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Scaling Farmer Managed Natural Regeneration (FMNR) in Niger

TECHNICAL BRIEF

Fruit nursery and forest tree seedling production in the village of Wacha (Magaria, Zinder). The name of the young person is Haoua Harou.

Cover photo by Ibrahim Mana Koudoussou

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Summary

Niger regards restoring degraded landscapes as a critical issue for achieving its environmental and development goals. Farmer Managed Natural Regeneration (FMNR) is an agroforestry-based low-cost land restoration technique where farmers take an active role in regenerating and managing the growth of trees and shrubs from existing root systems or stumps. FMNR is increasingly advocated as a nature-based solution to address land degradation. Niger has long history of practicing FMNR, and the government has committed to restoring 3.2 million hectares of land by 2030, primarily through FMNR, to enhance the living conditions of its population.

Despite many years of experience in implementing FMNR in Niger, there have been significant challenges concerning the sustainability of the environmental and socio-economic benefits derived from it.[1] One of the critical issues lies in the lack of a mechanistic understanding of how contextual factors influence FMNR and its subsequent impact on sustainability.[2] Among these gaps is the need for a deeper comprehension of how various biophysical, social, economic, and political conditions at the local level affect the sustainability of FMNR. To scale up FMNR and achieve the desired land restoration objectives, it is crucial to establish a systematic approach that can assist and guide the process of determining where and for whom FMNR is an appropriate restoration technique and where it might be necessary to complement it with other soil and water management technologies to enhance FMNR adoption and achieve its desired outcomes.

This technical brief provides governments, NGOs, local communities, and international partners with actionable insights on implementing and scaling FMNR for sustainable land management in Niger.

The brief presents a holistic conceptual framework for the assessment of local agricultural governance and socio-economic systems, and the requisite biophysical conditions for scaling FMNR. The framework can serve as a tool to guide FMNR suitability assessing where, when, and for whom FMNR might be appropriate. Moreover, this holistic approach helps in understanding the barriers that hinder its uptake.

For FMNR to be scaled up in Niger and elsewhere, such assessments are crucial so that initiatives will be informed by evidence demonstrating how and why farmers might practice a restoration activity as well as how context influences their choices.

1 Chomba, et al. (2020) "Opportunities and constraints for using Farmer Managed Natural Regeneration for land restoration in sub-Saharan Africa." https://www.frontiersin.org/articles/10.3389/ffgc.2020.571679/full

2 Lohbeck, et al. (2020) "Drivers of farm managed natural regeneration in the Sahel. Lessons for restoration." https://www.nature.com/articles/s41598-020-70746-z

Furthermore, the brief presents result from integrated management options that are designed to test different soil and water management technology options that can be combined with FMNR and help improve crop yield at farm-level in the short term. Our findings reveal that farmers shape their perspectives on the value of FMNR through nuanced insights into local farming practices and livelihood benefits, as well as the systems governing land and tree tenure.

Kolema Boucar holds food she has been able to purchase with support from CRS' Cash-for-Work project in Gamdou village, Niger. Her family has been participating in CRS' cash-for-work emergency response, which helps families that have hosted refugees fleeing Boko Haram's violence. [Photo by Michael Stulman for CRS]

A woman from the village of Tourbey in Niger works the millet with two calabashes. Millet is a staple food in Nigerien villages. CRS is here to respond to the needs of this vulnerable population with programs such as Cash for Work. [Photo by Francois Therrien for CRS]

1. Background and Context

Niger, spanning 1,267,000 km^2, ranks among West Africa's largest countries with a population of 22 million and an estimated growth rate of 3.7% .[3] This growth fuels resource demands, straining agricultural and forestry lands, water, and energy sources. Overexploitation, intensive farming, and land fragmentation are reducing natural resource quality and quantity, particularly evident in deforestation due to increased demand for fuelwood and unsustainable agricultural practices. Agriculture, employing 80% of the population and contributing 45% to the country's GDP, intensifies the pressure on land, resulting in visible impacts on agroecosystems, causing deforestation and land degradation.

These challenges are compounded by climate change-induced extreme weather events. The country has experienced unusual climatic events including floods and droughts over the last two decades,[4] These events have led to food and water scarcities, soil degradation, and shifts in crop suitability, causing a considerable decrease in plant cover and overall system productivity. Protecting and restoring natural ecosystems like land and water has become critical. Addressing these issues aligns with global initiatives such as the United Nations' 2030 Agenda for Sustainable Development, the African Union's 2063 Agenda, the United Nations Convention to Combat Desertification's Land Degradation Neutrality (LDN), the post-2020 Global Biodiversity Framework of the UN Convention on Biodiversity, and initiatives like the AFR 100 within the Bonn Challenge.

