Research support to overcome barriers and accelerate the impact of the Great Green Wall Initiative

CGIAR | ClimBeR: Building Systemic Resilience Against Climate Variability and Extremes

Alliance

Bioversity International | CIAT International Center for Tropical Agriculture | CIFOR | World Agroforestry

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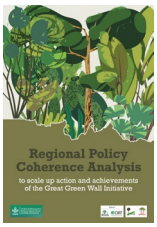
Through the sub-grant, the Centre for International Forestry Research-World Agroforestry (CIFOR-ICRAF) have supported ClimBeR through extensive stakeholder consultation on the four focus countries, Senegal, Mali, Ethiopia and Sudan. In addition to the focus countries, regional engagement and a series of virtual events and stakeholder interviews have been synthesised into the knowledge series. We would like to thank the time and expertise from stakeholders for interviews, workshops, regional events and sharing their insights towards this important project.

ClimBeR
ClimBeR seeks to address challenges to adaptation by small-holder farmers through science and innovation aimed at transforming the climate adaptation capacity of food, land, and water systems, working closely with partners at the local, national, regional, and global levels. ClimBeR focuses on generating knowledge to unlock public and private finance, foster climate- and peace-sensitive policies and backstop the Great Green Wall Initiative (GGWI), Africa's flagship programme to address climate change and desertification.

https://www.cgiar.org/research/publication/initiative-overview-climber-building-systemic-resilience-against-climate-variability-and-extremes/

CGIAR | ClimBeR: Building Systemic Resilience Against Climate Variability and Extremes

Knowledge series



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Acronyms

AICCRA	Accelerating the Impact of CGIAR Climate Research for Africa
ARC	Agricultural Research Corporation
ATI	Agricultural Transformation Institute
CCC-E	Consortium for Climate Change Ethiopia
CCAFS	Climate Change, Agriculture and Food Security
CLimBeR	Building Systemic Resilience Against Climate Variability and Extremes
CERAAS	Regional Study Centre for Drought Adaptation
CIFOR-ICRAF	Center for International Forestry Research and World Agroforestry
CIMMYT	International Maize and Wheat Improvement Centre
CIRAD	The Centre for International Cooperation in Agronomic Research for Development
CORAF	The West and Central African Council for Agricultural Research and Development
CSE	Centre de Suivi Écologique
CNRS	The French National Centre for Scientific Research
One CGIAR	Consortium of International Agricultural Research Centers
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
DCF	Decentralising Climate Funds
ECRC	The Environment and Climate Research Centre
EFD	The Ethiopian Forestry Development
EIAR	Ethiopian Institute of Agriculture Research
GGWII	Great Green Wall Initiative
HER+	Harnessing gender and social equality for resilience in agrifood systems
IER	The Institute of Rural Economy
ICARDA	International Center for Agricultural Research in Dry Areas
ICRISAT	International Crops Research Institute for the semi-arid tropics
ILRI	International Livestock Research Institute
IRD	Research Institute for Development
ISRA	Institut Sénégalais de Recherche Agricole
INP	The Soil Science Institute
IPAR	Initiative Prospective Agricole
LAC	Livestock and Climate
OHM	Observatoire Homme-Milieu
PPZS	Pôle Pastoralisme et Zones Sèches
SLM	Sustainable Land Management
SAPLING	Sustainable Animal Productivity for Livelihoods, Nutrition and Gender Inclusion
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
UNCBD	United Nations Convention on Biological Diversity
UCAD	The Cheick Anta Diop University of Dakar

1 Background

The Africa Union's Great Green Wall Initiative Strategy and ten-year Implementation Framework, drafted in December 2022, reiterates the need to facilitate collaboration between stakeholders – including strengthening linkages with the research community – to coordinate and scale actions towards achieving its goals.

In addition the recent Landmark Report on the implementation status of the GGWI highlighted the lack of its prioritisation in national environmental and climate priorities, and the resultant lack of integration in relevant sector strategies, policies, and action plans. The report also highlighted weak institutional and coordination structures for implementation, including the **exchange and flow of information** at multiple scales. The African Union and partners of the GGWI call upon all stakeholders, and the research community, to assist in addressing these challenges. It also requests research to contribute evidence to enhance and target investment in small and medium-sized farms and strengthen value chains, local markets and exports; promote land restoration and sustainable management of ecosystems, including climate-resilient natural infrastructure; strengthen institutional frameworks to promote effective governance, sustainability, stability, and security and capacity building. As such, there is **a renewed momentum for research that is tailored in response to national and regional government priorities and community needs**, through demand-driven processes of adequate stakeholder engagement and inclusivity.

This short summary report maps the policy bottlenecks that were identified through a regional virtual dialogue, hosted by the One CGIAR ClimBeR Initiative and Alliance of Bioversity International and the International Centre for Tropical Agriculture along with CIFOR-ICRAF. In addition it brings in analysis and insights from stakeholder interviews conducted.

This report aims to synthesise key bottlenecks that emerged from the regional dialogue and link research support, opportunities and offerings to address these barriers and bottlenecks. The objective is to build an agenda to respond to the current bottlenecks experienced in the implementation of the GGWI by connecting relevant research activities and research outputs from the One CGIAR and other research organisations to strategic stakeholders implementing the GGWI.

2 Challenges and bottlenecks of the GGWI

The new draft report of the **Africa Union's Great Green Wall Initiative Strategy and ten-year Implementation Framework**, drafted in December 2022, mentions various challenges and bottlenecks for the effective implementation of the GGWI. In the following section, some of these challenges, as well as potential actions and areas of strategic support needed from the research community are summarized.

Enhance governance, coordination and inclusion

There is difficulty with adopting a landscape approach that transcends jurisdictional boundaries and traditional sectors (agriculture, environment, forestry, water, energy, land use and decentralization). There is also a lack of policy stakeholder involvement in the operational and strategic management of the GGWI, including of local authorities, producer organisations and civil society. Some practical research tools that can be developed to overcome this hurdle, including research that maps policy linkages and commitments between GGW and other multilateral processes (i.e., the action plans of the UNCCD, UNFCCC and UNCBD) as well as establishing multi-stakeholder, multi-sector platforms to promote coordination and dialogue at various scales.

Promote research, science, technologies and innovation; strengthen the policy to science interface

Knowledge developed through UNCCD processes, and other SLM adaptation/mitigation projects is poorly disseminated and largely unknown. In addition, the role of science and research in informing the GGWI is not well emphasized. Also, there is no specific scientific advisory structure at the African or national levels. It is therefore important that the research community assists with the integration of research within national coalition. It is also important that research is packaged in a way that it meets the needs of policy makes and helps to inform decision making.

On the other hand, there is a need for the mapping and organisation of research initiatives. The GGW Secretariat can undertake an initial scoping exercise to determine the direction and focus of its research needs in order to ensure that research partners are supporting a unified, coherent, overall objective. The GGW Secretariat can then use the research findings and recommendations to influence its political and institutional power to achieve its objectives.

