Info Note

Can the Great Green Wall deliver more than trees?

A rapid review of the potential multidimensional impacts of trees in the Sahel

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Key messages

- The Great Green Wall (GGW) is focused on land restoration through tree planting and natural regeneration across 8,000km of the Sahel.
- Impacts to-date include land restoration on 4m hectares of the official target zone and an additional 14m ha across the target region. USD 90m in revenue has also been generated.
- The GGW has the potential to contribute to global goals related to climate mitigation, ecological resilience, improved human health and wellbeing, and equity and empowerment.
- Ensuring and building upon the varied impacts of GGW activities will require specific attention to monitoring and evaluation approaches and activities.

The Great Green Wall (GGW) is an effort to manage and restore landscapes across 8,000 km of semi-arid land in the Sahel region of sub-Saharan Africa. The initiative, which began in the late 2000s, was originally focused on addressing land degradation with the goal of improving the natural resource base and thus improving food security and poverty. This has meant investing in activities like tree planting and cultivation, land restoration through water and crop management, and conservation of existing trees and shrubland to avoid further land degradation. These activities have generated meaningful outcomes on the ground, but at the same time, the full breadth and scope of GGW impacts has proved challenging to monitor (Arakwiye et al. 2020).

As the GGW moves well into its second decade, many of the investments and projects associated with it have expanded their ambitions to include many additional types of activities and possible impacts. These include an expanded focus on job creation and improved livelihoods, explicit inclusion of climate mitigation targets, and a wider view of the potential of the GGW to deliver co-benefits for many of the United Nations Sustainable Development Goals (SDGs). However, the potential ripple effects that GGW activities could generate and the underlying properties of the environmental and social systems in the Sahel that these potential impacts suggest have not been made explicit.

Figure 1. Map of the planned Great Green Wall path

GGW targets, activities and achievements through 2020

A recent report from the Pan-African Agency of the GGW (PA-GGW), coordinated by the United Nations Convention to Combat Desertification (UNCCD), provides an update on the targets, activities and outcomes of the GGW in the first 12 years (UNCCD 2020).

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Land restored: The simplest target and outcome reported for the GGW is number of hectares (ha) of land restored. Global commitments at COP21 focused on restoring 100m ha by 2030, whereas PA-GGW has set a more modest target of 25m ha. Up to 2020, 4m ha has been restored in the official GGW target zone, which is roughly 2% of the total target zone. An additional 13.8 m ha were restored throughout the broader region (UNCCD 2020). The main restoration activities include water management, reforestation, conservation of existing trees, agroforestry, direct land restoration.

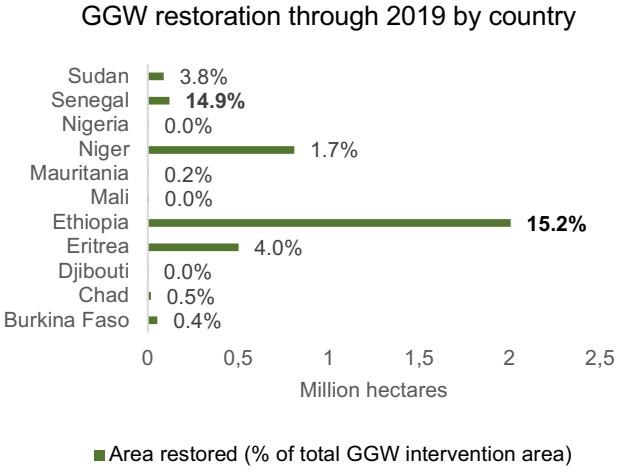

Figure 2. Area restored in the GGW target zone by country and proportion of country's total GGW target zone (adapted from UNCCD 2020)

Income-generating activities: The main socio-economic target for the GGW focuses on creating 10 million green jobs by 2030. Reporting suggests that a relatively small number of jobs have been created to-date, but revenue-generating activities related to the GGW have generated almost USD 90 million since 2007. Activities that generate income include the sale of non-timber forest products (NTFP) generated by the GGW ecosystem, the sale of seedlings and provision of labor for the restoration efforts, and the sale of fodder produced through integrated land management that includes fodder species (UNCCD 2020; Diop et al. 2018).

Contributions to SDGs: The impacts of GGW activities have the potential to contribute to several SDGs. The creation of income-generating activities and jobs contributes to decreased poverty and improved livelihood opportunities (SDGs 1 and 8). Implementation of land restoration and sustainable land management contributes to responsible production, biodiversity conservation and carbon sequestration (SDGs 12, 13, and 15). Sustainable land management practices that improve production efficiency and diversification can improve food security (SDG 2). However, the specific pathways that could lead from GGW activities to a broad range of impacts and co-benefits could benefit from further specification to guide implementation and monitoring (Goffner et al. 2019).

