SUSTAINABLE WOODFUEL BRIEF #7

Sustainable woodfuel management in refugee-hosting areas in East Cameroon

Tabi Eckebil PP, Awono A, Ingram V, Eba'a Atyi R, Hiol Hiol F, Schure J

GML GOVERNING MULTIFUNCTIONAL LANDSCAPES
CIFOR
World Agroforestry

Sustainable woodfuel management in refugee-hosting areas in East Cameroon

Tabi Eckebil PP, Awono A, Ingram V, Eba'a Atyi R, Hiol Hiol F, Schure J

This publication is part of a series of briefs describing findings from the EU-funded Governing Multifunctional Landscapes Sustainable Woodfuel project, which aims to contribute to knowledge, options and engagement for more sustainable woodfuel value chains across Sub-Saharan Africa.

cifor.org/gml/sustainable-woodfuel

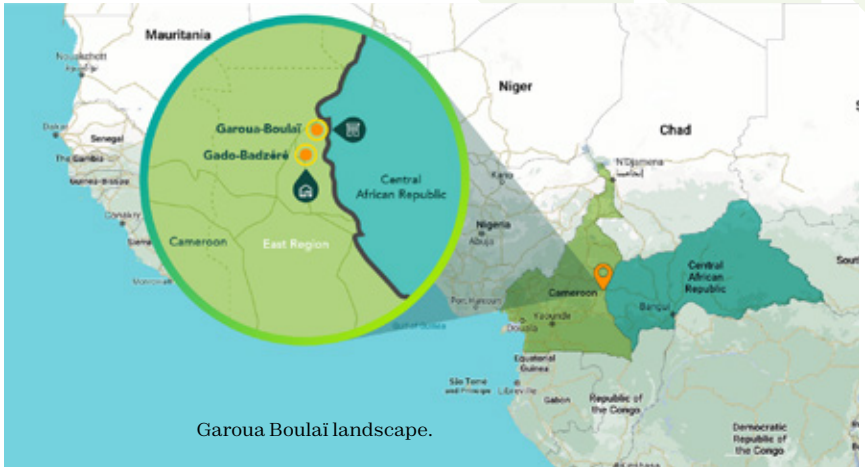
Key lessons

- Long-term follow-up is essential to support and assess the environmental and socioeconomic outcomes of reforestation activities and improved cookstove adoption.
- Ongoing and 'refresher' training of actors to build and maintain specific capacities is important, given the time needed for trees to mature and the relatively short lifetime of a cookstove made with clay.
- Indicators to monitor the durability and scalability of reforestation initiatives are needed to ensure that when activities deviate from the plan they can be corrected in time, and address the actors and technological aspects.
- International organizations that fund or implement such projects should consider the views of the local communities and build a framework that involves both men and women, as well as both host and refugee communities.
- This model from East Cameroon could be useful for scaling out to other settlements, as it is based on an integrated landscape and value chain approach.

Introduction
Woodfuel in the refugee-hosting Garoua Boulaï landscape, Cameroon

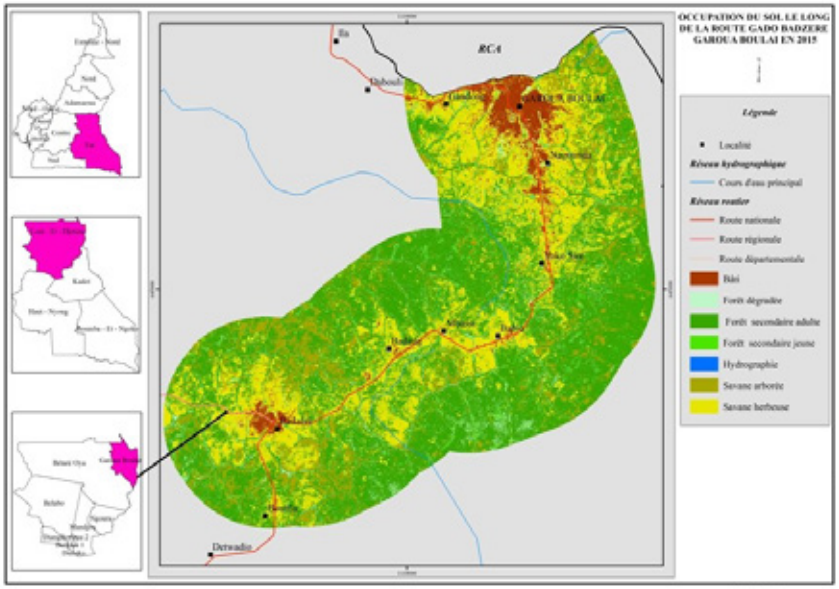
Sub-Saharan Africa hosts about 26% of the world's refugee population, estimated at over 26 million globally (UNHCR 2019). This number has drastically increased since the 2000s due to sociopolitical crises in many African countries such as in the Central Africa Republic (CAR), Nigeria and Sudan/South Sudan, Somalia. These crises led to the displacement of people fleeing war and violence to neighbouring countries (Crisp 2000). In Eastern Cameroon, 304,000 refugees from the CAR now live within organized settlements (30%) and within host communities (70%), with over 60,000 people settled in Gado Badzéré village in the Garoua Boulaï Council area. As of May 2021, the municipality hosted 60,277 refugees: 27,667 in Gado Badzéré and 32,610 within host communities (see figure).