Advocacy, communication, awareness raising, education

There is a lack of understanding of the importance and value of GGWI, as well as drylands in general. There is also a need to emphasise that the GGWI is a development plan for drylands and not a tree planting initiative. The GGWI therefore needs to build/ market itself better as a resilience building initiative. Research organisations can assist with the development and sharing of success stories for the capitalisation and popularisation of good practices of sustainable land management, including community practices and traditional knowledge. Equally, important lessons can be learnt through sharing failed experiences. Experiences in the economic valorisation and monetisation of natural resources that strongly encourage local communities to adopt and adapt the concept and operational modalities of the GGWI. Research entities can contribute to dialogue forums to share lessons among stakeholders, member states and project partners.

Promotion of livelihood opportunities

A key need of the GGWI is the promotion of a green/ restoration economy through the valorisation of natural resources within the framework of the creation of value chains, including the implementation of non-timber forestry products processing infrastructures and the creation of green jobs. This includes efforts to facilitate access to finance for SMEs and overcome market-entry barriers to international markets arising from complex standards and regulations, as well as the economic diversification, on-site processing of products and marketing and the creation of value addition at the local level. Research can assist with scoping and lesson sharing to promote context-specific livelihood alternatives in the dryland areas, as well as to explore the enabling environment to enhance their success. This includes, for example, the creation of polyvalent vegetable gardens for women for income generation and ensuring food and nutrition security.

These challenges from the African Union draft report are further supplemented by the comments and recommendations from the CIFOR-ICRAF virtual consultation break out groups:

Funding mechanisms and alignment

With the onset of COVID-19, as well as regional security issues, the GGWI is no longer viewed as a government priority as it has been in the past in some countries. It has failed so far to deliver the large-scale change that was originally envisaged, and therefore not only has this resulted in a lack of commitment from sectoral ministries to coordinate finances, but the funding that is available, is being prioritized elsewhere.

The draft AU GGW Strategy further highlights the need to facilitate dialogues for enhanced Public – Private – Philanthropic – Partnerships, including the exploration of new areas of financing opportunities i.e. through carbon markets and trust-based grants. Building national capacity to mobilize domestic and international financial resources with a view to mastering the procedures for accessing the main sources of financing is also key.

Policy and enabling environment

The lack of land use policies and laws are being challenged within GGWI member states, particularly in countries like Ethiopia and Sudan. The GGWI countries need land use policies and governance structures so that the communities have ownership, tenure and resource use rights to successfully restore degraded lands and avert recurrent droughts and loss of livelihoods. Other challenges include the lack of synergy at the national level, and the issue of ministries working in silos. Communities often do not believe that they will receive the benefits of the GGWI, particularly in the initial phase where they do not readily see the benefits. Government support is critical to help encourage communities to participate in GGWI activities, until the point where they start to see the benefits of the initiative.

Institutional relationships and partnerships

Partnerships are not being funded, given that this is not a traditional funding line item. There is also a need for more national engagements to break down the silos that are a major barrier to effective communication and coordination. An example of a success partnership includes the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) and AGRHYMET's development of a national platform to work together across countries and create a common programme of work.

Research and academia

There is a lack of availability and sharing of information between research houses and government departments. This is associated with the lack of funding available for research, as well as the absence of clear communication pathways to share knowledge, particularly indigenous knowledge. While it is critical that science is linked to policy, it is equally critical that indigenous knowledge is taken into consideration when policies are developed and updated.

Promoting practice and capacity development
With regards to promoting practice and capacity development, technologies exist, but these are not always accessible, particularly at the grassroots level. The GGWI needs to reach out to civic societies and the private sector to mobilise resources and enhance the resilience of communities. Research support and capacity development can be directed to assist designated implementing institutions as well as local communities, both of whom play key roles in the outcome of the GGWI projects.

3 Research that can help to overcome GGWI challenges and barriers

One CGIAR – the unified Consortium of International Agricultural Research Centres - is well placed to provide overall analytical and strategic guidance to support the GGWI Secretariat, regional bodies and partners achieve its key strategic objectives.

Through its long history of focus in the areas of land management, natural resource governance, climate change and climate resilient development, One CGIAR research is contributing to achieve the objectives of the GGWI, both from a country and regional perspective. For example, there are abundant technologies, best practices, scientific information and experiences that can be mainstreamed into GGWI from existing research sites and through documenting good indigenous practices. There is also new research that is being undertaken to highlight promising technologies and practices to support farmers and local communities.

One CGIAR attempts to **produce research that promotes a nexus approach** to sustainable land, water, and soil management and integrates biodiversity conservation and governance across sectors and scales. Its various research houses produce scientific, practical and traditional knowledge that promote multidisciplinary and participatory research and the R&D, tailored to Africa's unique position. Its initiatives look to develop and strengthen appropriate knowledge management, sharing and coordination mechanisms, including the establishment of science-policy working groups to promote the uptake of science into decision making.

One CGIAR can help to clarify the **conceptual framing for the GGWI** and emphasise its shift from a focus on tree planting to a more integrative development perspective that aims to transform the lives of those living in the Sahel by creating a mosaic of green and productive landscapes. There is part of a growing response that highlights the role of regenerative grazing and silvopastoral systems as a central part of a holistic response to curb climate change and promote ecosystem and human health. GGWI needs to clearly define its value-add at the country level and One CGIAR research can align to make this 'pathway' clearer. In addition, One CGIAR research encourages countries to investigate the systemic challenges of land degradation and climate change, to build transformative systemic climate resilience of small-scale farmers and rural communities.

One CGIAR also has expertise in p**artnership brokering** and can help to develop and enhance partnerships through promoting strategic knowledge alliances for actions and innovations. Through its experience in facilitating multi-stakeholder, multi-sectoral platforms, the One CGIAR projects and initiates (such as ClimBeR) are facilitating stakeholder dialogues in the region to promote the coordination of various groupings. This can include conversations with various policy communities from the Rio Conventions to disseminate key commitments and processes; to help policy makers align their restoration goals and targets; to include local communities and authorities and to help define their role and responsibilities; as well as to ensure that non-state actors (particularly farming communities and civil society) and included in GGWI conversations. this includes the private sector where One CGIAR has good working relationships.

3.1 One CGIAR initiatives contributing research to support GGWI goals

ClimBer

Building Systemic Resilience Against Climate Variability and Extremes (ClimBer) focuses on building transformative systemic climate resilience of small-scale farmers and rural communities through improved innovations and financial flows in 6 countries globally, including in Senegal and Mali. The ClimBeR initiative is focused on generating knowledge to unlock public and private finance, foster climate- and peace-sensitive policies and backstop the GGWI.

