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Nuyok Farmer-Managed Natural Regeneration (FMNR) and Tree Planting ASSESSMENT REPORT



June 2023



Acknowledgement

The contribution of the entire assessment team (Nuyok Resilience Team and MEAL (Monitoring, Evaluation, Accountability, and Learning) Team) to collect qualitative information, analyzing data and compiling the report has been acknowledged. Grateful to Caritas Moroto Diocese (CMD) and Caritas Kotido Diocese (CKD) staff who helped define the sample size and mobilize participants for the Farmer Managed Natural Regeneration (FMNR) assessment.

Cover photo by CRS staff:

Top Left Lobolwala FMNR site in Abim.

Top right: orange seedling planted in Nabulenger Nakapiripirit district,

Bottom left: A farmer in Lorengedwat protecting an acacia tree with half-moon,

Bottom right: A contour ditch harvesting water at Loboloin FMNR site in Nakapiripirit.

Disclaimer: This assessment was made possible by the support of the American people through the United States Agency for International Development/Bureau for Humanitarian Assistance (USAID/BHA). The contents of the report are the sole responsibility of Catholic Relief Services (CRS) and do not necessarily reflect the views of USAID/BHA or the United States Government.

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List of acronyms

BHA	Bureau of Humanitarian Assistance
CKD	Caritas Kotido Diocese
CMD	Caritas Kotido Diocese
CRS	Catholic Relief Services
CU5	Children under five years of age
DBH	Diameter at breast height
DRR	Disaster Risk Reduction
FGD	Focused Group Discussion
FMNR	Farmer Managed Natural Regeneration
HA	Hectares
KII	Key Informant Interviews
NGO	Non-Governmental Organization
NRM	Natural Resource Management
OPM	Office of the Prime Minister
PLW	Pregnant and Lactating Women
RWANU	Resilience through Wealth, Agriculture, and Nutrition
UGX	Uganda Shillings
USAID	United States Agency for International Development
VDMC	Village Disaster Management Committee
VDMP	Village Disaster Management Plan
WASH	Water, Sanitation, and Hygiene

Executive summary

The Farmer Managed Natural Regeneration (FMNR) and tree planting intervention aimed to improve the resilience of vulnerable communities. The report presents the findings of a qualitative assessment of restoring 116 hectares (ha) and 52,000 trees using FMNR, 357,548 seedlings planted by the communities in the Karamoja sub-region, lessons learned about the effects of these interventions on food security, income, environment, climate change and overall resilience. FMNR practice is to find tree stumps and seedlings to protect them while the bigger ones are pruned by cutting lower branches to allow rapid growth. The report also documents best practices and the motivators and barriers to the adoption of the approach.

The study conducted seven focus group discussions (FGDs) and nine key informants' interviews (KII) in Abim, Nakapiripirit, Nabilatuk and Napak districts in March 2023. The team measured the diameter of trees at breast height (DBH), to evaluate the growth rate and compare it with the baseline DBH carried out in March 2021.

Key findings/results

The results show that communities understood the FMNR approach and appreciated the positive biophysical changes observed on protected sites, including the conservation of native trees. All participants said there was growth of trees and an increase in habitat for birds, dik dik (genus *Madoqua*), reptiles, rabbits, among others.

The protected trees served as a source of food, trees like terminalia Spp, *Ximenia americana*, *Balanites aegyptica* are a source of fruits and vegetables. Additionally, trees provide fodder for animals as they browse leaves on trees. *Acacia tortilis* pods are fed by goats during the dry season. Trees also provide fuel, wood, fencing and building materials for communities. Some tree species are medicinal from plants like *Ficus sycomorus*. The respondents also reported that FMNR controls soil and wind erosion. The communities also understood they would also have the same benefits from planted trees once these grow and mature.

The semicircular bunds and contour trenches constructed on FMNR sites fostered regeneration, controlled soil erosion, and hydrated the landscapes by harvesting water during rainfall events. All the respondents interviewed agreed that water harvesting structures have not only been a source of water for animals but also wildlife. While such practices are necessary for restoring landscapes, the communities find them labor intensive and require some level of technical competency to set up a contour. Contour bunds construction was tedious in dry season and rocky places since the soil would be dry and difficult to work on.

The above practices can achieve regeneration targets within a short timeframe. However, the selected soil and water conservation practices should be simple to implement to increase adoption by local communities. The simplest practice was half-moon method, and this was widely practiced by project participants.

