International Water Management Institute

RRR in Refugee Settlements in Africa

Project Brief Series - No. 3

Circular bio-economy innovations for resilient refugee and host communities in East Africa

The Resource Recovery and Reuse (RRR) in Refugee Settlements in Africa project is being implemented in six refugee camps and settlements and their surrounding host communities in Ethiopia, Kenya and Uganda. The aim of the project is to increase the resilience of these communities through the implementation of RRR solutions. This work builds on previous research and innovations by project partners in developing, testing and verifying technologies and livelihood models for gender-responsive, circular bio-economy solutions to capture energy, water and nutrients, and building resilient food and energy systems for refugee settlements and their host communities.

Harvesting amaranth leaves from a greywater-irrigated home garden in Kalobeyei Settlement in Kenya – a bunch of leaves retails at KES 10 (USD 0.1) (*photo:* IWMI).

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Project background

Refugee-hosting landscapes are complex spaces characterized by dynamic fluctuations, often rapid, in the flows of people, carbon, nutrients and water. The overlapping human dimensions include refugees, host communities, and the layers of control and management systems that govern, what are often, contested spaces with rich political ecologies. This has proven to be the case on this project,[1] which aims to implement resource, recovery and reuse (RRR),[2] also known as circular bio-economy, solutions in six refugee camps and settlements and their surrounding host communities in Ethiopia, Kenya and Uganda (Figure 1). For each location, the management systems in place include national refugee

Figure 1. Project sites in Ethiopia, Kenya and Uganda.

[1] https://rrr-refugee.iwmi.org/
[2] https://www.iwmi.cgiar.org/publications/resource-recovery-reuse/

bodies, local authorities, United Nations (UN) agencies, national and international nongovernmental organizations, and community-based organizations from the refugee camps and settlements and their surrounding host communities. The UN cluster system provides a framework for the management and structure of refugee camps and settlements, with the hosting country taking overall responsibility at each site. In this backdrop, the human needs of both the refugees and host communities must be met, preferably with regenerative approaches that build the local natural resource base rather than degrading it. Equally important is how this occurs, as it should also strengthen social cohesion between refugees and the host communities.

Scale is a further consideration. In this project, the regenerative approaches being practiced include home gardens, agroforestry and efficient cooking energy management, none of which are being implemented in isolation. All three activities are interconnected to form a nexus through a circular bio-economy approach that exploits organic waste and greywater at the household level (Figure 2). Thus, the project aims to build the natural resource base at the macro-scale through small-scale interventions at the micro-scale. Through the adoption of an action research approach, an additional dimension of this work is the building of an evidence base to impact future programs and policy recommendations across the broad project objectives of food security, efficient and sustainable cooking energy access, environmental sanitation and social cohesion. All this being carried out within a gender-sensitive framework that aims to lighten the load of women and schoolgirls from both refugee camps and host communities.

Project approach

The *RRR in Refugee Settlements in Africa* project has drawn from a range of participatory approaches. For example, selection and development of the practical project activities have been done in close consultation with both refugees and the host communities while considering the impact on women's food and energy burdens. This process was then used to feed into the co-development of a training manual and workshop curriculum, which has remained an open working document that captures the nuances from the field. The training content has been delivered through a network of local community-based facilitators that were trained during a number of 'training of trainer' (ToT) workshops (Table 1). Majority of the trainees are female, accounting for 85% of the total trainees in Kenya and 57% in Uganda. In Ethiopia, no progress has been reported due to challenges (caused by security issues) faced in implementing project activities.

Throughout the implementation process, regular monitoring has shaped the practical project activities to ensure they were modified to the specific needs of both the refugee camps and host communities. From this process, two clear consequences have emerged. First, the formal ToT pathway has gone from strength to strength, with strong evidence of project activities being taken up through an informal 'peer-to-peer' pathway that has gone beyond the project's target beneficiaries. Second, the effects of the Covid-19 pandemic have resulted in an increase in remote mechanisms in both project management and technical support. Ironically, this in return has ensured wider participation of all project staff in all stages of the project life cycle while strengthening the localization aspects of the project as local decisions were prioritized and taken.