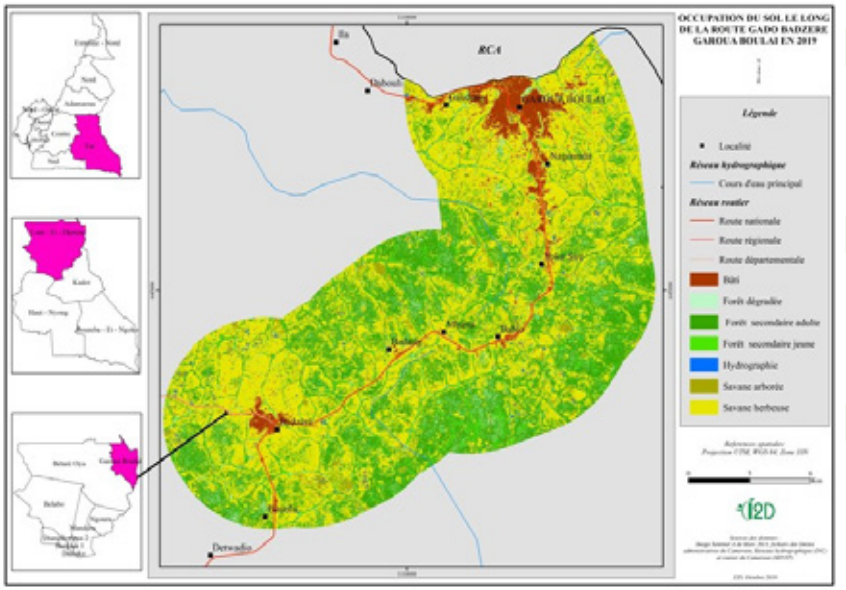
Refugees in these locations have limited livelihood options. For their daily cooking and heating needs, firewood is the most available resource, while collecting and selling firewood also provide cash income. Because refugees generally don't have access to land, firewood collection is a source of conflict with local communities. It is also unsustainable, as evidenced by the increasing distances that refugees and hosting communities must travel to collect fuel.



Garoua Boulaï landscape.

Garoua Boulaï landscape is characterized by wooded savannas and is situated in the transition zone between humid forest and savanna in eastern Cameroon. The influx of refugees has led to rapid and extensive land and soil degradation and deforestation in the landscape (Braun et al. 2019; Maystadt et al. 2020). An area of about 50 km around the city of Garoua Boulaï and Gado Badzéré village has been degraded. Between 2015 and 2019, the area covered by mature secondary forests within a radius of 10 km from the city decreased from 83% to 35%, largely replaced by grassy savannas (I2D, 2019) (see figure).





Land use map showing an area of 5 km bordering both sides of the road from Gado Badzéré to Garoua Boulaï in 2015 (A) and 2019 (B), revealing the extent of deforestation related to fuelwood collection (I2D, 2019).

Many socioeconomic and ecological impacts associated with woodfuel collection have been identified, including social conflict, soil erosion, and biodiversity loss affecting both local and refugee community livelihoods due to the multifunctional nature of the different land uses in this landscape (World Bank 2010; Taylor and al. 2016; Schneiderheinze and Lücke 2020). Generally, firewood is collected by local and refugee families in the same area where they undertake activities such as farming and pastoralism. While emergency assistance for refugees such as housing and food supplies are usually provided, this has not always been the case for energy or income-generating activities (Kibreab 1997; Lynch 2002).