Potential impacts of GGW

Carbon sequestration and climate regulation: Restoration activities within the GGW are likely sequester some carbon, both in above-ground biomass in trees and shrubs, and below ground in soils. However, there is very limited data on biomass, soils or carbon in the Sahel, and thus GGW impacts on carbon sequestration are all estimates using global or regional data, with a high degree of uncertainty (Sinare and Gordon 2015; UNCCD 2020). In addition, estimating climate change mitigation impacts over time assumes that the carbon sinks persist – trees and shrubs stay in the ground, soil is not disturbed to the point of releasing carbon back into the atmosphere. Safeguards do not exist within GGW activities and countries to ensure the long-term integrity of the GGW as a carbon sink. The climate regulation potential of the restoration similarly shows a high degree of variability when land-atmosphere dynamics are modeled. The potential impacts on regional rainfall and temperatures are not uniformly positive and need to be accounted for in future GGW planning (Saley et al. 2019; Ellison and Speranza 2020).

Soil and water: Restoration, mostly through tree planting and assisted natural regeneration, has the potential to improve soil health and water availability. A study of potential tree species for the GGW in Senegal (Diallo et al. 2017) validated many previous studies that find significant improvement in soil microbial health and available nutrients under tree canopies when compared to non-tree canopy soils. Tree and shrub cover can improve water infiltration and groundwater recharge, both of which are important elements of the soil-water-nutrient cycle that underlies long-term improvements in landscape resilience in semi-arid regions (Ellison and Speranza 2020). Other impacts on soils and the water cycle of GGW activities, like increased erosion from increased heavy rainfall events, require additional adaptive activities to minimize adverse impacts (Saley et al. 2019).

Figure 3. Zai holes for pearl millet in Burkina Faso (credit: CCAFS)

Resilient landscapes: The overarching principle of the GGW is that planting trees and shrubs will 'seed' resilience and that the landscape will be able to self-sustain over time. However, biomass productivity is heavily constrained in across the Sahelian region by rainfall and temperature. Research past and present highlights the need for feasibility studies about the precipitation envelope within which long-term greening can be maintained without the need for irrigation and in the face of increasing temperatures (Herrmann et al. 2005; Pausata et al. 2020; Elabig et al. 2021). For animals, fieldwork in specific GGW locations as well as globally in other semi-arid regions has noted the biodiversity conservation potential of maintaining and restoring even small landscapes (Niang and Ndiaye 2021; Wintle et al. 2019).

Productivity: The impacts of GGW activities on agricultural productivity are predicated on the soil and water improvements highlighted above. Cropland productivity can increase with improved soil fertility and structure and improved water holding capacity, but the choice of tree and shrub species has a mixed impact on overall crop yields (Sinare and Gordon 2015). Integrated agro-pastoral and silvo-pastoral systems can produce multiple types of agricultural products and impacts can be maximized appropriate species are included in restoration efforts (O'Connor and Ford 2014). GGW activities can improve livestock productivity by providing a sustainable source of fodder as well as share, which mitigates heat-related stress on animals (Sinare and Gordon 2015).

Figure 4. Cattle in a silvo-pastoral system in Burkina Faso (credit: CCAFS)

Livelihoods: Livelihoods can be improved through GGW activities in several ways. Land degradation costs money through lost opportunities and increased risk exposure, so addressing it can provide positive economic benefits (Mirzabaev et al. 2021). There is money and jobs in restoration work itself (Iyer et al. 2021; UNCCD 2020). Improved and diversified agricultural production and the production of fuelwood and NTFPs can also generate income, especially for the poorest households (Sinare and Gordon 2015). Landscape restoration leading to biodiversity conservation can create opportunities for ecotourism (Goffner et al. 2019). Finally, GGW activities have also been shown to decrease some natural hazards that can threaten livelihoods and human wellbeing, including wildfires (Diop et al. 2018).

Human health: Although not the primary focus of GGW activities, the potential co-benefits for human health are diverse and substantial. Undernutrition can be addressed, especially in the lean season, by the presence of easily consumable fruits (Sinare and Gordon 2015). Nutritional status can also be improved through fruit, seed and leaf consumption, especially if species are being reintroduced to a region and thus increasing biodiversity (Bayala et al. 2014; Ramde-Tiendrebeogo et al. 2019). The presence of traditional medicines as well as of certain micronutrients can improve chronic and noncommunicable health conditions (Duboz et al. 2019). Long-term health status can also be improved due to the indirect impacts of restoration. For example, trees and shrubs can decrease erosion and provide windbreaks, both of which decrease ambient dust locally and across the continent and could thus improve respiratory health (Bellefontaine et al. 2011; Heft-Neal et al. 2020).

