

Opportunities for Participatory Rangeland Management (PRM) in the Great Green Wall Initiative in Mali and Senegal



ILRI PROJECT REPORT

Opportunities for Participatory Rangeland Management (PRM) in the Great Green Wall Initiative in Mali and Senegal

Fiona Flintan¹, Amadou Diop² and Mamadou Coulibaly³

February 2022

¹ ILRI Email: f.flintan@cgiar.org

² Consultant Email: amtadiop@gmail.com

³ Consultant Email: coulibalymdd@gmail.com

© 2022 International Livestock Research Institute (ILRI)

ILRI thanks all donors and organizations which globally supports its work through their contributions to the CGIAR Trust Fund

Attribution:



This publication is copyrighted by the International Livestock Research Institute (ILRI). It is licensed for use under the Creative Commons Attribution 4.0 International Licence. To view this licence, visit <https://creativecommons.org/licenses/by/4.0> Unless otherwise noted, you are free to share (copy and redistribute the material in any medium or format), adapt (remix, transform, and build upon the material) for any purpose, even commercially, under the following conditions:

- » The work must be attributed, but not in any way that suggests endorsement by ILRI or the author(s).
- » For any reuse or distribution, the licence terms of this work must be made clear to others.
- » Any of the above conditions can be waived if permission is obtained from the copyright holder.
- » Nothing in this licence impairs or restricts the author's moral rights.
- » Fair dealing and other rights are in no way affected by the above.
- » The parts used must not misrepresent the meaning of the publication.

ILRI would appreciate being sent a copy of any materials in which text, photos etc. have been used.

Editing, design and layout: ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover pictures: ©ILRI.

Citation: Flintan F., Diop A., Coulibaly M., 2022. *Opportunities for Participatory Rangeland Management (PRM) in the Great Green Wall Initiative in Mali and Senegal*. Addis Ababa, Ethiopia, ILRI.

ISBN: 92-9146-710-3.

Contents

Abbreviations and acronyms	7
Acknowledgements	9
Executive summary	10
1 Introduction	12
1.1 The Great Green Wall	12
1.2 Participatory rangeland management	14
1.3 This study	14
2 The Great Green Wall (GGW) in Senegal and Mali	16
2.1 Review of activities and projects contributing to the GGW in Senegal	16
2.2 Review of activities and projects contributing to the GGW in Mali	24
3 Potential of PRM in Senegal	31
3.1 Current state of rangeland management in northern Senegal	31
3.2 Main community management approaches in ZSP	32
3.3 Problems and challenges of community management approaches	34
3.4 Solutions implemented	34
3.5 Conflicts	35
3.6 Analysis of past and present participatory management projects	36
3.7 Added value of participatory rangeland management (PRM) in pastoral areas of Senegal	43
3.8 Opportunities, challenges and bottlenecks in the implementation of PRM	45
3.9 Capacities of actors in the implementation of PRM	48
3.10 Phasing PRM implementation activities	50
3.11 Identification of partners likely to support PRM	51
3.12. Assessment of geographic areas likely to host PRM	52

Patron: Professor Peter C Doherty AC, FAA, FRS
Animal scientist, Nobel Prize Laureate for Physiology or Medicine-1996

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax+254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
better lives through livestock
ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

ILRI has offices in East Africa • South Asia • Southeast and East Asia • Southern Africa • West Africa

4 Mali	53
4.1 Current approaches to rangeland management in Mali	53
4.2 The management of bourgoutières	53
4.3 The current state of rangeland management	54
4.4 Inventory of projects working in the field of improving rangeland management	55
4.5 Relevance of PRM	58
4.6 Potential for PRM application	61
5 Conclusions	63
<hr/>	
Appendix 1	
List of people interviewed for this review.	66
Appendix 2	
Participants in the feedback/consultation meeting for the study in Bamako, Mali, 1st December 2021.	69
Appendix 3	
Participants in the feedback/consultation meeting for the study in Dakar, 3rd December 2021.	71
Appendix 4	
Liste des 55 communes, cercles et régions concernés par le tracé initial de la Grande muraille verte du Mali.	73
Appendix 5	
Communes La Grande Muraille Verte (GMV) par cercle, région et par population en 2017.	75

Abbreviations and acronyms

ADB	African Development Bank
AEDD	Agence pour l'environnement et le développement durable
AVSF	Agronomes et Vétérinaires Sans Frontières
BRACED	Building Resilience and Adaptation to Climate Extremes and Disaster
CIRAD	Centre de coopération Internationale en recherche agronomique pour le développement
CSE	Centre de Suivi Ecologique
ECOWAS	Economic Community of West African States
FLEUVE	Front Local pour une Union Verte
GGW	Great Green Wall
IFAD	UN International Fund for Agricultural Development
ILRI	International livestock Research Institute
IPAR	Initiative Prospective Agricole Rurale
IUCN	International Union for Conservation of Nature
NASA	National Aeronautics and Space Administration
PADAER	Programme d'Appui au Développement Agricole et à l'Entreprenariat Rural
PADER	Projet d'appui au développement économique des territoires ruraux des régions de Ségou et Tombouctou
PADV	Projet d'Aménagement et de Développement villageois
PAFA	Projet d'Appui à la Filière Agricole
PAPEL	Projet d'Appui à l'Elevage
PAPF	Projet d'Autopromotion Pastorale au Ferlo
PAPIL	Projet d'Appui à la Petite à la Petite Irrigation Locale
PASA LMK	Projet d'appui à la sécurité alimentaire dans les régions de Louga, Matam et Kaffrine

PDD DIN	Programme de développement durable du Delta Intérieur du Niger
PDDEPS	Programme de Développement Durable des exploitations Pastorales au Sahel
PDESOC	Projet de Développement de l'élevage au Sénégal Oriental et en haute Casamance
PDIDAS	Projet de Développement Inclusif et Durable de l'Agri business au Sénégal
PDIRAAM	Programme de développement des ressources animales et aquacoles au Mali
PDSEC	Programme de développement social et économique du cercle
PGRNCC	Projet de gestion des ressources naturelles et changement climatique
PIDACC/BN	Programme intégré de développement et d'adaptation aux changements climatiques dans le bassin du Niger
PNLCD	Plan national de lutte contre la désertification
PRM	Participatory rangeland management
POAS	Plans d'occupation et d'affectation des sols
PPPAO	Projet Pilote Pastoral de l'Afrique de l'Ouest
PPZS	Pastoralisme et Zones Sèches
PRAPS	Projet Régional d'Appui au Pastoralisme
PRODAM	Programme de Développement Agricole de Matam
PROGERT	Projet de Gestion et de Restauration des Terres Dégradées du Bassin Arachidier
PU	Pastoral Unit
PUDC	Programme d'Urgence de Développement Communautaire
SAED	Société d'Aménagement et d'Exploitation du Delta du Fleuve Sénégal
UCAD	Université Cheikh Anta Diop de Dakar
UNCCD	UN Convention to Combat Desertification
ZAPA	Zones agro-pastorales à priorité agricole
ZAPE	Zones agro-pastorales à priorité élevage
ZSP	Zone Sylvopastorale or Sylvopastoral Zone

Acknowledgements

This assessment was undertaken as a partnership between ILRI and IPAR (Initiative Prospective Agricole et Rurale, www.ipar.sn) with input of RECONCILE Kenya and TNRF Tanzania, reflecting the wider collaboration supported by the Rangelands Initiative of the International Land Coalition (ILC). IPAR led the research in both Senegal and Mali and much appreciation is given to the lead national researchers Amadou Diop for Senegal and Mamadou Coulibaly for Mali for their significant contribution under difficult circumstances and Dr Cheikh Ly for his vital coordination role and steadfast support throughout the assignment.

Executive summary

The Great Green Wall (GGW) initiative was initially conceived in 2007 as a reforestation project to create a shield of trees to keep the desert at bay and snakes across the Sahel region from Senegal in the West to Djibouti in the East of Africa. The GGW was launched in 2007 by the African Union to promote sustainable development and climate change mitigation. The 11 countries selected as intervention zones for the initiative are Burkina Faso, Chad, Djibouti, Eritrea, Ethiopia, Mali, Mauritania, Niger, Nigeria, Senegal and Sudan. The Great Green Wall (GGW) or La Grande Muraille Verte aims to restore 100 million hectares of degraded ecosystems and sequester 250 million tonnes of carbon across these 11 countries by 2030.

Despite some hurdles following its inception, the GGW initiative is now gathering pace, with renewed and refocused objectives and significant new funding mobilized in 2021. However, its implementation is patchy and incoherent across the eleven countries it covers. It has also been criticized as being top-down in its approach, excluding local land users and even contributing to conflicts between them.

UNEP is one of the key international partners contributing to the GGW initiative and most recently as a contribution to the UN Decade on Ecosystem Restoration 2021–2030. UNEP has committed to supporting pastoralism and rangelands with the agency's leadership of the UN Environment Assembly Resolution 2/24 on Combating Desertification, Land Degradation and Drought and Promoting Sustainable Pastoralism and Rangelands and Resolution 4/15 on Innovations in Sustainable Rangelands and Pastoralism. Following these resolutions, UNEP supported a gap analysis on rangelands and the resulting report: *Rangelands: A Case of Benign Neglect* highlights the lack of attention given to rangelands, particularly when compared to forests. UNEP has an interest in increasing investments in participatory approaches to rangeland restoration as part of its increasing investments to the GGW. Approaches such as participatory rangeland management (PRM) offer such opportunities.

UNEP supported a review of the potential of PRM to address some of the gaps in GGW implementation and particularly to improve the participation of local communities in rangeland restoration initiatives. PRM is a process building the capacity of communities to manage their rangelands leading to improved productivity and good governance. PRM has been implemented in East Africa over significant areas of rangelands in Ethiopia, Kenya and Tanzania. This review focuses on Senegal and Mali, where pastoralism is the most important livelihood activity for the majority of the rural population. Both countries have extensive rangelands, with significant areas undergoing degradation and are relatively active countries in the GGW initiative. The study was undertaken by the Initiative Prospective Agricole Rurale (IPAR) under the supervision of ILRI and included a literature review, visits to areas with potential for PRM, interviews with key stakeholders and a consultation workshop in each country.

In both Senegal and Mali, GGW interventions and activities are implemented top-down, with decisions about location and type of activities decided by the responsible GGW and local government agencies and with little consultation with local land users. In Senegal in particular, there are over a dozen projects that are currently

mapped to or contributing to the GGW. Tree-planting has been a key area of focus of the GGW to date, normally without including local land users beyond the planting trees through cash-for-work programmes and fencing off the areas thereby excluding them from local use.

Those interviewed during this study highlighted some major gaps in the implementation and monitoring of the GGW including the need to build stronger community participation and support and the need to a full and rigorous evaluation of tree-planting as the main area of focus of the GGW to date. In Mali, weak political commitment and related financing was also highlighted as a key challenge and in both countries, insecurity and conflicts in intervention areas were a concern although details on this were not available.

In Senegal, the government introduced the concept of pastoral units (PUs) in the 1980s and these have been supported by a number of projects since. The PUs were set up around water points with the objective to sustainably manage resources and spaces for the benefit of local populations and the community of transhumant pastoralists. The establishment of PUs appear to be a successful intervention in terms of developing better land management organizational systems and natural resources, and a water infrastructure management system and a transhumance/grazing management system. However, despite their apparent success, PUs have been implemented in a top-down manner and have failed to invest in or empower pastoral communities to manage the PUs. Once management plans are established, the PUs are often left without supervision, capacity building programmes or monitoring and as a result, management plans are rarely implemented. Good governance is weak as communities have not been given any authority over the Pus. Where pastoral unit management bodies exist, they are often politicized and heavily influenced by local chiefs.

A comparison of the processes of the PRM and pastoral unit approaches shows similarities including the undertaking of an investigation stage collecting and analyzing information on rangeland resources and other aspects of the local context, the development of a rangeland management plan and the establishment of a governance or management body. However, there are significant differences. Perhaps the most fundamental is that PRM is embedded in local land use practices with the community building on customary management and governance norms, whereas PUs are more like areas excised from the pastoral landscape and managed according to new rules and regulations that can often exclude local communities. The PUs will always require external interventions and resources, whereas in PRM a key objective is to build the capacity of communities to take control of the management, decision-making processes and the implementation of their own plan and it is anticipated they will invest in themselves.

In Mali, projects have set up pastoral units or pastoral perimeters around solar energy-powered boreholes. There is significant scope for PRM to add-value to these projects and processes already being implemented. In many areas customary institutions and governance have broken down leaving a vacuum in terms of institutions responsible for rangeland management and governance and increasing the likelihood of conflict. The emphasis on decentralization with power and management of resources in the hands of local communities provides the right political context for community-led processes such as PRM.

There is considerable potential for testing and piloting PRM in both Senegal and Mali which, if successful, could then be scaled up. In Senegal, a key issue is to clarify how PRM can add value to the already established PUs and contribute to improved management or rangelands outside these. In Mali, there is the challenge of identifying suitable areas that are manageable as units within the vast rangeland/pastoral landscapes and maintain connections between these, which will likely mean working at landscape and local scales to ensure that PRM is well-supported.

PRM can help bring a greater degree of community participation by including women and youth and in managing activities and interventions contributing to the GGW, where the mainly top-down approach to date has excluded communities and, in some situations, has created conflict with them. By building the capacity and willingness of communities to play a greater part in the GGW, implementation will have long-term beneficial impacts, including reduced costs and greater sustainability.

1

Introduction

1.1 The Great Green Wall

The Great Green Wall (GGW) initiative was conceived as a reforestation project to create a shield of trees to keep the desert at bay. It was launched in 2007 by the African Union to promote sustainable development and climate change mitigation. The 11 countries selected as intervention zones for the initiative are Burkina Faso, Chad, Djibouti, Eritrea, Ethiopia, Mali, Mauritania, Niger, Nigeria, Senegal and Sudan. The Great Green Wall (GGW) or La Grande Muraille Verte aims to restore 100 million hectares of degraded ecosystems across 11 countries in the Sahel region. The GGW snakes across the Sahel region from Senegal in the West to Djibouti in the East of Africa.

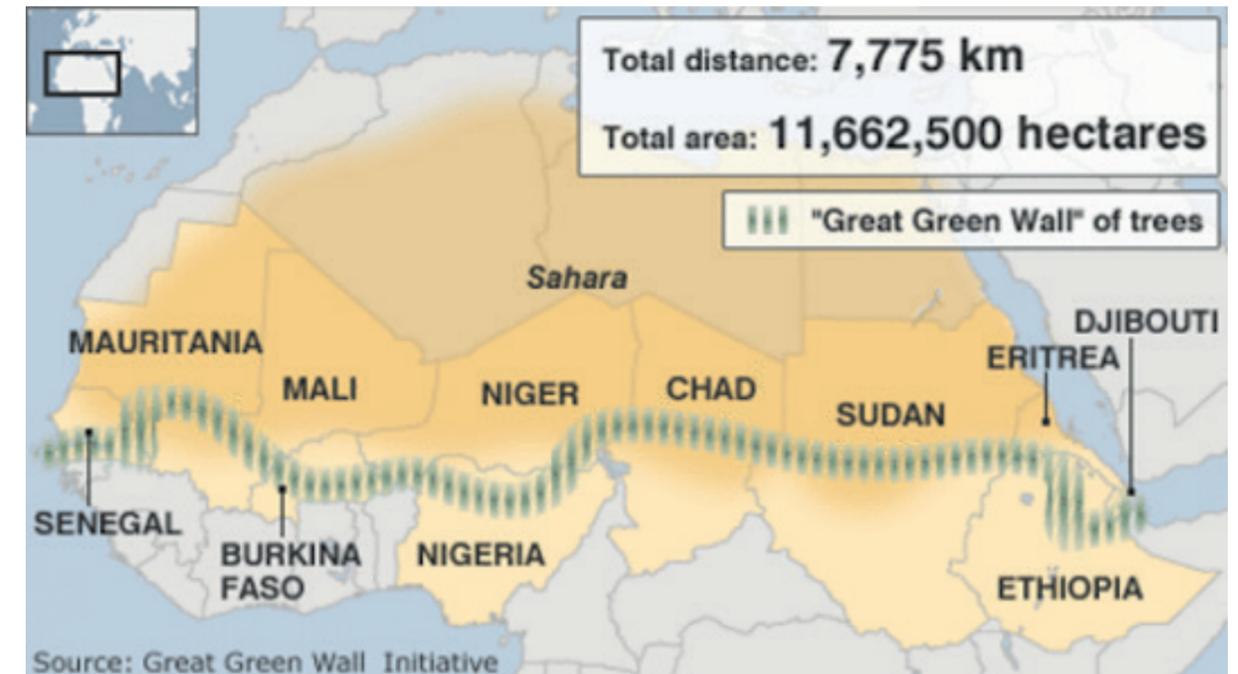
Today, the GGW has much broader and more ambitious goals and aims to promote sustainable land and water management in the drylands of Africa through a mosaic of interventions including climate-smart agriculture, sustainable pastoralism, conservation forestry, energy transition and natural resource governance. The initiative aims to restore land, sequester carbon and create jobs in some of the poorest communities in the world, where climate change is hitting the hardest. By 2030, it seeks to sequester 250 million tons of carbon and create 10 million jobs. This will support communities living along the GGW to improve land fertility and food security, create economic opportunities, and increase climate resilience. It will create a new world wonder spanning 8,000 km across Africa. The initiative received US\$14 billion in new funding in 2021.

The initiative is implemented by Agences Nationale de la Grande Muraille Verte (ANGMVs) (National Agencies of the Great Green Wall). The ANGMV's mission is to support the first continental program of the GGW against the advance of the desert over a distance of the GGW of 7,775 km and roughly 15 km wide, working at country level. It supports the implementation of the AFR100 (African Forest Landscape Restoration Initiative)⁴ and the more global Bonn Challenge.⁵

⁴ Aim: 100 million hectares restored by 2030 in 28 African countries. So far, 30 have committed to restore 126 million hectares.

⁵ A global effort to restore 150 million hectares of deforested and degraded land by 2020 launched by IUCN and the Government of Germany in 2011.

Figure 1. Location of planned GGW.



Source: Journals of India 2021 <https://journalsofindia.com/great-green-wall-ggw-programme/> Great Green Wall Programme.