Assessing options for a more sustainable woodfuel value chain

One major challenge encountered during stakeholder involvement was the lack of information and communication about woodfuel. The first step was, therefore, to improve knowledge of woodfuel value chains in the landscape. The methodology applied was based on an integrated landscape approach, defined as "governance strategies that attempt to reconcile multiple and conflicting land-use claims to harmonize the needs of people and the environment and establish more sustainable and equitable multifunctional landscapes" (Reed et al. 2020). This involved conducting a scoping study of the woodfuel value chain and cross-border trade, its stakeholders, humanitarian and environmental concerns, and impacts.

CIFOR-ICRAF organized a regional workshop in Bertoua in 2019 to develop a consensus on the results of the scoping studies. Key stakeholders within the landscape were invited, including government agencies in charge of policies concerning the forest and environment sectors, civil society, local administrative authorities, the mayor, decentralized administrations, traditional authorities representing their communities, United Nations agencies and international organizations, local non-governmental organizations (NGOs), religious authorities, and refugees. These stakeholders were subsequently involved at all steps of the project to ensure efficiency in the options developed for the benefit of host communities and refugees, as well as to establish a framework for sustainable management of the woodfuel value chain in a refugee-hosting area.

The co-development of a sustainable woodfuel management strategy was built on existing initiatives and collaborations between stakeholders. It was an opportunity for open and constructive discussions between stakeholders to identify knowledge gaps about woodfuel value chains and, subsequently, to test various options. These consisted of a package of activities, including reforestation of the landscape using fast-growing tree species and trees that provide non-timber forest products (NTFPs) and commercial fruits, as well as better end use of woodfuel using improved cookstoves. This brief describes these activities; the outcomes realized to date and those expected over the long term; and insights on the sustainability, durability and scalability of the woodfuel value chain in other locations.

Restoring degraded areas through agroforestry and land management

Because the scarcity of wood resources was creating difficulties for locals and refugees in the Garoua Boulaï landscape, the reforestation of degraded areas was prioritized as an option to be tested. This was implemented in partnership with APCRE (Action pour la Promotion et la CREation), with CIFOR-ICRAF providing technical support. ACPRE's experience in the development of nurseries in the area allowed them to build on links with local and refugee communities. Over 90,000 seedlings were grown in local nurseries by APCRE between 2020 and 2021. About 60% of the trees were fast-growing woodfuel species such as *Acacia mangium* (which is also nitrogen-rich and thus a good soil fertilizer), while 40% were fruit trees such as avocado (*Persea Americana*), citrus (*Citrus limon*), orange (*Citrus sinensis*), mandarin (*Citrus reticulata*), guava (*Psidium guajava*), soursop (*Annona muricata*) and native NTFP species, such as njangsang (*Ricinodendron heudoletii*) and safou (*Dacryodes edulis*). These species were chosen by the beneficiaries for their ability to contribute to food security, provide an additional source of income through the sale of harvested fruits and nuts, and create an incentive for producers to care for the trees planted in their fields. The trees were treated with insecticides to boost growth and ward off attacks from insects and nematodes.

As is often the case with reforestation, however, the challenge is less about producing and planting seedlings than maintaining and protecting them after planting. There was a 40% seedling mortality rate due to the dry season arriving earlier than expected, bush fires intentionally set by pastoralists, and grazing or trampling by stray livestock. Enclosures were built to prevent damage by roaming animals. The traditional and religious authorities were also in charge of raising awareness within communities on how to take care of the trees in their fields, as well as monitoring compliance with rules such as watering young plants and protecting trees from fire and browsing by animals. Local ownership and clear responsibilities are key to reforestation success. Thus, the project involved traditional and religious authorities to ensure follow up and protection of the tree nurseries. However, this was a challenge to verify due to the lack of follow up by communities, especially due to the Covid-19 pandemic, which forced some people to remain confined and away from their fields.

Equity in the distribution of seedlings is important to allow contributors to benefit from the fruits (sometimes literally) of their investment. To improve the long-term survival of the trees, seedlings were given to individuals who worked in the nurseries and to members of the community who owned land. Public agencies such as primary schools also received seedlings, to raise awareness among children about the importance of trees and the need to preserve forests.

Trainings on tree planting were given to beneficiaries (host communities and refugees) in the different project sites. Promotion of the combination of different fruit trees, such as fuelwood species with food-producing trees, was inspired by proven techniques from other tropical countries supporting multiple land and species uses (Torquebiau et al. 2002). In this approach, both men and women volunteers were involved at each step. In each of the five villages of Garoua Boulaï: Nandoungué, Gado Badzéré, Yoko Sire, Sabongarie and Bindiba, the support of local government officials was sought. This was not only to bring them closer to the engaged communities and increase ownership of the interventions, but also for them to contribute in an exemplary way to demonstrations of planting techniques at the official launch of the reforestation activities.