These objectives will be achieved through 4 workstreams:

1. Reducing risk in production system-linked livelihoods and value chains at scale, through agricultural risk management, digital agro-climate services, CSA innovations, diversifying production systems and reducing nutritional impacts of climatic risks.
2. Building production-system resilience through recognizing the relationships among climate, water, agriculture, security and peace, by providing robust science on the climate security, water and agriculture nexus, and designing evidence-based environmental, political and gender equitable solutions (which is particularly interesting to many countries in the Sahel where conflict and security issues are persistent).
3. Developing adaptation instruments to inform policy and investment, integrating a top-down approach using participatory scenario workshops, in-country task forces and knowledge integration workshops; and a bottom-up collective imagination of futures, incorporating existing innovative grassroots practices and ensuring the inclusion of women, youth and marginalised groups.
4. Promoting governance for transformative adaptation by developing and integrating bottom-up, multi-scale, polycentric governance frameworks for reducing systemic cascading risks; co-demonstrating transformative adaptation options with relevant actors to illustrate applicability across scales; and co-developing "champions of change" to advocate for multi-scale polycentric governance to target local investments for empowering farmers, including women.

Work package 4 is particularly relevant for the GGWI as it promotes innovative and flexible theoretical frameworks that combine institutional, social and policy network approaches to understand power imbalances, cross level interactions for a social equitable transformative adaptation and implementing sustainable strategies in response to climate change. ClimBer is also assisting the GGWI to promote partnership development and co-ordination for synergistic implementation. ClimBer brings stakeholders together and promotes synergy building and collaborative outcomes.

LAC

Livestock and Climate (LAC) is an initiative of the One CGIAR whereby researchers are working with public and private actors to identify solutions and to co-create and deliver innovations that quantifiably help producers, businesses and governments adapt livestock agri-food systems to climate change, while simultaneously reducing GHG emissions. A key intended outcome is that pastoralists and farmers adopt improved governance, management and restoration practices on 500,000 hectares of land used for livestock production and that international agencies and policymakers use the Initiative's products to shape policies or investments to strengthen socially inclusive, low-emissions, livestock production system resilience. LAC targets 8 countries globally, including Senegal, Mali, Ethiopia, Kenya, Tanzania and Tunisia in Africa.

The International Livestock Research Institute (ILRI) heads up LAC and each of the identified work streams are driven by a One CGIAR partner. The programme is working towards improving local capacities and inclusion in livestock production through biometric and socio-economic analysis of proposed on-farm technology packages to support inclusive scaling of resilient low-emission practices; developing digital services to manage climate risk and inform decision-making in livestock agri-food systems by co-designing, testing and scaling digitally enabled services that bundle tailored climate information, risk transfer and credit strategies; undertaking system-level research and interventions for climate-resilient and low emission livestock production systems, focusing

on understanding, measuring and rebuilding climate resilience within pastoral systems, with research-to-development partnerships that optimize scaling a priority; helping finance the transition to low-emission and resilient livestock agri-food systems by creating a research programme that builds investor awareness of and confidence in livestock investments with stated resilience and emission goals; and improving the enabling policy environment by generating data and developing systems to improve the design and implementation of policies and investment proposals at national and global level and supporting governments to monitor and quantify livestock contributions to climate commitments.

Rangeland restoration is an important component of research that is neglected in current literature for the Sahel. This includes improvement of productivity of lands, as well as Monitoring and Evaluation linkages. There is also an insufficient framework for community engagement, co-design and monitoring of interventions. Through ILRI and LACs work, they have established a process and framework for inclusive engagement. ILRI, for example, promotes Participatory Rangeland Management and can provide the framework and lessons to strengthen institutions and management in the GGWI. For example, it has developed indicators of women's empowerment and institutions and productivity. This is useful to promote systems science and partnership brokering for the new model of GGWI implementation, that can shift to integrative local participatory development process within intervention zone.

ILRI's LAC captures the impact of participatory, resilient pastoral systems on the productivity of land. ILRI brings in technical expertise and research to processes that are ongoing to enhance methods (for example looking at carbon market in rangelands and other emerging topics).

Accelerated Breeding

Accelerated Breeding is a 3-year programme, launched in September 2022, aims to develop better-performing, farmer-preferred crop varieties and to decrease the average age of varieties in farmers' fields, providing real-time adaptation to climate change, evolving markets and production systems. Amongst its 8 priority countries is Senegal. This programme partners with a multitude of other research and innovation initiatives.

AICCRA

Accelerating the Impact of CGIAR Climate Research for Africa (AICCRA) seeks to enhance access to CIS and validated CSA technologies across 6 African countries. The focus is on expanding access to demand-driven, cost-effective, timely CIS and CSA, while enhancing the capacities of national partners to sustainably adopt such services. Through climate risk mapping, near-real-time crop monitoring and climate change impact assessments, they also support research investment and policy decision-making. In each country, AICCRA teams collaborate through their activities on sharing knowledge, building partnerships, scaling innovation and fostering inclusion. Through the dissemination of climate services to the private sector, for example, AICCRA can help to forge public-private partnerships within GGWI. AICCRA also provides policy and technical support to the African Union Commission, to enhance its role in climate change, natural resource governance and green economy. This technical support could help to build an appropriate resource mobilization strategy i.e. through proposal writing and partnership development with the AUC.

SAPLING

Sustainable Animal Productivity for Livelihoods, Nutrition and Gender Inclusion (SAPLING) is a 3-year initiative, launched in 2022, implemented in Kenya, Tanzania, Ethiopia, Mali, Nepal, Vietnam to transform the livestock sectors in these target countries and make them more productive, resilient, equitable and sustainable. Projects include developing new and adapting existing technologies and practices to increase sustainable livestock production; encouraging innovative practices for consumption of livestock-derived foods as part of diverse diets; focusing on gender equity and social inclusion to understand

the constraints and opportunities of sustainable livestock production; promoting competitive and inclusive livestock value chains by generating evidence on institutional arrangements and technical interventions and generating and consolidating evidence and scalable models and tools to support public and private decision-making for a sustainable and inclusive livestock sector. SAPLING can encourage the contribution and involvement of the commercial sector to invest in rangeland restoration and valuable value chains. In addition, research to reduce risk and produce tools, processes and technologies to understand the most sustainable, cost-effective approaches to climate change and sustainable management. It sets up action research trials and monitors the impact - eg carbon stocks, vegetation rangeland health, species restoration.

HER+

Harnessing gender and social equality for resilience in agrifood systems (HER+) was launched in 2022, as a three-year research initiative to conduct innovative gender and social science research to progress climate resilience for women. In collaboration with partners, HER+ delivers direct outcomes that strengthen women's climate resilience. The research initiative identifies and tests climate solutions that do work—and work in specific and practical ways— for women as well as men, bringing to the fore evidence of best practices and lessons learned. The need to enhance gender equality and women and youth empowerment in the GGWI area has been highlighted in the new AU GGWI Strategy. The research of HER+ helps to promote economic empowerment opportunities to enable rural women and men to participate in and benefit from profitable economic activities in the GGWI area. It also seeks to support youth participation in rural development, within the context of a green economy, and establish business incubation centres for women and youth.