The tree planting program in Karamoja, which is in addition to the FMNR approach was also reviewed, and this approach had mixed results. The project distributed over 357,548 seedlings and after two months the survival rate was 50%. In one FGD in Napak they reported 100% losses

all seedlings. The losses were attributed to drought, water scarcity and pest infestation like termites. One group said animals like goats and cows trampled the seedlings which were not fenced. In a March 2023 assessment, the team also found that 50% of the seedlings survived. The district officials interviewed mentioned the level of commitment from the community to manage and monitor tree growing was very low for communal woodlots compared with individual tree planting. However, even individual tree planting in the Karamoja sub-Region was associated with high levels of failure.

Recommendations

To improve FMNR, tree planting should be complemented with other activities such as:-

- (i) Improved soil and water conservation practices, using methods that are simple and low cost, such as demi-lunes (half-moons) and contour trenches.

To improve the success of tree planting and avoid high levels of seedling losses, planting should be complemented with additional activities including:-

- (ii) Prior to planting, project teams should undertake a soil assessment to make decisions on the timing of tree planting and growing practices. For example, soils with hard pan need early preparation of the planting hole prior to the actual planting period (the planting hole must be dug early in February, apply manure and later the tree is planted).
- (iii) Promote tree varieties that are valued by the community, fast growing, and are adapted to the harsh climatic conditions in Karamoja.
- (iv) To improve or reduce losses, projects should engage the community to develop a calendar for pruning trees so that they are able to collectively maintain the sites in the absence of the project staff.

The species that were best adapted include Markhamia Lutea, Azadirachta Indica (Neem), Eucalyptus, Pines, Senna semia, Acacia Senegal for woodlot and fruit trees like Mangoes, Citrus and Guavas. Also, Kei-apple for fencing.

Conclusions

Although FMNR is one of the simplest techniques for restoring degraded land, adoption of this approach is constrained by several barriers. The governance of communal land tenure makes it difficult to manage forest resources; deforestation is being driven by agriculture and the creation of new settlements; high levels of poverty drives charcoal production and there are conflicting interests between crop farmers and pastoralists where animals trampling tree seedlings. FMNR is also prone to bush fires initiated by pastoralists as part of their rangeland management. FMNR approach should be complemented by soil and water conservation practices to achieve best results. FMNR can be scaled through development projects. Tree planting is also necessary for the region, but it requires both proper planning and technical considerations for different ecological zones. Tree planting despite many failures in the sub region is important in addressing deforestation and food security issues. The success of tree planting campaigns will depend on the delivery models as the recent approaches have been on entirely free where both the cost of seedlings and technical support is borne by the donors.

1.0 Introduction

Catholic Relief Services (CRS) is leading a consortium of six partners to implement a six-year, United States Agency for International Development/Bureau for Humanitarian Assistance (USAID/BHA) funded activity, called Nuyok (which means “it is ours” in the local language) to improve food and nutrition security for vulnerable rural families in the four districts of Abim, Nakapiripirit, Nabilatuk, and Napak, in the Karamoja sub-region. To achieve the overall goal of food and nutrition security, Nuyok used a multi-sectoral approach to strengthen governance and gender equity, community capacity to manage shocks and stresses, traditional and diversified livelihood opportunities and nutrition and health (including improved water, sanitation, and hygiene (WASH)) of pregnant and lactating women (PLW), and children under five years of age (CU5).

To build the capacity of communities to manage shocks and stresses through the resilience pathways, Nuyok used a community led participatory disaster risk management approach implemented through the Village Disaster Management Committees (VDMCs). The VDMCs identified hazards, analysis, and planning and developed an action plan called the Village Disaster Management Plan (VDMP) having disaster risk reduction and climate change adaptation and mitigation measures to address different shocks. Deforestation was one of the key issues of concern that communities wanted to tackle. To reduce deforestation and reverse environmental degradation, CRS worked in partnership with Caritas Moroto and Kotido Resilience teams to encourage VDMCs and communities to adopt FMNR and participate in tree planting. The Nuyok team aimed to raise community awareness about the importance of FMNR and value of tree planting to address environment and climate-related shocks and improve their resilience through trainings on disaster risk reduction measures (for example, erosion control, fire line establishment, regeneration among others), improved livelihoods through labor-based incomes and skills in bee keeping.