Steps to successful reforestation

1. **Give refugees and host communities the opportunity to make their own choices by selecting appropriate species according to their needs and landscape context.** Species for woodfuel, logging and food security are recommended.
2. **Identify the places and the areas where trees will be planted** in lands where community members practice agriculture or have customary rights, as well as in communal lands belonging to the state (with official documents).
3. **Organize training on how to successfully manage tree nurseries** so that communities can autonomously continue with tree nurseries after the end of the project and capitalize on the knowledge to continue investing in reforestation.
4. **Install nurseries close to reforestation locations** and involve beneficiaries in regular monitoring of planted trees.
5. **Include at least three years of follow up of seedlings after planting** to ensure trees are protected from animals, pastoralism and bush fires during that period.

How to reduce woodfuel consumption through improved cookstoves

As the adoption of improved cooking stoves has seen mixed results across Sub-Saharan Africa, we opted for a combination of awareness campaigns, and training and engagement with communities, religious leaders, and local artisans to investigate the potential for introducing improved cookstoves.

Different improved cookstoves from around the world were presented during awareness campaigns in 2019. Some are made with clay while others are composed of metal, usually aluminium and iron. The project launched training courses on the benefits of improved cooking stoves, including demonstrations using a controlled cooking test, and production of the models selected by beneficiaries began in 2020. The cooking test involved three types of cookstoves (one made of clay, one of metal, and another made of a combination of both). In addition, we use the traditional stove as a basis for comparison, to better allow communities to compare the pros and cons. One test was conducted per cookstove in three sub-groups/communities (Bertoua, Mandjou, Sabongarie) involving about 15 people per sub-group (see table).

The controlled cooking test was used to demonstrate the functioning of three improved cookstoves and to allow participants to assess their performance compared to traditional stoves.
The indicators measured were:

- overall efficiency
- fuel consumption
- time to cook a specific meal
- applicability of the cookstoves to the local context
- user satisfaction

At the end of the test, all improved cookstoves were evaluated as more efficient than the traditional three-stone method, which consumed on average three times as much wood as the stoves made with clay, which cooked meals slightly faster and with less smoke. Handling was easier and safer with the fixed cookstoves, unlike with the traditional method that required dexterity to balance the pots on the stones.. The models that were chosen were those made with clay, because they best fit the communities' expectations.

Woman cooking with improved fireplace in Gado Badzéré, East Cameroon. (Emily Pinna/CIFOR)

Testing three improved cookstoves versus a traditional 'three-stone' method

	Improved metal stoves (using charcoal) – IMS	Improved clay stoves (using firewood) – ICS	Improved semi-metallic and clay stoves (using charcoal) – IsMCS	Traditional 'three-stone method' (TS)
				
Cooking time (rice and soup with meat) Mandjou Gado Badzéré Garoua Boulaï	1h 26' 1h 23' 1h 31'	**1h 24'** **1h 18'** **1h 20'**	1h 27' 1h 15' 1h 25'	1h 24' 1h 20' 1h 30'
Average quantity of firewood/ charcoal used per stove for the test meal	0.7 ± 0.6 kg of Charcoal	1.2 ± 0.5 kg of firewood	1 ± 0.3 kg of charcoal plus 0.4 kg of firewood	2.3 ± 0.5 kg of firewood
Appreciation	Moderately appreciated (++)	Most appreciated (+++)	Less appreciated (+)	N/A
General impressions	IMS must be used with dry charcoal. The stove is made of metal and must be purchased at the market.	ICS is easier to use and can be constructed from clay, cow dung and straw by anyone who has learned the technique.	ISMCS, like IMS requires dry charcoal, is made of clay and metal, and can only be purchased in a market.	TS requires only three stones. This type of stove is widely used by communities, but it releases large amounts of smoke and carries the risk of the pot falling into the fire if not properly balanced on the stones.

Both men and women took part in training to construct the improved clay stove, from material preparation to mixing of the components, kneading and moulding. However, the training was targeted to women, as they are the main users of cookstoves and are most exposed to the many health risks caused by smoke and fine particles released from woodfuel. Seventy (70) women were trained as trainers in cookstove production. By July 2022, women's production of improved cookstoves far exceeded the 20,000 stoves originally planned in the landscape intervention area. As many of the communities had already received training on improved cookstoves, our training differed from that of other organizations in its approach, which included awareness campaigns, presentation of an overview of existing model types, cooking tests and the invitation to communities to express their preferences.