Figure 5. Balanites aegyptiaca (desert date) in Senegal. Balanites is commonly used in GGW activities and the fruits provide food in the dry season (credit: Trees for the Future)

Equity and empowerment: Early articulations of the GGW approach included an explicit focus on local communities and the acknowledgement that activities were being planned on actively used lands (Bellefontaine et al. 2011). Community participation early in the restoration process, through species and site selection, can set the stage for empowerment over time (Sacande and Berrahmouni 2016). Sustainable fuelwood production can generate time-savings for women and youth, which can be a precursor to empowerment as it frees up time for education and other activities. Gender empowerment is also possible through the processing and sale of NTFPs, many of which are traditionally in women's domain (Berrahmouni and Bojang 2014). Assisted natural regeneration (ANR) has the potential to improve equity through access to all of the products from trees that have

regenerated in a household or village's fields. Land tenure is a challenge with ANR and local natural resource management more generally, especially when pastoralism and transhumance systems coincide with cropping systems, as is the case in much of Sahel. Land tenure arrangements vary widely across the GGW region and must be considered to ensure equity in accessing resources and benefits from GGW activities (Bellefontaine et al. 2011).

Monitoring and evaluation implications

Use of advanced technologies for ecological impacts: Ever-improving satellite imagery and other remote sensing technology can provide a more refined and accurate estimate of the extent, quality and durability of restoration activities (Iyer et al. 2021). GGW activities could be further expanded if specific projects could be supported by global climate finance mechanisms. Most of these funders require evidence of mitigation impact, however, pointing to the need for better empirical evidence of carbon sequestration from GGW activities (UNCCD 2020).

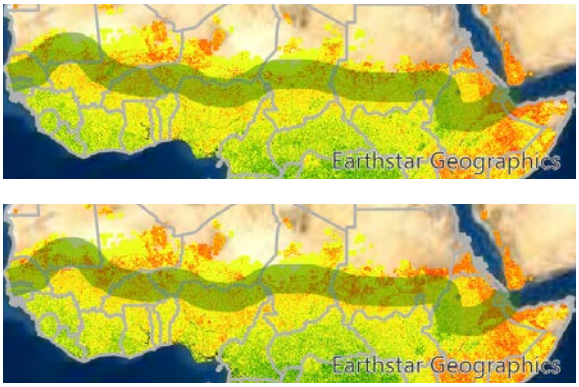

Figure 6. Severity of soil erosion in 2007 (top) and 2017 (bottom) in GGW region. Data from Vagen and Winowiecki (2019), downloaded from the ICRAF Landscape Portal.

Panel surveys and repeat measurements: Implicit in the theory of change that underlies GGW activities is the temporal element of impacts, with positive impacts building and diversifying over time. Approaches to M&E should therefore include panel surveys with individuals and households, as well as repeat measurements of both environmental and social indicators of impact. For example, a recent study from Sacande et al. (2021) utilized diachronic and synchronic survey approaches to identify change over time and compare that change to a control group of households in the GGW intervention area.

Gender disaggregation: Climate risks and vulnerabilities have outsized impacts on women, especially in the context of land degradation in the Sahel (Berrahmouni and Bojang 2014). The diversified and locally specific contributions that GGW activities can make to livelihoods and health have the potential to positively impact women in terms of economic equity. However, M&E efforts must collect and report data disaggregated by gender in order to ensure that benefits are truly accessible to women. In this context, gender disaggregation should also include information about whether a woman is head of the household and her marriage order, as single women and junior wives are more likely to be vulnerable to unequal access to resources (Turner et al. 2021).

Governance and accountability: The purpose of M&E is not only to document impact but also to support the evolution of development programming and projects and to ensure that vulnerabilities are not being created or exacerbated (Turner et al. 2021). The GGW stretches across 11 countries and myriad communities, and will require strong leadership to set, collect and act upon a consistent set of indicators of impact (UNCCD 2020). Clear and consistent governance structures are also needed to leverage and maximize financial resources flowing into GGW activities. Investment in local restoration entrepreneurs can amplify environmental and livelihoods impacts, as well as improve equitable access to economic benefits of restoration activities However, trees are a long-term investment and thus governments need to de-risk the restoration sector and improve access to public and private finance to facilitate expansion (Iyer et al. 2021).

Way forward

In January 2021, over USD14 billion in new funding was announced to 'accelerate' the activities and impacts of the GGW. At COP26 in November, the Green Climate Fund and the International Fund for Agricultural Development announced an additional USD143 million investment program for seven countries in the GGW zone. Taken together, these investments will provide the foundation for the GGW Accelerator and the ambitious set of activities planned over the next ten years. As overviewed in this Info Note, GGW activities have the potential to generate diverse impacts and a broad range of co-benefits.

To minimize trade-offs, ensure that benefits are distributed equitably and to prioritize investments going forward, efforts to monitor and evaluate the impacts of GGW activities must be enhanced. Utilizing advanced technology to track indicators of change across the landscape will help to identify areas where on-the-ground impacts seem to be lagging. Initiating consistent and long-term social science research efforts will help monitor change for individuals over time. Finally, both data and governance mechanisms must include consistent emphasis on vulnerable groups who could be disproportionately impacted by a failure to implement the GGW or by inequitable distribution of the demands and benefits associated with GGW activities.

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