1.1 Background to the Nuyok FMNR and Tree Planting Interventions

Karamoja is one of the poorest sub regions in Uganda and suffers from recurrent shocks and stresses such as drought, water scarcity, flooding following heavy rains, conflicts, pests, animal and human diseases, high winds, and uncontrolled fires. These have short and long-term impacts on livelihoods and recurrent shocks which have pushed many households into abject poverty and food and nutrition insecurity.

The sub-region was a major pastoralist zone in the past, but over the past 20 years, the communities have become far more dependent on farming systems and use of natural resources. For many families, especially the poorest households, they are increasingly engaged in charcoal production and sales of firewood, to provide cash and supply the rapidly growing urban centers. The rising demand for charcoal, is unfortunately also driving environmental degradation and this has other negative effects such as women needing to walk longer distances for their household firewood. Recent studies show that impacts of degradation have been worsened by climate change affecting crop farming and livestock production¹. Reversing environmental degradation through both tree restoration and tree replanting campaigns to slow the loss of natural resource

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https://www.researchgate.net/publication/284364313_Land_degradation_and_agriculture_in_the_Sahel_of_Africa_causes_impacts_and_recommendations

ecosystems requires a concerted effort. The endline evaluation for an earlier project, Resilience through Wealth, Agriculture, and Nutrition (RWANU) program reveals considerable knowledge on management practices among communities. However, the adoption rate for the NRM practices was 3%² at the endline despite an overall increase from the baseline.

Nuyok interventions for natural resource management and disaster risk reduction established activities to reduce environmental risks and improve natural resources. Positive outcomes were hinged on implementing community Disaster Risk Reduction (DRR) plans. Nuyok promoted FMNR to accelerate natural tree restoration in degraded landscapes and improving water harvesting practices such as half-moon and contour trenches. FMNR was practiced on household gardens and communal lands. The project also provided tree seedlings to 358 VDMCs.

By the end of the activity, Nuyok set up 17 FMNR sites, which covered over 116 hectares of communal and individual land. The VDMC members protected 52,400 trees at farm level. Nuyok continued to monitor tree growth through tree size measurements. Similarly, through Caritas Kotido Diocese (CKD) and Caritas Moroto Diocese (CMD), community members planted 68,449 fruit trees (mango, lemon, orange, guava, pawpaw, avocado, and jack fruit), 17,699 shade trees (neem and cassia), and 271,400 kei-apple seedlings to meet the nutritional and natural/green fencing of manyattas/homesteads and to promote climate adaptation and more resilient landscapes.

The project assessed best practices, opportunities, and challenges of landscape restoration through FMNR and tree planting in the Karamoja sub-region. The project also assessed the contribution of FMNR and tree planting to communities' resilience to food security and socio-economic, environmental and climate change.

Purpose of this assessment

The main objective of this study was to gather, document and share lessons/best practices for FMNR and tree planting in Abim, Napak, Nakapiripirit and Nabilatuk districts.

Sub-objectives

- Assess the contribution of FMNR and tree planting interventions to socio-economic, environment and climate change in the Karamoja sub-region.
- Analyze the motivators and barriers to the adoption of FMNR and tree planting.

2.0 Methodology

The assessment used a qualitative method through FGDs and KIIs to collect information on perceptions of communities on FMNR and tree planting and their contribution to socio-economic and environmental benefits. The same qualitative method was used to understand some of the opportunities and barriers to adoption.

² Final Performance Evaluation of Resiliency through Wealth, Agriculture, and Nutrition in Karamoja (RWANU) Final Evaluation Report

2.1 Assessment area and sampling

The assessment was conducted in all the Nuyok areas where FMNR and tree planting was implemented in Nakapiripirit, Nabilatuk, Napak and Abim. Purposive sampling was used to select the study areas. In each district, two villages were selected, one that had a communal FMNR site and the other that had tree planting and individual protection of trees at the garden level. The key informants (local leaders and district technical staff) were purposely selected based on their involvement in FMNR or tree planting activities in their administrative areas.

Table 1: The list of Sampled locations for the FGDs

District	Sub County	Village
Abim	Morulem	- Lobolwala Village for FMNR communal site
	Magamaga	- Bed Ata South-Koya village for Individual FMNR and tree planting
Napak	Lokopo	- Nakicheelet Village for FMNR community site
	Ngoleriet	- Nakipomia Village for individual FMNR and tree planting
Nabilatuk	Lolachat	- Nakurobuin Village for FMNR communal sites
Nakapiripirit	Loregae	- Loboloin Village for FMNR site
		- Nabulenger village for tree planting

2.2 Study population and sample size

The study population for the FGD were VDMC members in selected villages for both FMNR and tree planting. There was an equal representation of both men and women in FGDs. KII participants were selected by partner staff based on their experience. This included the district forest and/or environment officers, community development officers, LC3 and Senior Assistant Secretary, who can testify of the changes in the environment as result of FMNR.