During the training, beneficiaries learned that by acquiring improved cookstoves and adopting new techniques and practices, they could reduce their spending on firewood, lessen the risks of travelling long distances (often alone) for heavy loads of woodfuel, and lower their exposure to large amounts of smoke from traditional cookstoves. This 'business model' allows more time for income-generating activities.

Buy-in from communities and families on the design and the use of specific improved stoves was seen as key, as not all 'improved' stoves met the local requirements and preferences of community members. The model of cookstove peferred by the women (both local and refugee), was the ICS model that they could construct themselves by using locally available clay, cow dung and straw materials. Two prototypes of the ICS cookstoves model were produced by local artisans based on the model presented during the awareness campaigns, which they adapted to local preferences and materials.

Prototype of improved cookstove made with locally available materials

Collected firewood in Gado Badzéré refugee camp.

Stakeholder story
Leo Kortekaas

In Cameroon, UNHCR, the UN Refugee Agency, plays a key role in the protection of refugees. The organization also partners with other organizations to help reduce the impact of refugees on forests.

"When you have massive movements of people – for example, 300,000 people or more – they need a place to live, grow food, raise animals, and find pasture for them. This can have a greater than expected impact on natural resources," explained Leo Kortekaas, a senior development officer with UNHCR.

Kortekaas described the visible impact on forests, which is evident in satellite images of Garoua Boulaï taken before the arrival of refugees and five years after.

"Of course, it's not their fault – everyone needs wood. But migration has a major impact on the environment, we need to be conscious of this and mitigate the negative effects on forests, land and water."

Energy is extremely important to refugees. If there are no other sources available, wood is used for heating and cooking. As locals and refugees chop trees around villages, people need to walk further and farther to find woodfuel – sometimes up to 10-15 kilometers.

UNHCR works to support governments in finding alternatives to cutting trees for wood fuel.

> *"For refugees, the challenge is complicated by the fact that it is not their land – in fact, planting a tree may be interpreted by locals as a claim to their land."*

"For example, in the Far North, we are looking at the potential of biogas, and using household refuse as fertilizer," said Kortekaas. Other alternatives being explored include bio-charcoal in the East and Far North (through partners Lutheran World Federation, LWF, and Plan International) and reforestation in the Far North.

Agroforestry with fast-growing trees is another option. However, Kortekaas raised issues that might arise from motivating displaced persons to plant and care for trees.

"For refugees, the challenge is complicated by the fact that it is not their land. In fact, planting a tree may be interpreted by locals as a claim to their land. Therefore, tree planting initiatives require extensive awareness raising with host communities and careful planning to ensure that both the local population and refugees understand the benefits."

Also, the use of wood in the context of refugees needs to take into consideration that some displaced populations may stay for over 20 years before returning home.

"More and more, we realize we need to look at long-term needs for shelter and energy," said Kortekaas. "For example, tree planting and agroforestry should begin as soon as refugees arrive to ensure the availability of wood over time."

Key outcomes

Although it is too early to assess whether the project activities will have positive and lasting environmental impacts, short- and medium-term outcomes were assessed, particularly those relating to governance structures that support longer-term positive impacts.

Institutional outcomes

One of the main challenges was to engage people from the community (beneficiaries), explain the project to them, capture their interest, and enlist them in the implementation of the activities. To reinforce social cohesion, the project invested in ensuring that both local and refugee communities were involved in the common activities. Although refugees and host communities have received a lot of support from different organizations in the past, most initiatives linked to improving their living conditions and livelihoods did not demonstrate significant results beyond the duration of the project, with few long-term behavioural changes.

There has been a lack of synergies among the actions of previous and current initiatives, and communities showed 'project fatigue' as they did not experience tangible benefits from the interventions. Community members were not involved in the conceptualization of previous projects and there was no visible capacity building. To inspire confidence, the GML project created a solid and inclusive institutional framework that invited all local stakeholders – from communal authorities to refugees to village chiefs – to discuss and co-organize project activities.

While this framework represents an innovative outcome of the project, it remains a new concept that requires all stakeholders involved to maintain its inclusive nature and to adapt activities related to the community livelihoods according to the evolving context.

Socioeconomic outcomes

For many decades the main source of income for rural populations has been agriculture. However, given the tendency of farmers to clear land through 'slash and burn' practices, agriculture is also a major driver of deforestation and land degradation. The approach of involving communities in tree nursery development, inviting local authorities to take on a leadership role, and encouraging local communities and refugees to work together was seen by the beneficiaries as a good way to strengthen links between host and refugee communities.