Niger regards restoring degraded landscapes as a critical issue for achieving its environmental and development goals. At national level, the government of Niger has pledged to restore 3.2 million hectares of land by 2030, with the aim to improve the population's livelihoods. Niger has a long history of practicing Farmer Managed Natural Regeneration (FMNR), which is increasingly advocated as the most promising strategy for scaling up landscape restoration activities. Niger was among the targeted countries in the ambitious five-year Regreening Africa project (2017-2022).[5] World Vision Niger and its partners spearheaded initiatives to combat land degradation, specifically focusing on FMNR, with a goal of rehabilitating 90,000 hectares and benefiting 40,000 households.

Despite many years of experience in implementing FMNR in Niger, there have been significant challenges concerning the sustainability of the environmental and socio-economic benefits derived from it.[6] One of the critical issues lies in the lack of a mechanistic understanding of how contextual factors influence

3 INS, 2021. Tableau de bord Social. Institut National de la Statistique-Niger. PP 71. https://www.pnin.org

4 Fiorillo, et al. (2018) "Recent Changes of Floods and Related Impacts in Niger Based on the ANADIA Niger Flood Database." *Climate* https://doi.org/10.3390/cli6030059

5 https://regreeningafrica.org/

6 Chomba, et al. (2020) "Opportunities and constraints for using Farmer Managed Natural Regeneration for land restoration in sub-Saharan Africa." https://www.frontiersin.org/articles/10.3389/ffgc.2020.571679/full

FMNR and its subsequent impact on sustainability.[7] Among these gaps is the need for a deeper comprehension of how various biophysical, social, economic, and political conditions at the local level affect the sustainability of FMNR. To scale FMNR and achieve the desired land restoration objectives, it is crucial to establish a systematic approach that can assist and guide the process of determining where and for whom FMNR is an appropriate restoration technique and where it might be necessary to complement it with other soil and water management technologies to enhance FMNR adoption and achieve its desired outcomes.

Through a pilot project in line with the agency's flagship *Transforming Livelihoods and Landscapes* platform (SCP3),[8] Catholic Relief Services (CRS) joined efforts with International Crops Research Center for the Semi-Arid Tropics (ICRISAT) and the Direction de la Gestion Durable des Terres et des Forêts (DGDT/F) to understand key barriers for effective implementation of FMNR and also to explore alternative low-cost options that can be combined with FMNR to increase crop yield. This could enable most farmers to continue practicing FMNR until it realizes its potential to improve food security and livelihood outcomes in the long run while increasing crop yield in the short term. The study focused on determining the best combination of FMNR with the three most common low-cost soil fertility management options: spreading manure, applying compost, and digging "Zaï holes" for micro-catchment of water. The main objective was to improve crop yields in fields undergoing restoration practices, particularly in the early years. Specifically, the study aimed to (i) determine the best combinations of FMNR with soil fertility management practices on crop yields under real agricultural conditions, using demonstration plots; (ii) assess farmers' perceptions of combining FMNR with water and soil fertility management practices and (iii) identify any limits and advantages associated with the combinations of FMNR with water and soil fertility management practices.

2. Objectives of the Technical Brief

The aim of this technical brief is to offer insights into how contextual factors—encompassing biophysical, social, economic, and political conditions at the local level—impact the adoption of FMNR. It provides actionable guidance to governmental bodies, non-governmental organizations (NGOs), local communities, and international partners involved in implementing and scaling FMNR in Niger. It further aims to bridge gaps in knowledge and perceptions while offering contextual insights for promoting FMNR adoption as a nature-based solution to combat land degradation and address climate change.

7 Lohbeck, et al. (2020) "Drivers of farm managed natural regeneration in the Sahel. Lessons for restoration." https://www.nature.com/articles/s41598-020-70746-z

8 Transforming Livelihoods and Landscapes—Scaling Land Restoration Agriculture Livelihoods, WES and MF - SP3 Livelihoods and Landscapes Platform Core Team - Livelihoods Landscapes tech brief Final.pdf - All Documents (sharepoint.com)

3. Opportunities and Challenges for Scaling FMNR

Farmer Managed Natural Regeneration stands as a leading restoration technique in Niger, entailing the deliberate selection, protection, and management of woody plants by nurturing tree and shrub growth from existing root systems or stumps within farms and landscapes. FMNR contributes significant environmental and livelihood benefits, with trees serving vital roles as windbreaks that safeguard young plants while enhancing soil moisture conservation, carbon sequestration, fertility, and erosion control, ultimately boosting crop yields. Additionally, these trees offer such multifaceted benefits as providing fodder for livestock (especially the *Acacia albida* species) and supplying wood, shade, and gathering spots.

FMNR has had good success in Niger, though in limited zones and specific contexts. Scaling this experience has proven challenging, due to contextual variables and inadequate understanding of what constitutes an enabling environment. Additionally, the return on investment for farmers practicing FMNR takes a relatively long time (typically not less than three years), which often limits its widespread adoption and sustainability.