The project has had to contend with problems such as persistent land loss, the lack of a shared mechanism for monitoring progress and ineffective involvement of some GGW stakeholders. The first appraisal survey, commissioned by the United Nations Convention to Combat Desertification and released in September 2020, shows limited progress. Only 4 million hectares have been restored in the 11 founding member states, which is only 15–18% of the area the project aims to cover by 2030.⁶

The United Nations Environment Programme (UNEP) is one of the main international partners contributing to the GGW initiative. UNEP and other agencies operate many restoration projects along the entire Great Green Wall, funded by the [Global Environment Facility](#) and other donors. The United Nations has been working with the African Union Commission, the [Pan-African Agency of the Great Green Wall](#) and member countries to define their national strategies and action plans (2010–2013), a regional harmonized strategy (2012) and to support implementation activities on the ground (2014–2020). FAO and UNEP are now planning another boost to the Great Green Wall in coming years. Both agencies are leading the new [UN Decade on Ecosystem Restoration 2021–2030](#) and the GGW will be one of the UN Decade's flagship projects.

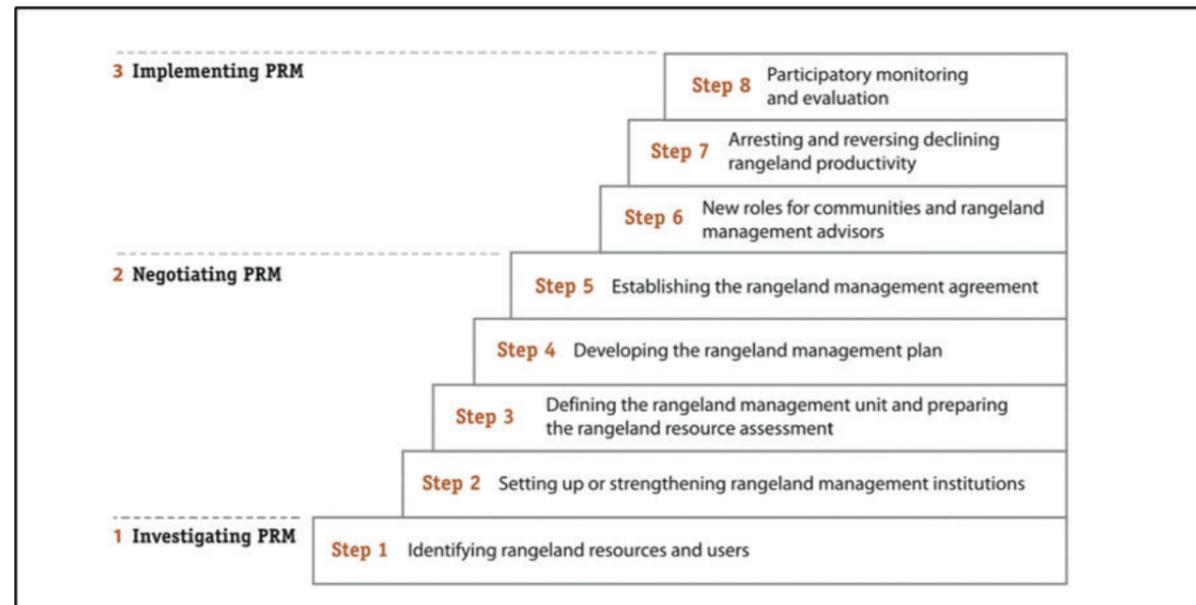
In addition, UNEP has strengthened its commitment to supporting pastoralism and rangelands with the agency's leadership of the UN Environment Assembly Resolution 2/24 on [Combating Desertification, Land Degradation and Drought and Promoting Sustainable Pastoralism and Rangelands](#) and Resolution 4/15 on [Innovations in Sustainable Rangelands and Pastoralism](#). Following these resolutions UNEP supported a gap analysis on rangelands and the resulting report ([Rangelands: A Case of Benign Neglect](#)) which highlights the lack of attention given to rangelands, particularly when compared to forests. UNEP has an interest in increasing investments in participatory approaches to rangeland restoration as part of its increasing investments to the GGW and approaches such as participatory rangeland management offer such opportunities.

⁶ The Great Green Wall Implementation Status and Way Ahead to 2030. UNCCD, Bonn. <https://www.unccd.int/publications/great-green-wall-implementation-status-and-way-ahead-2030>

1.2 Participatory rangeland management

Participatory rangeland management (PRM) is a step-by-step process for improving management, governance and investment in rangelands and is led by communities and supported by NGOs, researchers and development agents (Figure 2). For introductory guidelines see Flintan and Cullis (2010).

Figure 2. Main stages and steps in PRM.



Source: Flintan and Cullis 2010

PRM has the potential to improve incentives for investments in rangeland restoration as part of the GGW initiative, particularly for communities and building the capacities and skills, improving security to land, planning resource use, visioning, risk management and willingness to invest in restoration activities.

PRM was first piloted in Ethiopia and then scaled up to over more than 1 million hectares with significant impacts on strengthening the management of access to rangelands, improving productivity and empowering communities, in particular women. For a review of PRM in Ethiopia see Flintan et al. (2019). The process has led to community, donor and public investment in rangeland restoration. Following on from the experiences in Ethiopia and with local adaptations, PRM has been piloted in Kenya and Tanzania with funding from the EU and as a contribution to the Rangelands Initiative of the International Land Coalition with similar results and funding is likely for further scaling. Despite its potential for supporting initiatives such as the Great Green Wall, PRM has not yet been piloted or implemented in West Africa.

1.3 This study

On the request of UNEP, a review was carried out to assess the potential for piloting and implementing PRM projects in Mali and Senegal, in the context of supporting the GGW initiative. The review was undertaken by IPAR under the supervision of ILRI and included a literature review, visits to areas with potential for PRM, interviews with key stakeholders (interview lists are provided in Appendix 1) and a consultation workshop in each country (participant lists provided in Appendix 2 and 3). The interviews followed checklists developed by IPAR and ILRI, approved by ILRI's Research Ethics Committee.

This scoping study/review considered the following aspects:

(i) A review of current activities and projects contributing to GGW:

- » Current activities and projects underway or planned to fulfil country commitments to implementing the GGW.
- » Challenges and bottlenecks to the implementation of GGW projects.
- » Tree planting as part of GGW interventions.

(ii) The potential of PRM:

This review looked at demand for a PRM approach from communities, government and other stakeholders considering other initiatives, projects and programmes focusing on rangeland management already in-country.

- » The relevance of PRM to local contexts considering local institutions and governance, access and security to land, the use of land, mobility and movement of livestock and people, the status of rangelands and rangeland degradation, gender issues, presence of conflicts and other relevant issues.
- » The presence or absence of a policy an enabling environment for PRM and opportunities for influencing policy.
- » Capacities needed to pilot and implement PRM amongst government, NGOs and communities and gaps in the capacities that need to be built.
- » Donor and development agency interest in supporting PRM in the future.
- » Potential in-country and regional partners.
- » Geographical areas suitable for PRM.

The results were presented at two feedback consultation meetings:

- » One on 1 December, 2021. See Appendix 1: Participant List.
- » One on 3 December, 2021 at the Hotel Mamoune, Dakar. The opening session was chaired by Mr. Youssoupha Diouf, FONSTAB (Fonds d'Appui à la Stabulation) Manager in Dahra Djolof, representing the Ministry of Livestock and Animal Production. See Appendix 2: Participant List.

2

The Great Green Wall (GGW) in Senegal and Mali

2.1 Review of activities and projects contributing to the GGW in Senegal

2.1.1 Introduction to the GGW in Senegal

Senegal was one of the first countries where the GGW was operationalized. This commenced with the creation of the Senegalese Agence Nationale de la Grande Muraille Verte (ANGMV) (or National Agency of the Great Green Wall) in 2008. This rapid implementation was the result of high-level commitment supported by institutional continuity between 2005 and 2012, and the active participation of scientific and institutional partners including Université Cheikh Anta Diop de Dakar (UCAD), Centre de Suivi Ecologique (CSE), Institut Sénégalais de Recherche Agricole, Ministry of the Environment and Ministry of Agriculture. This commitment was reinforced by the socio-political stability that prevailed and still prevails in the country and the existence of solid technical and institutional capacities that do not exist in the other Sahelian states of the GGW.

The strategic objectives of the GGW in Senegal are listed in Box 1.

Box 1 The strategic objectives of the GGW in Senegal

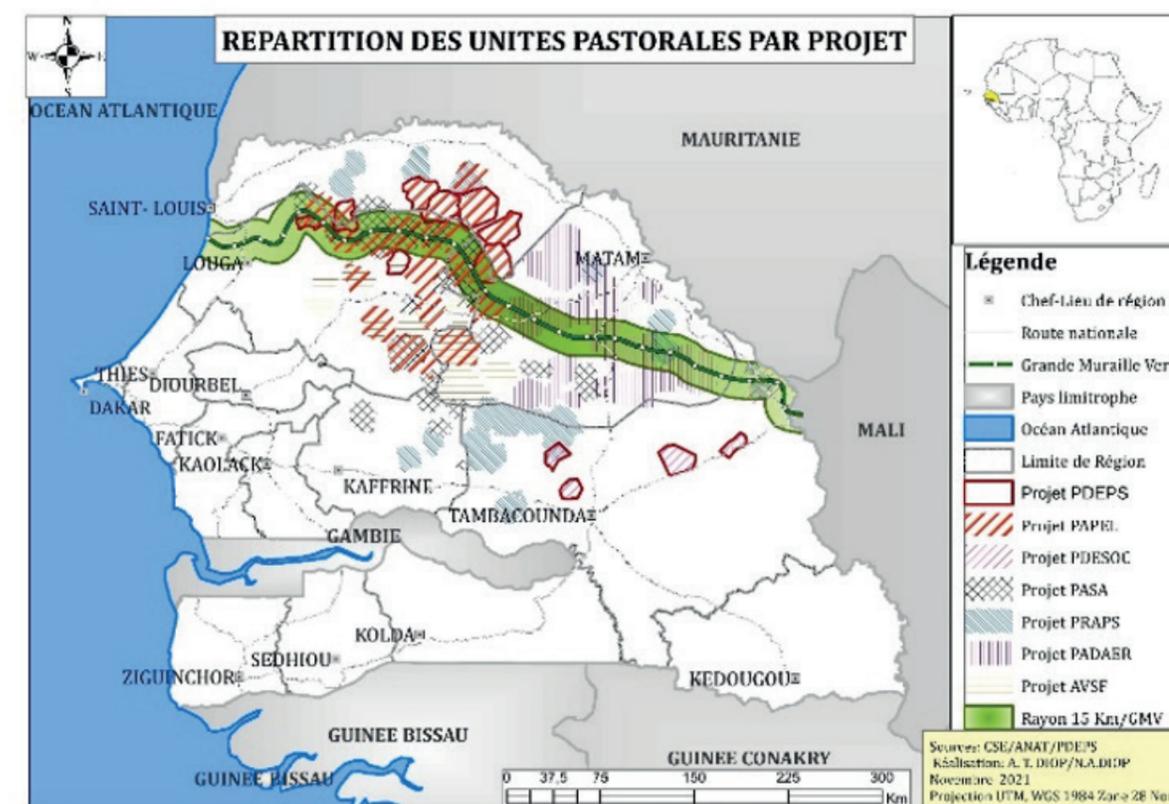
The strategic objectives of the GGW in Senegal are:

- » Intensify the fight against desertification and land degradation and by 2030 achieve land degradation neutrality (LDN).
- » Significantly increase the areas of agricultural land for the substantial strengthening of the productivity and production of agrosylvopastoral systems and the optimization of agricultural value chains.
- » Develop economic clusters through processing and promoting local products to strengthen the conditions for the emergence and development of the economic scope of the GGW.
- » Ensure the mobilization and integrated management of a significant part of water resources, for the improvement of access to drinking water and sanitation services.
- » Develop and promote renewable energy resources in the corridor.
- » Contribute effectively through capacity building and the amplification of low carbon achievements.
- » Promote inclusive development and the culture of peace, security and social cohesion in the Sahara-Sahelian Strip.

Source: PAGGW (2020)

The commitment is also reflected in the speed with which the ANGMV managed to define the project area. This area, 585 km by 15 km wide, is located mainly in the Sahelian part of Senegal (Figure 3).

Figure 3. The planned GGW in Senegal.



With the vision of a green Senegal in the near future, the ANGMV was replaced in 2019 by the Agence Sénégalaise de la Reforestation et de la Grande Muraille Verte (or Senegalese Agency for Reforestation and the Great Green Wall)⁷ within which there is a Directorate in charge of the GGW. For more effective implementation, consultation frameworks have been set up by decree at the national, regional and local level for, among other things: (i) the coordination and harmonization of interventions at the level of the GGW; (ii) monitoring and evaluation of municipal plan contracts and facilitation of information and knowledge sharing on the GGW.

2.1.2 Analysis of projects/programmes implemented within the framework of the GGW

A. Current and recent projects

i) Front Local Environnemental pour une Union Verte (FLEUVE) (or Local Environmental Front for a Green Union)

- » **Scope:** Senegal plus four other GGW countries
- » **Location:** GGW intervention area
- » **Duration:** 2014–2018
- » **Objective:** FLEUVE aimed to strengthen the capacities of local communities to help boost investments in land restoration and created employment opportunities for green jobs.

⁷ See Facebook site: <https://www.facebook.com/photo/?fbid=201722562063054&set=a.201722528729724>

- » **Beneficiaries:** 23 communities in five countries (see below)
- » **Funding and implementation:** Implemented by UNCCD, financed by the European Commission for about Euro 7 million.
- » **Main results and impacts:** implementation of investment micro-projects in 23 communities in five Sahelian countries (Mali, Niger, Burkina Faso, Chad and Senegal), strengthening of national coordination and capitalization capacities (dissemination of good practices for sustainable land management).

ii) Projet Action Contre la Désertification (Project Action Against Desertification)

- » **Scope:** National plus four other GGW countries
- » **Location:** GGW intervention area
- » **Duration:** 2014-2019
- » **Beneficiaries:** member countries of the GGW
- » **Funding and implementation:** European Union and FAO
- » **Main results and impacts:** the creation of reforestation plots, the restoration of land using the usual anti-erosion techniques and the development of market gardening plots thanks to the creation of small hydraulic installations.

iii) Projet Action Contre la Désertification (PUDC) (Emergency Community Development Program)

- » **Scope:** National
- » **Location:** national scale, in Ferlo⁸ in particular
- » **Duration:** 2015–2018
- » **Beneficiaries:** Ferlo populations, students and researchers (Africans, French)
- » **Funding and implementation:** UNDP
- » **Main results and impacts:** construction of tracks and support for agricultural development, diversification of activity systems.

iv) Projet d'Appui à la Sécurité Alimentaire dans les Régions de Louga, Matam et Kaffrine (PASA LMK) (Food Security Support Project in the Regions of Louga, Matam and Kaffrine)

- » **Scope:** National
- » **Location:** Region of Louga, Matam and Kaffrine
- » **Duration:** 2013–2022
- » **Funding and implementation:** Global Agriculture and Food Security Program (GAFSP)
- » **Main results and impacts:** development of lowlands, support for market gardening, construction or rehabilitation of boreholes, creation of vaccination centers, reforestation.

v) Projet de Lutte Contre la Désertification par l'Appui au Pastoralisme dans le Ferlo (Ega Egga Ferlo)

- » **Scope :** National
- » **Location:** Louga and Matam regions
- » **Duration:** 2016–2020
- » **Beneficiaries:** Nine municipalities in the departments of Linguère, Matam and Ranérou
- » **Funding and implementation:** French Fund for the Global Environment and French Development Agency
- » **Main results and impacts:** Provision of services (animal health, environmental information), creation of infrastructure, support for pastoral units.

vi) Projet de Développement Inclusif et Durable de l'Agri business au Sénégal (PDIDAS) Inclusive and Sustainable Development Project for Agribusiness in Senegal

- » **Scope:** National
- » **Location:** Region of Saint Louis and Louga
- » **Duration:** 2014–2021
- » **Beneficiaries:** Medium and small producers, salaried workers and small independent farmers in the project area
- » **Funding and implementation:** World Bank
- » **Main results and impacts:** In the GGW zone, the restoration of the classified forests of MPA{; Merinaghene was expected but it could not be done for reasons of a misunderstanding with local authorities.

vii) L'Observatoire Homme-Milieus de Tessékéré (Man-Environment Observatory of Tessékéré)

- » **Scope:** National
- » **Location:** Tessékéré
- » **Established:** 2007/2008
- » **Beneficiaries:** Ferlo populations, students and researchers (Africans, French)
- » **Funding and implementation:** Klorane Foundation, University Cheikh Anta Diop and Centre Nationale de la Recherche Scientifique
- » **Main results and impacts:** Studying complexity of Sahel ecosystems; partnership with the French institute Klorane linked to the cosmetics industry; production and centralization of data, carrying out individual or collective research projects (funding of theses, reception of students, scientific publications); organization of an annual reforestation camp.

viii) Projet GCP/INT/120/EC4 (Appui à la Mise en Ouvre de l'Initiative de la Grande Muraille Verte)

- » **Scope:** Senegal plus four other GGW countries
- » **Location:** GGW intervention area
- » **Funding and implementation:** EU, FAO

8 Ferlo is a designated agrosilvopastoral area

B. Planned programmes and projects

i) Projet Régional d'Appui au Pastoralisme (PRAPS) (Regional Pastoralism Support Project (Phase II))

- » **Scope:** National and regional
- » **Location:** Saint Louis region; Matam, Louga, Kaffrine, Tambacounda
- » **Period/duration:** 2022–2027
- » **Beneficiaries:** Pastoralists and agro-pastoralists distributed among 24,400 pastoral households (20% of total pastoralist households)
- » **Funding and implementation:** World Bank
- » **Main expected results and impacts:** (i) greater areas of land where sustainable landscape management practices adopted following the project; (ii) functional committees for the sustainable management of territories facilitating mobility set up or supported; (iii) functional water points accessible to transhumant herders and agro-pastoralists; (iv) fodder produced and available to pastoralists and agro-pastoralists; (v) management committees with at least 15% of women actively participating; (vi) women who have received training in financial management.

ii) Initiative Grande Muraille Verte Plan d'Investissement Prioritaires Décennal 2021–2030 (Great Green Wall Initiative Ten-Year Priority Investment Plan 202–2030)

- » **Scope:** Senegal and other GGW countries
- » **Location:** GGW intervention area
- » **Duration:** 2021–2030
- » **Beneficiaries:** All populations of the Sahelian region
- » **Funding and implementation:** States, local authorities and national private sector up to 20% and foreign direct investments and financing for 80%
- » **Main expected results and impacts:** Land restoration and development; biodiversity conservation; integrated management of water resources; management of climate and ecological impacts and risks; capacity building; resilient economic development and security.

2.1.3 Main challenges and bottlenecks in the implementation of GGW projects in Senegal

There are a number of challenges and bottlenecks related to the implementation of the projects. These are summarized in Table 1.

Table 1. Challenges and bottlenecks related to the implementation of GGW projects.