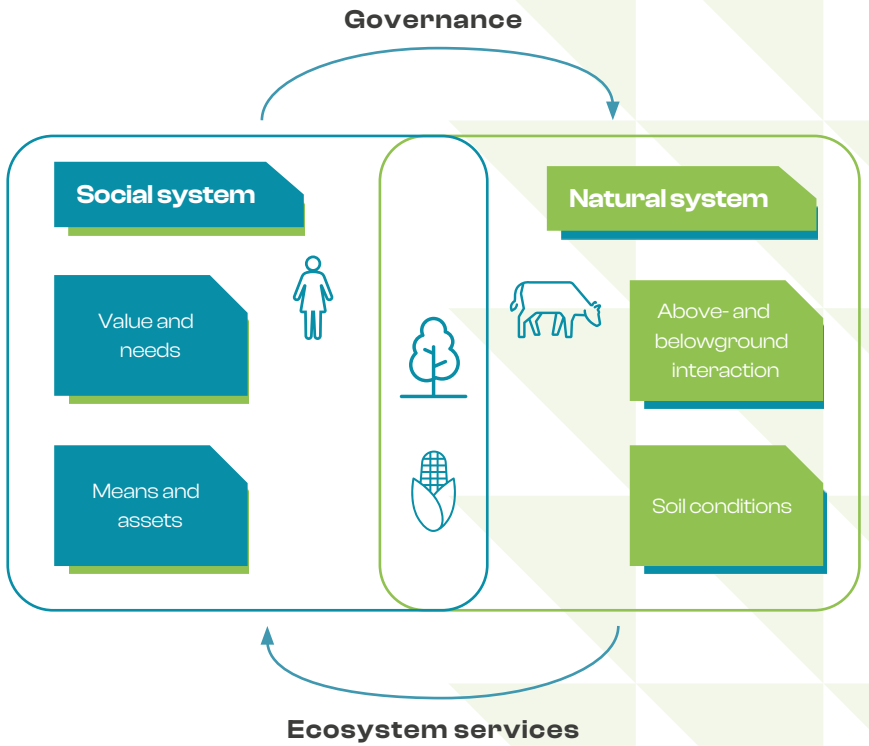
Maintaining these socioeconomic outcomes and aligning them with the environmental context in the landscape requires ongoing support to all communities to reduce wood consumption. One way is to scale up improved cookstoves at the household level. Other options include addressing the efficiency of commercial and industrial users of woodfuel (e.g., restaurants, bakeries, brick factories, etc.) and involving them in tree and forest resource management.

This requires a careful process of establishing rules between host communities and refugees about who can manage and use trees, based on new agreements on land and tree ownership. Awareness-raising sessions can help to communicate existing customary rules, and new models can stipulate how trees can be planted, loaned, managed and used by refugees.

Environmental outcomes

Environmental benefits were recognized from the nursery techniques presented and adopted, the training on reforestation, and stakeholders' recognition of the long-term benefits of agroforestry and support for land tenure.

However, sustaining these outcomes requires follow-up after planting and ongoing maintenance and management of the planted trees. This includes weeding to reduce competition between trees with other food crops (cassava, maize, peanuts, potatoes, etc.); fencing to reduce consumption or damage by stray animals; and protection against or prevention of bush fires. Traditional authorities also set up rules to keep pastoralists out of reforested areas. In the savanna ecosystem, bush fires are common during the long dry season between mid-November to mid-February. Both farmers and pastoralists are responsible for setting fires, which are seen to provide natural fertilization through ashes and stimulate fresh grass for cattle. The potential of using different technologies to protect seedlings against bush fires, such as the installation of hedges, as practiced in other areas (Diatta et al. 2016; Dubiez et al. 2014), was not implemented in our project but can be explored. Alternatives that take into account the context and traditional behaviours of farmers and pastoralists with regard to fire and various burning regimes could also be explored. These include night paddocking and soil fertility improvement systems, land tillage, alternative pasture, farming and fire management regimes (Erikson 2007, Tamou 2017) (see figure).



A holistic framework for refugee-hosting landscapes that includes sustainable management of wood energy for energy and income generation (©WUR, 2022)

Lessons learned

- The scoping study enabled the identification of potential bottlenecks to desired outcomes, allowing these to be addressed through the involvement of stakeholders at all steps of the project. For example, in the communities where tree planting is implemented, contacts can be established with local administrators in charge of agriculture and forestry to obtain technical advice on how to address plant pest diseases. Any tree planting initiated by the council should take advantage of the technical expertise of nearby villages that received project training on nursery management and tree planting.