Seven FGDs with VDMCs were conducted (Abim -2, Napak -2) Nakapiripirit -2 and Nabilatuk - 1) each with the composition of about 6-12 participants. The total participants were 82. Participants were randomly selected out of the 20 members of VDMCs. There were 9 KIIs across the districts.

Table 2: The list of Key Informant Interviews participants

District	Key informants
Abim	District Forest Officer
	Local Council 3, Magamaga Sub County
	Parish Chief, Aremo Parish
Napak	District forest officer
	Community Development Officer, Lotome Sub County
	Senior Assistant Secretary, Ngoleriet sub county
Nakapiripirit	District Forest Officer
	Parish Chief, Losam Parish
Nabilatuk	District Environment Officer

2.3 Data collection, quality, and analysis

Data was collected and analyzed by the project implementation team. The recorded interviews were transcribed and filled in the FGD transcription summary template containing codes/themes for synthesizing and each team member was assigned to a topic of interest as per the objectives of the assessment to analyze.

2.4 Limitations of this assessment

The major limitation of this assessment was related to perceived bias due to the familiarity of the approach by internal technical staff who were collecting and analyzing the data. The findings may have been diluted or some responses from the participants may have been overlooked. While the voices/findings help to shed light on the how/why/where/when/how of things, they do not represent generalizable data points.

3.0 Results and discussion

The results sections are divided into findings related to FMNR and tree planting.

3.1 Community knowledge and perceptions on FMNR

The communities involved in FMNR were asked about their knowledge, practices, and purpose of FMNR. Participants said they regenerated the sites by pruning trees by cutting lower branches, digging contour bands and half-moons next to the tree to harvest water for the tree growth. They all agreed as a group to slash and trim off grass around the site (creation of fire line and area enclosure) to prevent wildfires from burning the site. One group in Abim defined FMNR as a way in which a farmer finds a tree that is growing by itself and is then given proper attention regarding management by pruning, digging water harvesting methods and applying mulch inside the basin to enable the tree to grow. Most members said they had replicated FMNR on their farms.

Why did farmers adopt FMNR? A few individuals said that FMNR was introduced to address drought. Other participants indicated they were engaged to receive money from the cash for work incentive. Participants mentioned the benefits provided by trees including old branches are used as firewood, tree species that can easily be found for medicinal values, edible fruits, forage for animals. Other practices like contours harvested water for domestic animals and control flooding. The participants therefore understand FMNR because of the benefits the trees provide.

Lesson: Despite obvious benefits of FMNR practices, some community members only participate for immediate incentives. Although this is unsustainable in the wrong run, it could be an essential component to drum up initial interested and support.

3.2 Simplest and difficult FMNR practices

FMNR practice is to find tree stumps and seedlings to protect them while the bigger ones are pruned by cutting lower branches to allow rapid growth. The project added other technologies to assist in regeneration. The technologies included mulching, construction of contour bunds on landscapes and semicircular bunds besides trees under regeneration. As such, participants were asked which practices were easy to implement and could be replicated.

Lesson: Pruning was the simplest method because it can be done with available tools and can be done by young and old. This is crucial for implementation where communities are vulnerable and cannot spare money to buy expensive tools. Where feasible, simpler, and inexpensive tools

Lesson: Semicircular bunds and contour bunds were difficult because it requires additional tools such as pickaxes, hoes. Such specialized efforts require input from development actors and the government as vulnerable communities would be less willing to purchase these. To improve sustainability, these could be provided to communities on a cost-share basis where the communities also contribute towards their purchase.

Lesson: There are technical constraints to shaping contour bund. Making bunds and fire lines “requires a lot of energy.” Contour bunds were even more technical, as this requires correct measurements using the “A” frame technology to align with the slope. As the program sets out to implement these effective measures, there is a need to use simplified methods of training communities on how to implement these techniques. This can be in the form of identifying community members who can easily grasp concepts and lead this process.