Areas concerned	Challenges	Bottlenecks
Land	Access to hostile environments.	Isolation of localities, especially in the rainy season.
		Difficult access to water.
Institutions and governance	Harmonization of sectoral interventions on the theme of desert advancement. Real involvement of local communities.	Need to put up fences before reforestation.
		Lack of formal partnership.
		Direct interventions partly in the GGW area. GGW not taken into account.
Funding	Diversification of financial partners.	Low level of disbursement compared to the intensity of activities.
Engagement of different stakeholders	Increased involvement of state technical services.	Women's activities slowed down due to the search for water.
Climate and climate change	Find alternative solutions for access to water.	-
Insecurity and conflict	Maintenance of measures to fight against external attacks (firewalls, fences, etc.).	Different use of space by several actors e.g. pastoralists and farmers.
Community membership	Genuine support from pastoral communities.	-
Others	Identification of forest fruits.	-

2.1.4 Reforestation and tree planting in GGW projects and programmes

Reforestation and tree planting is a key intervention of the GGW and its supporting projects. Activities occur in the designated GGW belt or Ferlo (designated agrosylvopastoral area). The choice of sites is made following consultation with the municipal authorities. A basic study is made to determine appropriate areas (see below). There was little if any consultation with communities in this decision.

The choice of tree species planted refers back to a colloquium on the subject held in February, 2009 and takes into account both ecological and socio-economic criteria (resistance to water stress and potential development by local populations). The species chosen include *Acacia senegal*, *Acacia raddiana*, *Acacia nilotica*, *Acacia tortilis*, *Balanites aegyptiaca* and *Ziziphus mauritiana*.

Reforestation agents set up the nurseries where seedlings are produced before being transferred to the plots. The production of seedlings in nurseries mobilizes the local workforce. Thanks to the availability of water for irrigation from boreholes, more than two million plants are produced each year (ANGMV, 2011). This relatively high figure is explained by the need to prevent the high mortality observed during the transport of seedlings from the nursery to the plots. At around six months, the plants are transported during the rainy/winter period (from mid-August to mid-September) to the plots to be planted in accordance with the technical choices of the forest agents, particularly in terms of density per hectare. Before planting the seedlings, a tractor and a subsoiler are used to dig the furrows. To facilitate the growth of the plants, a low density of plants is preferred (spacing of 10 meters between the lines, distance of 8 meters between the plants).

The unpredictable distribution of the rains can promote or limit the growth of young plants in the sandy substrate, hence the frequent need to transplant from October. The last technical phase concerns plant maintenance. The restocking and guarding operations make it possible to consolidate the density of trees on the scale of the plot. Since 2010, the risk of destruction of plants caused by wandering cattle justified the installation of metal fences around the plots, but also of firewalls to protect the plantations from bush fires.

An assisted natural regeneration strategy is implemented consisting of securing plots of land as protected areas where it is prohibited to harvest wood or non-timber products such as fruits or leaves and pastoralists are not allowed to graze their livestock. The construction of fences around these plots is effective in enforcing the bans on use. Given the strong resilience of Sahelian vegetation and in particular of tree species, a period of three to five years is sufficient for the young shoots to reach maturity. Ecologically efficient, this technique also offers the great advantage of being much less expensive than reforestation, which requires significant labor and financial resources. In total, no less than 10,000 hectares are protected in this way.

Starting in 2008, the reforestation operations have continued to be renewed. Until 2012, they were concentrated in the communes of Téssékéré and Labgar. About ten plots of variable surface area (between 500 and 2,500 ha) are located on the outskirts of the villages of Téssékéré, Widou Thiengoly and Labgar covering approximately 20,000 hectares. From 2012, reforestation efforts have been deployed within the GGW belt in the adjacent territories located to the west (municipalities of Syer and Mboula) and to the east (municipality of Loughré Thioly de Ouadalaye) where in 2018 another ten plots were established. In total, more than 40,000 ha have been reforested in Ferlo.

However, plant losses have been noted. The relative scarcity of water constrains both the production of seedlings in the nursery (obsolete and dysfunctional boreholes) and their growth within the plots (weakness and variability of rainfall). In addition, a significant proportion of the plants do not survive potting and planting. The destruction caused by cattle that get into the plots is also an issue. Overall, these factors result in the loss of approximately half the seedlings. Table 2 indicates the challenges and bottlenecks related to project implementation.

Table 2. Challenges and bottlenecks in the implementation of GGW projects.

Area concerned	Challenges	Bottlenecks
Land	Reduction of soil erosion Restructuring of degraded soils	
Management	Empowerment of local populations in the management of natural resources	
Political ecology	Conflicts between decentralized actors and the central state	
Funding	Increase the share of financing from the State	Limited financial resources
Engagement of different stakeholders	Increased involvement of state technical services	Women's participation limited due to their search for water
Climate and climate change		Late installation of wintering Deep aquifers (230 m)
Conflict and insecurity	Bush fire management Breeder/farmer conflicts	Livestock wandering in reforested plots
Community membership	Mobilization of stakeholders	
Others		Insufficient logistics and isolation of reforestation areas

2.1.5 Market gardens

Market gardens have also been constructed. The multipurpose market gardens form the second pillar of the project's intervention in the Sylvopastoral Zone (ZSP). Despite their modest size and limited number, their multifunctionality makes them particularly attractive, both from the point of view of developers and the beneficiary populations. Between 2010 and 2016, eleven gardens were created. Four gardens are located in the villages located inside the Six Drillings reserve (Loughré Thiolly, Labgar, Tésékéré and Amaly,) while the other seven are located in the western part of the of the GMV belt (Widou Thiengoly, Koyli Alpha, Mbar Toubab, Syer, Kadiar and Sakal which has two). They are mainly located in the western part of the ZSP. Their distribution on the outskirts of Ranérou, east of the national route, has been planned since 2016 but has been slow to materialize. The gardens are mainly for market gardening but also house orchards. Arboriculture is based on mango and guava trees whose young plants are irrigated by drip.

The managers of the GGW entrust the gardens to a horticultural agent who supervises the agricultural practices of the groups of 100 to 300 women previously formed. This organization of women's groups, which had been widely tested in the Ferlo during a Senegalese-German project, facilitates the exploitation of plots. The horticultural agent provides the seeds each year, mainly carrots, tomatoes, onions and potatoes.

The produce is marketed locally, almost entirely to other women in the same group and also at the weekly markets. Marketing is therefore based on a closed industry. This operation has the advantage of favoring the constitution of a monetary capital for the women, the sale of the harvests generating an income for the whole of the group which can then practice revolving credit. Finally, to encourage women, the GGW established a partnership with the World Food Programme in 2009. The Food for Work programme consisted of providing women's groups with food aid conditional on their participation in the farm plots.

The environmental function of gardens is not negligible. These gardens contribute to the re-greening of the Ferlo, especially when arboriculture develops there and provide additional pasture for home cattle thanks to the use of market garden residues and other weeds which contribute to reducing pastoral pressure on fodder resources. They may also offer, in the medium or long term, an alternative activity to livestock farming to slow the increase in pressure on water and pasture resources.

However, the study of the functioning of multipurpose village gardens raises the question of their sustainability. Does their very poor productive and financial performance not condemn them to remain «under perfusion» vis-à-vis both the GGW project and the World Food Programme? This is the major ambiguity of the GGW gardens which, in attempting to promote tools for the fight against poverty, adopt the institutionalized practices of humanitarian aid.

2.1.6 Retention basins

Retention basins also feature prominently in the priorities of GGW development choices (ANGGW, 2009). The first was set up in Labgar in 2009. It was not so much a question of creating an artificial water reservoir as of deepening an existing clay depression. Extending the longevity of temporary ponds that appear during the rainy season in this way makes it possible to improve the availability of water resources for livestock watering.

The results of these developments are rather mixed, the main example being that of Labgar. Developed in 1931 at the instigation of Bouna Albouy, the last ruler of Djolof, the Labgar retention basin has been exploited for a long time by local breeders. To increase the theoretical capacity (objective of 25,000 m³) work was undertaken in 2008 by the managers of the GGW. Design flaws seriously reduced their effectiveness by causing a decrease in runoff and an increase in water infiltration into the ground. Little used in the rainy season when water is abundant, the basin is dried out by December. Since then, the experience of the retention basins has not been extended to other municipalities along the GGW route.

2.1.7 Opinion on the La Grande Muraille Verte initiative and its chances of success

Most people only know about the GGW through the media and they have not been involved in it or seen it. Animal grazing is a major obstacle for planting seedlings and in areas where there are livestock, the solution so far has been to fence off seeded areas, which has worked well but is expensive. From the interviews, two key points were raised, i) there is need to build a strong community base to increase the likelihood of the sustainability of the activities and a reduction in the costs of implementation and ii) there is a need to make a more rigorous evaluation of the success rates of the plantations.

2.2 Review of activities and projects contributing to the GGW in Mali

2.2.1 Introduction to the GGW in Mali

Historically, Mali's participation in the GGW initiative is in the context of the continued implementation of its Plan national de lutte contre la désertification or National Plan for the Fight Against Desertification (PNLCD) adopted in October 1985. This strategy, presented at the first conference of donors, made the fight against desertification as one of the main axes of food security. At the same time, the PNLCD was topical at the regional level.

Mali's commitments for the GGW have been set as part of the country-level ANGMV (as with Senegal), which was established in Mali by Ordinance No. 2019-016 of September 20, 2019. Decree No. 2019-0765 /P-RM of September 30, 2019 sets the organization and operating methods of the ANGMV, its role and responsibilities (see Box 2).

Box 2 Responsibilities of the ANGMV in Mali

In Mali, the ANGMV was established to:

- » Ensure the execution, the coordination and the follow-up of the continental project of the Great Green Wall in Mali.
- » Design and support the development of plans, projects and programmes in the national segment of the GGW.
- » Mobilize financial resources for the implementation of GGW projects and programmes.
- » Implement the programmes and decisions of the Pan-African Agency of the GGW in relation to the national institutions and structures concerned.
- » Strengthen the resilience of the populations in the arid and semi-arid zones of the national segment of the GGW in the face of climate change, desertification and the degradation of biological diversity.
- » Contribute to strengthening the skills and operational capacities of state and non-state actors involved in the implementation of the GGW.
- » Implement a global communication strategy around the GGW.
- » Promote the partnership and the synergy of actions between the actors of implementation of the GGW.

By signing the Convention establishing the Pan-African Agency of the Great Green Wall, Mali has undertaken to work with the other member countries to relaunch the development of the Sahelo-Saharan strip of Africa. The GGW Objectives in Mali are: "Contribution to the fight against the advance of the desert and to the development of the Saharo-Sahelian zones for a sustainable management of natural resources and the fight

2.2.3 Ongoing or planned interventions for scaling up GGW implementation

The projects currently implemented within the framework of the GGW are:

- » Fermes Agricoles Communautaires Intégrées or Integrated Community Agricultural Farms)
- » Projet de Gestion des Ressources Naturelles et Changement Climatique (Natural Resource Management and Climate Change Project)
- » Projet Régional d'Appui au Pastoralisme au Sahel Mali (Regional (Project to Support Pastoralism in the Sahel Mali)
- » Programme de Développement des Ressources Animales et Aquacoles au Mali (Programme for the Development of Animal and Aquaculture Resources in Mali)
- » the PDDEPS Mali (Projet de Développement Durable des Exploitations Pastorales au Sahel Mali (Sustainable Development Project For Pastoral Farms in the Sahel Mali)
- » projects implemented by NGOs and international organizations (e.g. UNDP, FAO, UN Organisation for International Migration)

Future projects include:

- » PRAPS II
- » FAO resilience project
- » Projet de Gestion Intégrée des Paysages au Mali (Integrated Landscape Management Project in Mali being formulated)
- » PDD DIN II (Programme de Développement Durable du Delta Intérieur du Niger)

Project objectives cover the following areas:

- » Restore degraded lands
- » Improve soil fertility
- » Increase agrosylvopastoral production
- » Improve incomes through the creation of income generating activities
- » Lighten women's work, in particular water pumping
- » Strengthen the resilience of people in the intervention area
- » Ensuring food and nutritional security
- » Facilitate the mobility of people and their goods
- » Promote free trade
- » Improve the living environment

Areas of intervention and partnership

The area of intervention concerned is that of the various projects with the involvement of all actors (public, private, communities, technical and financial partners) and specifically the communities of Niore du Sahel, Nara, Timbuktu. These projects also involve the various initiatives underway at the regional and international levels including:

- » Comité Inter-État de Lutte contre la Sécheresse au Sahel
- » Union Économique et Monétaire Ouest Africaine
- » Economic Community of West African States
- » G5 Sahel
- » African Union

2.2.4 Existing challenges and bottlenecks in the implementation of GGW-focused projects

The challenges and bottlenecks of the GGW implementation are:

- » The low level of financing linked mainly to a weak mobilization of technical and financial partners around the GGW and the insufficient level of mobilization of internal resources. Several projects to improve agrosylvopastoral production have been developed and submitted to technical and financial partners for funding. From 2017 to 2020, 670,750,435 CFA francs were invested at the level of the ANGMV, of which 497,000,000 CFA francs were from the State (74%), the APGMV 15,000,000 CFA francs (2%) and technical and financial partners 158,750,435 (24%).
- » The extreme poverty of some communities on the GGW route and their vulnerability.
- » The severe degradation of ecosystems and land along the route.
- » Insufficient and poor distribution of rainfall.
- » The general disruption of the climate.
- » Interethnic conflicts and the insecurity that prevails in the GGW area impacts negatively on the successful implementation of activities.

As part of the search for funding, the ANGGW is collaborating with several technical and financial partners including the African Development Bank, FAO, the World Bank, the Global Environment Facility and the Global Climate Fund.

2.2.5 Bottlenecks and challenges to scaling up GGW interventions

The bottlenecks or challenges to scaling up GGW interventions are:

- » Weak political commitment to the GGW compared to other initiatives.
- » Failure to respect the commitments made by the States for the execution of certain decisions: for example, the holding of three conferences of Heads of State and Government since the creation of the GGW initiative only in 2010.
- » Weakness of internal funding for the execution of certain subregional activities.
- » Weak participation of the populations often due to the lack of information on the projects in progress (weakness or even lack of communication).
- » Climate changes leading to the impoverishment of populations.
- » Insecurity and conflicts preventing development efforts in intervention areas.

2.2.6 Tree planting as part of GGW interventions

Reforestation is one of the main activities in various projects and is characterized by the following:

- » Tree planting decisions and choice of reforestation sites are taken by mutual agreement with the beneficiary populations.
- » Trees are planted collectively and on a voluntary basis or as part of the food-for-work programme or through service providers in collaboration with the beneficiary populations.
- » Trees are maintained by local people, often within the framework of the food-for-work programme according to the project intervention methods or paid for in cash. If necessary, a service provider does the maintenance and watering under a contract.

- » Good recovery rates of reforested plants are recorded in the field, supported by the commitment of the beneficiary populations under a contract with a service provider.
- » Bottlenecks and challenges are linked to the lack of fencing for trees and straying animals causing damage to young trees during the recovery period. However, under the contract with the service provider and the beneficiary populations, arrangements are made for guarding.
- » Provisions are made for the registration of wooded areas for the benefit of the beneficiary populations through the communes that host these plantations.

3

Potential of PRM in Senegal

3.1 Current state of rangeland management in northern Senegal

The drylands of northern Senegal receive little rainfall and what they do is highly variable. This is a main factor in the absence of woody and herbaceous plant cover. During years of good rainfall, the herbaceous layer reaches high production levels. Pastoralists and other livestock keepers are unanimous in saying that livestock and breeding practices are not a factor in rangeland degradation in the ZSP.

The degree of plant cover and the presence of particular plants is said by local populations to be indicative of degradation. The presence of *uulo* (*Cassia obtusifolia*) and *bamwaami* (*Calotropis procera*) is considered a sign of degradation. *C. obtusifolia* tends to colonize all the lowlands, especially southern Djolof. When green, it is not very palatable for livestock and in the dry season when the leaves have fallen, only stems remain, which grazing animals cannot consume.

In recent years, *Diodia scandens*, an unpalatable herbaceous species, has colonized large areas of pasture land. As for *C. procera*, formerly considered as a species limited to inhabited areas, it has formed significant colonies, especially in the northern part of the ZSP. During the lean season, when pastures become scarce, its leaves drop and are eaten by animals. Some breeders, especially from Djoloff and Walo, are hesitant to say anything negative about this species because it helps feed their livestock.

Fires can be common in areas with woody species. At the time of this study (November) there had been sixteen bushfires in Ogo and four in Thiel. Breeders report that each time a fire breaks out, the floristic composition of herbs at the site changes. Most often, the species which grow after a fire are very coarse (e.g. *Andropogon pseudapricus* and *Pennisetum pedicellatum*) and palatable for cattle but not small ruminants. Around residential areas, especially around boreholes, large quantities of plastic bags are found that can be eaten by livestock and often kill them. In response to this problem, the Namarel dairy started using paper bags and others could be encouraged to follow suit.

3.2 Main community management approaches in ZSP

3.2.1 Pastoral Units approach

The establishment of pastoral units (PUs) began in eastern Senegal in the 1980s. The Government of Senegal and donors considered the results to be satisfactory and the approach was taken up in the Ferlo under the *Projet d'Appui à l'Élevage (PAPEL)* in the 1990s. Other partners followed. PUs have been established mostly around existing water points. The service area of the water point constitutes its limits. The objective of the PUs is to sustainably manage resources and spaces for the benefit of local populations and the community of transhumant pastoralists.

Since their initial establishment, PUs have been promoted by several other development projects including:

- » *Projet d'Appui à la Sécurité Alimentaire dans les Régions de Louga, Matam et Kaffrine (PASA LMK)*
- » *Programme de Développement Agricole de Matam (PRODAM)*
- » *Programme d'Appui au Développement Agricole et à l'Entreprenariat Rural (PADAER)*
- » *Projet de Développement de l'Élevage au Sénégal Oriental et en Haute Casamance (PDESOC)*
- » *Projet d'Appui à la Filière Agricole (PAFA)*
- » *Agronomes et Vétérinaires Sans Frontières*

In Senegal, there is some consensus that well-functioning PUs are characterized by transparency and fairness and this has enabled better ownership of the land and local development by stakeholders, including transhumants and indigenous people.

For each PU, a rangelands management plan is developed. Designed as a planning instrument for the pastoral unit, it has the following main objectives: i) development of organizational systems at the level of the PU and between PUs to ensure the consistency of sustainable management; ii) adoption of natural resource management techniques which are adapted to the characteristics of each space and which are reproducible; iii) development of a water infrastructure management system; and iv) development of a transhumance management system.