CIMMYT

International Maize and Wheat Improvement Centre (CIMMYT) is a global research body that specializes in CSA in maize and wheat. The activities of CIMMYT support dryland research and areas affected by drought which is relevant to GGWI. CIMMYT's work in Africa to help farmers access new maize and wheat systems-based technologies, information and markets, and enhance crop resilience to drought and climate change. CIMMYT sets priorities in consultation with ministries of agriculture, seed companies, farming communities and other stakeholders in the maize and wheat value chains.

CIMMYT works at the country level. For example, in Ethiopia, it supported maize and wheat germplasm supply and joint technology generation and demonstrations at scale. It also plans to support data warehouse development that will provide farmers with access to an agronomy advisory services hotline and support the breading of wheat for heat tolerance and Ethiopia's irrigated wheat initiative.

ICARDA

International Centre for Agricultural Research in Dry Areas (ICARDA) works together with a wide network of national agricultural research systems and advanced research institutions to enhance their efforts and competencies to drive local and national research and development agendas. This includes thematic areas such as climate smart crops, agrosilvopastoral systems, and soil and water agronomy.

In east Africa ICARDA works with Ethiopia to promote drought-resistant pulses and their adaptation to climate change, as well as seed banks in dryland areas. These technological advances can support GGWI goals. ICARDA also works with local scientists. In Ethiopia ICARDA and local scientists generated international public goods, such as biotic stress-resistant varieties like rust-resistant wheat varieties, wilt-resistant lentil varieties and Asochcyta Blight-resistant Kabuli chickpea varieties.

ICRISAT

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is currently working across Africa with offices in Ethiopia and Mali. This research project is providing CIS for agro-pastoralists in the GGWI area. In Senegal ICRISAT is working to improve climate smart millet and legumes, while in Mali stakeholders have developed and validated a "Business to business to client" model between the producers of climate information (Mali -Weather and IER), dissemination services (extension agents and Orange Mali) and end-users such as municipalities, radios and farmers' organizations with a particular focus on the GGWI intervention area.

3.2 Regional entities working to produce research to support GGWI needs

CIFOR-ICRAF

CIFOR-ICRAF is working to help countries meet their restoration targets and create impact through a mandate to build, disseminate and apply evidence about the role of soils, trees, forests and tree-based agriculture as pathways to solving global crises, including poverty, hunger, land degradation, climate change, and unsustainable supply and value chains. With a presence in 13 countries across Africa, and offices in Ethiopia and Mali, CIFOR-ICRAF is leading research in development to enhance knowledge to support the regeneration of degraded land, enhance agricultural productivity, promote the use of trees, develop 'green' commodity supply chains, harness sustainable bioenergy, and transform national food systems. Through collaboration with farmers, pastoralists, forest communities and other partners, CIFOR-ICRAF drive dialogues and builds communities of practice (such as the Global Landscapes Forum) on sustainable land use and builds transformative partnership platforms and alliances.

Significant work in the Sahel and Horn of Africa on land health, degradation drivers, agroforestry and forests as well as impacts of diverse interventions has resulted in a vast evidence base that can and is being used to inform the GGWI. Regreening Africa, an ambitious land restoration programme, covering eight countries (four of which are within the GGWI and others expressing interest to join) has brought together evidence on promising practices and approaches that can scale, incentives for restoration adoption and benefits (livelihood and land health) that are integrated into GGWI planning and discussions.

In December 2021, the Centre for International Forestry Research (CIFOR) and World Agroforestry (ICRAF) completed a three-year programmatic and operational merger process. While maintaining separate legal entities, CIFOR-ICRAF now operates under a single governing Board and single leadership team, with a joint regional structure and five joint research themes, all guided by the CIFOR-ICRAF Strategy 2020–2030. The functional merger brings together more than 70 years of combined expertise, over 700 staff working in 60 countries across the Global South, offices in 25 countries, 14 host country agreements, nearly 200 active partnerships, and intellectual assets published in some 25,000 research products.

IPAR

Initiative Prospective Agricole (IPAR) is a think tank working on strengthening agricultural and rural sector policies in West Africa. It operates in the sub-region, including in Mali and Senegal. IPAR is involved with the ClimBer initiative, supporting the stakeholder engagement for work stream 4. IPAR was mandated to study the feasibility of creating a National Land Observatory in Senegal based on the existing one. IPAR can assist the GGWI with issues related with land tenure issues as it is conducting high level research on the issue. IPAR, in partnership with ILRI, undertook a study on 'The Opportunities for Participatory Rangeland Management (PRM) in the GGWI in Mali and Senegal' to explore the potential for testing and piloting Participatory Rangeland Management (PRM) and to potentially scale up this approach in the context of the GGWI. PRM can help bring a greater degree of community participation, by including women and youth, and in managing activities and interventions contributing to the GGWI, where the mainly top-down approach to date. it 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 GGWI, implementation will have long-term beneficial impacts, including reduced costs and greater sustainability."

CORAF

The West and Central African Council for Agricultural Research and Development (CORAF) is an association of national agricultural research systems in 23 West and Central African countries.[1] Together with the Association for strengthening agricultural research in Eastern and central Africa (ASARECA), the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) and the North African Sub-Regional Research Organization (NASRO), it forms the four sub-regional organizations that make up the Forum for Agricultural Research in Africa (FARA).

IRD

Research Institute for Development (IRD) is a French Institute that has been developing research, training and innovation activities with entities in the Sahel for a long period of time. The research

1. *Together with ASARECA (Association for strengthening agricultural research in Eastern and central Africa), CCARDESA (Centre for Coordination of Agricultural Research and Development for Southern Africa) and NASRO (North African Sub-Regional Research Organization), it forms the four sub-regional organizations that make up the Forum for Agricultural Research in Africa, FARA.Research consortia and research projects*

topics are defined jointly by the target countries and French researchers according to the priorities identified within the country and the scientific axes of the Institute.

DCF

Decentralising Climate Funds (DCF) is an action-research and advocacy project supporting communities in Senegal and Mali to access to locally-controlled adaptation funds. Resilience investments are identified and prioritised by local communities through a participatory process which is inclusive of women. Planning and finance mechanisms are embedded in local and national systems. The project shares locally-generated evidence from these experiences with local, national and international audiences, to encourage greater decentralisation of climate funds. The Programme is implemented by the Near East Foundation (NEF), in partnership with Innovation, Environnement et Développement en Afrique and the International Institute for Environment and Development.

CIRAD

The Centre for International Cooperation in Agronomic Research for Development (CIRAD) has developed a community-based approach to research the GGWI with local partnerships. It is involved in the newly launched Health and Territories project, which aims to revolutionize integrated approaches to health by linking them to the agro-ecological transition framework in Senegal. It is also involved in the PRAPS 2 (a World Bank funded project to realise the full potential of pastoralism in the Sahel) and it as co-implemented the ABEE project in Burkina Faso, Niger, Senegal that aims to better coordinate approaches to plant breeding, both at the regional and national levels, by placing breeders of 5 target species (millet, sorghum, fonio, groundnut and cowpea) at the heart of the action to improve and modernise their breeding practices and better respond to market demand.