3.3 Role of FMNR in Environment and Biodiversity

There was a consensus that FMNR brought many positive biophysical changes to the site ecosystems. The first change mentioned by the respondents was the increase in vegetation with some describing the site as bushy and dense. The trees in the sites had grown both in height and diameter. Secondly, the presence of animals like rabbits, dik dik and birds was seen by the participants. The data collection team also observed many bird nests on trees and chirping of different bird species like the winding cisticola, long crested eagle (Adokei), little weaver and superb starling (narekook) spotted at various sites.

Lesson: FMNR increases tree and bush growth, and this attracts increased diversity of wildlife. These are beneficial to the local communities as they increase access to food resources from trees and wildlife has many benefits including fertilizing the ground and spreading seeds.

One respondent said that “the FMNR brought a lot of changes in the area including the trees in the site have grown which has attracted insects like grasshoppers, birds and other animals like rabbits.” These statements were consistent with the responses from the District Forest Officers and sub county officials in the four districts who said there was increased biodiversity at the FMNR sites compared to non-protected areas.

The observed changes were in line with other studies which show that FMNR leads to restoration and creates functional and structural habitats for biodiversity such as plants, animal, and soil organisms³.

³ <http://fmnrhub.com.au/wp-content/uploads/2015/04/Francis-Weston-Birch-2015-FMNR-Study.pdf>



Figure 11: Loboloin FMNR site in April 2020 and March 2023, Loregae sub-County, Nakapiripirit district

3.4 Role of FMNR and tree planting in addressing mitigation and adaptation to climate change.

Many respondents in the district and sub counties said trees played a critical role in regulating climate. The respondents said trees protected at the FMNR site attract and changed the microclimate of their farms. They added that trees on their farms act as wind breaks and provided shade for resting during the farming season.

Trees play a role in climate change mitigation and adaptation. In 2020, Nuyok randomly sampled and measured the size of trees in planned FMNR sites, to inform DBH at baseline to compare the growth rates of trees by the end of the project. The average tree size at baseline was 3 cm. In 2023, 133 trees were randomly sampled from 15 FMNR locations and the findings showed that the current average size is 4.5 cm . Compared to 3 years ago, the native trees grew by 0.5 cm per year. The annual increase in size directly translates to the carbon stored by trees and subsequently carbon dioxide sequestration.



Figure 2: Tree Measurement of the diameter at breast height (DBH, 1 meter above ground) at FMNR sites. Photos from Loboloin, Lobolwala and Aroo FMNR sites)

Under climate change adaptation, the respondents said, “protected trees in gardens provide the crops with a cooler environment, improves soil fertility, provides wind breaks and shade”. While the respondents who protected FMNR sites said, “Trees provide shade for the people and animals in the community, beautify the place and reduce the speed of wind which would destroy houses”.

Nakapiripirit Forest Officer said “Nuyok FMNR activity is one of the approaches which has worked well in Nakapiripirit except that only one village was piloted. I therefore request the approach scaled up to help avert climate change impacts since many sites can be regenerated in the district”.

Lesson: FMNR is a simple intervention to adopt with the outcomes being felt within the shortest time possible and generates a lot of social benefits. This provides an eco-tourism site, bioenergy/fuel wood, fodder for livestock and above all it does not require advanced technical skills for management and maintenance.

Best practices: The use of half-moons, contour bunds and fire lines were important additions to the FMNR methodology and adaptation to climate change. The region has been prone to water and fire hazards and the communities seem not to have had an answer to this, but the introduction of these technologies will provide better protection.

The District Forest Officer for Napak said “Most of the FMNR sites that were bare have regenerated quickly and the gully’s which were previously created by erosions because of water runoff have been reduced because of soil and water conservation structures (half-moons and contour bunds) that were constructed. This statement was consistent with other officials in all the districts.

3.5 Role of FMNR and tree planting in food security and socio-economic gains

The respondents mentioned that FMNR contributes a lot to food security and their overall wellbeing. They added that FMNR approach leads to protection and conservation of native trees which are important sources of fuel wood, fodder for animals, building materials and medicines.

Lesson: Trees like *Ximenia americana* are known by the community to supply good fruits for the communities. Their flowers and the presence of water is also known to increase honey production. It is easier to encourage FMNR and tree planting with popular species with well-known benefits for sustainability unlike introducing unproven new species.

Another one added, “branches got while pruning trees are used as fuel wood and leaves fodder for livestock hence improving livestock productivity”. The Parish chief for Loregae sub county said “The FMNR site also provides fodder for the grazing animals especially the small ruminants leading to increased level of production for milk”.