It should be emphasized that the viability of PUs depends to a large extent on the diversity of the forms of livestock mobility developed by the pastoral communities concerned. However, these specificities are not always taken into account in the approaches developed for PUs.

3.2.2 Plans d'Occupation et d'Affectation des Sols

Initiated for the first time in the rural community of Ross-Béthio between 1997 and 1999, *Plans d'Occupation et d'Affectation des Sols (POAS)* provides a framework for local managers to plan, implement and develop at the local scale. It integrates pastoralists into the administrative decentralization process and contributes to a grassroots democracy. As it currently stands, the application of the framework is far from effective for several reasons related to: i) the insufficient means of intervention of zonal commissions; ii) the capacity deficit of the members of these commissions; and iii) a lack of will to apply the rules enacted.

To take into account livestock concerns, the POAS zones an area by delimiting at least three types of land use: i) agropastoral zones with agricultural priority (ZAPA); ii) agropastoral zones with livestock priority (ZAPE); and iii) sylvopastoral zones (ZSP). The latter is reserved for livestock only and agriculture is strictly prohibited.

The POAS framework was scaled up across all the rural communities of the river region thanks to support from the *Société d'Aménagement et d'Exploitation du Delta du Fleuve Sénégal (SAED)* and *Programme d'Appui aux Communautés Rurales* and in some communities of Niayes in the Tamba Region. More recently, communes in the Department of Podo saw their POAS updated within the framework of the *Projet d'Appui à l'Agriculture Irriguée et au Développement Economique de Podor* which was piloted by SAED between 2014 and 2019.

3.2.3 Carrying capacity as a basis for improving animal production

Determining the carrying capacity of pastures has been the subject of studies in many livestock regions in the Sahel. However, its application has always been problematic, not least because of the unsuitability of the term for environments with highly variable rainfall. In Senegal, an experiment took place around drilling a borehole in Widou Tiengoli between 1981 and 1987 under the direction of the department in charge of water and forests with German funding. It was concluded that the carrying capacity for sustainable pastoral production in this region is 10 ha/TLU (tropical livestock unit) for an animal of approximately 250 kg of live weight. Attempts were also made to sedentarize pastoralists while reducing herd numbers.

After several years of implementing the approach, the evaluation found that far from resolving the issue of carrying capacity around the Widou Tiengoli borehole, it created problems. Almost all the inhabitants and users of the area grazed part of their herd outside the perimeter of the borehole space so that rather than sell their livestock they moved and added them to the herd that grazed outside. The process of destocking was slowed down but the load limit (10 ha/TLU) was often exceeded in the plots.

This experience in Widou Tiengoli is comparable to that in rental plots supported by the *Centre de Recherches Zootechniques (CRZ) Dahra*. As part of its research and development activities, in 1996 the CRZ initiated a partnership with pastoralists living in the vicinity of the centre who were authorized to graze their animals on centre plots as long as they respected the animal carrying capacity calculated on the basis of 18.75 kg of dry matter per day per animal. However, it was soon realised that the herders were not bringing in the same animals all the time and were using the plots as a fodder reserve rather than as a controlled experiment. These two examples highlight that, for pastoralists at least, the term 'carrying capacity' remains an abstraction.

3.2.4 Application of holistic rangeland management in the ZSP

From 1994, the *Projet Pilote Pastoral de l'Afrique de l'Ouest (PPPAO)* was set up with funding from the World Bank. It aimed to demonstrate that through appropriate management of resources and holistic rangeland management, it is possible to reverse the process of soil and vegetation degradation currently observed in most pastoral areas of the Sahel and to make agro-pastoral production viable. From 1996, the Senegalese component of the PPPAO was responsible for testing the applicability of the holistic rangeland management approach, popularizing the management model in the pilot sites and gradually extending it to other pastoral areas. For this purpose, two sites were chosen: Asré bani and Lol Lol.

During the first years of the project, impact monitoring depended on feedback and assessment from the pastoralists. Each time the World Bank experts came on an assessment mission, the pastoralists unanimously said that, as a result of the project, plant species that had disappeared were reappearing, the toccoonde (soil spots slightly raised and bare in season) had decreased and their cows were giving more milk. However, a subsequent monitoring system set up by an external team showed that there was in fact no difference between the management of herds in the pilot sites and those of the surrounding areas and the 'reappearing species' were not found.

3.3 Problems and challenges of community management approaches

Problems and challenges related to projects supporting community management approaches include:

- » Empowerment of pastoral communities in relation to the management of their space and resources has not yet been achieved in any PU.
- » Insufficiently trained human resources.
- » Lack of skills in animation techniques, capacity building and monitoring and community evaluation.
- » Involvement of local communities not always effective.
- » Capacity building of grassroots actors not yet effective.
- » Monitoring committee bringing together all the parties and responsible for the assessment not yet set up..
- » Lack of consultation among stakeholders
- » Extension of the agricultural front causes the fragmentation of rangelands.
- » Densification around the boreholes causing too much exploitation of the routes.
- » Political interference during the composition of the management bodies of the PUs (the will of the chiefs not always going in the direction of strengthening the PU management bodies).
- » Very often amicable settlement of disputes.
- » Emphasis on infrastructure, not on good governance.

3.4 Solutions implemented

Solutions implemented to alleviate problems in community management approaches include:

- » Awareness-raising through the media, animators (forest assistants identified and then trained) and music.
- » Marking cattle tracks and development of amenities (e.g. rest areas).
- » Creation of inter-community groups within certain municipalities (Bakel, Podor, etc.).
- » Establishment of a service centre for pastoralists (e.g. shops, veterinary pharmacies).
- » Digitization of livestock feed sales data (e.g. easier access to livestock feed for the shepherd).
- » Holding informed debates on rangeland management.
- » Increased social mobilization against bush fires.
- » Strengthening the role of community radio stations in raising awareness and informing the population (e.g. participation of the population in opening community firewalls).
- » Better management of transhumants, dwellings (e.g. reduction in the number of cases of bush fires and slow drying up of ponds).
- » Better use of ponds (lengthening the duration of watering of ponds and reduction of pollution).
- » Establishment of Association des Usagers des Forages Ruraux (better support for repairs and maintenance of boreholes).

3.5 Conflicts

The combined effect of the extension of agricultural activities and modernization of the means of production and the degradation of soils lead to a restrictive redefinition of the rules of access to natural resources and a growing inequity in access. Pastoral communities are particularly handicapped. The surveys carried out in the ZSP in the Touba-Tessékéré-Podor axis identified several types of conflicts (Table 3).

Table 3. Main types of conflicts identified in the municipalities in the passage corridor.

Type of conflict	Nature of conflict
Conflicts between farmers and transhumants	a. Animal wandering
	b. Destruction of field fences
	c. Obstruction of passageways, pastoral water points through fields
	d. Access to post-cropping pastures
Conflicts between transhumants and indigenous herders	a. Cattle thefts
	b. Competition for access to pastoral resources, mowing grass
Conflicts between transhumants and villagers	a. Access, uses, upkeep and maintenance of community infrastructure
	b. Non-compliance with local rules (access to wells, boreholes, etc.)
	c. Camping near common spaces
Conflicts between native breeders (living in the village/land) and farmers	a. Animal wandering
	b. Destruction of fences
	c. Access to post-cropping pastures
Conflicts between transhumants and water and forest services	a. Bush fires
	b. Cutting and pruning trees
	c. Excessive or unauthorized clearing
	d. Crop encroachment on protected areas
Conflicts between indigenous herders (living in the village or territory) and agro-industrialists	a. Animals wandering into agro-industrial areas
	b. Destruction of fences
	c. Prohibited access and use of pastures in the perimeters

Source: CSE surveys, July 2020 to February 2021

Analysis of survey results on the types of conflicts shows that tensions between farmers and transhumants account for 55.2% of all conflicts identified. The main causes are linked to animal wandering but also how the extension of fields affects passageways. The main conflicts mainly take place over two periods: i) in June at sowing time until August and ii) at harvest time from October until December or January.

The strong pressure on land and the gradual annexation of pastoral areas resulting in the obstruction of passageways are the main factors fueling conflicts. Not respecting or not delimiting rights-of-way of pastoral spaces is the most important factor aggravating conflicts. The most recurrent are the decisions of municipal or administrative authorities which set the conditions for carrying out pastoral and agricultural activities, for example, timing the start of cultivation and the release of fields for grazing, especially during the rainy season.

Most conflicts end in amicable solutions between the protagonists. Traditional mechanisms and recourse to village chiefs and municipal councils, in particular the mayor or the president of the state commission, are the main mechanisms for conflict resolution.

3.6 Analysis of past and present participatory management projects

Compared to agricultural areas in other regions of Senegal, the intervention of livestock projects is more recent in the ZSP. Development activities were carried out until the 1970s by traditional development services. NGOs are relatively rare even now and the incentives to regroup are not as strong as among farmers. We indicate below the main development projects that occupied this space in the early 2020s.

3.6.1 The Société de Développement de l'Élevage dans la Zone Sylvopastorale

The Society for the Development of Livestock in the Sylvopastoral Zone (SODEP) was set up in 1975 in the aftermath of a long period of drought. It was responsible for organizing the overall development of the ZSP within the framework of the strategy for the establishment of Sociétés Régionales de Développement Rural or Regional Rural Development Societies at the level of the main agro-ecological zones of Senegal.

Their strategy was based on production stratification comprised of leading each stage of animal husbandry in the most suitable ecological zone and the intensification of production through the optimal use of inputs. Thus, in Ferlo and calving areas the animals were then transported to the Doli ranch, which was the breeding centre. Finishing took place at a feeder farm in Keur Massar. Thanks to its strategy at the ZSP level, control of water supplies was possible through the management of boreholes in the area.

Pressure from various partners, in particular donors and pastoralists and the state's policy of disengaging from production companies, resulted in the closure of SODEP's activities and its liquidation. This left a void in the provision of serviced for quite some time.

3.6.2 Projet d'Appui à l'Élevage (PAPEL) or Livestock Support Project

PAPEL's activities cover the ZSP and the Groundnut Basin. The first phase started in 1993. However, difficulties caused by delays in the disbursement of funds made it impossible to achieve its objectives. Nonetheless, boreholes were rehabilitated and water supplies (antennas) put in place. Organizational bases for natural resource management were also developed.

The second phase started in 2002 and the results included:

- » facilitation of pastoralists to access animal feed,
- » rehabilitation of drought reserves and the establishment of production tracks,
- » support for processing and marketing milk,
- » continuation and consolidation of rangeland management plans of nineteen pastoral units and the development of ponds,
- » installation of nurseries, the provision of materials, equipment and inputs and the production of seedlings for the regeneration of rangelands,
- » combating bush fires,
- » production of cowpeas and sorghum fodder seeds,

- » establishment and rehabilitation of boreholes and water supply,
- » improving the quality of household drinking water,
- » capacity building of producer organizations, and
- » opening a literacy centre in poular.

3.6.3 Projet Sénégal-Allemand de Reboisement de la Zone Nord, Senegalese-German (Reforestation Project of the North Zone and Pastoral Self-Promotion Projet in the Ferlo)

In the aftermath of the great drought of 1972–1973, Senegal asked the Federal Republic of Germany for support for natural resources management. This resulted in the German Forestry Mission at the Ferlo level and a series of projects.

- » The Senegalese-German Reforestation Project of the North Zone (1975–1980). This first project had as priority objectives to restore the broken ecological balance around the boreholes of Mbar Toubab, Niassanté, Tatki, Widou-Thiengoli and Ganina and restore the massif of the classified forest of Rao, characterized by excessive felling, straying cattle and frequent fires. This project ran until 1980 and made it possible to achieve:
 - » 2,149 ha of reforestation under management
 - » 636 ha of community reforestation over the last two years (1979–1980)
 - » and 57 ha of defenses. The species used for reforestation was Acacia Senegal
- » **The Projet Sénégal-Allemand de Reboisement de la Zone Nord or Senegal-German Reforestation and Sylvo-pastoral Development project of the North Zone project (1981–1987)**. In addition to the objectives of the first project, new objectives were added such as i) improvement of the operating system for pastures for better animal production that would be compatible with self-restoration and maintaining the ecological balance of the environment, ii) regeneration of mainly bare cropland in the southern part of a Ferlo called Djoloff and iii) support for peasant reforestation activities in the region surrounding the Six Forages Reserve.

Around the Widou Thiengoli borehole, a programme was started in 1981 to develop plots of 200 ha over an area of 1,400 ha. The carrying capacity at the level of each perimeter was limited to 10 ha/TLU in three of the plots and 14 ha/TLU in three others. The success of this first operation meant that in 1986, the project carried out a first extension of 14,000 ha. A second extension took place in 1989 with a perimeter of 4,200 ha. The safeguarding of pastoral perimeters was therefore done to the detriment of undeveloped areas.

The Projet d'Autopromotion Pastorale au Ferlo or Pastoral Self-Promotion Project in Ferlo (PAPF). Failure made it possible to reorient the approach towards pastoral self-promotion in 1993 with an effective start of activities two years later. This approach started with five boreholes (Widou Thiengoli, Wendou Oldou, Ganina, Bouteyni and Tatki) and was later extended to five others. It enabled the PAPF to

- » organize and support the pastoral communities of these drilling areas in the fight against bush fires with 1,200 km of firebreaks,
- » set up a regulation system for transhumance to raise awareness of the content of legal texts governing their environment (notion of classified reservations),
- » organize women into groups and support them as millet growers,
- » promote the transparent management of boreholes by grouping users together in user associations, and set up a literacy program especially for young people in the municipalities.

Experimental plots have been set up since 1980 to monitor the effect of load on the regeneration of plant species. PAF activities ended in 2008 after 32 years of activity.

3.6.4 Programme de Développement Agricole de Matam (PRODAM)

PRODAM was initially an emergency project that aimed to support and integrate returnees and dispossessed people following the events between Senegal and Mauritania. It was co-financed by IFAD, the Banque Ouest Africaine de Développement, the Government of Senegal and beneficiary populations. Activities started in 1995 and mainly targeted populations in Matam (Walo and Jeeri).

The main results were:

- » Strengthening the operational capacities of the livestock service through institutional support
- » Creation of pastoral units
- » Establishing firewalls
- » Construction of livestock feed stores and vaccination yards
- » Training centres for farmer organizations (POs)
- » Construction of points for storage and sale of animal feed
- » Construction of fodder storage sheds
- » Development of rural roads
- » Support for the creation and modernization of goat and sheepfolds equipped with night parks
- » Construction of hydraulic structures

3.6.5 The Management Project and Restoration of Degraded Land of the Groundnut Basin (PROGERT)

The activities carried out by PROGERT (2007–2012) first enabled the establishment of PUs in Diassarnabé Aly, Sam Kébé, Keur Ibra Binta (Louga Region) and in the Mbégué sylvopastoral reserve (Kaffrine Region) within which the following actions were developed:

- » Capacity building of management committees and support for the implementation of annual action plans.
- » Dissemination of local conventions in local languages.
- » Physical materialization of Pus.
- » Enrichment of livestock routes.

PROGERT enabled consultations at the local level and contract signings with local populations for the delimitation of livestock corridors that had been identified and mapped in 2009. They also organized training for a hundred livestock breeders and PUs in fodder crop techniques and planting fodder species on 50 ha in the Mbégué PU.

3.6.6 The Louga, Matam and Kaffrine Food Security Support Project (PASA LMK)

PASA LMK intervened in the ZSP communes in Téssékéré, Labgar and Louguéré Thioly from 2013 to 2020. Interventions were financed by the ADB. In terms of results, the project developed firewalls and rural tracks and preserved biomass and rangeland areas. It also took into account the issue of capacity building through:

- » Support for the establishment or revitalization of 25 borehole management bodies such as Association des Usagers des Forages Ruraux.
- » Structuring, supervision and animation of 25 PU in the ZSP.
- » Actions to support health coverage and food supplementation for livestock.

In terms of hydraulic infrastructure, the project established new pastoral boreholes and the rehabilitation of existing boreholes and equipped new boreholes with water towers and drinkers and extended existing networks and developed firewalls and rural roads in the ZSP.

3.6.7 Projet d'Aménagement et de Développement Villageois (PADV)

The PADV was implemented from 2000 to 2007 in the northern region of Senegal in the Louga Region with funding from IFAD. Its objective was to create a sustainable dynamic of development by building the capacities of local populations and mobilizing available agro-pastoral resources. Among its achievements were:

- » Establishing and strengthening the Comité de Développement Villageois or Village Development Committees.
- » Establishing committees to fight against bush fires.
- » A basic literacy programme (Wolof and Pulaar).
- » Rehabilitation of boreholes equipped with drinking troughs and water towers.
- » Installation of Association des Usagers des Forages Ruraux and training in management techniques.

it also set up firewalls and rural roads (opening up about fifty villages), grain and animal feed stores, improved henhouses and a village shop. In the Departments of Louga and Linguère, it introduced the production of cowpea seeds and the construction of improved henhouses, dairy barns, market garden plots for the production of cowpeas for food; forage production (andropogon, cowpea forage, *Leucena* sp.) and building up fodder reserves through the provision of equipment (motor mowers, carts, etc.).

3.6.8 Projet d'Appui à la Petite à la Petite Irrigation Locale (PAPIL) (2010)

PAPIL was set up to combat bush fires. In 2010, 35 bush fire control committees were revitalized and equipped. In addition, 65 km of firewalls were opened as part of the fight against bush fires, thus making it possible to secure nearly 60,000 ha of forest. In connection with the Ecological Monitoring Center, the monitoring pastures and bush fires has been carried out every year for more than three decades. Biomass maps at the end of the rainy season have made it possible to increase the fodder potential and provide information on deficits by region and bush fires are monitored every year throughout the dry season.

On the outskirts of Niokolo Koba National Park, the International Union for the Conservation of Nature (IUCN) Senegal has developed activities for establishing land management plans, including plans for pasture management committees.

3.6.9 The Pastoral Livestock Security Project in the Matam region

This project was financed by the decentralized cooperation with Rhône Alpes to set up a PU approach and strengthen pastoral organisations and diversify economic activities such as market gardening and livestock fattening. It was implemented thanks to a partnership with local communities, and technical services and specialized services like ISRA and the Centre de Suivi Ecologique. It was recommended to refine the PU approach and integrate them into municipal bodies.

3.6.10 Project to combat desertification by supporting pastoralism (Egga Egga)

This project, implemented by the Agronomes et Vétérinaires Sans Frontières (AVSF) between 2016 and 2020, took place in the Departments of Linguère, Ranérou and Matam. Activities focused on:

- » networking POs,
- » establishing a strong pastoral civil society and a municipal and departmental federation,
- » creating a partnership between UP managers and the Maison des Eleveurs and putting them in touch with the technical services, and
- » technical strengthening of POs to take charge of pastoral issues.