Scaling FMNR in Niger offers both challenges and opportunities, which are arrayed in Table 1 as they pertain to sustainable implementation and scaling.

FMNR field in the third year of operation in the village of Angoual Gamdji 2 (Magaria, Zinder). The name of the grower is Saidou Mato. [Photo by Issiaka Laouali for CRS]

Table 1: Opportunities and challenges for sustainable implementation and scaling FMNR in Niger.

OPPORTUNITIES	CHALLENGES
Local knowledge and tradition	Despite its long history, there is limited quantitative data pertaining to the impact of FMNR on income, crop yield, etc.
Simple, low-cost restoration technique /approach	While there may be supportive policies in place at the national level, their implementation at the local level can be a challenge
Aligning with global agendas	Limited scientific evidence related to contextual variables (biophysical and enabling environment) in which FMNR can be successfully implemented and scaled
Environmental and livelihood benefits to showcase in some regions	Climate change, poverty, and conflict
FMNR Presidential Decree[9]	Uncertainties related to land and tree tenure
Can be applied in different land use and scale, including agricultural, pastor al, farm, and landscape	Gender and social inclusion

4. Empowering Change: Building Capacity and Raising Awareness Among Local Communities

Implementing FMNR often demands a shift both in mindsets and tree care methods, making it a potent catalyst for societal transformation and fostering environmental principles. The true challenge in FMNR's success lies not in nurturing tree growth (as trees possess that inherent capability), but rather in empowering individuals and communities to recognize their capacity to enact beneficial change (a belief many lack, having surrendered hope). To effectively utilize FMNR, it's crucial to assure people that transitioning from harmful environmental practices to constructive and regenerative ones aligns with their best interests. Anecdotal evidence for areas in Niger where FMNR is successfully implemented suggests that FMNR plays a role in empowering women and fostering social cohesion by boosting income generation and provisioning services. Women's participation in FMNR groups and meetings not only enhances their leadership skills but also improves communication within communities.

5. Stakeholder Engagement Collaboration for Scaling FMNR

The foundational stage in scaling FMNR involves actively engaging stakeholders and local communities in the process. This engagement fosters a sense of ownership, empowering these communities and ensuring the

9 https://regreeningafrica.org/project-updates/niger-formally-adopts-farmer-managed-natural-regeneration/

lasting sustainability of land restoration endeavors. A vital aspect is to listen to contextual perspectives, involve stakeholders in decision making, and cultivate an environment conducive to their active participation in FMNR activities. Simultaneously, establishing a stakeholder platform dedicated to implementing and scaling FMNR and advocating for its widespread awareness becomes imperative. This platform serves as a pivotal avenue to influence policies, drive implementation, and generate awareness regarding the significance of FMNR.

As part of the pilot project, agency partners engaged with the Direction de la Gestion Durable des Terres et des Forêts (DGDT/F) in Niger. This government directorate oversees and implements land restoration policies and hosts the national platform for stakeholders involved in land restoration initiatives. Within this partnership, DGDT/F, CRS, and ICRISAT played a pivotal role in coordinating and leveraging the efforts of diverse stakeholders. In 2023, the partnership held a national workshop for scaling FMNR with over 52 people from 15 organizations participating. They reflected upon and celebrated the many achievements and emerging approaches for sustainability and scaling FMNR, and identified how these can be amplified.[10]

6. Policy and Institutional Support for FMNR Scaling

As a signatory to the 1994 United Nations Convention to Combat Desertification and the UN 2030 Sustainable Development Goals Agenda, the Government of Niger has exhibited a strong commitment to bolstering agricultural system sustainability and mitigating land degradation. Given the potential for development through natural resources, the nation's primary concerns revolve around the Agriculture, Forestry, and Other Land Allocations (AFAT) sector, with land restoration through FMNR identified as one of the pivotal areas for intervention in Niger's Nationally Determined Contributions and AFR100 commitments. In line with these efforts, the government has pledged to restore 3.2 million hectares of land by 2030, aligning with the AFR100 initiative.

Thus, the main policies and legal documents related to FMNR in Niger include:

- The Nationally Determined Contribution.
- The National Policy on Environment and Sustainable Development.
- The Strategic Framework for Sustainable Land Management in Niger.
- Decree for implementation of law no. 2004-040 of 8 June 2004 on the forestry regime in Niger.
- Decree no. 2020-602/PRN/MESUDD of 30 July 2020 regulating the practice of Farmer Managed Natural Regeneration in Niger, giving the right to farmers to enjoy the benefit of their efforts and access to dead wood products in agroforestry parkland.