Pruned branches of *Acacia* are used for fencing and provision of building materials to the community. Another one said, “trees are used for making mingling sticks and timber”.

Respondents mentioned that FMNR promotes the conservation of trees that are medicinal for animals and people. One respondent said that the tree like “Yaa”, when ripe, its flesh eaten, and the seed crushed for oil used for appetizing food and smearing as ointment newborn babies.” However, some members in the community looked at the site as a hiding place for the enemies because the FMNR site has regenerated with dense biomass growth.

Other added practices associated with FMNR have been acknowledged by many respondents as important in the rapid growth of trees and supply other benefits. Contour bands in the site keep water used to water our animals during scarcity. One respondent said, “The knowledge I acquired about controlling floods at the site was also helpful to us because we were able to divert and control water from our homes”.

Table 3: The list of native trees under FMNR with their benefits

Local name Lebtur/Ngarimojong	Botanical name	Benefit
Opedo	Harrisomia abyssinica	Medicinal/fodder
Ekwakwala	Strychnos innocua	Fodder-wild animals
Olam	Tamilina spp	Fodder-birds
Kworo/	Ficus sycomorous	Medicinal-its bark treats diarrhea/dysentery
Cumu	Diospyros mespilifomis	Medicinal remedy for tooth ache
Acuga	Carissa edulis	Medicinal-treats diarrhea
Orwecho	Vitex doniana	Medicinal-treats eye cataracts
Obwolo	Soursop (Annona muricata)	Medicinal remedy for back ache
Alemu/Ngalam	Ximenia americana	Fruits
Cwaa/Epeduru	Tamarind (Tamarindus indica)	Fruits
Yaa	Vitalleria paradoxa	Sheanut oil

4.0 Motivators and barriers for FMNR adoption

4.1 Motivators for FMNR Adoption and tree planting

FMNR and tree planting is a low cost, adaptable and regenerative practice for the indigenous tree species which is important for ecosystem resilience. The community also acknowledged that native trees grow faster and provide fruits, fuel wood and support apiculture.

The community engagement approach empowered the community to understand the challenges they faced such as rampant tree cutting. They opted to regenerate the indigenous tree species and offered the land for the setting up of learning site.

Lesson: The community led disaster risk management process made the community own the entire process together with the formation of the local committees to oversee the management and monitoring of the FMNR sites. This approach is better than a leader or NGO led approach where humanitarian actors lead the implementation of FMNR practices, which stops as soon as the actors leave.

“FMNR being the easy intervention to adopt with the outcomes being felt within the shortest time possible and also generates a lot of social benefits like being an eco-tourism site, provision of bioenergy/fuel wood, fodder for livestock and above all it doesn’t require technical skills for management and maintenance” says the District Forest Officer for Nakapiripirit.

Indigenous tree species in the FMNR site like Acacia senegal, Balanites aegyptica, Balanites orbicularis, Acacia seyal, Acacia hockii among other act as food and have medicinal herbs extracted from them.

4.2 The role of the district and sub county officials

The district and sub county officials supported Nuyok staff identify FMNR sites and facilitated FMNR and tree planting trainings. Additionally, they engaged the communities in developing by-laws for protecting sites.

The district and sub county officials took part in monthly and quarterly visits organized by Nuyok to check and inspect FMNR sites. During these visits, the community was advised on how to protect the sites, make corrections, and shared tips on community ownership and sustainability of FMNR sites.

District and sub county officials with support from VDMCs members used community meetings to sensitize communities on benefits of FMNR sites and tree planting in the community.

4.3 Barriers to FMNR adoption and tree planting

Although there was a warm reception by community members to FMNR and tree planting, there are still some barriers to the approach that were identified. These barriers make it difficult for communities to adopt the FMNR approach and tree planting which would otherwise benefit their communities.

In most rural areas, the land is communal and belongs to the state. The rural community has access to the land and can work on the land, but ultimate control lies with the government. As such, managing land under communal ownership is difficult because no one has the authority to control the land and its resources. Land management interventions can be destroyed when there is a change of land use.

Best Practice: The District Forest Officer for Napak recommends targeting farmers who have sites for regeneration for proper management and sustainability compared to communal land where no one is in control. Farmers will practice FMNR and tree planting on their farms knowing they will get the benefits directly.