3.6.11 Projet d'Amélioration de la Sécurité Alimentaire et d'Appui à la mise en marché dans la région de Matam and Projet d'Appui à la Promotion des Exploitations Familiales dans la région de Matam

These projects, financed by the French Development Agency, were entrusted to SAED with technical assistance from AVSF and Géophyte. They started in 2017 and ended in 2022. There is a support fund for local communities to set up pastoral and productive infrastructure but not social projects.

Activities include:

- » Reforestation
- » Establishing a land information system in rural areas
- » Developing an action plan for classified forests
- » Implementing restoration actions
- » Training people to use and develop local natural resources, in particular, *Borassus flabellifera* (rônier) and *Balanites aegyptiaca* (soump).

3.6.12 Building Resilience and Adaptation to Climate Extremes and Disaster (BRACED)

This project was financed by the UK Department for International Development in partnership with the European Union and Air France and ran from 2015 to 2018. It was carried by the Antenne Sénégal Réseau Billital Maroobe the Senegalese arm of Réseau Billital Marobé Senegal (RBM).

The results were:

- » Securing cattle tracks through mapping and marking off certain areas and development of water points, rest areas and grazing areas.
- » Provision of basic services (animal feed, veto products) to pastoralists and agro-pastoralists along corridors.

- » Development and multiplication of advocacy tools to enable key actors to advocate for cross-border livestock mobility at the local, national and ECOWAS levels.

3.6.13 The Sustainable Development Programme for Pastoral Farms in the Sahel (PDEPS)

The PDEPS approach is participatory and inclusive and the beneficiaries are pastoralists and agro-pastoralists in its area of intervention. It ran for five years and was implemented by Ministère de l'Élevage et des Productions Animales, with technical partners. The following main results are expected from its implementation:

- » improved management of fodder resources and access to water,
- » development of the milk and small ruminant value chain and
- » capacity building of pastoralists and agro-pastoralists.

3.6.14 The Regional Support Project for Pastoralism in the Sahel I (PRAPS) Phase I

The objective of the PRAPS-SN was to improve access to markets and essential production means and services for pastoralists and agro-pastoralists in the areas targeted by the project and improve the national capacity to respond in a timely manner in the event of pastoral crises or emergencies. Funded by the World Bank with international development assistance funds it ran from 2016 to 2021. Its area of intervention included eight departments spread over five regions of the ZSP, the Groundnut Basin and Eastern Senegal. The direct beneficiaries of the Project were 230,000 pastoralists and agro-pastoralists.

The main results were:

- » creation and rehabilitation of 20 pastoral units with management plans,
- » setting up an extension network with a network of animators equipped with motorcycles and smartphones,
- » materialization of transhumance corridors,
- » the establishment of inter-community consultation frameworks in the project intervention area,
- » bush fire prevention measures and creation of defensive areas,
- » creation and rehabilitation of nurseries,
- » reforestation in the 200 ha and 20 km linear reforested PUs.
- » the distribution of mowers, training intermediaries in techniques of sustainable management of pastoral resources and establishment of fodder reserves,
- » construction and rehabilitation of pastoral boreholes, and
- » construction of vaccination centers, livestock feed stores and pastoral shops run by women.

3.6.15 Dolly Ranch Holistic Rangeland and Livestock Management Project

This project, funded for a period of five years, is implemented by Heifer International in partnership with Savory Institute and the MEPA. Its objective is to restore the routes of the Ranch de Dolly through the natural regeneration of plant species. The beneficiaries of the project are pastoralists and agro-pastoralists of the Ranch. The main results are:

- » the development of a management plan for the rangelands of the Ranch,
- » the introduction of new forage varieties, and
- » the fight against unpalatable species such as *Diodia scandens*.

3.6.16 Azila Gum Company

The Azila Gum Company is financed by Saudi partners which set up in the ZSP at the beginning of the 2000s. With approval from the municipal councils of communes in the Department of Linguère, it was able to obtain plots that it reforested with *Acacia senegal*. Currently, the gum tree plantations have reached the age of harvesting. To prevent fraudulent exploitation, it prohibits access to the plots by pastoralists, which sets them against the local population. Conflicts are recurrent.

3.6.17 The Regional Support Project for Pastoralism in the Sahel I (PRAPS SN) Phase II

The objective of PRAPS2-SN is to improve the resilience of pastoralists and agro-pastoralists in certain areas of the region and to strengthen the capacities of countries to respond quickly and effectively to crises or pastoral emergencies. Its execution period is six years (2021–2027). The project will intervene in ten departments (Dagana, Podor, Matam, Kanel, Ranérou, Linguère, Louga, Koungheul, Bakel and Koumpentoum).

In its component on Sustainable Landscape Management and Governance, the project aims to improve the availability of food resources for livestock through better access to pasture, water and complementary feed and fodder. To this end, it will intervene in:

- » the conservation and protection of fodder resources on natural rangelands, protection of plots and actions to restore the environment,
- » pasture production, dynamics of poisonous and invasive plants, such as *Diodia scandens* and identification of appropriate management methods, and
- » identification, mapping and materialization of 100 km of passageways for transhumant herds, in addition to similar work already carried out or planned by other projects (BRACED, PDEPS, PADAER, etc.).

The beneficiaries and the main expected results are the same as in the first phase.

3.6.18 West Forest

This project announced by AVSF will intervene in the field of carbon sequestration through the reforestation of 10,000 ha. The feasibility study will start from mid-November 2021.

3.7 Added value of participatory rangeland management (PRM) in pastoral areas of Senegal

There are strong similarities between the UP approach and the PRM approach. However, differences can be noted in the steps (Table 4).

Table 4. Comparison of Participatory Rangeland Management and Pastoral Units.

Stages of PRM	Stages of PU implementation		
Phase 1: Investigation	Step 1: Identification of resources and users	Investigation phase	1. Descriptive and evolutionary analysis of resources and place of PU (inventory of fixtures), characterisations
			2. Identification of constraints and opportunities
			3. Definition of issues and strategic options
			4. Proposal of an action programme and timetable
Phase 2: Negotiation	Step 2: Strengthen or establish rangeland management institutions	Feedback and validation phase	5. Diagnosis analysis and results
	Step 3: Define the rangeland management unit and prepare the resource assessment		6. Information about working mode and setting
	Step 4: Develop the Rangeland Management Plan		
	Step 5: Establish the rangeland management agreement		
Phase 3: Implementation	Step 6: New roles for communities and rangeland management advisors	Development phase for governance arrangements of PU	7. Establishment of management bodies
	Step 7: Halt and reverse decline in rangeland productivity		8. Identification and management of financial resources
	Step 8: Participatory monitoring and evaluation		
		PU plan approval phase	9. Submission of the PU plan by the project to the administrative and local authorities
		PU plan implementation phase	10. Return after approval of the PU plan for the start of activities

Table 5. Added Value of Participatory Rangeland Management in ZSP

Items	Comments
Rangeland management (water, vegetation, land)	Livestock-land carrying capacity better managed Dysfunction of hydraulic structures Improved infrastructure and equipment management
Productivity of rangelands	Possibility of feeding livestock significantly improved Reduced losses from trampling and bush fires Well-delineated and preserved livestock routes
Livestock productivity and health	Reduced losses related to malnutrition and disease Reduction of factors at the origin Fight against various pathogens
Livelihoods of pastoralists	Strengthened local economy leading to flourishing markets Improved incomes
Access to land and resources	More equitable access to land Quality of pond water preserved Easy access to pond water resources
Conflicts	Reduced number of conflicts
Planning and decision-making processes	Strengthening dialogue between different actors Assistance in decision-making
Resilience to shocks and climate stresses	Better management of the needs of vulnerable groups Better possibility of preparing local populations

3.8 Opportunities, challenges and bottlenecks in the implementation of PRM

There are multiple opportunities for implementing PRM (Table 6) but the challenges are numerous and the bottlenecks are real (Tables 7 and 8).

Table 6. Main Opportunities Related to the Implementation of Participatory Rangeland Management.

Implementing agency	Opportunities
Government support	Existence of a decentralization policy Government support through decentralization and the transfer of competence Existence of a ministry in charge of livestock
Institutions and governance	Existence of a research and development tradition with the presence of the Centre de Recherches Zootechniques of Dahra Existence of a strong experience of community management of rangelands Understanding the issues thanks to the implementation of similar management tools (POAS and UP)
Cattle movements	Better fertilization of agricultural land Recognition of transhumance corridors increasingly recognized by other actors including authorities Existence of an essentially pastoral system, a favourable environment for livestock activity
Finances	Finances increasingly available through financial and technical partners, NGOs, PPP, local authorities and adaptation funds
Community membership and other government commitments	Increasing presence of the Organization of Basic Communities (OCB) and dynamic producer organizations Existence of Pus and PAOS
Conflicts and insecurities	Existing consultation frameworks

Source: Author's elaboration.

Table 7. Main challenges related to the implementation of PMR in ZSP.

Institutions and governance	<p>Guarantee the proper functioning of institutions</p> <p>Guarantee a good practice of pastoralism (management of transhumance)</p> <p>Adoption of the new code</p> <p>Legal recognition of UP and POAS as a spatial management tool</p> <p>Choice of competent teams to steer the process</p> <p>Guarantee transparent management of the various management bodies (drilling committee, etc.)</p> <p>Strengthening of women's and youth organizations for better access to new technologies</p> <p>Need to find strategies for articulation and harmonization of approaches</p> <p>Legal recognition of PUs as spatial management tools</p> <p>Harmonization of points of view and acceptance to apply the rules of the game</p> <p>Positive or negative sanction</p>
Cattle movements	<p>Marking of transhumance corridors</p> <p>Facilitation of mobility (development of rest areas, watering along the axes, etc.)</p>
Finances	<p>Funding of skills transferred in the area of environmental and natural resource management</p> <p>Empowerment of PUs for their sustainability at the end of the project</p> <p>External financial partnership to be strengthened</p> <p>External financing to be reinforced</p>
Community membership and other government commitments	<p>Involvement of children by also emphasizing the benefits drawn by the community (parents and family)</p> <p>Effective involvement of women in the various management bodies (management committees of PUs, boreholes, etc.)</p> <p>Better organization of communities in the exploitation of resources</p> <p>Operationalization of policies (Governance)</p> <p>Better involvement of communities</p> <p>Community adherence to established management rules (management plans management)</p> <p>Stimulate the practice of «restore after harvest»</p> <p>Harmonization of tools and sustainability</p>
Conflict and insecurity	<p>Reduction of conflicts between farmers and herders</p>
Natural resources (land / forestry)	<p>Reclaiming a space with a sharp decrease in resources (gum arabic)</p> <p>Development of woody resources</p> <p>Preservation of areas reserved for pastoral farming</p> <p>Reconciliation of reforestation with livestock activities</p> <p>Involvement of Producer Organizations in the sustainability of natural resource management tools</p> <p>Securing transhumance corridors and access to resources</p> <p>Strengthening of the local economy</p> <p>Short-term profit instead of immediate profit and that of the community instead of individuals or groups</p>
Other factors	<p>Cultural practice to return what has been taken</p>

Table 8. Main bottlenecks related to the implementation of PRM in ZSP.

Implementing agency	Bottleneck
Government support	<p>Insufficient duration of projects (need to work in the long term)</p> <p>Difficulties in getting local or administrative authorities to sign documents relating to PRM activities</p> <p>Lack of support from local communities</p> <p>Lack of technical services at the local level</p> <p>Failure to respect schedules for setting up infrastructure (in particular water points) and equipment</p> <p>Equipment not suitable for development work</p>
Institutions and governance	<p>Lack of coordination and consistency linked to the multiplicity of structures</p> <p>Legal dimension of local agreements to be consolidated</p> <p>Low level of representation of pastoralists in the process of setting up steering activities</p> <p>Duration of mandates of local elected officials does not ensure the sustainability of decisions and programmes</p> <p>Reluctance of authorities to share decision-making power</p> <p>Obsolete texts (not responding to the current challenges of pastoralism)</p> <p>Willingness of political authorities to make decisions in place of managers chosen by user groups</p>
Finances	<p>Guarantee substantial financing of activities</p>
Community membership and other government commitments	<p>Better involvement in the activities of the PUs and the local structures present (community radio, NGOs, etc.)</p> <p>Communities lose momentum after the departures of projects and programmes, abandonment of animation activities and consultations for concerted and sustainable management</p> <p>Lack of dynamism among heads of management committees</p> <p>Demobilization of populations in the event of a delay in the investment programme, particularly with regard to water</p> <p>Return to a cultural practice of «return what has been taken»</p> <p>Prominence of the word of authority figures</p>
Livestock movements	<p>Extension of duration of the transhumance</p>
Gender and social inclusion	<p>Prominence of the voice of the elderly over women and young people</p>
Climate and climate change	<p>Density of rain gauges still insufficient in pastoral areas</p> <p>Non-existent or poorly performing climate forecasting models</p>
Conflict and insecurity	<p>Lack of social cohesion among pastoral populations</p> <p>Reduction of pastoral space for the benefit of other actors (agribusiness, religious authorities, urbanization, mining, etc.)</p> <p>Low representation of certain key players in decision-making bodies (for example shepherds)</p>

3.9 Capacities of actors in the implementation of PRM

3.9.1 Understanding pastoral production systems

Significant achievements have been made in improving knowledge of pastoral resources and their management through collaboration between national institutions and with foreign institutions, particularly Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) and Institut de Recherche pour le Développement. Work began with mapping pastures in the main production areas and later with the development of forage biomass maps (1984 in conjunction with NASA) and bushfire zones. Investigations were also carried out on the importance of water resources, woody forage potential, soil types and animal potential. The interactions between these resources were the subject of an analysis of the methods of exploitation of fodder resources in relation to other types of resources (e.g. ground and surface water, soil).

In the early 2000s, a scientific interest group, the Pastoralisme et Zones Sèches (PPZS) was set up. This collective brought together 17 to 25 researchers (sociologists, economists, geographers, pastoralists, foresters, biologists, zootechnicians, modellers) belonging to three national institutions: ISRA, Université Cheikh Anta Diop de Dakar, Centre de Suivi Ecologique, and CIRAD. This group has been able to add value through a coherent inter- and multidisciplinary research dynamic around the theme of pastoralism and has made significant achievements in the knowledge of pastoral systems. In relation to development institutions and universities, great efforts over the years have led to a marked improvement in the knowledge of Senegal's pastoral systems. However, the high variability of pastoral systems, particularly with climate change, requires the use of increasingly efficient tools and therefore, investigations are continuing.

3.9.2 Facilitation, community mobilization and animation skills in the field of PRM at the national level

Several organizations are active in the area of capacity building. Among these are NGOs like AVSF, producer organizations like Réseau Billital Marobé Senegal (RBM) and Association pour la Promotion de l'Élevage au Sahel et en Savane and consultancy firms like SAHEL EPA (Environment-Pastoralism-Agriculture).

Veterinary Agronomists Without Borders (AVSF)

AVSF is an NGO that aims to secure the mobility of pastoral livestock. Since 2008, it has supported Ferlo breeders in their fight against desertification. It has carried out projects in the following areas:

- » securing the mobility of pastoral livestock by equitable regulation of access to pastoral resources,
- » actions for mitigation and adaptation to climate change in the Ferlo area, and
- » the fight against desertification by supporting pastoralism in the Ferlo (Egga Egga).

The competence of its experts has enabled it to develop a Capacity Building Manual for Pastoral Units in Senegal, which is a benchmark in the field of animation and facilitation. AVSF works in collaboration with the RBM for animation and mobilization activities.

Réseau Billital Marobé Senegal (RBM)

RBM ASE is a development association bringing together 23 Producer Organizations in 12 regions of Senegal. Its financial partnership portfolio is quite extensive. RBM is also a technical partner with several institutions in the implementation and monitoring of PUs. Its presence in the field through the members of its Producer Organizations allows it to carry out facilitation, mobilization and animation activities. Its most important contribution is its ability to continue activities even after funding from partners has ended.

The Council of Community Volunteers for the Development of the Sahel (CVCS)

The CVCS is a civil society organization set up in 2009. Its mission is to contribute to the management of resilience for sustainable development by providing communities with qualified human capital. Its 67-member system is active in the field of facilitation, awareness-raising and learning. It is made up of facilitators with good experience in support, community relays, assistants, literacy and animation supervisors, education volunteers and CAF facilitators. In the field of PU management it has supported several projects (e.g. PRAPS, PDEPS, PAFA Extension).

Association for the Promotion of Livestock in the Sahel and Savannah

This association has been in the ZSP since 1998 where it is increasing the influence of pastoral farming (pastoralists' advocacy capacity) and the development of knowledge houses (dissemination of good practices). With the Gallo project, it has supported breeders to be more present in decision-making centers with a view to their better access to natural resources. In partnership with the Laiterie du Berger (2013–2018), it contributed to training and better structuring of pastoralists and agro-pastoralists in the Niassanté area. It also contributes to the education of pastoralists through the implementation of the Regional Program for the Education of Pastoral Populations with Swiss funding and the capacity building of women in the field of savings.

SAHEL EPA (Environment-Pastoralism-Agriculture)

SAHEL EPA started to be active in the island sector pastoral care in 2005. The skills of its experts revolve around supporting partners in the management of Pastoral Units (animation and social mobilization of local institutions, etc). SAHEL EPA carried out awareness-raising activities, community mobilization in the field of PU management on behalf of projects such as PRODAM, PADAER and PAFA and provided training for the heads of pastoral units and local elected officials. It is also involved in the implementation of PU management plans.

3.9.3 Gender and social inclusion

Gender and social inclusion in rangeland management does not appear to have been a significant area of development investment to date.

3.9.4 Rangeland management techniques

To generate the significant knowledge available on pastoral systems in Senegal, it was necessary to develop increasingly efficient inventory and monitoring methodologies for most resources and techniques for the use and restoration of spaces. The complexity of pastoral systems and the weak commitment of partners, particularly financial partners for pastoral livestock production, have been a barrier to systems support for some time. In the early 2000s, the establishment of the PPZS made it possible to make significant progress in the analysis of these systems and it was possible to develop resource monitoring indicators and tools and knowledge on the study and management of pastoral socio-ecosystems. Some projects have supported universities and other research and educational institutions in the development of training modules on arid and semi-arid ecosystems aimed on the one hand at higher education and on the other hand the transfer of skills for the benefit of pastoral societies.