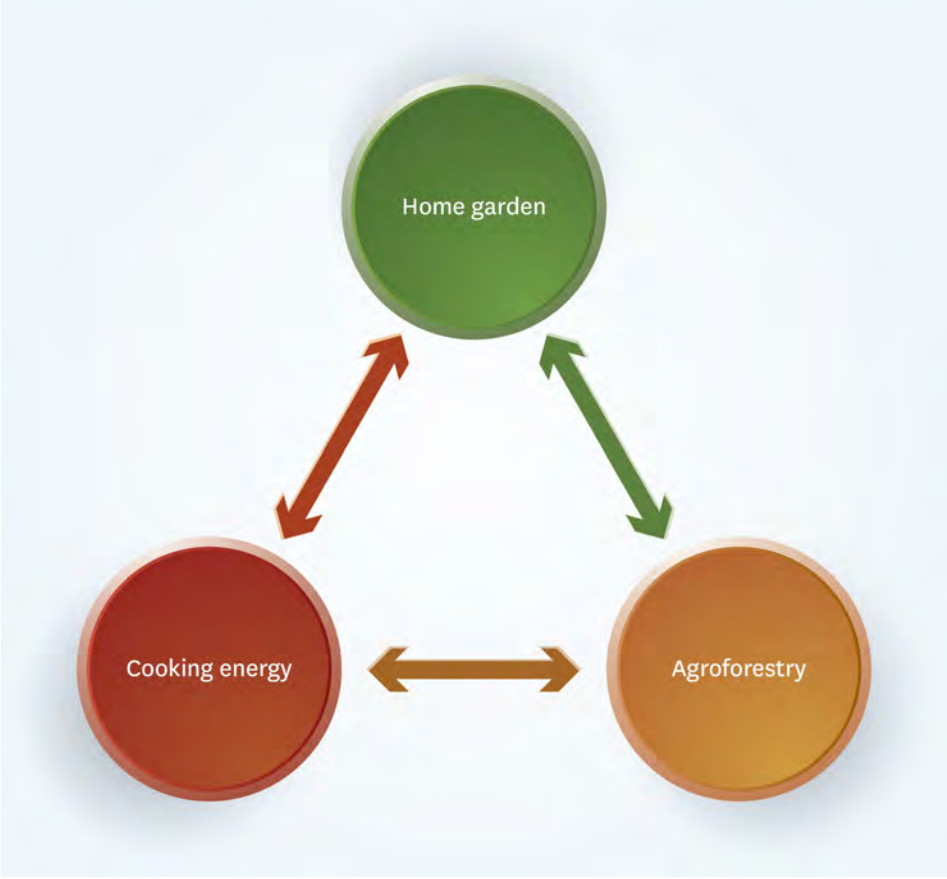

Figure 2. The home garden-agroforestry-cooking energy nexus.

Table 1. Summary of the number of refugee and host community households trained in each project country.

Country	Number of facilitators trained	Number of households trained				Total
		Refugee community		Host community		
		Female	Male	Female	Male	
Ethiopia	4	-	-	-	-	-
Kenya	7	556	99	96	12	763
Uganda	16	448	312	75	79	914
Total	27	1,004	411	171	91	1,677

Project activities

Following the delivery of the training workshops, community-based facilitators set about training both refugees and host community members in a range of regenerative activities through demonstration, mentoring and peer-to-peer support. Although each of the regenerative activities can be implemented as standalone projects, the innovative approach of the project is to maximize the synergies between each of the regenerative activities at the household level, thereby mainstreaming a circular bio-economy approach. Adopting a circular bio-economy approach has linked the following regenerative activities:

- Establishing home gardens
- Planting fruit and multi-purpose trees
- Producing energy briquettes and charcoal
- Producing biochar for the home garden
- Producing compost for the home garden

The circular bio-economy approach has provided the link between all the regenerative activities listed above. In the project, no single regenerative activity has been implemented in isolation. Maximizing the synergies and the resource flows between the regenerative activities at the household level is the innovative aspect to this work. Furthermore, households were provided with basic farm inputs and tools to establish their own home garden units, which they have all done successfully. The synergies and resource flows between regenerative activities are illustrated in Figure 3.