CIRAD is coordinated by the West and Central African Council for Agricultural Research and Development (CORAF), through funding from the EU. It promotes research applied to field problems, co-constructed with the beneficiary populations. It works with partners on different types of solutions (biological, technical, organisational, institutional) in a wide range of fields, to respond to the specific constraints within the GGWI. It favours an inclusive approach that builds on the questions posed locally by the partners and ensures coordination with national and local authorities, through "Partnership Research and Training Facilities", as well as:

- Improvement of scientific, technical and economic knowledge on pastoralism (Economy of pastoral and agropastoral households, Value chains and investment needs, Evaluation of the carbon balance of Sahelian pastoral systems, Monitoring of pastures and fodder balance, Organisation of technical interviews); and
- Targeted regional integration actions (Updating of the mapping of transhumance corridors and axes, Georeferencing of infrastructure, equipment and animal health infrastructure, Resilience of information systems and a database on pastoral hydraulics).

CIRAD has also been involved in training and supervising senior staff around areas of pastoralism. CIRAD has developed a community based approach to research on the GGWI with local partnerships. It coordinates FAIR Sahel (2020-2023), a project focusing on a transition to agro-ecology.

CILSS, AGRHYMET Regional Centre

The AGRHYMET Regional Centre is a specialised institution of the Permanent Interstates Committee for Drought Control in the Sahel (CILSS) with a mandate to train personnel, provide adequate equipment for the meteorological and hydrological stations networks, and set up regional and national multidisciplinary working groups to monitor the meteorological, hydrological, crops and pastures conditions during the rainy season. It is considered as the West Africa drought monitoring centre. After 40 years of existence, AGRHYMET's scope of activities extends beyond the geographical boundaries of CILSS member states, to include broader West Africa. It is now implementing initiatives on behalf of the Economic Commission of West African States (ECOWAS) on food security and environmental issues, including climate change. AGRHYMET has developed, in collaboration with international research organisations, models and methodologies based on ground and satellite observations to monitor rainfall, food crop water requirements satisfaction and prospective yields, the progress of vegetation front and its seasonal and interannual variations. It has trained about 1200 new experts in agrometeorology, hydrology, equipment maintenance, and plant protection, and more than 6000 professionals on topics related to food security, climate change, and sustainable natural resources management. AGRHYMET staff are also involved in several international initiatives on climate change, food security, and environmental monitoring that allow them keep abreast of the best available technologies and methods, and also contribute to generating knowledge on those issues.

Photo: Kelvin Trautman for Regreening Africa

Funded by European Union

Regreening Africa

Scaling best practice in restoration: Lessons from the Regreening Africa programme[2]

Regreening Africa (2017-2023) is an ambitious multi-country, multi-stakeholder restoration initiative to generate and share lessons from local, national and global restoration efforts. This programme aims to **directly reverse land degradation across 8 countries in sub-Saharan Africa by integrating trees into agricultural systems while simultaneously improving livelihoods, food security, and climate change resilience of smallholder farmers**. The programme's vision is to catalyze regreening among 500,000 households across 1 million hectares in Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, and Somalia, scaling efforts to regreen degraded land across Africa using locally appropriate practices, such as farmer-managed natural regeneration, nurseries, tree planting, water harvesting and other forms of agroforestry and sustainable land management interventions.

The programme operates as a consortium of research partners (ICRAF) and implementing NGOs (World Vision, CRS, Care International, Sahel Eco, Oxfam) in partnership with local governments and communities. Using monitoring tools like the Regreening Africa App developed by ICRAF, scientists are empowered to monitor the progress for a more holistic picture of local realities.

In **Ethiopia**, this project has had vast success. It operates in 25 woredas of four regional states. In the past 5 years, Catholic Relief Service and World Vision Ethiopia alone have **planted nearly 20 million tree seedlings and restored 217,056 ha of degraded land to benefit 156,206 household**s. Another 125,000 ha is brought under area enclosures for restoration with 1,146 government and private nurseries providing technical support. The project location includes Jeju, Hula, Shasahogo, Ambassel, Atsigde tsimbla, Medebayzana weredas of Ethiopia. These areas are highly degraded areas with less forest vegetation, high levels of soil erosion, nutrient depletion by agricultural soil mismanagement and overgrazing of livestock. Some of these locations particularly, in Tigray, are located in GGWI areas.

To foster a massive, sustained landscape restoration movement with nationwide uptake, the project has **built on the successes of existing restoration in-country programmes**, providing a solid basis for nationwide scale-up.

Regreening Africa's innovative implementation approaches:

- Participatory design and implementation and monitoring approach with community
- Direct scaling-up of re-greening practices, including FMNR, tree plantation, agroforestry, area closure and soil and water conservation
- Leveraging approaches for adopting re-greening practices
- Community mobilization for scaling re-greening practices
- Engaging volunteer farmer trainers, community-based organizations, youth, women and other stakeholders.
- Capacity building trainings and knowledge transfer
- Supporting nurseries, established RRCs.
- Integrating and strengthening tree planting with income generation activities, such as beekeeping and honey production and fodder trees.

The project used practical training to get hands on-site training. Different manuals on Farmers Managed Natural Regeneration were prepared and disseminated to target groups. In addition, the project created awareness using different T-shirts during tree planting, combined with radio communication using local languages to reach out to more people.

The project in Ethiopia has had numerous successes, including achieving the restoration process both in terms of household and hectare of restored land. It has also established and strengthened nurseries. The community groups used small spaces in their compound for seedling raising and the project supported them through training on quality seed sourcing in collaboration with ICRAF.

The project also linked to other research institutions for practical training on Beekeeping and Grafting. It used the Rural Resource Center (RRC) approach for seedling production where the RRC focus on grafting of costly unavailable fruits like mango, avocado and Apple and distribute to the nearby community. The project engaged community for mass mobilization and enhanced the capacity of government workers.

Photo: Kelvin Trautman for Regreening Africa

As part of the project, a study was conducted looking at soil fertility in the context of reforestation. This study and the expertise developed around it would be relevant to inform decision makers and the methodology adopted for the study could be expanded to other agro-ecological areas.

2. *https://regreeningafrica.org/wp-content/uploads/2022/12/Insights-series_Partnerships_18Nov_2.pdf*

3.3 National organisations that are responding to the research needs of the GGWI

Senegal

One CGIAR programmes and centres

Climate Change, Agriculture and Food Security (CCAFS) implemented a three-year intervention in Senegal between 2016 – 2019, that sought to increase the resilience and productivity of targeted farming, pastoralist and fisher communities through the provision, communication and use of climate information services. Projects conducted under CCAFS included the development of a climate-smart village model, where farmers worked with researchers and local partners to test a portfolio of climate-smart technologies and practices in the Kaffrine region. In addition, CCAFS established a national science-policy dialogue platform to regularly exchange knowledge on adaptation to climate change and it helped to developed a CSA Alliance, launched in 2015 in partnership with ECOWAS, of which Senegal is a member.