Lesson: High levels of poverty and limited income opportunities is driving indiscriminate tree cutting for firewood and sales of wood and charcoal to boost household incomes. The communities prioritize immediate gain to alleviate their current vulnerability. This has increased the rate of deforestation, faster than the rate of FMNR and tree planting. To alleviate this, farmers need alternative sources of income.

Conversion of land into agriculture and creation of new settlements is accelerating deforestation. The FMNR sites of Lobolwala and Nakaramwae were settled by the owners and the Ugandan army respectively by the time of measuring the trees sizes.

Lesson: The conflicting interests between an agro-forestry farmers and the pastoralists hinder FMNR practices due to animal trampling on the tree seedlings and pastoralists using bush fires as a rangeland management tool. Community leaders with the engagement of the community members need to demarcate protected places where seedlings can be brought up safely.

5.0 Tree planting experience in Karamoja

Tree planting was promoted by Nuyok to complement FMNR and increase the nutritional diversity and tree cover in the homesteads of VMDCs where trees were completely cut during settlement. Across all the four districts, all participants said they received fruit trees. In Nakapiripirit, participants were able to mention types of fruit trees that were provided to them which included mangoes, citrus, oranges jackfruits, avocado and guavas. The participants preferred fruit trees because they are a future source of food and nutritious for good health and get income from the sale of fruits at maturity.

In Nakapiripirit and Nabilatuk all participants received five (5) seedlings each, while for Abim and Napak, participants received between 2 to 5 seedlings. Some participants rejected the seedlings because they were said to be of poor quality and some said to have rejected certain species like jack fruit, a species known by the community in Abim to be associated with bad luck to households.

The belief was confirmed by the LC3 of Magamaga who said, “communities do not want to plant jack fruit because they said you will die after planting and people cut them when they find it. but for me as a leader I have planted the jack fruit to show the community nothing will happen to me.”

In addition to the project seedlings, some participants in Abim received 10 seedlings from a project from the Office of the Prime Minister while in other districts a few participants bought seedlings using their own resources. In Nakapiripirit/Nabilatuk, participants bought some seedlings like eucalyptus and mangoes from GIZ and ACTED. They planted eucalyptus as a buffer to overcome the water logging in the community.

The participants were asked if the seedlings they planted survived. Many said they lost most of the seedlings because they dried up due to different climate conditions. And these were the same observations found in the monitoring reports where the survival rate was at 50%. The time of distributing seedlings in Napak coincided with the dry season putting a lot of burden to participants to water seedlings.

Lessons: The tree planting campaign experienced severe losses of at least 50% of the seedlings planted. This was exacerbated by seedlings given out during the dry season. Timely distribution and planting of seedlings is crucial for their survival. Planting during the rainy season ensures the seedlings have water during their critical stage of survival.

5.1 Tree planting challenges

All the VDMCs and the key informants at the sub county and district said tree planting in the region is generally challenging because of several reasons.

Lesson: Drought and climate variability makes it difficult to grow trees in many parts of Karamoja, unless farmers have access to year found water sources.

Lesson: Seedlings died due to infestation by pests and disease after planting, and farmers were not trained in how to control against these pests. Participants said many seedlings looked healthy on the shoot but fell off later. Upcoming interventions should ensure there is a component of pest and disease management for the project to be successful.

Lesson: Pastoralists commonly burn the bush to promote fresh pasture growth. Burning is a repeat obstacle to tree planting initiatives in the district. There is a need to work with community leaders to demarcate areas for tree planting and these be protected by community by-laws.

District officials also confirmed that bush burning in the dry season is a common practice which destroys trees, especially young trees and this makes tree growing difficult in Karamoja.

Napak forest officer said, *“The management of the woodlots is a challenge at planting, when trees are weak. Communities often abandon or neglect the woodlot interventions. However, individuals who offered their land for the trees to be planted are doing very well.”*

Lesson: It is difficult for communities to manage woodlots unless there is a clear business and management plan and incentives for protection and a level of investment in the first two to three years. Most vulnerable communities prioritize what could feed them on the day and not what would be beneficial in the next two to three years. This should be taken into consideration by development actors.

Even though individual tree planting was recommended, it was not successful in the past. The Parish Chief for Aryemo said OPM supplied the tree seedlings for planting but the community members who received them left the tree seedlings to die. This was the same observation with some of the Nuyok supplied seedlings.

Lesson: It is important to assess the past performance of interventions with local experts, prior to implementation, and or use the information from recent past experiences to adapt and improve the approach.