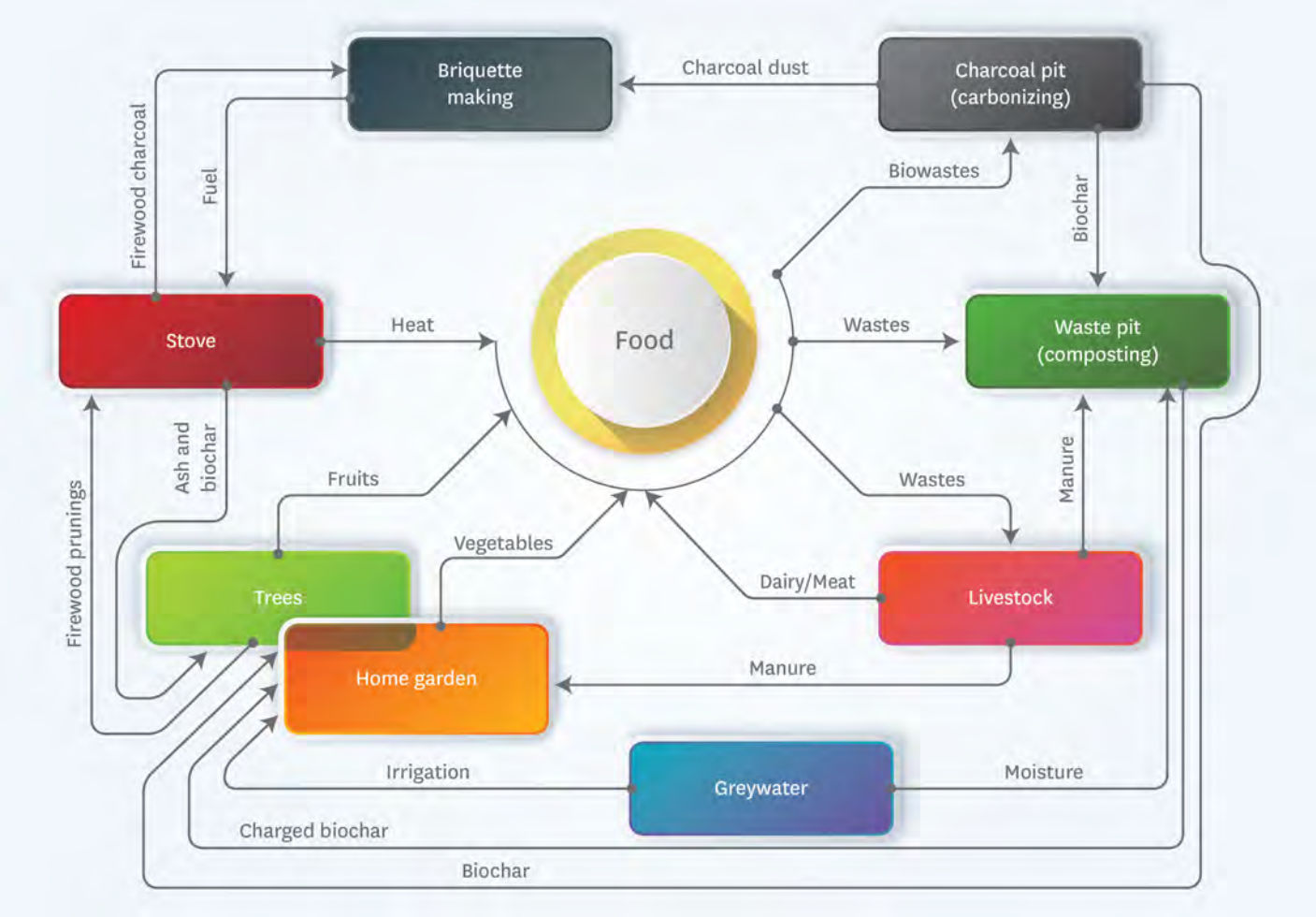

Figure 3. Synergies of carbon, nutrient and water flows between the regenerative activities at the household level.

Communal garden with individually managed plots irrigated using greywater from a watering point at Kalobeyei Settlement in Kenya (*photo:* Edwin Okoth/World Agroforestry [ICRAF]).