ClimBer, of which Senegal is a focal country, held its first consultation in Dakar in 2022 with the aim of building a network for knowledge sharing to identify practical and actionable knowledge on multiscale governance for transformative adaptation that can be used by a broad range of government and non-government representatives. The ClimBeR has been consulting with key stakeholders on the proposed AWARE platform to promote integrated multiscale institutional responses to climate shocks. It is also utilizing ClimAdapt.Gov to empower farmers, community and policy planners to plan and implement bottom-up integrated climate and water risk management interventions.

AICCRA-Senegal builds on existing scientific and educational networks in Senegal and across West Africa to enhance the capacity of public institutions and private enterprise to deliver CIS and CSA along value chains vital to the Senegalese economy. The AICCRA Senegal team is creating training programmes for agricultural researchers and extension workers, while establishing 'AgriTech' innovation platforms. These actions complement the overall objectives of the GGWI. AICCRA-Senegal is led by ILRI in collaboration with the Alliance of Bioversity International and CIAT, the International Research Institute for Climate and Society, the Agence Nationale de Conseil Agricole et Rural, the Centre d'Études Régional pour L'Amélioration de l'Adaptation à la Sécheresse, the Agence nationale de l'Aviation Civile et de la Météorologie and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). AICCRA works with a variety of private sector enterprises, including Jokalante, Mlouma, Compagnie Nationale d'Assurance Agricole du Sénégal and myAgro. Support for the activation of public-private partnerships to accelerate the implementation of GGWI ambitions is key to the achievement of Senegal's restoration goals.

National research institutions and universities

Centre de Suivi Écologique (CSE) is Senegal's Ecological Monitoring Centre that provides information for decision-making, particularly in the management of natural disasters, and has developed expertise in as coastal management, monitoring of rangelands, bushfires and agricultural production, vulnerability and adaptation studies to climate change, carbon sequestration, long-term monitoring of ecosystems, economic valuation of ecosystem services and environment-health issues. CSE has been accredited as a National Implementing Entity by the Adaptation Fund since 2010 and by the GCF in 2015.

The Senegalese Institute of Agricultural Research (ISRA) is conducts research on the promotion of resilient and sustainable production systems; the transformation of agriculture and sustainable support to family farms and agro-industries; on monitoring, forecasting and valuation; and on capacity building and partnership consolidation. ISRA works with other national and local centres and research organisations to co-produce research, including Senegal's National Forestry Research Centre; the Bureau of Macroeconomic Analysis and Social Engineering, and the National Laboratories of Research on Crop Production,

Animal Production and Fisheries production. ISRA has contributed to the development of many management plans developed by projects at the national level. ISRA and CNRF have successfully domesticated several forest species (Baobab, Zizyphus, etc.) that can be integrated into the agrarian landscape. It can make contributions in working with local farmer-innovators to scale up ANR, addressing socio-economic dynamics with pastoralists.

The Soil Science Institute (INP), within the Ministry of Agriculture, identifies and diagnoses degraded soils and provides best practice solutions for sustainable land management. The INP's laboratories conduct soil, water, and fertilizer analyses to meet the needs of crop producers. INP is developing a national database of degraded soils which could benefit the work done by the GGWIA.

Regional Study Centre for Drought Adaptation (CERAAS) was an initiative of ISRA and the research institutes of CORAF member countries, to respond to the challenges of improving agricultural production under drought conditions. CERAAS is specialized in research on improving crop adaptation to drought for research teams in West and Central Africa. Today it is the National Centre of Specialisation for Dry Grains. This is relevant for the GGWI area where water stress is posited as a key issue

The Cheick Anta Diop University of Dakar (UCAD) hosts the Institute of Environmental Sciences (ISE). In 2021, the Senegalese Agency of Reforestation and the GGWI allocated 1000 ha to the University to orchestrate field research across Senegal. It also developed a curriculum on agroforestry. Involved in CNRS funded projects focusing on anthropo-biological approach to GGWI projects. Through its students they make available to development institutions and services. On site expertise with managing restoration under the GGWI (was granted an experimental field to carry out research in 2021)

Research Institute for Development (IRD) has been developing research, training and innovation activities in partnership with Senegalese institutions for over fifty years. In Senegal, thematic research is focused on CSA, food security and sustainable environment, inclusive social change, public health, marine ecosystems and fisheries resources. To date the IRD has focused on carbon storage. It is however keen to get involved with the GGWI and has started to become more involved with the setting up of the GGW Initative Alliance.

The French National Centre for Scientific Research (CNRS) has been involved in researching the GGWI since its inception in 2008. It has set up an international research laboratory in West Africa, with branches in Mali, Burkina Faso and Senegal. In partnership with the GGWI National Agency, the CNRS is driving cross-sectoral, transdisciplinary research around the GGWI with a focus on both sociological and ecological aspects. The CNRS has designed and driven two important research projects linked to the GGWI, namely: Future Sahel (2015- 2019) and Xpath Futures (ongoing). Amongst other things, Future Sahel developed a socio-environmental database along the GGWI and GIS as well as an inventory of vegetal biodiversity and research on multipurpose trees. Xpath Futures, on the other hand, focused on the Senegalese englobes in Louga and Matam, which is largely dedicated to extensive livestock herding, integrating livestock, forage and trees, a key part of Senegal's GGWI. This project used extensive, participatory multistakeholder workshops to better understand the local aspirations, constraints and solutions of this area. Both of these projects have advocated for a new orientation in the way GGWI interventions are designed and implemented (i.e. with true participation of local actors in GGWI action co-design and co-construction). A strong focus of both is the need to identify and design context-specific actions, while insisting on the key role of governance and an enabling social context for implementation. The findings from these projects can offer the GGWI, and its partners, in-depth knowledge (scientific, technical, traditional, institutional) and multi-scale vision of the social-ecological systems underlying the GGWI path, both from a structural and functional standpoint, to assist in good decision making and design. CNRS has also assisted with advocacy capacity to bring this approach to scale.

Research consortia

The Observatoire Homme-Milieu (OHM) is an observatory, funded by the CNRS, which focuses on cross-sectoral research and ecology. OHM operates exclusively in the GGWI intervention area. While their main focus is on Senegal, they plan to expand research in Burkina Faso, Nigeria and Mali. OHM has strong capacity in indigenous fauna and flora, a strong focus on researching human health issues and the use of indigenous plants. They are endowed with strong expertise from an environmental management perspective and have a long working experience with the Pan African Agency. The OHM offers training

and research missions on themes such as the adaptation of biodiversity, both animal and plant, to climate change, the health of populations or their use of plants. It organises summer university on an annual basis on a relevant GGWI site, attended by GGWI Agency. Their research demonstrates the health impacts of environmental change, the human health benefits of reforestation as it brings back biodiversity, strong focus on the benefit of the GGWI to local populations. They have also been involved in research revealing the high salinity of deep wells drilled in the GGWI area. By virtue of its experience in fostering high level research collaborations in intertropical areas, the OHM can be an inspiration for other GGWI countries.