10 Traore, B., Laouali, A. M., Arzika, Z., Koudoussou, I. M., Assoumane, G., & Subagadis, Y. H. (2023). *Scaling up land restoration in Niger :insights from a national workshop.* https://doi.org/10.13140/RG.2.2.15978.29122

7. Holistic Framework for Scaling FMNR in Niger

For successful scaling of FMNR, an in-depth consideration of contextual variables defining farmers' decision making within diverse social and agroecological settings is imperative. This technical brief presents a comprehensive conceptual framework designed to evaluate local agricultural governance, socio-economic systems, and necessary biophysical conditions crucial for scaling FMNR (see Figure 1). This framework serves as a valuable tool for assessing FMNR suitability—identifying suitable locations, timing, and target beneficiaries—while facilitating an understanding of the obstacles impeding its widespread adoption. Such assessments are pivotal for providing initiatives with evidence on why and how farmers engage in restoration activities, and clarifying the influence of context on their choices.

The holistic approach emphasizes biophysical, socio-economic, and governance elements encompassing sustainability and provisioning services, including livelihoods, income, and environmental benefits such as soil fertility and carbon sequestration. Notably, FMNR holds significant economic potential for farmers through employment, wood product marketing, and agri-entrepreneurship. With ongoing climate change and biodiversity policies advocating carbon markets, FMNR provides communities with an avenue for compensation via on-farm carbon sequestration. Collaboration among stakeholders is critical to ensure the efficacy of this integrated management approach in enhancing production system quality. Amidst growing scarcity of financial and natural resources, the "SaZa" FMNR model (Section 6.1) offers decision-makers geospatial insight, optimizing resource allocation and enhancing the sustainability of land restoration efforts.

A group photo of Haouaou (seated, green dress) with the rest of the participants and their trainers from ICRISAT/Sadoré, before joining "Work Ready Now!" and "Be Your Own Boss" (WRN/BYOB), a youth-oriented entrepreneurship program under the CRS Girma project funded by the USAID/BHA.
[Photo by Hadjara Laouali Balla for CRS]

Illustrative Suitability Analysis using SaZa FMNR Model

Figure 1: A holistic conceptual framework to understand relationships among biophysical, socio-economic and governance contextual variables that affect scaling FMNR in Niger

7.1 Illustrative Suitability Analysis Using SaZa FMNR Model

Within the farmwork of the holistic approach depicted above, a decision-support tool is proposed, the SaZa model, to aid in assessing where, when and for whom FMNR might be appropriate. The SaZa model, "Sassaben Zamani" in local language, was initially developed as part of ICRISAT's SERVIR program (https://servir.icrisat.org/farmer-managed-natural-regeneration/). It serves to qualify, compare, and rank potential sites based on alignment with FMNR suitability criteria established by diverse stakeholders, including experts, scientists, donors, and the practitioner community. This multicriteria decision-making tool identifies FMNR suitability areas and recommends actions to enhance the suitability of targeted locations.

As a geospatial model, the SaZa FMNR model integrates spatial data from various sources, encompassing earth observation, documentation, surveys, and publicly available data from government and NGO websites. Based on an analysis of 15 years of satellite image time series, field surveys, and expert opinions, the model identifies three key variables conducive to FMNR success: biophysical, socio-economic, and governance factors. A total of 14 variables are considered, comprising rainfall, terrain morphology, land use, vegetation density, soil texture, vulnerability, education, land tenure, labor availability, proximity to markets, legal frameworks, agricultural systems, dialogue frameworks, and policy frameworks.

The identification of suitable areas for FMNR involves several steps. Initially, parameters were prioritized using the Analytical Hierarchy Process (AHP) ,[11] establishing constant weights applicable to any targeted area. Subsequently, a specific study area was chosen to test the model. Thematic spatial maps for socio-economic and governance parameters were generated using QGIS 3.28.3, interpolating data collected from a socio-economic survey conducted in the study site. Biophysical parameter thematic maps were derived from earth observation data, except for soil texture, obtained from the soil map provided by the Institut de Recherche pour le Développement (IRD). Finally, the overlay weighted method was applied, integrating the weights from the AHP process assignment with the suitability area analysis.

The results of the analytical prioritization process revealed that in Niger, the policy framework is the parameter most conducive to the success of FMNR in each locality (Table 2). It is mainly followed by the legal framework, the framework for dialogue, land tenure, and the framing system. In short, emphasis must be put on governance and socio-economic parameters for the success of FMNR in a selected locality.

The overall results of the model indicate the site's suitability for scaling FMNR, with 42.5% of the site covered by a suitable zone and 51.5% moderately suitable. However, the area not favorable covers only 5% of the test site (Figure 2).

11 Wind, Y., Saaty, T.L., (1980). "Marketing applications of the analytic hierarchy process." *Management Science* 26, 641–658

Table 2: Results from the analytical hierarchy process validated with the community of practitioners.