Reflective Learning and Establishing an Evidence Base

Applying an action research approach and establishing a strong evidence base around all the project activities that are being implemented have been strongly endorsed by representatives from the Food and Agriculture Organization of the United Nations (FAO) and UN-Habitat in Kenya, and the Office of the Prime Minster (OPM) and the United Nations High Commissioner for Refugees (UNHCR) in Uganda. For example, following the analysis of the baseline survey, a number of journal papers are in preparation and will be submitted for peer review; already, several other papers have been submitted and are now being peer reviewed for possible publication. In addition to the baseline survey and the mid-project monitoring that is underway, a number of field visits were conducted by the transdisciplinary technical support team. Not only have these visits provided opportunities for further capacity building with local partners and reflective learning for all, but they have also allowed the team to identify innovative research opportunities that cut across the project objectives while also building the gender-sensitive aspects to the work. For example, the mineral content of okra grown in the four refugee camps and settlements in Ethiopia and Uganda has been analyzed (Woldetsadik et al. 2022). Consequently, the contribution towards the adequate intake (AI) or recommended dietary allowances (RDAs) of different minerals for young children and pregnant and lactating women (PLW) has been identified and quantified. While the benefits of home gardens are well established, this innovative research study clearly highlights the additional benefits of nutrition-sensitive home gardens as spaces that allow household members, often women, to complement the cereal-based relief food offered to refugees in East Africa. In fact, the CGIAR Research Initiatives *Resilient Cities Through Sustainable Urban and Peri-Urban Agrifood Systems*[3] and *Fruit and Vegetables for Sustainable Healthy Diets*[4] encourage safe and sustainable production to strengthen local food systems.

Representatives from OPM and UNHCR participating in a stakeholder engagement workshop held in Rhino and Imvepi Settlements in Uganda (*photo:* ICRAF).

[3] https://www.cgiar.org/initiative/16-resilient-cities-through-sustainable-urban-and-peri-urban-agrifood-systems/
[4] https://www.cgiar.org/initiative/fruit-and-vegetables-for-sustainable-healthy-diets-fresh/

In May 2022, the transdisciplinary technical support team visited the Kalobeyei Settlement and Kakuma Refugee Camp in Kenya and Rhino and Imvepi Settlements in Uganda. The team was unable to return to the project sites in Ethiopia due to access restrictions. However, in both Kenya and Uganda, the visiting team worked with the local implementing partner, Danish Refugee Council (DRC),[5] and with local community-based facilitators from both the refugee and host communities. The combined team visited over 100 households from the communities that are engaging in the circular bio-economy activities and held focus group discussions (FGDs) with community members. In Kenya, the team visited homes to check the status of the interventions and held FGDs involving a total of 43 households from the refugee and host communities in Kakuma Refugee Camp and Kalobeyei Settlement. In Uganda, the team conducted similar activities with 63 households from Rhino and Imvepi Settlements.

In each project country, the final activity included a stakeholder engagement workshop where discussions were held on ways of mainstreaming the circular bio-economy in food, cooking energy and resilient environment initiatives across all four sites in Kenya and Uganda. During the stakeholder engagement workshop in Kenya, Francis Ekiru, Head of FAO, based in Kakuma in Kenya, stated that "sustained implementation of innovations targeting the same communities should not stop at the end of a project. Other stakeholders should be able to carry it on." This is one way of addressing the scaling up and sustainability of the innovations. From these field visits and workshops, a process of reflective learning has taken place and this is now shaping future research and development of the project.

Water: A major challenge for the project

Across all four sites in Kenya and Uganda, the biggest challenge reported from household members and participants of FGDs has been accessing water. Even accessing potable water for domestic use has been challenging at times, for example, in Kalobeyei Settlement in Kenya. Such limitations have a clear knock-on effect when planning for home gardens and agroforestry plots as both activities involve frequent irrigation.

In late 2021, the dry period in Rhino and Imvepi Settlements in Uganda resulted in a very low survival rate for the fruit trees that had been planted in October that year. As access to water was restricted due to the very dry conditions, household members stopped irrigating the fruit trees. This pattern was found across both refugee camps and host communities. Unfortunately, the tree planting had taken place earlier to maximize the seasonal benefits, but community-based facilitators were trained in all aspects of the circular bio-economy later in December. Consequently, as the dry season was approaching, household members were reluctant to use domestic greywater to irrigate the fruit trees and many perished as a result.

Despite water shortages at all locations, there are still opportunities to irrigate using the runoff at water points and domestic greywater in Kakuma Refugee Camp and the host community in Kenya (*photos:* left: IWMI, right: ICRAF).