- The project focused on minimizing the negative impacts of firewood collection in the landscape of Garoua Boulaï by launching agroforestry and reforestation activities in the targeted villages. Communities learned the main steps for successful nursery planning, adapted to the farming calendar for each specific ecosystem to ensure the survival of seedlings after planting.

- Training on improved cookstoves refreshed knowledge from previous initiatives. Although the technique of using clay to fabricate stoves is well known, the quality of available clay remains a challenge. The cooking test allowed a demonstration of how different models use woodfuel; however, continued awareness-raising is needed to demonstrate how improved cookstoves can save communities both time and money.

- A strategic, inclusive multistakeholder consultative platform that allows room for complementarity among different partners at various stages of the implementation process is an essential institutional structure to support sustainable woodfuel. Such structures need to be able to adapt and respond to changing circumstances to provide a basis for guiding and governing long-lasting positive socioeconomic and environmental changes.

- The integrated landscape approach and value chain model used in the implementation of the project, involving multistakeholders at each step, awareness campaigns and trainings, appears to be replicable in other refugee sites, provided it is adapted to each specific context and dynamics. However, such an approach requires a clear financing mechanism, local state and non-state supports, and the involvement of civil society to ensure that capacities and knowledge are built and maintained for adoption and upscaling.

Woman carrying bundle of firewood near Garoua Boulai, East Cameroon. (CIFOR database)

Conclusions

Long-term follow-up is essential to support and assess the environmental and socioeconomic outcomes of reforestation activities and improved cookstove adoption. Also important is ongoing and 'refresher' training of actors to build and maintain specific capacities in both caring for trees and use of the improved cookstoves. Fruit trees take on average 5–7 years to produce fruit and need rigorous care for the first three years after planting, and the lifetime of a cookstove made with clay is estimated at two years (according to the trainers), and thus requires regular renewal. Indicators to monitor the durability and scalability of reforestation initiatives are also needed, to ensure that when activities deviate from the plan they can be corrected in time by those responsible for follow-up activities.

Actors should be made aware of and trained on key issues regarding the woodfuel value chain in a specific landscape, as their insights and recommendations are needed to identify bottlenecks and to adopt proposed solutions. International organizations that fund or implement such projects should consider the views of the local communities and build a framework that involves all actors, including both host and refugee communities. As there are many refugee settlements in East Cameroon, the model used here could be useful for scaling out to other settlements. As it is based on an integrated landscape and value chain approach, this model implies the involvement of multiple stakeholders at all steps, including awareness-raising campaigns and training. To achieve longer-term outcomes, humanitarian and development actors should work together for greater impact.

Taking a landscape-scale perspective, the options developed in this project in Garoua Boulaï aim to contribute over the long term to ensuring a social and ecological balance in landscapes with vulnerable forest areas, so that they are able to withstand pressure on resources and contribute to sustainable woodfuel value chains.

The experiences described in this brief indicate that the earlier energy supply and livelihood options are included in a 'unified' conceptual framework for initial (humanitarian) interventions in refugee situations, the easier it is to avoid damages and long-term impacts. In such contexts, coordination and synergies between the humanitarian organization and development organizations are key to achieving positive socio-environmental outcomes.

This brief shares experiences from an integrated approach as part of the Governing Multifunctional Landscapes project, which involved international research for development organizations (such as CIFOR-ICRAF); technical and financial partners of concerned governments (national, regional and local, such as the European Union United Nations High Commissioner for Refugees (UNHCR), Lutheran World Federation, and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH; local and national government agencies such as the Ministry of Forests and Wildlife (MINFOF), Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED) and Ministry of Agriculture and Rural Development (MINADER); local civil society organizations; and villages with chiefs, chiefdom members, representative 'notables', members of the host community, and refugees. All partners came together to discuss common problems related to humanitarian and environmental crises and to find integrated landscape solutions to address the issue of unsustainable woodfuel value chains.

References

Braun A, Fakhri F, Hochschild V. 2019. Refugee camp monitoring and environmental change assessment of Kutupalong, Bangladesh, based on Radar Imagery of Sentinel-1 and ALOS-2. Remote Sensing 11:2047.

Crisp J. 2000. Africa's refugees: Patterns, problems and policy challenges. Journal of Contemporary African Studies 18(2):157–178.