Pôle Pastoralisme et Zones Sèches (PPZS), based in Dakar, is a research consortium that focuses on pastoral livestock and drylands. The PPZS has been conducting research for the past 5 years on local governance and on the development of local policies for land restoration – both essential to support the social anchoring of the GGWI. Their expertise in "accompanying modelling" could assist other projects with embedding GGWI projects in the local anthropo-sociology and territorial dynamics i.e. the "social engineering dimension". This same tool could be used to develop a multi layered (from local to national) mapping of GGWI actors

Avaclim project aims to create the necessary conditions for the deployment of agroecology in drylands (2020-2022). CARI, the leading NGO, has partnered with practitioners, farmers and scientists to study agro-ecological initiatives in 7 countries, including Burkina Faso, Senegal, Morocco, and Ethiopia, in order to promote agroecology to their national and regional policy makers. This has led to the development of multidimensional indicators of the impacts of agroecology that could be used when monitoring GGWI actions. The national lead in Senegal is the NGO Enda Pronat.

Mali

One CGIAR programmes and centres

Climate Change, Agriculture and Food Security (CCAFS) promoted integrated soil-water-energy systems as a climate-smart agro-silvopastoral production models in Cinzana (2017-2021) to boost the livestock sector of the Segou region of Mali. CCAFS used its CSV in Cinzana to promote the adoption of climate-smart agro-silvopastoral systems for improved and sustained fodder availability and livestock nutrition. Sufficient documentation of fodder species (trees, shrubs, forbes, grasses), farmer perceptions of their use, priorities among livestock producers, and their nutritional profiles are also considered knowledge gaps in the project area which are crucial for strategic livestock farm technology development, feeding and supplementation to livestock ration in the region.

CIFOR-ICRAF is involved in Regreening Africa. In Mali, local partners include Oxfam, Sahel Eco and World Vision. It aims to engage 80,000 smallholder farmers in the regreening of 160,000 ha in four districts, namely Bla, Koutiala, San and Yorosso.

AICCRA-Mali targets the rice value chain and other key food systems that are integrated with rice production, such as legumes, vegetables, tubers, fish and trees. Research work has recently been undertaken to explore the potential for setting up PPP's in enhancing collaboration between actors [namely ANGMVM, the National Meteorological Agency (MALI-METEO), the Mobile phone company Orange Mali and the Institute of Rural Economy (IER)], for effective access and use of climate information service by farmers and pastoralists in the GGWI intervention zone of Mali. This adopted methodology that identifies a mutual benefit for PPPs can be replicated and systematised around other problems related to the GGWI in Mali to contribute to the acceleration of the GGWI implementation and resolved issues related to lack of coordination.

National research institutions and universities

The Institute of Rural Economy (IER) is a public scientific and technological service in Mali that develops and implements agricultural research programmes, transfers technological innovations to the rural communities and contributes to the training of agricultural research staff on new technologies on crops. IER has the mandate from the government to do research and share the results with farmers for demonstration and dissemination. IER is specialized on agricultural research activities for rural development and its main research programmes focus on climate-adapted seed varieties selection, soil and water management technologies, and environmental changes studies. Many of these projects are related to the GGWI. While the IER has a department of communication specifically for rural communities, additional financial and technical resources are needed to strengthen the dissemination these findings (specifically related to new adapted varieties and technologies to climate change).

University of Ségou is a public institution of a scientific, technological and cultural nature. It comprises three faculties and one institute including a Faculty of Agronomy and Animal Medicine and a University Institute of Professional Training.

Sahel Eco is a local Malian NGO, developed in 2004, to strengthen the capacity of communities to take action on climate change, food and nutritional security, as well as to diversity and secure rural economy and promote access to renewable energies and their productive use. Sahel Eco does this through developing a public advocacy strategy to influence development policies and practices, as well as providing a space for interactive exchanges.

Research Institute for Development (IRD) has been working in partnership with Malian institutions since 1984. Their research in Mali has focuses on climatic changes related to the sustainable management of water and geo-resources; the challenges of meeting agriculture and nutrition demands, while supporting the preservation of eco socio-systems and biodiversity; understanding health dynamics by informing policies for the elimination of diseases; and understanding the socio-economic challenges of post-conflict reconstruction and sustainable development in Mali.

The IRD and the IER are working on developing agricultural tools, that are relevant to the GGWI. These include the JEAI AMSAMA, which models the spatial evolution of agricultural dynamics and develops decision-making tools for the development of agricultural land. In addition, the IER and the IRD are cooperating on the 'Coalition against agricultural pests in Mali' which aims to contributes to the fight against crop pests; in particular, against bacteriosis (rice disease), which is on the rise in Mali and more widely in the Sahel. It is developing molecular tools that can be used for epidemiological monitoring of bacterial diseases and for understanding invasion routes, as well as for discovering the factors that influence infectious and resistance mechanisms in plants, and the evolution and pathogenesis of pathogens.

Research consortia and networks

Agri Vision Sahel (spinoff of AgriPro Mali) is a local NGO that works to strengthen the role of agriculture in the Sahel by creating a country-wide agricultural network. It facilitates the sharing of lessons and new designs amongst small and medium scale farmers, as well as agri-entrepreneurs, agri-businesses and network partners from government, civil society and knowledge institutions.

Ethiopia

One CGIAR programmes and centres

CIFOR-ICRAF has operated in Ethiopia since 2005, partnering with relevant institutions on climate change, forests and dryland forests. The National Watershed and Agroforestry Multi-Stakeholders Platform, facilitated by CIFOR-ICRAF and chaired by the Ministry of Agriculture, is an important platform to enhance the work of GGWI. CIFOR has also involved in studies related watershed development and agroforestry that feed into the GGWI goal on afforestation. CIFOR-ICRAF conducts and supports technical and policy research to enhance Ethiopia's GGWI goals. For example, it contributed to the revision of the 2007 Forest Law. Ethiopia's current National Forest Law (2018) now recognizes the need for secure forest tenure, the need for classifying forests based on their primary uses, and the rights of communities, in part informed by long-term CIFOR-ICRAF research and engagement. In addition, research work has helped to strengthen other policies. For example, 'the context of REDD+ in Ethiopia: Drivers, agents and institutions' helped inform the formulation of the national REDD+ strategy, and CIFOR-ICRAF has played a lead role in supporting the government to prepare its second phase proposal for the REDD+ Investment Programme .

ILRI works in Ethiopia on CSA and innovation in the areas of livestock. Support national effort and stakeholders in knowledge generation over the livestock areas. Low land livestock research and information generation, data generation and technology dissemination. Important stakeholder for generating public good information and hence should be part of stakeholders. Organize the youth groups into clusters so that they have sufficient representation in the GGWI.