PARAMETERS	DESCRIPTION	PRIORITY	RANK
Policy framework	Incentive measures and access to finance	15.2	1
Legal framework	Enforcement of policies and by-laws, community corporation	14.7	2
Dialogue framework	Avenues for advocacies, existence of civil societies, and gender and youth inclusion	12	3
Land capital	Type of land acquiring system	10.8	4
Access to extension service	Trained and equipped extension workers	10.1	5
Education	Education rate geospatial distribution	7.2	6
Vulnerability	Vulnerability rate geospatial distribution	6.3	7
Soil texture	Types of soil and geospatial distribution	5.1	8
Labor force	Availability of labor at the time of FMNR implementation	4.7	9
Land use	Types of land use	3.4	10
Rainfall	Distribution of rainfall	3.3	11
Vegetation density	Density of the vegetation at geospatial level	3.1	12
Distance from market	The distance separating a district to the marketplace	2.2	13
Morphology	Landform types	1.8	14

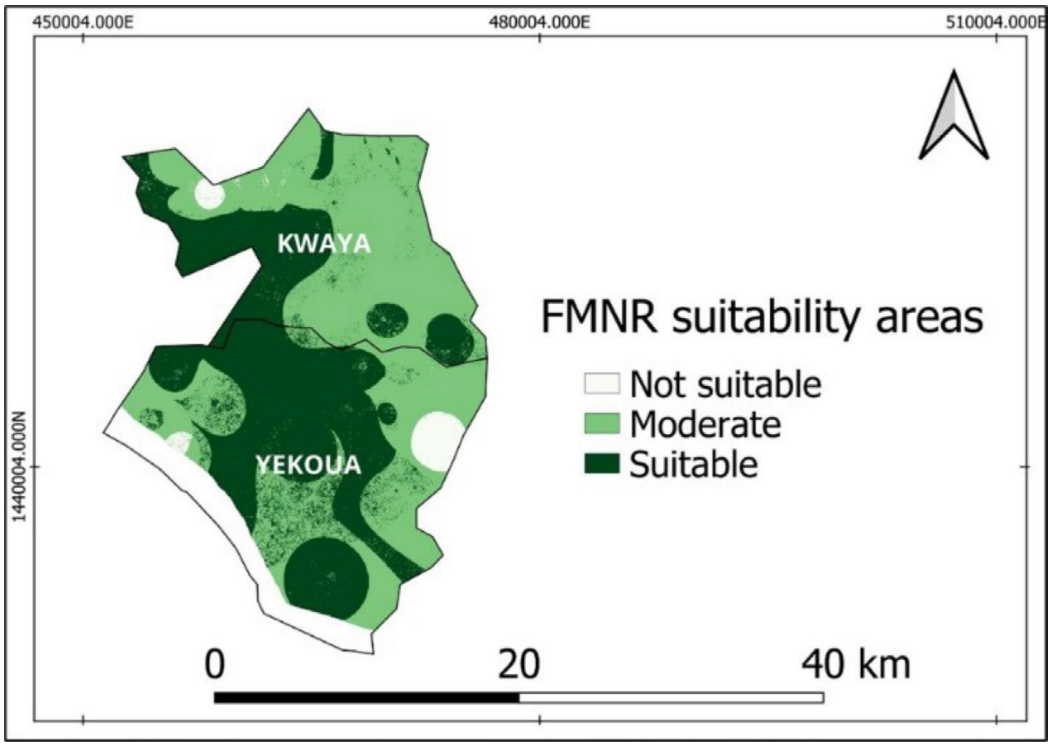

Figure 2: Suitability areas for FMNR in the communes Kwaya & Yekoua, Region of Zinder.

8. Case study: Integrated Management Options at Farm Level for Scaling FMNR

In the communes of Kwaya and Yekoua in the department of Magaria in Niger, a set of selected Integrated Management Options (IMO) were tested in combination with FMNR. The program assessed the impact on farmers' ability to sustain FMNR over the long term until it began to improve their income and livelihood, with IMO boosting their short-term crop yield. The pilot consisted of a series of tests in selected villages where FMRN was combined with such interventions as (i) Zaï pits (a soil and water conservation technique); (ii) organic fertilizers (traditional composting or smart composting); and (iii) youth engagement as Private Sector Providers in seedling production and grafting, to assess the most suitable options.

The IMOs to be tested were selected by a participative process with farmers which involved focus group discussions and interviews with key informants. The target group included 260 FMNR farmers, 30 local elected officials, 30 local structures, 10 field agents, 14 extension services, 30 nurserymen, and 4 youth service providers. Data collection in May 2022 employed qualitative methods, with over 50 focus group discussions involving the Chief's committee in various localities and interviews with 363 farmers.