3.9.5 Planning an governance of activities

In Senegal, the Ministry of Livestock and Animal Productions (MEPA) is responsible for ensuring that livestock and pastoralism are taken into account in planning rural areas. It also ensures the improvement and protection of pastures, water supplies for livestock, animal health, genetic improvement of the herd and encourages the creation of pastoral infrastructure. MEPA is responsible for promoting the training and supervision of breeders, with a view to carrying out projects adapted to their needs. MEPA has experts in veterinary sciences, zootechnics, socio-economics, pastoral planning and related fields who are capable of managing all concerns leading to the development, implementation and monitoring and evaluation of projects and programmes. These teams were able to support previous and current projects in this area.

MEPA is supported by development structures from other ministries (several national research and development institutions such as ISRA and universities) and the Ecological Monitoring Center and PPZS. Multi-institutional structures are put in place whenever necessary for planning project activities.

3.9.6 Information on climate and climate change

ANACIM has a network of meteorological stations and rain gauges across the country. A series of daily data (rainfall, humidity, temperature, wind, etc.) more or less complete over several decades can therefore be obtained on request. National institutions (MEPA, Hydraulics, etc.) have monthly data at different scales in their reports on different resources (animal, plant, water, etc.) allowing cross-analyses to be carried out to determine trends. Normalized Differential Vegetation Index data are available throughout the rainy season and bush fires throughout the year thanks to the work of the Ecological Monitoring Center. With ad hoc studies and cross-referencing the basic data generated by these institutions, analyses are carried out to assess the country's situation in terms of the impact of climate variations at various levels.

3.9.7 Monitoring and evaluation of beneficiaries

Indicators are selected at the start of projects for monitoring performance. Monitoring and evaluation managers of these projects are national experts commissioned for data collection. At regular intervals, an analysis is carried out internally or with the help of external firms. Local people are increasingly involved in periodic assessments. Appropriate methodological approaches have been developed by most projects to strengthen the results obtained on the basis of indicators.

3.10 Phasing PRM implementation activities

As with PPM projects already carried out or in progress, PRM implementation activities can be phased as follows:

- » First step as for UP, identify the actors who are active in the area and inform them.
- » The selection criteria (social cohesion, organizational dynamism, proximity to other PUs) are validated by local populations, authorities and supervisory structures during the local committees for development (Comités Locaux de Développement) organized for this purpose.
- » Field surveys are then organized with a multidisciplinary team accompanied by representatives of producer organizations.
- » The surveys are analyzed with a scoring system according to the criteria.
- » These choices are validated during the Comités Locaux de Développement meetings and the concerned populations are informed.

3.11 Identification of partners likely to support PRM

In Senegal, the partners who support participatory rangeland approaches are numerous. In the implementation of PRM, their experience would be a great contribution (Table 9).

Table 9. Contribution of the various partners able to support PRM.

Organization/Group	Comments
Local partners	Réseau Billital Marobé Senegal producer organizations: Many producers in the ZSP are members of the network of community relays trained in data collection and sensitization of pastoral populations.
	AVSF, NGOs: Funded and implemented the development and implementation of PU.
Local collectives (communes)	The management of natural resources is the responsibility of the mayors; municipal councillors through the various commissions, including the State Commission, have an important role to play.
Ministries and local authorities	MEPA coordinates and executes the implementation of rangeland projects.
	Certain rangelands are in protected areas which are under MED supervision; responsible for the preservation of natural resources (fire fighting, etc.).
	Ministry of the Interior through the prefects and sub-prefects
	The GGW helps take charge of the needs of the populations through its consultation frameworks.
Technical and financial partners: bilateral and multilateral cooperation	France: Alongside national research structures, its institutions have developed research products that have contributed to the GPP approach.
	Germany: German Agency for International Cooperation has acquired considerable experience in forestry issues in pastoral areas.
	World Bank, ADB, IFAD have financed a number of projects in the field of PRM.
	FAO has developed projects that support activities carried out in rangeland projects.
Partners in research development and education	ISRA has contributed to the development of many management plans developed by projects at the national level.
	Universities: UCAD, Alioune Diop, Iba Der Thiam through their students they make available to development institutions and services.

3.12. Assessment of geographic areas likely to host PRM

Following discussions, these proposals emerged:

Existence of a platform of institutions working at the level of the department on issues relating to livestock (departmental services, NGOs), unfinished socio-economic infrastructure, e.g. the case of the Department of Linguère.

- » Need to make the PUs progress in all tasks: this is to make a situation with regard to the PUs and choose the sites that do not have them.
- » Sites that have been the subject of previous investigations and the establishment of participatory rangeland management plans.
- » Areas of high conflict intensity to allow them to benefit from the advantages of participatory management.

Sites with research data over several years:

- » **Zone of Niassanté:** Supply axis for a dairy industry (La Laiterie du Berger), research on this site will take into account the new structuring of activities within farms, in particular the fixation and assisted supplementation of a dairy nucleus in the camps.
- » **Widou area:** Long-term research site of a Senegalese-German project on the sustainable management of natural resources and pastoral self-promotion. This site is the starting point for the reforestation initiative (the Great Green Wall) which has started in Tessékéré. This conservation approach will have effects on the agropastoral dynamics which will require an improvement. It is up to date in terms of knowledge for development. According to some, Tessékéré is a crossroads area for transhumance movements.
- » **Tatki site:** PPZS long-term research site. Continued research on this site will take into account changes in production systems and lifestyles in a context of aridity.

4

Mali

4.1 Current approaches to rangeland management in Mali

Mali has 34,000,000 hectares of rangelands, or 24.16% of the national territory. Several participatory rangeland management initiatives have been developed for the rational management of pastures within the framework of the implementation of livestock and pastoralism development projects and programmes. This has mainly resulted in the demarcation of pastoral perimeters in the large pastoral areas and livestock regions with the participation of pastoralists, transhumant and nomadic pastoralists. Each perimeter is delimited on the basis of criteria accepted by all users including the number of livestock, the area and the infrastructures (stables, vaccination centres, water points, etc.).

Several rangelands management approaches and practices are common in Mali. They are mainly managed by traditional leaders and village chiefs and vary according to the resources and the cultural influences prevalent within the routes and are for the most part effective but not always inclusive or participatory. Communities have not been able to take ownership of rangelands management and manage according to traditional mechanisms which can be effective but are often conflictual. They include: i) land management, ii) pasture development plans and iii) bourgoutière management (see section 3.4).

Land management is based on a participatory approach and concerns the integrated management of all the resources of a given environment (agricultural, pastoral, forestry, etc.). It is especially developed in agropastoral environments. It aims to develop a Land Use Planning Scheme. It is, to a large extent, comparable to the PRM approach.

The pasture development plan approach consists in organizing breeders (in association, or pastoral group, cooperative, etc.) on the basis of specifications around a permanent water point in an exclusively pastoral area with the beneficiaries taking charge of the operation of the water point.

4.2 The management of bourgoutières

A bourgoutière is a grassy plant formation dominated by *Echinochloa stagnina* (locally called bourgou). This plant association forms floating pastures in the flood plains of the Inner Niger Delta which are of great importance to the cattle breeders of the region.

The management of the bourgoutières is a unique, centuries-old practice originally based on the association of the professional specialization of the ethnic groups in society with ecological niches: fishers (Bozo and Somono), farmers (Bambara, Marka) the exploiters of and breeders (Peulhs). The exploitation of the bourgoutières is itself based on a distribution of existing bourgou fields among all lineages, providing each Peulh family with a family bourgou placed under the management of a Jowro (traditional governance institution). Each Jowro controls the limits of their territory. The system operates on the basis of a rural code taking into account the main activities (agriculture, breeding and fishing) and establishing an annual calendar for the movement of animals set up since 1820 by the Dîna under the authority of its spiritual leader Sékou Ahmadou.

4.3 The current state of rangeland management

The current state of range management is satisfactory in areas with developed routes (pastoral perimeters) but less so in areas without supervision. The main problems and challenges are:

- » the weak network and the lack of control of water points along the routes,
- » land tenure insecurity,
- » the extensive nature of breeding,
- » obstruction of tracks to pastoral routes,
- » the weak involvement of communities in rangeland management with the exception of areas with natural resource management conventions,
- » low awareness of natural resources degradation on the part of the populations who blame it solely on climate change and ignore human actions, including the impacts of demography and urbanization, and
- » the irrational use of the routes and the lack of monitoring and control of load capacities.

The solutions considered are:

- » improving communication on climate change,
- » strong involvement of communities in environmental preservation,
- » the development of synergy of action between projects, programmes and actors,
- » strong involvement of the private sector,
- » the appropriation of management mechanisms by the communities,
- » the tools of the technical services in the control of the dynamics of the rangelands,
- » development and sowing rangelands under the aegis of the joint committees (technical services, communities, operators and partners) and
- » the delimitation, development and participatory management of pastoral areas in an inclusive manner.

The level of degradation of the rangelands is:

- » medium in areas under controlled management (pastoral perimeters),
- » very advanced in diffuse areas, where the stocking rates of the rangelands are constantly decreasing (by way of illustration, the Delta Intérieur du Niger, which could support more than two million TLU (tropical livestock units) around Lake Walado-Débo, is struggling to support a million today according to several studies), and this is closely linked to the effects of climate change, overgrazing and manifests itself in decreased biodiversity and fodder biomass and the drying up of water points.

Conflicts over precedence, ownership and exploitation in the rangelands are important and come from all the actors and operators: breeders, farmers, forest operators. With the early return of herds to homes and settlement areas, particularly transhumant herds and their late return to grazing sites, there are conflicts between herders and farmers. The obstruction of rangelands is a major source of conflict between farmers and breeders. These conflicts have a negative impact on rangelands management and therefore on environmental preservation.

An analysis shows the fragility of rangeland management institutions leading to poor governance of natural resources. Another weakness stems from the non-transparent use of resources resulting from the collection of taxes or rangelands access rights under codified management (bourgoutières, pastoral perimeters) without any control from the state or from communities. This is not favourable to the restoration of the rangelands.

A significant strength of the governance of codified management rangelands is the acceptance of codification and the recognition of cultural and institutional anchoring by communities and stakeholders. Projects have been implemented for the peaceful use and management of pastoral rangelands, in particular with the development of local agreements for the management of pastoral resources. However, the institutional framework put in place for the implementation of these conventions ceases to function with the end of the project. These projects have, however, fostered the creation of breeders' associations across the country.

From this comprehensive analysis of the current state of rangeland management in Mali, it emerges that the peaceful use of rangelands remains an open issue, particularly degradation in areas with non-codified management and exploitation conflicts despite the laudable efforts made by the various initiatives of the last two to three decades to find lasting solutions. Governance mechanisms, even textbook cases, rarely survive the projects and programmes that gave rise to their development. Among the solutions proposed, the demarcation, development and participatory management of pastoral areas in an inclusive manner figures prominently.

4.4 Inventory of projects working in the field of improving rangeland management

Projects focusing on rangeland management include:

- » PGRN CC (Projet de Gestion des Ressources Naturelles et Changement Climatique)
- » PRAPS-ML (Projet Régional d'Appui au Pastoralisme au Sahel-Mali)
- » PDIRAAM (Programme de Développement des Ressources Animales et Aquacoles au Mali)
- » PDDEPS-Mali (Projet de Développement Durable des Exploitations Pastorales au Sahel Mali)
- » PDD DIN II (Programme de Développement Durable du Delta Intérieur du Niger)
- » PIDACC / BN (Programme Intégré de Développement et d'Adaptation aux Changements Climatiques dans le Bassin du Niger)
- » Appui au Renforcement de l'Élevage et de l'Économie Pastorale/Koulikoro)
- » PADER (Projet d'Appui au Développement Économique des Territoires Ruraux des Régions de Ségou et Tombouctou)

4.4.1 Implementation areas

Western Sahel zone: West and north of the regions of Kayes, Koulikoro, Ségou)

Central Delta area: North-East of the Ségou region; Mopti region of Gao, Timbuktu and Menaka.

Main sources of funding:

- » World Bank
- » FAO
- » Banque Islamique de Développement
- » Organisation of Petroleum Exporting Countries funds
- » Embassy of the Kingdom of Sweden
- » Embassy of the Kingdom of Belgium
- » Asian Development Bank
- » Comité Inter-État de Lutte contre la Sécheresse au SaheFrench Development Agency Responsible for implementation
- » Ministère de l'Environnement, de l'Assainissement du Développement Durable)
- » Ministère du Développement Rural
- » Ministère des Mines, de l'Eau et de l'Energie)

4.4.2 Approach

Approaches for implementation include:

- » Collaboration agreements
- » Partnership agreements
- » Protocol of agreements
- » Participatory and inclusive approaches involving regional technical services, regional chambers of agriculture, municipalities, Producer Organizations of the livestock and meat sector in the region and the circles and municipalities concerned
- » Accountability of beneficiaries (POs and elected officials of municipalities through management agreements of the achievements)
- » Participatory and contractual approaches through NGOs

4.4.3 Challenges

Challenges in implementation include:

- » Strong commitment from stakeholders
- » Re-greening the rangelands
- » Improving the carrying capacity and institution of more rational and inclusive management
- » Recurring insecurity making access difficult
- » Scarcity of well-qualified companies based in insecure areas
- » Betting on the inclusiveness and empowerment of beneficiaries in a context of conflict in which all the actors do not appear publicly
- » Scaling up good practices from a low level of funding
- » Consistent implementation rate of projects faced with cumbersome procedures for releasing funds

4.4.4 Successes and failures

The main successes and failures of these projects include:

- » Good physical achievements due to the monitoring, evaluation and steering mechanisms put in place
- » Satisfaction of the populations of the different areas of the projects and programmes
- » the organization of communities for better management and the strengthening of communities in their roles and responsibilities in the face of rangelands challenges
- » the organization of communities for better management and the strengthening of communities in their roles and responsibilities facing rangelands challenges

4.4.5 Principle results

The main results achieved by these projects include:

- » Marking nearly 240 km of access track to the rangelands.
- » Strengthening the capacity of breeders' organizations and communities.
- » Sowing nearly 500 ha of bourgoutière; improvement of fodder production.
- » Construction of pastoral works and stores for animal feed.
- » Support for animal health information and awareness in the municipalities affected by interventions.
- » Regeneration and reforestation of 3,000 ha of degraded land in the Kayes and Niore regions of the Sahel, with the promotion of decent jobs in the background, in particular green jobs.
- » Improving access to essential production resources and services and to markets for pastoralists and agropastoralists in cross-border areas along international transhumance axes.
- » Strengthening sustainable management of natural resources by pastoral and agropastoral communities and securing access to these resources.
- » Direct increase in incomes and assets of the actors.

Reference documents and contacts for follow-up:

- » Evaluation reports
- » Completion reports
- » Capitalization reports; reports from Direction Régionale des Productions et Industries Animales Mopti
- » Reports of the regional conference on bourgoutière
- » Contacts:
 - » PGRN CC (2022 1074)
 - » PDIRAAM (63 29 98 88)
 - » PDDEPS (20 22 15 09)
 - » PRAPS-ML (66 74 91 60)
 - » Appui au Renforcement de L'élevage et de l'Economie Pastorale/Koulikoro (20 23 96 42)
 - » PIDACC (76 46 16 52)

4.5 Relevance of PRM

The PRM approach is considered relevant and capable of producing added value in local contexts marked by the existence of large areas of undeveloped land and insufficient grazing for animals, poorly performing institutions and governance, problems of access and security of land, mobility of livestock and people, degraded rangelands and the presence of localized conflicts. The added value is:

- » better managed rangelands with the appropriation of methods of inclusive participation of actors,
- » improved rangeland productivity and better biomass supply for secondary production,
- » productivity and health status of livestock are improved due to the availability of more extensive pastures in time and space,
- » the means of subsistence of pastoralists are more developed,
- » access to land facilitated and made more equitable by the joint management and monitoring committees,
- » conflicts related to access, operation and control could be reduced with concerted management,
- » planning and decision-making will be carried out in accordance with the operators' operating schedule,
- » reinforcement of vegetation will lead to an increase in the available forage in the range and to controlling climatic stress and improve the resilience of farmers to climatic stress, and
- » adaptation to climate change made easier.

4.5.1 Presence or absence of a legislative and regulatory framework favourable to PRM

There are a legislative and regulatory frameworks favourable to PRM but they are insufficiently implemented. Among those instruments favourable to PRM are the law on the pastoral charter, the agricultural orientation law, the forestry code, the Politique Nationale de Développement de l'Élevage, 2004–2020 and the land commissions at the level of each municipality. This favourable political and regulatory environment is documented at various levels including:

- » Government documented legislative and regulatory texts.
- » Community support in the form of community Programme de Développement Social et Économique du Cercle with elements supporting policy but the challenge remains mobilization of resources (human, financial and others).
- » **Institutions and governance:** decentralization of governance through the transfer of skills to community level.
- » **Livestock movements:** The pastoral charter at the national level and the ECOWAS convention regulate the movement of livestock but also local and regional conferences are held each year to facilitate the movement of animals.
- » **Finances:** The National Agriculture Support Fund and community membership and other government commitments through community participation in forums and respect for laws and conventions.

4.5.2 Capacities within government, NGOs and communities to experience and implement PRM and gaps to be filled in these capacities

The Government and NGOs have capacities to experiment with and implement PRM. However, despite traditional knowledge in terms of customary and traditional management of the rangelands, there are gaps to be filled in the following areas:

- » Understanding pastoral production systems within the framework of a PRM process
- » Governance of resource management
- » Community facilitation and mobilization skills
- » Gender and social inclusion
- » Management and exploitation techniques of the rangelands
- » Planning
- » Information on climate and climate change (data collection and analysis)

In addition, the creation and operationalization of the National Transhumance Committee would further improve the management of problems linked to transhumance as in other ECOWAS countries. Finally, whatever the level considered, the availability and commitment of all the players are a guarantee of success.

4.5.3 First steps in generating interest from donors and development agencies to support PRM in the future

First steps in building and gaining the support of partners are:

- » The establishment and animation of an inclusive national framework (state, NGOs, TFPs, local authorities and communities concerned, Producer Organizations in the rural development sector) to share the vision and orientations of the PRM which are essential for a coherent implementation
- » Sensitization of communities and collectives to seek support for PRM and to contribute to its financing (for example investing the community budget)
- » Adaptation of an adequate legal and regulatory framework
- » Capacity building of stakeholders
- » Prior clarification of land, governance and project management issues to the satisfaction of all parties
- » Seeking financial support for preliminary studies
- » Identification, delimitation and delineation of all pastoral and forest routes

4.5.4 Potential partners in the country and in the region

Identify the structures, including national and international NGOs, which have been working in natural resources and pastoral care. These would include sub-regional institutions such as Comité Inter-État de Lutte Contre la Sécheresse au Sahel and the Union Économique et Monétaire Ouest Africaine

National institutions

- » Ministries in charge of rural development, environment, land management and sustainable development and decentralized services
- » Projects and programmes:
 - » PGRNCC
 - » PRAPS-ML
 - » PDIRAAM
 - » PDDEPS-Mali
 - » PDD DIN II,
 - » PIDACC-BN
 - » Appui au Renforcement de l'Élevage et de l'Économie Pastorale/Koulikoro PADER)
 - » communities
 - » private actors

4.5.5 Geographical areas suitable for PRM

Notwithstanding the 34,000,000 hectares of rangelands, pastoral resources are declining in Mali due to natural hazards and pressure from human actions. The imbalance between the needs of local populations and the environment is more apparent and the maintenance of the traditional systems for managing rangelands becomes increasingly difficult.