Lessons: When planting trees with communities be sure to follow the following precautions:-

- (i) Make sure to offer farmers tree seedlings during the rainy season,
- (ii) Only offer trees into locations that have sufficient water to support tree growth,
- (iii) Seedlings should not be given for free but at an affordable price. This can be at a cost-share modality that self-selects for people who really want the trees and are interested in managing the trees,
- (iv) Tree planting programs should not be forced if people have limited skill or not interested in managing them.
- (v) Assess the type of soils and environment before promoting tree planting. Necessary measures should be taken for locations with hard soil structure is hard, land is degraded and where there is limited access to water.

The District Forest Officer for Napak said, “The soil conditions in Napak, have a hard top pan and trees will not survive if tree holes are dug to the normal 50 cm depth, (about 1.64 ft), to be successful, the holes need to be at least 1 m deep and 1 m wide to allow the roots to penetrate and establish”.

Maintenance costs are remarkably high when setting up a woodlot whether as an individual or community while the cost of buying the tree seedling is cheaper and/or free when provided by government. According to Napak forest officer, soils with hard soil pan are expensive for local vulnerable communities for planting as each task is charged 1,000 Uganda Shillings (Ugx) (US\$ 0.27) from digging the planting hole, planting the tree seedling, watering, and application of manure, with a total cost of 5,000 Ugx (US\$ 1.37).

6. Best Practices for FMNR and tree planting in Karamoja

Inclusive participatory community engagement approach in the disaster planning process ensured households understood and appreciated the FMNR practices in addressing the environmental issues in their areas. The involvement of the community and district leaders in monitoring and training was key in promoting local ownership, scale up and sustainability of the practices.

Best Practice: Complementary interventions to FMNR like soil and water conservation and fire line construction played a key role in easy identification of the site under restoration which made the community prevent cutting trees in those locations.

Lessons: Timely planting and constant follow-up for participants that received tree seedlings contributed to the tree's survival rate. Areas that were not monitored had the lowest tree survival rate. It is important that the project has a monitoring component in place to follow up and offer solutions for problems faced by the communities to ensure higher survival rates.

7.0 Conclusion and recommendations

FMNR is an effective method which can be used by communities to restore degraded lands, increasing bush and forest cover. The findings from this intervention found that using to support FMNR in scrub lands increased vegetation cover and over time attracted more wild animals. The approach was adopted by the communities as it does not require complicated tools.

However, in the Karamoja context, FMNR alone cannot foster regeneration without added soil and water conservation practices. Key challenges included the prevalence of bush fires started by pastoralists, and this led to the recommendation to include fire lines, enclosures to restrict cattle in the FMNR areas.

To improve soil and water management, FMNR also requires construction of semicircular bunds next to the trees and contour trenches to increase water harvesting and retention and control soil erosion. The adoption of the complementary practices is dependent on the availability of the time, technical and outside resources to support the communities.

The inclusive community participatory approach played a critical role in ensuring the community and local leaders understood the risks with using FMNR and the roles each of them played in the project. The leaders and communities set up bylaws for the protection of the FMNR sites and

areas with traditional structures were managed by elders. However, it was difficult to enforce these bylaws in areas where land was owned individually like in Abim where the owners changed the land use to farming and settlements.

Communities with FMNR sites should be linked to voluntary carbon market projects provided there are additional incentives to strengthen the protection and conservation of the trees. This way, communities will know they will only receive payments or community benefits from the carbon trade, in the form of eco-systems services, if the tree planting is successful, the sites are managed by the community and that the forests were protected. This carbon related management schemes have a duration of at least 30 years.

A soil assessment is key in deciding the tree planting and growing practices. For example, soils with hard pan need early preparation of the planting hole prior to the actual planting period (the planting hole must be dug early in February, apply manure and later the tree is planted).

Giving trees to communities or individuals free of charge does not generally lead to strong community engagement, farmers who invest in trees to some portions have better results in terms of tree survival and permanence.

Promotion of individual tree planting should be accompanied with frequent technical support.

Plant trees varieties that are acceptable and valued by the community and selected trees must be adapted to the harsh climatic conditions.

The type of species selected should be fast growing to meet medium to long-term needs of the communities. Species that were found to be most appreciated included:- Markhamia Lutea, Azadirachta Indica (Neem), Eucalyptus, Pines, Senna semia, Acacia Senegal for woodlot as well as fruit trees like Mangoes, Citrus and Guavas. Also, and Kei-apple for fencing.