Good example of an FMNR field in Doungass, Zinder. [Photo by Ibrahima Abdoussalam for CRS]

Information from focus group discussions mainly contributed to characterizing the suitability analysis model site, while survey data was utilized for production function analysis and assessing the impact of farm inputs.

8.1 Experimental Design Description

Experiments were conducted during the 2022 agricultural season in two villages of the Kwaya commune, Zinder region. The two villages were selected based on their accessibility by our field agents, the social/ cultural similarities of farmers, severe land degradation, and comparable agroecological conditions in the study commune. Sixteen farmers per village were selected to participate in the experimental demonstration based on their willingness. Each farmer had four experimental plots of 250 m^2, hence four treatments (P1: FMNR + Zaï + Compost; P2: FMNR + Zaï + Manure; P3: FMNR + Zaï; P4: FMNR) as depicted below (Figure 3).

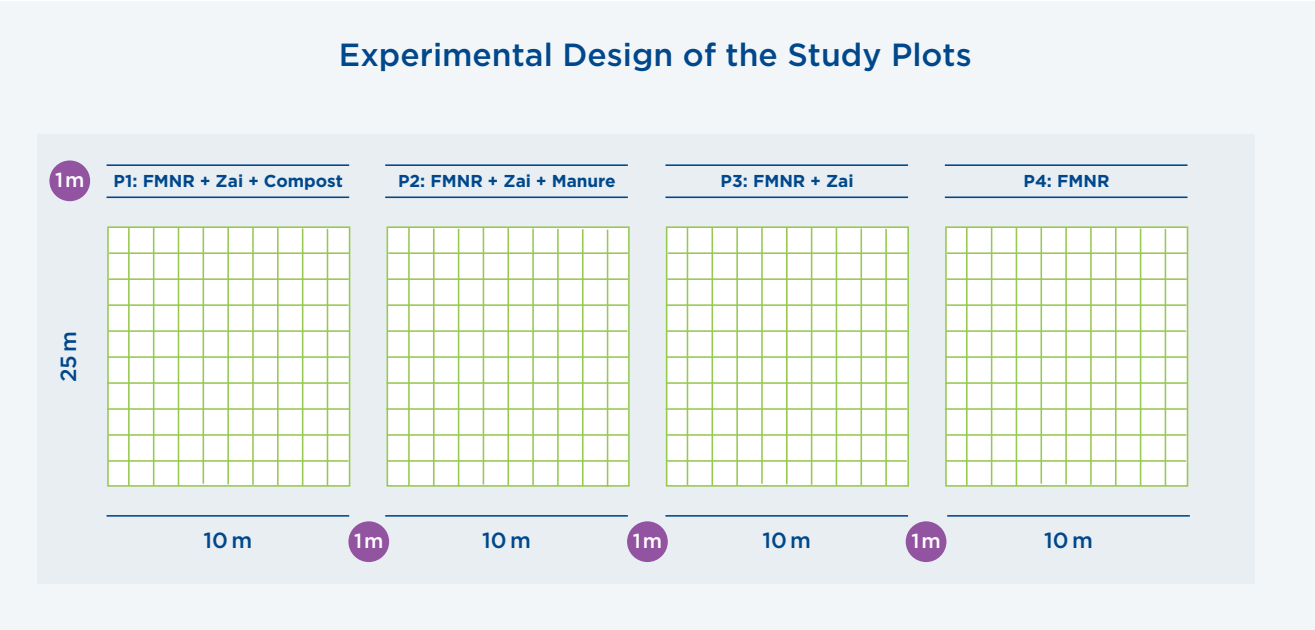

Figure 3: Experimental study plots

8.2 Crop Yield Associated with Different IMO under FMNR Practice

At Faroua and Kadey, using FMNR alone resulted in average grain yields of 279 kg/ha and 236 kg/ha, respectively (Table 4 and Figure 4). Combining FMNR with the Zaï technique increased grain yields by 21% in Faroua and 111% in Kadey, providing additional economic benefits of 18,560 FCFA and 83,840 FCFA, respectively (Table 3). Introducing manure into the Zaï holes amplified yields by 118% and 208% compared to FMNR in Faroua and Kadey, respectively, generating additional economic benefits of 104,960 FCFA and 157,120 FCFA. Interestingly, when compared to the FMNR + Zaï combination, both villages experienced precisely 97% yield increase.

