In some countries FMNR is not seen by government as serious forestry, that is, they think it doesn’t have economic impact. Often there is a bias against indigenous trees – they are often seen as being inferior to exotics. There are strong biases against trees on farms – it’s seen as backwards, incompatible with farm machinery and another way to keep African farmers in the dark ages... (Tony Rinaudo, pers. comm. 11/6/16)*

This is supported by Tougiani *et al.* (2009) who writes *‘the strong belief that a good farmer was a ‘clean’ farmer, who removed this regrowth, was reinforced by extension and project staff who promoted ‘modern’ farming methods.*

## Moving forward

### Overview

Whilst there is good evidence for the effectiveness of FMNR, there is also opportunity to strengthen the evidence base to further demonstrate biophysical, economic and social impact. The insights provided by this evidence gap analysis sharpen the requirements for future evaluations, as well as identify areas best addressed by research partners. Areas for further development and recommendations for each key outcome are summarised in Table 4.

Table 4: Summary of evidence needs for FMNR

Outcome	Further evidence required
Tree cover	<ul style="list-style-type: none"><li>• More quantitative data required – tree cover is integral to FMNR.</li><li>• Strengthen tree monitoring protocols, and document costs of implementation in comparison to tree planting activities.</li></ul> <p>Recommendation: Every project requires both area of FMNR as well as tree density – baseline and endline.</p>
Soil fertility	<ul style="list-style-type: none"><li>• Impact can be long term – beyond scope of most World Vision projects.</li><li>• Strengthen links between most common trees and soil fertility – research literature.</li></ul>



	<p>Recommendation: Partner with others (eg ICRAF) for measurement.</p>
Crop yields	<ul style="list-style-type: none"> <li>• Improve measurement of crop yields in farmlands with FMNR through household surveys – main staple and cash crop.</li> </ul> <p>Recommendation: Partner with others for experimental research – beyond scope of World Vision.</p>
Household income	<ul style="list-style-type: none"> <li>• Sophisticated analysis to quantify impact of FMNR on household income, including when programmed with other approaches such as LVCD.</li> <li>• Analysis should be gender sensitive to capture differences in access and control of income. Are benefits from FMNR equally shared – across the community, between women and men?</li> </ul> <p>Recommendation: This should be a WVA focus as it is integral to every grant design.</p>
Community empowerment	<ul style="list-style-type: none"> <li>• Implement tools to more rigorously measure community empowerment – currently reliant on qualitative data only.</li> </ul> <p>Recommendation: This should be a WVA focus as is FMNR specific.</p>
Gender	<ul style="list-style-type: none"> <li>• More sex and age-disaggregated quantitative and qualitative data.</li> <li>• Longitudinal studies of the impact of FMNR on firewood and fodder collection time.</li> <li>• Impact of FMNR interventions on changes in women’s status within household and community.</li> <li>• Implications of saved time from FMNR for women, girls, men and boys.</li> </ul> <p>Recommendation: This should be a WVA focus as important to us and our donors.</p>

### Priority studies

Previous project evaluations have shown the effectiveness of FMNR in creating change in the community through empowerment and resulting in reforestation providing a variety of economic and biophysical benefits. Yet they remain somewhat unconvincing in the face of an audience demanding statistically rigorous evaluation designs. Greater geographic spread of FMNR project evaluations is also required to assess the impact in new and different contexts.

Two key opportunities to strengthen the evidence are identified:

1. An assessment of the integration of FMNR together with a LVCD project model to understand the different impacts within the South Asia context, using IRED in East Sumba, Indonesia as the case study.
2. A mixed methods assessment which looks at the impact of FMNR (trees) on household poverty across four countries in East Africa (Kenya, Uganda, Rwanda and Tanzania).

A further opportunity would be to strengthen the evidence for FMNR in Timor Leste by ensuring a strong evaluation of the 'Building Against Climate Change' (BACC) Bobonaro project in 2016-17. A new project in Somalia, 'Enhancing Resilience in Somaliland through Farmer Managed Natural Regeneration' also provides an opportunity to explore the implementation of FMNR within a fragile state context.

In the future, consideration should be given to returning to a previous project community such as Talensi, Ghana or Humbo, Ethiopia to assess the sustainability and longer term impacts of FMNR for communities, women and men.

### **Improved project designs for evidence needs**

Given the nature of the evidence required, and the concurrent programming of FMNR with other elements such as economic development, consideration to project design for evidence needs is required from the outset.

Project designs that allowed for impact studies, with control and intervention communities, would be valuable. Whilst the household could be the unit of analysis for income data (with consideration given to women and men), the nature of the FMNR intervention at a community level precludes random assignment of households *within* communities to the FMNR program.

Aligning with research partners from the outset (eg econometrics, biophysical and agronomic research), building off this Evidence Gap Analysis, is important to ensure that the design meets evidence gap needs and the required information is collected during the baseline prior to project implementation. This also requires appropriate budget from the project start. Designs must also allow for the disaggregation of FMNR impacts from complementary programming.

Tracking changes over time, not just at baseline and endline, would allow identification of the *timing* of project results – for example, improved soil fertility, increased incomes. This would support improved project design in the future because of a better sense of the optimal time to undertake activities and achieve desired outcomes.

Improved project designs would also consider data collection needs to better address the different impacts of gender for women and men, as outlined in previous sections.

Additional steps to improve the evaluation of FMNR projects and further development of the evidence base includes:

- Review FMNR project model and ‘simple’ theory of change to embed gender and update evidence,
- Identify gender outcomes for FMNR,
- Crosscheck World Vision’s FMNR project model indicators with these evidence gap analysis outcomes, ensuring strong alignment.

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