National research institutions and universities

Agricultural Transformation Institute (ATI) is a government agency created to help accelerate the growth and transformation of Ethiopia's agriculture sector through improving the livelihoods of smallholder farmers across the country.

The Ethiopian Forestry Development (EFD) is federal institution that resulted from a merger between the Ethiopian Environment and Forest Research Institute (EEFRI) and then Environment, Forest and climate change commission. The EFD has a number of research Directorates that are aligned with the goals of the GGWI. This includes the Climate Science Research Directorate that is organized around climate modelling and risk management, as well as around climate adaptation and mitigation research. This Climate Research Directorate has 4 main research projects undertaken across various agro-ecologies of Ethiopia. These include projects on climate modelling and risk management; traditional ecological knowledge systems for climate adaptation and mitigation; agro-forestry and drylands forests for climate change adaptation and mitigation. In addition to this Climate Directorate, there is also a Plantation and Agroforestry Research Directorate; an Ecosystem management Directorate and a Forest Protection Research Directorate (and others) which deal with research themes that support the interests of the GGWI. The EFD also has 7 forestry development centres/ outposts that are responsible for research related to plantation and agroforestry, non-timber forest products, ecosystem management, forest resources utilization, forest protection and socio-economics, policy, extension and gender.

The Environment and Climate Research Centre (ECRC) of the Policy Studies Institute supports green and climate-resilient development in Ethiopia as a knowledge backstop. ECRC's core function is to undertake policy-oriented research on the economics of climate and environment in Ethiopia, conducting real time impact evaluation of the Climate Resilient Green Economy's implementation process, and to serve as an interaction hub for research and policy. The centre also plays an important role in building domestic analytical capacity on climate related issues as well as developing a data and knowledge repository of Ethiopia's green growth experience. Core thematic areas of focus on include sustainable agriculture and sustainable forestry management. In 2022, climate change research was undertaken with the University of Copenhagen's Development Economics Research Group on "Building Resilience to Climate Change in Ethiopia". The study contains a survey of 2 000 households in five regional states of Ethiopia. The Policy Research institute and the Ethiopian

Economics Association (EEA) also conduct policy research and policy dialogue forums.

Ethiopian Institute of Agriculture Research (EIAR) is a lead federal institute focusing on research that supports the generation of technologies related to agriculture and pastoralism. The EIAR oversees several Directorates that promote research on key thematic issues, including on competitive and resilient crops, livestock, seeds etc. EIAR partners with government institutes and bureaus, as well research institutes and the private sector. Some of these research networks are on wilt and root rot diseases in legumes and stem rust disease in wheat.

Mekelle University has established a land portal to document and disseminate research related to land degradation and restoration. This includes publications on soil erosion hotspots and the potential of certain land practices on soil health.

Research consortia and networks

Consortium for Climate Change Ethiopia (CCC-E) is member organization to raise awareness network, engage and coordinate actions on climate change. Members include the Forum for Environment, the Environment and Development Action Ethiopia, the Institute of Sustainable Development, SOS Sahel and others.

Sudan

National research institutions and universities

The University of Khartoum supports research relevant to support the objectives of the GGWI. This includes the Faculty of Agriculture which offers research on the natural resources and agricultural extension. The Institute of Environmental Studies, which offers research climate change, desertification and water resources, as well as the Institute of Desertification and Desert Cultivation Studies that focuses on land degradation research, community-based engagement – all of which is relevant to GGWI activities. In addition, the Faculty of Economic and Social Studies conducts research and skills development on environmental, social, and economic impacts of land degradation. The university has qualified staff and technicians, well equipped labs and infrastructure to support and help the GGWI for better implementation through the project's execution and operations. Many of the staff from the University are involved in the activities of the GGWI, such as SSNRMP and GAMS.

Sudan's **National Research Centre** conducts scientific and applied research for the purpose of economic and social development.

Faculty of Forestry and Rangelands in the Sudan University of Sciences and Technology engages in forest research and range land studies, remote sensing application in forest degradation and rangeland forest fires.

Sudan has many other universities which also offer research and academic support to the GGWI. This includes the University of Alfashir, the University of Gedarif and the University of Sinnar. Many of these higher education institutions conduct research on natural resources and community forest management. The University of Kordofan also focuses on climate change adaptation, Gum Arabic and desertification, training and capacity building. Moreover, researchers at the Feinstein Centre of Tufts University have maintained an active research collaboration with the Ministry of Animal Resources (MAR) and some NGOs on pastoralism in the Darfur region and the impacts of climate change on livelihoods, conflicts, and displacement.

Agricultural Research Corporation (ARC) is a centre of excellence in agricultural research on crop sciences in relation to climate change, ecosystem conservation, technology transfer. The generation of technologies to ensure sustainable crop production and the active role in technology transfer are among pivotal roles of ARC. ARC has a wide network of linkages with many research institutions, including the One CGIAR centres of ICARDA, ICRISAT, IRRI, CIAT, IITA, CIP, ILRI and CIMMYT, as well as regional agricultural research associations like ASARECA, AARINENA and FARA.

4 Recommendations

The GGWI can be seen as a unifying platform for sustainable development and poverty reduction policies and activities in the drylands of Africa, focused currently on the Sahel/Sahara. The GGWI provides a point of mutual convergence and synergy for other Rio conventions, including for climate change, biodiversity, land degradation, disaster risk management and health.

There are enormous opportunities to leverage GGWI to achieve food security and poverty reduction goals through diversification of agriculture and production systems to boost food production and create employment opportunities, particularly for women and youth in arid zones. However, ccoherent and coordinated research efforts are still needed to support the challenges experienced in the implementation of the GGWI over the past ten years. The One CGIAR and other global, regional and local research organisations are playing a key role in developing and fulfilling this agenda.

There are many opportunities to expand research efforts and ensure that research offerings are aligned with the strategic priorities of the GGWI under different strategies. However, there is a need for the mapping and organisation of research initiatives. In principle, the GGWI regional bodies should undertake the initial scoping exercise to determine the direction and focus of its research needs in order to ensure that research partners are supporting a coherent, overall objective. In addition, GGWI should engage research partners in the national coalitions to promote greater integration and more capacity for adaptive learning and reflection. The GGWI partners can then use the research findings and recommendations to influence its political and institutional power to achieve its objectives.

i. UNCCD. The Great Green Wall: Implementation Status and Way Ahead to 2030. 7 September 2020.

ii. Regenerative grazing for climate ecosystem and human health (for COP27). November 2022. https://savory.global/regenerative-grazing-for-climate-ecosystem-and-human-health-cop27-document/

iii. CIFOR-ICRAF Ethiopia. https://www.cifor-icraf.org/locations/africa/ethiopia/

CGIAR | ClimBeR: Building Systemic Resilience Against Climate Variability and Extremes

Alliance

Bioversity International | CIAT International Center for Tropical Agriculture | CIFOR | World Agroforestry