Table 3: Yield comparison per management option

TREATMENT	YIELD (FAROUA)	INCREASED PERCENTAGE (FAROUA)	YIELD (KADEY)	INCREASED PERCENTAGE (KADEY)
FMNR	279	0%	236	0%
FMNR + Zaï	337	21%	498	111%
FMNR + Zaï + Manure	607	118%	727	208%
FMNR + Zaï + Compost	693	148%	780	231%

Table 4: Income generation Comparison per management option

OPTIONS COMPARISON	YIELD DIFFERENCE AT FAROUA (KG/HA)	YIELD DIFFERENCE AT KADEY (KG/HA)	INCOME DIFFERENCE AT FAROUA (FCFA)	INCOME DIFFERENCE AT KADEY (FCFA)
FMNR vs FMNR + Zaï	58	262	18560	83840
FMNR vs FMNR + Zaï + Manure	328	491	104960	157120
FMNR vs FMNR + Zaï + Compost	414	544	132480	174080

Good example of an FMNR field in Magaria, Zinder. [Photo by Massaoudou Saley for CRS]

Substituting manure with compost in the Zaï holes resulted in a yield surge of 148% in Faroua and 231% in Kadey compared to FMNR, equating to an additional economic benefit of 132,445 to 188,000 FCFA. In contrast, compared to the FMNR + Zaï + manure combination, yield increases were up to 31% in Faroua and 22% in Kadey. These findings highlight that the FMNR + Zaï + Compost combination emerges as the optimal soil fertility option within this study's context. Nonetheless, in the absence of compost, farmers can still achieve significant additional benefits using manure.

The increase in grain yield can be attributed to the positive impact of manure and compost applications in the sandy soil of the study area, compensating for low organic matter levels that limit nutrient availability and soil water retention. While FMNR alone may not markedly enhance yields in the short-term within Niger's acidic sandy soils, its combination with compost or manure effectively addresses nutrient deficits and water stress, leading to a significant increase in yields.