The route of the GGW Initiative hosts a large area of natural rangelands from Kayes to Ménaka, including purely agricultural, forest and pastoral areas developed or under codified management but still a lot of space in the diffuse areas subject to free, all-out and sometimes conflicting exploitation by various stakeholders.

The stakeholder consultation proposes a panoply of candidate areas to host a possible intervention for the introduction and implementation of PRM in Mali. They are listed in the large agro-ecological zones of the Western Sahel, of DIN, of Gourma of Méma and in the regions of Kayes, Ségou, Mopti.

In the Kayes region:

- » Dag Dag–Aourou (Circle of Kayes)
- » Sambawonsi–Bilajimi (Circle of Kayes)
- » Ranch Tintiba (Circle of Kayes)
- » Ateissane–Bilajimi (Circle of Kayes)
- » Faleya–Ainamolo (Circle of Kayes)
- » Lawoïnatt–Djemaël (Circle of Yélimané)
- » Lakamané–Kaniara (Circle of Diéma)
- » Guidimakan Keri Kafo (Circle of Kayes)
- » Ségala (Circle of Kayes)

In the Ségou region:

- » Pastoral space of Daouana
- » Missibougou polygon

In the region of Mopti:

- » Municipality of Mopti: village of Sio
- » Municipality of Douentza: villages of Douentza, Koubewel Koundia and Dangol Boré
- » Municipality of Bandiagara: villages of Dourou, Pignari and Pignari Bana
- » Municipality of Djenné: villages of Femaye, Fakala and Dandougou Fakala
- » Municipality of Djaptodji in Karwassa

Areas proposed for PRM

On the basis of the availability of free-to-operate routes already codified and extensive (at least 25,000 ha) the following areas are proposed for a possible piloting intervention on PRM:

- » the Dag Dag–Aourou area in the Cercle de Kayes
- » the pastoral space of Daouana in the circle of Ségou
- » Djaptodji commune in Karwassa, Mopti circle

4.6 Potential for PRM application

The comprehensive analysis of the current state of rangeland management in the GGW zone in Mali reveals the following major difficulties:

- » unsatisfactory level of rangeland management,
- » extensive degradation of the rangelands in places,
- » unsatisfactory governance (in the hands of poorly equipped traditional chiefdoms or cooperative societies whose management suffers from a lack of transparency and reinvestment in pastoral rangelands),
- » problems of peaceful use of rangelands, and
- » operating conflicts, especially in diffuse areas.

It will be difficult to find lasting solutions without codified management despite the laudable efforts made by various interventions in the last two to three decades. Governance mechanisms, even textbook cases, rarely outlive the projects and programmes that funded them. Among the solutions proposed, demarcation, development and participatory and inclusive management of pastoral areas (a sum of actions closely related to PRM) figure prominently. To implement these proposals, there is capacity within the state and NGOs and the available legislative and regulatory framework is favourable and the support of technical and financial partners is available on request.

Feedback meetings confirmed the interest of stakeholders in the PRM approach. In Dakar, the opening session was chaired by Mr. Youssoupha Diouf, the manager for Fonds d'Appui à la Stabulation in Dahra Djolof, representing the Ministry of Livestock and Animal Production (MEPA). He noted that the MEPA is committed to developing a participatory rangeland management approach through its projects and is interested in the PRM approach being shared.

The GGW experienced difficulties in both countries during the setup phase but momentum has increased. In Senegal, there are funding possibilities through the Priority Ten-Year Investment Plan 2021–2030. In both countries there are large projects whose interventions can contribute to the GGW. In Senegal, it is set up as a directorate in the National Reforestation Agency.

The GGW promotes an inclusive approach with support from technical partners (state and non-state) and a pooling of resources in line with PRM. To date, the GGW has been mainly implemented in a top-down way with little dialogue, consultation with or participation of local communities beyond being paid to plant trees or other activities. Pastoralists, particularly transhumant pastoralists, have hardly been involved. With greater support from local populations there would be less need for fences to secure intervention areas and where these are needed, greater opportunities for cost-sharing. Experience for how this could work is provided by the example of IED Afrique in Ngohé.

In Senegal, there are participatory approaches such as POAS although this has not been very effective. The establishment of PUs is a similar approach to PRM but carried out in a top-down manner and there are gaps in capacity building and mobilization of communities. Communities are reluctant to follow rules of use established in PUs, not least because they are distanced from the process and feel no sense of ownership. PRM is an opportunity to empower communities and improve their inputs to decision-making processes related to rangelands and the GGW initiative. To avoid overlap between these approaches, any application of PRM will need to be undertaken by building the PUs and other institutions or processes already established. However, it was agreed by stakeholders that PRM can add value to the already established PU approach. PRM can be a useful approach for addressing invasive species, which requires coordination, capacity building, community mobilisation and investment. Combined with digital tools for addressing feed and veterinary requirements, PRM has the potential to improve livestock productivity.

In Mali, the decentralisation process started in the 1960s and has been strengthened with greater power and authority within local communities and to some degree finances. This new institutional concept places communities and local actors as privileged managers of these resources and creates opportunities for more community-led GGW interventions. This will reduce the cost of rangelands management and ensure greater enforcement of regulations.

PRM will need to consider the processes related to development of agreements or conventions for resource use at the local level, which will need to be developed with pastoralists and other stakeholders. Mobility and protection of livestock corridors will also need attention. It was recommended that given PRM requires investments in capacity building, sustainable rangeland management activities and monitoring and evaluation, PRM should be implemented in areas with a well-defined status and boundary. It was highlighted that PRM has potential to help vulnerable groups such as women and youth to better contribute to and benefit from rangeland management. There should be greater sharing of experiences between those working on these issues and a platform to do this would be useful.

5

Conclusions

Despite some hurdles following its inception, the GGW initiative is now gathering pace, with renewed and refocused objectives and significant new funding mobilised in 2021. However, its implementation is patchy and incoherent across the eleven countries it covers. In Senegal renewed government commitments to the initiative and restructuring of the responsible agency has helped ensure a high profile of the GGW Senegal and the securing of resources for implementation of plans either directly through responsible government bodies or through donor-funded projects. Mali is less far ahead in this regard, although regional projects such as PRAPS II (2022-27) (including Mali and Senegal) offer significant opportunity for advancement of activities over the next few years.

Objectives of the GGW have been broadened from what were very technical in focus more socio-economic and inclusive objectives such as developing economic clusters through processing and promotion of local products, renewable energy resource development and carbon sequestration and promoting inclusive development and a culture of peace, security and social cohesion.

In both Senegal and Mali, GGW interventions and activities are driven from the top-down, with decisions about location and type of activities decided by the responsible GGW agency and government and with little consultation with local land users. In Senegal, there are over a dozen projects currently mapped to and contributing to the GGW including the involvement of UNCCD, World Bank, EU, French Development Agency and FAO. An improved understanding of how these projects operate and contribute to the GGW in practice is needed.

Tree planting for reforestation and forestation is still a strong focus of GGW interventions. This is despite significant loss of seedlings, most commonly during transplanting in the designated area. Although it was indicated that losses were often replaced, there was no clear evidence of this nor have there been rigorous evaluations of the impacts of GGW interventions and activities. Tree species planted tend to be local trees adapted to the local environment and with numerous local uses. Tree production in nurseries and planting is normally organized by the GGW agency and local government and community members paid to plant and sometimes look after the trees after transplanting through food-for-work programmes. In Senegal, the location of tree planting is decided through discussion with the local municipality and in Mali it was said that it is agreed with beneficiary populations, although there was no clear evidence of this.

Under what Senegal calls an assisted natural regeneration strategy, more often than not an area where trees have been planted is fenced off from local use which increases costs significantly and risks hostile relations with local communities. Access to water is also a problem and where possible boreholes have been built to provide a constant supply. In larger reforestation projects where fencing is not an option, seedlings are often destroyed by cattle. Beyond being paid to plant trees there has been little if any involvement of local populations particularly pastoralists in the activities and there is little genuine support from local populations

for the initiative. In Senegal, market gardens are another approach to greening pastoral areas and while they have had some success they are heavily reliant on external aid and support. In Mali, provisions are made at the level of the administration for the registration of wooded areas for the benefit of beneficiary populations through the communes which shelter these plantations.

Those interviewed during this study highlighted some major gaps in the implementation and monitoring of the GGW including the need to build stronger community participation and support and the need to undertake a full and rigorous evaluation of tree planting as the main area of focus of the GGW to date. In Mali, weak political commitment and related financing was also highlighted as a key challenge and in both countries, insecurity and conflicts in intervention areas although details were not available).

In Senegal the government introduced the concept of pastoral units (PUs) in the 1980s and these have been supported by a number of projects since. The PUs were set up around water points with the objective of sustainably managing resources and spaces for the benefit of local populations and the community of transhumant pastoralists. PUs appear to be a successful intervention that has helped develop better organisational systems of land and natural resources management, a water infrastructure management system and a transhumance and grazing management system. Holistic rangeland management has been introduced in some of the PUs and in other areas through projects.

Despite their successes, PUs have been implemented in a top-down manner and have failed to invest in or empower pastoral communities to manage the PUs. Once management plans are established, the PUs are often left without supervision, capacity building or monitoring and as a result all the stages of the management plans are rarely implemented. Good governance can be missing as communities have not been given any authority over the PUs and where PU management bodies do exist, they are often politicised and heavily influenced by local chiefs.

A significant number of projects have supported interventions in the pastoral areas including strengthening PUs. These have rangeland management components including new forage varieties, control of invasive species and rangeland restoration. Mobility and the mapping and maintenance of livestock routes are also project components. However, there is little attention to building the capacities of communities to make decisions about and to lead these processes themselves, including strengthening local rangeland management and good governance. Some projects, such as the establishment of areas of *Acacia senegal* for harvesting gums and resins have explicitly excluded pastoralists, which sets them against the local population and conflicts are recurrent.

A comparison of the processes of PRM and PUs shows similarities between the two including the undertaking of an investigation stage collecting and analysing information on rangeland resources and other aspects of the local context, the development of a rangeland management plan and the establishment of a governance or management body. However, there are also significant differences and PRM remains embedded in local land use practices, building on customary management and governance and part of the pastoral landscape, whereas PUs are more an area separated from the pastoral landscape and managed according to new rules and regulations that often exclude local communities. The PUs will always require external intervention and resources, whereas in PRM a key objective is to build the capacity of communities to take control of the management and decision-making processes and implement the plan.

This suggests that, despite the significant number of projects and interventions in rangelands in Senegal including the development of PUs, there is an opportunity for PRM with its structured process of building the capacities of communities to improve the management and governance of their own lands and strengthening the linkages between pastoralists, their land and their livestock and to add value. The flexibility of PRM would allow it to be implemented in both PUs and in larger pastoral units. This conclusion from the consultants was verified and supported in the dissemination workshops.

In Mali, projects have set up pastoral units or pastoral perimeters around solar energy-powered boreholes. There is significant scope for PRM to add-value to the projects and processes already being implemented. In many areas, customary institutions and governance have broken down leaving a vacuum in terms of institutions responsible for rangeland management and governance and increasing the likelihood of conflict. The emphasis on decentralisation with power and management of resources in the hands of local communities provides the right political context for community-led processes such as PRM.

Stakeholders believe that PRM has the potential for improving rangeland management and governance, increasing land productivity and contributing to conflict resolution between herders and other land users. However, if PRM is to be implemented here, there would be the need to influence the legislative and regulatory framework to be more supportive in parallel and build the capacities of government, NGOs and communities to implement PRM. A number of sites were identified where PRM could be tested, all of which are in the GGW belt.

Clearly, there is potential for the testing and piloting PRM in both Senegal and Mali, which if successful could then be scaled up. In Senegal, a key issue is to clarify how PRM can add value to the already established PUs and contribute to improved management of rangelands outside these. In Mali, there is the challenge of identifying suitable areas that are manageable as units within the vast rangeland and pastoral landscapes and ensure and maintain connections between these, which will likely mean working at different levels and scales (landscape and local) to ensure that PRM is well-supported.

PRM is a process that can support a greater degree of community participation including women and youth and management of activities and interventions contributing to the GGW, where the mainly top-down approach to date has excluded communities and in some situations created conflict. Building the capacity and willingness of communities to play a greater part in the GGW implementation will have long-term beneficial impacts including in reducing costs of interventions and also in terms of sustainability.

Appendix 1

List of people interviewed for this review.

A. Interview list for Senegal

	Personnes	Institutions
1	Ka Alioune	Pers. ressour
2	Centre de Suivi Ecologique	Centre de Suivi Ecologique
3	Mbaye Momar	USAID
4	Kane Atoumane	Agronomes et Vétérinaires Sans Frontières
5	Sall Cheikh	PPZS
6	Beye Gora	PDDEPS
7	Niang Ibrahima	PRAPS
8	Diaw Moustapha	PASA LOUMAKAF
9	Aka	Pers. ressou
10	Kane	Direl/Div past
11	Guissé Aliou	UCAD
12	Sow Oumar	CNCAS
13	Faye Malick	FAO
14	Ly Cheikh	Initiative Prospective Agricole Rurale
15	Gora Diop	GMV
16	Moustapha Dia	Réseau Billital Maroobé
17	Ndiaye Bamba	ACF
18	Mame Mor Anta Sylla	UGB
19	Ibra Touré	CIRAD
20	Astou Camara	ISRA/BAME
21	Abdourahmane Wane	CIRAD

B. Interview list for Mali

Ord	Nom et prénoms	Institutions
1	KELEMA Daniel, Secrétaire Général	Ministère du Développement Rural
2	KEITA Mady, Conseiller Technique (CT)	Ministère du Développement Rural
3	SYLLA Mahamadou, CT	Ministère du Développement Rural
4	CAMARA Adama, CT	Ministère du Développement Rural
5	SIDIBE Kassoum, Personne ressource	PDIRAAM (Programme de développement des ressources animales et aquacoles au Mali)
6	GAKOU Mamadou, Secrétaire Général	Ministère de l'environnement de l'assainissement et du développement durable (MEADD)
7	DIALLO Toumany, Directeur	Agence Nationale Grande Muraille Verte
8	SIDIBE Moussa, Directeur adjoint	ANGMV
9	SANOOGO Moumouni, Chef Département	ANGMV
10	DEMBELE Kalifa, Directeur	Direction Nationale des Production et Industries Animales
11	KONE Otongolo, Chef Division Aménagement et Hydraulique Pastorale	Direction Nationale des Production et Industries Animales
12	COULIBALY Drissa	Direction Nationale des Services Vétérinaires
13	KONE Sékou, Directeur Adjoint	Agence de l'Environnement et du Développement Durable
14	DIARRA Moussa, Chef Département développement durable	Agence de l'Environnement et du Développement Durable
15	SIDIBE, Directeur Adjoint	Direction Générale des Eaux & Forêts
16	COULIBALY Abdoulaye, Directeur	Direction régionale des productions et industries animales de Kayes
17	KASSOGUE Sana, Directeur	Direction régionale des services vétérinaires de Tombouctou
18	DANSOKO Kalifa, Chef SLPIA Nioro	Direction Régionale des Productions Animales de Kayes
19	MAKADJI Cheick M L, Personne ressource	ex Chef SLPIA de Kayes
20	TRAORE Ousmane, Personne ressource	
21	AG ALWALY Aziz, Représentant Antenne du Mali à Bamako	Réseau Bilital Maroobé
22	BARRY Belco, Représentant régional	
23	SYLLA Sanoussi Bouya, Président	
24	TOGO Issa, Secrétaire Général	Assemblée permanente des chambres d'agricultures du Mali
25	KEITA Balla, Directeur	CPS/SDR
26	BERTHE Yaya, Point focal PADER	Conseil Régional Ségou
27	COULIBALY Moussa, Coordinateur	PRAPS-ML
28	COULIBALY Kouloutan, Personne ressource	Ex Directeur ANGMV
29	SANGARE Yacouba, Personne ressource	Agro-pastoraliste, consultant indépendant
30	DIARRA Modibo	Les Assurances Bleues (CNAR)
31	DICKO Alhousseiny	Représentation FAO au Mali

Appendix 2

Participants in the feedback/consultation meeting for the study in Bamako, Mali, 1st December 2021.

Personnes	Institutions	Email/telephone
Camara Adama	Ministère du Développement Rural	camaraadama09@gmail.com
Aziz Ag Alwaly	Réseau Billital Marobé	agalwaly@yahoo.fr
Barry Belco	Assemblée permanente des chambres d'agricultures du Mali	Belcomoussa_barry@yahoo.fr
Coulibaly Seydina Ousmane	Direction Nationale des Production et Industries Animales	seidinaousmanecoulibaly@yahoo.fr
Yalcoue Adama	Direction Nationale des Production et Industries Animales Direction Nationale des Services Vétérinaires ANGMV	yalcoueadama@yahoo.com
Ndiaye Bréhima	MEADD	bndiyela@yahoo.fr
Coulibaly Abdoulaye	Direction régionale des productions et industries animales /Kayes	pablocoulibaly12@yahoo.fr
Cisse Hamaye Ag Aly	DANAYA/Sokolo	75 15 03 56
Diallo Aly	Bamba/Dilly	77 62 73 78
Haidara Moulaye	Haboité/Guiré	75 03 14 37
Diarra Mouslaha	N'Tomikoro/Dilly	75 06 35 75
Haidara Abderamane	Chatbé/Guiré	76 14 49 94
Arby	CPS/SDR	
Fatoumata Coulibaly	German Agency for International Cooperation	fatoumata.coulibaly@giz.de
Aboubacar Ba	FEBEVIM	febevim@yahoo.fr
Amadou Ba	BM	aba2@worldbank.org
Bocar Dit Sire Ba		bocaba@um.dk
Ntahombaye Marie-Goretti	Belgium-Bamako	Marie-Goretti.Ntahombaye@diplobel.fed.be
Dicko, Alhousseyni	FAOML	Alhousseyni.Dicko@fao.org
Gilles Vias	VSF BELGIUM	g.vias@vsf-belgium.org
Marc Chapon		m.chapon@avsf.org
Cisse Hamet	EDA CISHA	hamet.cisse@eda.admin.ch
N'Tossama Diarra	USAID	ntdiarra@usaid.gov
Toure, Modibo	FAOML	Modibo.Toure@fao.org
Karim Sissoko :	IFAD	k.sissoko@ifad.org
Malick Diallo	ICD	malick.diallo@icdmali.net
Monzon Traoré	UNDP	monzon.traore@undp.org

Appendix 3

Participants in the feedback/consultation meeting for the study in Dakar, 3rd December 2021.