Diatta AA, Ndour N, Manga A, Sambou B, Faye CS, Diatta L, Goudiaby A, Mbow C, Dieng SD. 2016. Services ecosystémiques du parc agroforestier à Cordyla pinnata (Lepr. ex A. Rich.) Milne-Redh dans le Sud du Bassin Arachidier (Sénégal). International Journal of Biological and Chemical Sciences, 10(6), 2511-2525.

Dubiez E, Marien J-N, Bisiaux F, Freycon V, Peroches A, Peltier A. 2014. La durabilité des systèmes agroforestiers à Acacia auriculiformis en Afrique centrale. Bois et Forêts des Tropiques 334:23.

Eriksen, C. 2007. Why do they burn the "bush"? Fire, rural livelihoods, and conservation in Zambia. The Geographical Journal 173(3) :242–256.

I2D. 2019. Cartographie et plan de restauration des terres dégradées dans les camps de refugies et leurs alentours dans la région de l'est Cameroun. Unpublished. 35pp.

Kibreab G. 1997. Environmental causes and impact of refugee movements: a critique of the current debate. Disasters 21(1):20-38.

Lynch M. 2002. Reducing environmental damage caused by the collection of cooking fuel by refugees. Canada's Journal on Refugees 18–27.

Maystadt J-F, Maystadt, Mueller V, Van Den Hoek J, Van Weezel Stijn. 2020. Vegetation changes attributable to refugees in Africa coincide with agricultural deforestation. Environmental Research Letters 15:044008.

Reed J, Ickowitz A, Chervier C, Djoudi H, Moombe K, Ros-Tonen M, Yanou M, Yuliani L, Sunderland T. 2020. Integrated landscape approaches in the tropics: A brief stock-take. Land Use Policy 99:104822.

Schneiderheinze C and Lücke M. 2020. Socioeconomic impacts of refugees on host communities in developing countries. Policy Studies from PEGNet - Poverty Reduction, Equity and Growth Network, Kiel Institute for the World Economy (IfW).

Tamou C. 2017. Understanding relations between pastoralism and its changing natural environment. [PhD thesis] Wageningen University & Research, The Netherlands. 164p.

Taylor E, Heng Zhu, Gupta A, Filipski M, Valli J, Gonzalez E. 2016. Economic impact of refugee settlements in Uganda. The CALP Network. https://www.calpnetwork.org/publication/economic-impact-of-refugee-settlements-in-uganda/

Torquebiau E, Mary F, Sibelet N. 2002. Les associations agroforestières et leurs multiples enjeux. Bois & Forêts Des Tropiques 271:23–35.

UNHCR. 2019. United Nations High Commissioner for Refugees (UNHCR). https://www.unhcr.org/refugee-statistics/

World Bank. 2010. The impacts of refugees on neighboring countries: A development challenge. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/459601468337158089/the-impacts-of-refugees-on-neighboring-countries-a-development-challenge

Suggested citation

Tabi Eckebil PP, Awono A, Ingram V, Eba'a Atyi R, Hiol Hiol F, Schure J. 2022. Sustainable woodfuel management in refugee-hosting areas in East Cameroon. Brief #7. Sustainable Woodfuel Brief Series. Governing Multifunctional Landscapes Project. Bogor, Indonesia and Nairobi, Kenya: CIFOR-ICRAF.

Contributing partners

Ingénieurs pour un Développement Durable (I2D)
Action pour la Promotion et la CREation (APCRE)

Acknowledged contributors

Reviewers: Paolo Cerutti, Phosiso Sola
Project coordination: Jolien Schure
Editing: Erin O'Connell
Graphic design: Laurent Nyssen

In honourable memory of co-author Dr François Hiol Hiol (16/04/1959-02/02/2022). Dr. Hiol Hiol collaborated with CIFOR for several years, and contributed to numerous forest studies. At the time of his death, he was contributing to this Sustainable Woodfuel Brief and also to the book Congo Basin Forests - State of the Forests 2021.

Photo credits

Cover: Axel Fassio

This initiative is part of the project Governing multifunctional landscapes in Sub-Saharan Africa: Managing trade-offs between social and ecological impacts (GML), which is financed by the European Union.

This research was carried out by CIFOR-ICRAF as part of the CGIAR Research Program on Forests, Trees and Agroforestry (FTA). FTA is the world's largest research for development program to enhance the role of forests, trees and agroforestry in sustainable development and food security and to address climate change. CIFOR leads FTA in partnership with Bioversity International, CATIE, CIRAD, INBAR, ICRAF and TBI. FTA's work is supported by the CGIAR Trust Fund: cgiar.org/funders/

cifor.org/gml