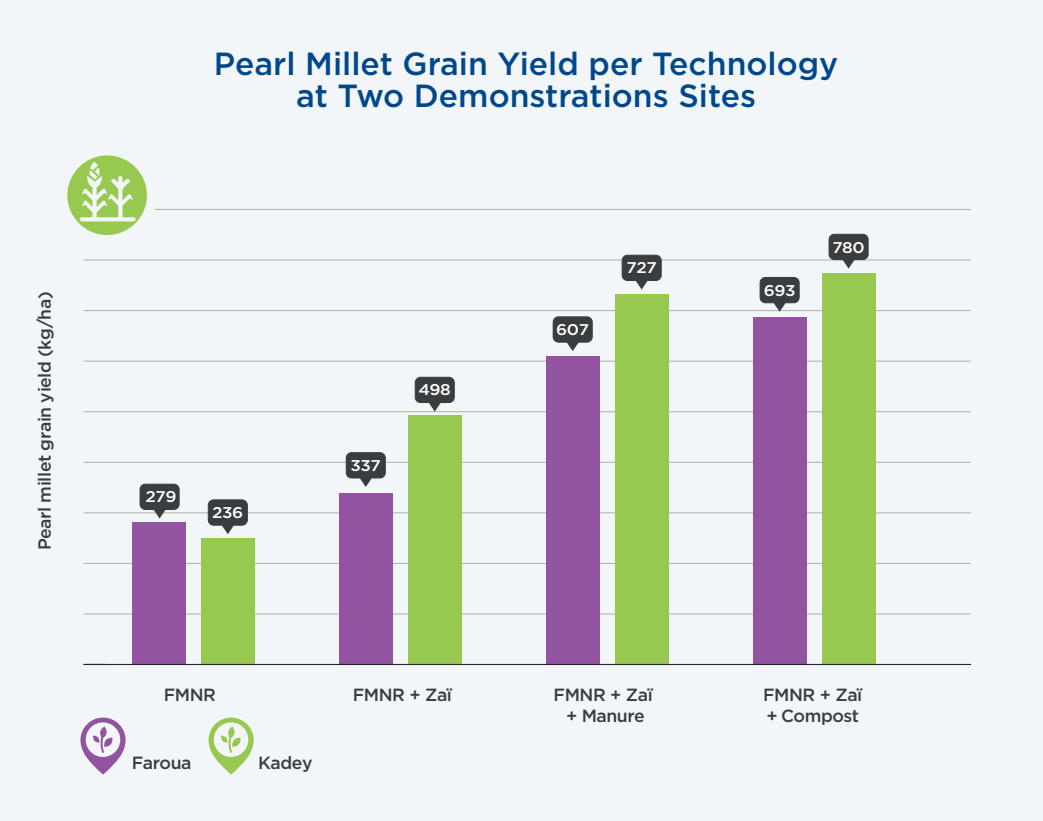

Figure 4: Pearl millet grain yield per technology at two demonstrations sites

9. Implication for Informed Decision Making

The successful scaling of FMNR hinges upon a comprehensive understanding of contextual factors that shape farmers' decision making within diverse social and agroecological landscapes. Despite FMNR's historical application in Niger, numerous technical and institutional constraints persist, hindering its sustainable implementation and scaling. To address this, a holistic approach is tested in this study that involves conceptual framework combined with the SaZa model for FMNR suitability analysis and IMO, all to support characterizing biophysical, socio-economic, and governance constraints to scaling FMNR in Niger. This strategic approach helps to avoid "blind piloting" and enables the FMNR implantation and scaling to be tailored to specific contexts. FMNR's practical implementation was coupled with community-driven IMOs, identified through participatory meetings to ensure community buy-in. While the introduction of land restoration techniques like Zaï, improved compost, and manure has bolstered millet production in conjunction with FMNR, their implementation demands significant labor and inputs. However, the resultant gains in grain production, particularly with compost application, have motivated farmers to cover production costs. Political commitment also plays a pivotal role in scaling FMNR, evident in Niger's adoption of the Presidential Decree regulating its practice, albeit with limited dissemination among environmental, agricultural, and producer professionals.

The SaZa model's categorization of sites based on biophysical, socio-economic, and governance characteristics facilitates the selection of restoration sites and sustainability measures within constrained timeframes and resources. For instance, focusing on actions geared towards enhancing local food security, economy, education, and disseminating legal texts and incentives based on site characteristics can significantly bolster sustainability. Societal factors such as measures to curb migration are also vital for securing the required labor force. Simultaneously, practical demonstrations of IMO combined with FMNR serve as a tangible practice for showcasing technology benefits directly to farmers. This approach not only enhances field productivity cost-effectively but also prioritizes farmer-driven decision making, a departure from traditional methods. The SaZa model and IMOs emerge as exceptional decision making tools in resource-scarce settings, promoting implementation and scaling FMNR in Niger.

10. Conclusion

In Niger's pursuit of environmental and developmental goals, restoring degraded landscapes remains pivotal. While Niger boasts a significant history and commitment to FMNR, challenges persist in expanding FMNR outside a few successful regions as well as sustaining its environmental and socio-economic benefits. Understanding contextual influences on FMNR's sustainability—biophysical, social, economic, and political factors at local levels—proves essential for its successful scaling.

Establishing a systematic approach becomes imperative, indicating where FMNR suits restoration needs and where additional soil and water management technologies are necessary for enhanced adoption and outcomes. Contrary to conventional wisdom, the analysis reveals that policy, legal frameworks, and dialogues are influential factors for the success of FMNR. It is paramount for non-governmental organizations (NGOs), technical development agencies, and financial partners engaged in land restoration through FMNR to utilize the suitability map generated by the SaZa model as a fundamental tool for site selection. Moreover, the implementation of the Presidential Decree is of utmost importance to provide legal certainty for FMNR practitioners, fostering the widespread adoption of FMNR and ensuring peaceful and organized access to wood resources and fodder in agroforestry parks for all stakeholders.

Additionally, the brief showcases integrated management options that enhance crop yields in the short term when combined with FMNR, unveiling how farmers perceive FMNR's value in relation to local practices, livelihood benefits, and land tenure systems. These insights underscore the necessity of informed decision making and integrated approaches for scaling FMNR in Niger and beyond, driving sustainable land restoration initiatives.

11. Recommendations

A. **Holistic assessment for FMNR suitability:** Implement a systematic approach to assess the suitability of FMNR for land restoration by considering a range of factors, including local agricultural systems, governance, socio-economic conditions, and biophysical factors. This holistic assessment will help identify where and for whom FMNR is an appropriate restoration technique

B. **Complementary soil and water management technologies:** Recognize that FMNR may need to be complemented with other soil and water management technologies in certain areas. Encourage research and development of integrated management options that combine FMNR with technologies to enhance crop yield and improve the livelihoods of local farmers in the short term.

C. **Evidence-based decision making:** Promote initiatives and policies that are informed by evidence demonstrating how and why resource managers engage in restoration activities, including FMNR. This evidence-based approach will help guide the scaling up of FMNR and ensure that it aligns with local needs and preferences.

D. **Capacity building, community engagement and knowledge transfer:** Invest in capacity building and knowledge transfer programs for government agencies, NGOs, and local communities involved in FMNR. Ensure active participation of local communities in decision making processes. Providing them with the necessary skills and information will enhance the effectiveness of FMNR implementation and management.

E. **Robust polices form the cornerstone of scaling FMNR:** Ensuring the diligent adoption and implementation of the Presidential Decree is essential to establish the legal assurance required for FMNR practitioners to fully reap the rewards of their hard work.

Compost production with the steam aerobic composter (CAV) in the village of Angoual Baskore (Magaria Zinder). The name of the young person is Rakibou Hassan. [Photo by Ibrahima Abdoussalam for CRS]

Haouaou Harou from Washa, practicing the grafting method during the Girma 1st cohort training session of its WRN/BYOB program at ICRISAT/Sadoré in September 2020. Haouaou learned grafting, assisted natural regeneration and compost and seedling production techniques. [Photo by Laouali Balla Hadjara for CRS]

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