Personnes	Institutions	Téléphone	Email
Dr Cheikh Tidiane Djigo	Linguère	776576767	atdjigo@avsf.org
Adji Aissatou Sy	Centre de Suivi Ecologique	776561525	aissatou.sy@cse.sn
Daniel Ouma	Tanzanie/TNRF	+225763061369	cf.ouma@tnrf.org
Fiona Fliantan	Rome/ILRI		f.flintan@cgiar.org
Dr Malick Ndiaye	FAO	776560747	malick.ndiaye@fao.org
Ibrahima Samb	PDEP	773255555	ibrahima5700@gmail.fr
Peter Ken Otieno	Kenya/RECONCILE	1254722902223	
Gora Mbaye	Enda	770507530	mbaygora@hotmail.fr
Mame Mory Diagne	IUCN/Dakar	774243965	mamemory.diagne@iucn.org
Moustapha Diouf	PROSE	776470760	moustapha.diouf@prose.org
Abderahmane Wane	CIRAD/ILRI	762532163	AWANE@cirad.fr
Aliou Ka	Thiès	776326546	alykan@gmail.com
Ibra Touré	CIRAD	+33640922022	ibra.toure@cirad.org
Binetou Diop	CNASS	771424555	binetou.diop@cnass.sn
Gora Diop	GMV/ASRGMV	775455778	goradiopsn@gmail.com
Kader Aka	Bargny	775741457	Kaderaka@gmail.com
Cheikh Sall	Consultant	776368600	cheikhsall1903@gmail.com
Moussa Sow	ASE/Réseau Billital Maroobé	775112121	sowpoponaajo@gmail.com
Amadou Tamsir Diop	Consultant	774455542	amtadiop@gmail.com
Sererra FERRARI	CIRAD	784869909	Serera.ferrari@cirad.fr
Cheikh Oumar Ba	IPAR	776332255	coba@ipar.sn
Peter Kar Olimo	RECOPALE	+254722902223	karolieno@reconcile-ea.org
Ibrahima Ndiaye	PASA/Linguère	776306719	ibrahimandiaye201@yahoo.fr
Youssoupha Ba	PRAPS/Dakar	778184812	youssoupha.ba@praps.org
Youssoupha Diouf	Fonds d'Appui à la Stabulation /Dakar	778725335	forestabzonenord@gmail.com
Cheikh Ly	Initiative Prospective Agricole Rurale	784262965	cheikh.ly@ipar.sn
Josephine T Sarr	Interprète	776442302	Josangel26@gmail.com
Lamine Hanne	Interprète	776388281	lamineba54@yahoo.fr
Joseph Diop	Initiative Prospective Agricole Rurale	776434611	josephdiop@ipar.org
Mary Ndiaye	Initiative Prospective Agricole Rurale	779011755	ndiyemamyfall@gmail.com
Fodé Diakité	Confortech	775675797	Lfilyfox73@yahoo.fr

Appendix 4

Liste des 55 communes, cercles et régions concernés par le tracé initial de la Grande muraille verte du Mali.

REGION	CERCLES	NOMBRE DE COMMUNES UGMV	NOMBRE DE COMMUNES UGMV FAISANT PARTIE DES 166 COMMUNES LES PLUS VULNERABLES DU MALI	COMMUNES FAISANT PARTIE DES 166 COMMUNES LES PLUS VULNERABLES DU MALI
GAO	Ansongo	5	3	Bara, Ansongo, Boura , Tin Hama, Talataye
	Bourem	5	5	Bamba , Temera, Bourem, Taboye et Tarkint.
	Gao	3	3	Sony Aliber , Gounzoureye, Gabero
MÉNAKA	Ménaka	2	2	Ménaka , Anderramboukane
KAYES	Kayes	2	2	Sahel , Koussané
	Yélimané	4	0	Gory, Guidime, Krémis, Kirané Kaniaga
	Nioro	7	6	Nioro Tougoune Rangabe , Yerere, Gogui , Baniere Kore, Diarra , Gavinané , Diaye Coura .
KOULIKORO	Nara	6	5	Dogofry , Dilly, Korongo, Nara, Gueneiba , Guire.
MOPTI	Youwarou	1	1	Farimaké .
SEGOU	Niono	2	1	Dogofry, Nampalari
TOMBOUCTOU	Goundam	5	5	Gargando , Tonka, Doukouria , Goundam , Douekire .
	Gourma-Rharous	5	4	Haribomo , Hamzakona , Serere, Rharous , Banicane .
	Niafunké	4	3	Soumpi , Léré , Dianké , Souboundou.
	Tombouctou	4	2	Alafia, Tombouctou, Bourem-Inaly , Lafia
7 régions	14 Cercles	55 Communes	42	

Appendix 5

Communes La Grande Muraille Verte (GMV) par cercle, région et par population en 2017.

ESPACE GMV DU MALI	PROJECTION DE POPULATION EN 2017		Région	Cercle	Communes	
	HOMME	FEMME	TOTAL			
	2 288 621	2 324 086	4 612 706	8	24	204

REGIONS	CERCLES	COMMUNES	POPULATION EN 2017		
			Masculin	Féminin	Ensemble
REGION DE KAYES			734 536	758 537	1 493 073
	KAYES		294 317	291 538	585 854
		KAYES COMMUNE	84 620	79 487	164 107
		BANGASSI	7 955	7 761	15 716
		COLIMBINE	7 982	8 253	16 235
		DIAMOU	9 243	9 114	18 357
		DJELEBOU	14 896	15 708	30 604
		FALEME	6 679	6 518	13 197
		GORY GOPELA	5 117	5 102	10 219
		GUIDIMAKAN KERI KAFFO	12 729	13 295	26 025
		HAWA DE MBAYA	4 425	4 476	8 900
		KARAKORO	9 660	10 094	19 755
		KEMENE TAMBO	10 888	11 139	22 027
		KHOULOUM	12 646	12 030	24 676
		KOUSSANE	13 605	14 444	28 049
		LIBERTE DEMBAYA	9 727	8 937	18 664
		LOGO	7 823	7 752	15 575
		MARENA DIOMBOUGOU	11 687	12 571	24 258
		MARINTOUMANIA	5 198	5 275	10 472
		SAHEL	7 844	8 040	15 885
		SAME DIOMGOMA	8 113	8 011	16 124
		SEGALA	16 736	16 786	33 522
		SERO DIAMANOU	15 086	15 235	30 321
		SONY	5 637	5 675	11 312
		TAFACIRGA	6 020	5 836	11 856
	BAFOULABE		55 250	59 359	114 610
		DIAKON	20 859	22 995	43 854
		DIALLAN	9 464	9 627	19 091
		SIDIBELA	4 681	5 137	9 818
		TOMORA	20 246	21 601	41 847

REGIONS	CERCLES	COMMUNES	POPULATION EN 2017		
			Masculin	Féminin	Ensemble
	DIEMA		133 150	141 973	275 123
		DIEMA	19 590	19 995	39 585
		BEMA	16 013	17 023	33 036
		DIANGOUNTE CAMARA	17 592	19 391	36 983
		DIANGUIRDE	7 616	7 959	15 574
		DIEOURA	7 156	8 124	15 279
		DIOUMARA KOUSSATA	10 397	10 753	21 150
		FASSOUBE	3 460	3 647	7 106
		FATAO	4 999	5 834	10 834
		GOMITRADOUGOU	4 726	4 752	9 479
		GROUMERA	7 089	7 875	14 965
		GUEDEBINE	3 313	3 299	6 611
		LAKAMANE	10 205	10 535	20 740
		LAMBIDOU	9 133	10 083	19 216
		MADIGA SACKO	8 698	9 407	18 105
		SANSANKIDE	3 163	3 297	6 461
		DJOUGOUN	5 212	5 742	10 954
		GUEMOUKOURABA	6 257	6 902	13 159
		MADINA	8 933	9 288	18 221
		SEFETO NORD	7 048	7 968	15 016
	NIORO		141 202	146 962	288 164
		NIORO COMMUNE	22 421	21 349	43 770
		BANIERE KORE	3 684	3 670	7 354
		DIABIGUE	5 836	6 387	12 222
		DIARRA	4 448	4 824	9 272
		DIAYE COURA	8 517	9 303	17 820
		GAVINANE	9 972	10 397	20 369
		GOGUI	8 037	8 784	16 820
		GUETEMA	5 825	6 298	12 124
		KADIABA KADIEL	6 472	6 423	12 895
		KORERA KORE	12 281	12 958	25 239
		NIORO TOUGOUNE RANGABE	8 328	8 823	17 150
		SANDARE	16 365	16 914	33 279
		SIMBI	12 713	13 390	26 104
		TROUNGOUMBE	7 770	8 454	16 224
		YERERE	8 532	8 990	17 522

REGIONS	CERCLES	COMMUNES	POPULATION EN 2017		
			Masculin	Féminin	Ensemble
	YELIMANE		110 617	118 705	229 322
		GUIDIME	25 207	26 529	51 736
		DIAFOUNOU DIONGAGA	6 058	6 515	12 573
		DIAFOUNOU GORY	12 548	13 759	26 308
		FANGA	5 017	5 289	10 306
		GORY	7 965	8 405	16 371
		KIRANE KANIAGA	21 908	23 429	45 336
		KONSIGA	2 998	3 404	6 402
		KREMIS	7 110	7 238	14 348
		MAREKAFO	3 249	3 667	6 917
		SOUMPOU	3 071	3 234	6 305
		TOYA	7 734	8 693	16 426
		TRINGA	7 751	8 543	16 294
	REGION DE KOULIKORO		155 186	159 115	314 301
		SEBETE	2 618	2 657	5 275
		TOUBACORO	9 248	9 428	18 676
		SAGABALA	11 195	11 812	23 006
	NARA		155 186	159 115	314 301
		NARA	18 945	19 516	38 461
		ALLAHINA	7 242	7 819	15 061
		DABO	7 186	7 917	15 103
		DILLY	25 071	24 885	49 956
		DOGOFRY	21 947	23 079	45 027
		FALLOU	19 283	19 741	39 024
		GUENEIBE	5 744	5 626	11 370
		GUIRE	13 041	12 782	25 823
		KORONGA	7 192	7 115	14 306
		NIAMANA	17 969	18 515	36 484
		OUAGADOU	11 566	12 120	23 686
	REGION DE SEGOU		336 770	342 362	679 132
	SEGOU		13 436	13 290	26 726
		BELLEN	4 565	4 419	8 984
		N:KOUMANDOUGOU	8 871	8 871	17 742
	MACINA		87 690	90 673	178 363
		MACINA	23 023	24 102	47 125
		BOKY WERE	10 062	9 948	20 010
		KOKRY CENTRE	11 408	11 307	22 715
		KOLONGO	21 504	22 895	44 399
		MONIMPEBOUGOU	21 692	22 422	44 113

REGIONS	CERCLES	COMMUNES	POPULATION EN 2017		
			Masculin	Féminin	Ensemble
	NIONO		235 644	238 399	474 043
		NIONO	52 578	53 494	106 071
		DIABALY	22 375	22 219	44 594
		DOGOFRY	21 962	22 228	44 190
		KALA SIGUIDA	13 748	13 981	27 729
		MARIKO	15 324	14 964	30 288
		NAMPALARI	7 238	7 189	14 426
		POGO	10 579	10 630	21 210
		SIRIBALA	24 816	24 250	49 066
		SIRIFILA BOUNDY	21 041	21 723	42 763
		SOKOLO	16 267	16 276	32 544
		TORIDAGA KO	18 645	20 027	38 672
		YEREDON SANIONA	11 071	11 419	22 489
	REGION DE MOPTI		269 844	274 420	544 264
	MOPTI		70 426	72 077	142 502
		DIALLOUBE	19 760	20 441	40 201
		KONNA	23 782	24 008	47 790
		KOROMBANA	18 856	19 777	38 633
		OUROUBE DOUDE	8 028	7 851	15 879
	DOUMENTZA		40 991	40 549	81 540
		DANGOL-BORE	17 149	17 326	34 475
		DJAPTODJI	23 842	23 223	47 065
	TENENKOU		88 285	90 968	179 253
		DIAFARABE	9 642	9 722	19 364
		DIACA	12 538	12 766	25 304
		DIONDIORI	13 142	13 477	26 619
		KARERI	18 121	17 995	36 116
		OURO ARDO	6 478	6 955	13 433
		OURO GUIRE	5 121	5 456	10 576
		SOUGOULBE	5 679	6 343	12 022
		TOGUERE-COUMBE	17 565	18 255	35 819
	YOUWAROU		70 142	70 827	140 969
		YOUWAROU	15 038	15 245	30 283
		BIMBERE TAMA	5 183	5 519	10 702
		DEBOYE	14 986	15 088	30 074
		DIRMA	5 254	5 291	10 545
		DONGO	7 387	7 520	14 907
		FARIMAKE	7 839	7 639	15 479
		N:DODJIGA	14 454	14 525	28 979

REGIONS	CERCLES	COMMUNES	POPULATION EN 2017		
			Masculin	Féminin	Ensemble
REGION DE TOMB.			430 638	430 005	860 643
	TOMBOUCTOU		84 739	80 744	165 483
		TOMBOUCTOU COMMUNE	36 280	34 719	70 999
		ALAFIA	8 268	8 513	16 781
		BER	12 932	11 719	24 651
		BOUREM-INALY	7 099	7 983	15 081
		LAFIA	4 948	5 130	10 078
		SALAM	15 213	12 681	27 893
	DIRE		70 933	71 589	142 522
		DIRE	13 247	13 184	26 431
		ARHAM	1 765	1 899	3 664
		BINGA	3 248	3 400	6 648
		BOUREM SIDI AMAR	5 284	5 834	11 119
		DANGHA	8 352	8 420	16 772
		GARBAKOIRA	3 847	3 497	7 344
		HAIBONGO	9 241	9 289	18 529
		KIRCHAMBA	2 716	2 638	5 355
		KONDI	2 012	1 953	3 965
		SAREYAMOU	10 939	11 085	22 024
		TIENKOUR	4 221	4 262	8 483
		TINDIRMA	4 169	4 249	8 418
		TINGUEREGUIF	1 891	1 879	3 770
	GOUNDAM		89 771	90 547	180 318
		ALZOUNOUB	3 118	2 701	5 819
		BINTAGOUNGOU	5 283	5 521	10 804
		ADARMALANE	602	639	1 241
		DOUEKIRE	11 696	11 822	23 517
		DOUKOURIA	1 908	1 686	3 594
		ESSAKANE	7 571	7 191	14 762
		GARGANDO	5 725	5 351	11 076
		ISSA BERY	2 585	2 777	5 362
		KANEYE	1 517	1 514	3 031
		M·BOUNA	2 462	2 517	4 979
		RAZ-EL-MA	3 018	2 698	5 716
		TELE	3 846	3 856	7 702
		TILEMSI	5 091	4 516	9 607
		TIN AICHA	1 953	1 916	3 869
		TONKA	33 399	35 842	69 241

REGIONS	CERCLES	COMMUNES	POPULATION EN 2017		
			Masculin	Féminin	Ensemble
	GOURMA-RHAROUS		70 865	73 440	144 305
		RHAROUS	16 435	17 729	34 164
		BAMBARA MAOUDE	10 807	10 618	21 425
		BANIKANE	5 873	6 407	12 280
		GOSSI	15 176	16 100	31 276
		HANZAKOMA	5 816	5 990	11 806
		HARIBOMO	4 830	4 750	9 580
		INADIATAFANE	2 406	2 217	4 623
		OUINERDEN	4 004	3 925	7 929
		SERERE	5 518	5 703	11 221
	NIAFUNKE		114 330	113 685	228 015
		SOBOUNDOU	26 254	26 284	52 539
		BANIKANE NARHAWA	13 931	13 717	27 648
		DIANKE	6 721	6 857	13 578
		FITTOUGA	19 513	19 603	39 116
		KOUMAIRA	9 482	9 273	18 755
		LERE	11 229	11 427	22 656
		N·GORKOU	16 091	15 606	31 697
		SOUMPI	11 108	10 918	22 027
REGION DE GAO			351 031	350 256	701 287
	GAO		156 035	155 363	311 398
		GAO COMMUNE	56 671	55 588	112 260
		ANCHAWADI	13 928	12 799	26 727
		GABERO	15 833	17 475	33 308
		GOUNZOUREYE	17 479	17 945	35 424
		N·TILLIT	14 815	14 156	28 971
		SONY ALIBER	30 514	31 390	61 904
		TILEMSI	6 795	6 010	12 805
	ANSONGO		86 071	85 469	171 540
		ANSONGO	19 119	19 999	39 119
		BARA	9 443	10 176	19 620
		BOURRA	12 216	12 128	24 344
		OUATTAGOUNA	19 699	19 643	39 342
		TALATAYE	9 617	8 613	18 230
		TESSIT	9 285	8 611	17 896
		TIN-HAMA	6 691	6 299	12 990

REGIONS	CERCLES	COMMUNES	POPULATION EN 2017		
			Masculin	Féminin	Ensemble
	BOUREM		73 584	77 685	151 269
		BOUREM	17 038	18 697	35 735
		BAMBA	17 516	19 685	37 201
		TABOYE	12 809	14 024	26 833
		TARKINT	13 313	11 515	24 829
		TEMERA	12 908	13 763	26 671
	MENAKA		35 341	31 740	67 080
		MENAKA	15 376	14 080	29 457
		ANDERAMBOUKANE	12 341	11 176	23 517
		INEKAR	3 778	3 270	7 047
		TIDERMENE	3 845	3 214	7 059
REGION DE KIDAL			28 799	24 944	53 743
	KIDAL	5 240	4 500	9 739	
		ANEFIF	3 565	3 085	6 650
		ESSOUK	1 675	1 415	3 089
	TESSALIT		5 377	4 890	10 267
		AGUEL-HOC	5 377	4 890	10 267



ISBN 92-9146-710-3



The **International Livestock Research Institute (ILRI)** works to improve food security and reduce poverty in developing countries through research for better and more sustainable use of livestock. ILRI is a CGIAR research centre. It works through a network of regional and country offices and projects in East, South and Southeast Asia, and Central, East, Southern and West Africa. www.ilri.org



CGIAR is a global research partnership for a food-secure future. Its science is carried out by 15 Research Centers in close collaboration with hundreds of partners across the globe. www.cgiar.org