[5] https://drc.ngo/our-work/where-we-work/east-africa-great-lakes/

Greywater: A major opportunity for nutrition security and improvement in women's well-being

Switching to a circular bio-economy approach places an emphasis on recovering organic waste rather than allowing this to be disposed of through a linear waste model. In the context of this project, the recoverable organic waste that has been used up to now include the following:

- Domestic organic kitchen waste (vegetable and fruit peelings/remains).
- Garden waste (biowaste).
- Cooking fuel waste (charcoal remains from cooking with firewood, carbonized crop residues such as cassava stems, charcoal dust from household or trading places).
- Greywater (water or soapy water from washing cooking or eating utensils, preparing food, washing clothes and bathing).

In the dry and semi-arid region of northwest Kenya, the recovery of greywater has been a game changer. In a circular bio-economy home garden, the availability of greywater becomes the critical design factor as this determines the surface area that can be planted andirrigated during the dry season. This extends the growing period into dry spells, and in the case of the refugee camps and settlements, enables refugee women to grow crops and thereby strengthen the local food system. This pattern was very evident in both Kakuma Refugee Camp and in the Kalobeyei Settlement, despite the latter being renowned for its water shortages. In fact, this new recognition of the benefits of greywater irrigation has even resulted in additional small plots of vegetables being cultivated adjacent to water supply points. Nearby residents have redirected the runoff from around the water points onto vegetable plots. For example, host community households established individual and communal gardens adjacent to water points in Kakuma. Spillage from water points is being harvested and used to irrigate home gardens. This process has highlighted that small gardens with simply constructed vegetable beds can be maintained throughout all the seasons, thereby increasing diet diversification and, in many cases, even leading to income generation.

In one case, a female grower sold her vegetables and used the profits to buy wheat flour to make *Ndazi*, a small fried snack, which she then sold. Many of the female growers reported profits from selling their small bundles of surplus green vegetables such as jute mallow, amaranth and cowpea. In some cases, these simple transactions have enabled mothers to purchase schoolbooks for their children, building their confidence as growers and entrepreneurs in the process. From a monitoring perspective, the ongoing surveys, for example, in the mid-project activities have been designed to capture and quantify such transactions, along with home garden productivity levels. This will enable the building of an evidence base for using a circular bio-economy approach in refugee camps and settlements and their surrounding host communities.

Greywater-irrigated home garden in Kakuma Refugee Camp in Kenya (*photo:* ICRAF).

In Kenya, the host communities consist primarily of former pastoralists whose herds have been lost to drought. For these individuals, home gardening represents a major shift from previous modes of life and diet. When asked about this issue, the response was pragmatic - “the herds are gone, one must eat.” In the case of host community members from the Kakuma area, herding had already been replaced by selling firewood to refugees. Firewood provisioning was never very successful but it did generate some income. In one FGD with the host community, there was a discussion about the fact that home gardening did not combine well with firewood collection, which takes women away from their homes for up to a full day. Given that selling firewood is frustrating for host community members, it is not entirely clear which option they preferred: firewood selling or home gardening. This point should be investigated further. It must also be noted that home gardening appeared to be a primarily female activity. In cases where men were involved, the home gardens tended to be much larger and resembled small farms which required more water than a home could produce in the form of greywater. There appeared to be more flexibility around gender roles among refugees, although a larger sample would need to be assessed.

Cooking energy

In both Kenya and Uganda, there are now clear examples of the circular bio-economy in progress. Greywater is used to irrigate home gardens and trees. Home gardens provide food for consumption and biomass for carbonizing and composting. Composted material is applied to the home garden and carbonized material is used to produce fuel briquettes for cooking. The remaining ash from cooking is applied to the home garden and trees. Trees provide shade for the home garden, fruit for consumption, biomass for carbonizing, and pruned branches for firewood. This is the biocycle in action and it then continues, maximizing the synergies between the three nexus components of home gardens, agroforestry and cooking energy (Figure 2).

Of all the project components, maximizing the efficiency of cooking processes, from improving fuel energy to the cooking stove, has the capacity to bring about change at the landscape level through reductions in deforestation and land degradation. It also brings a level of protection for women and children as less time and energy are being used to search for and collect firewood for cooking. Cooking energy projects are not new in both Kenya and Uganda. However, the synergies with carbonizing biowaste and small tree pruning for the purpose of briquette production is an innovative spin in this context. The use of briquettes is already having a substantial impact, with women reporting a reduction in the fuel and time needed to cook the same amount of beans, which is usually an energy intensive process. It was also reported that cooking with briquettes substantially reduces the amount of smoke emitted, and there is also a reduction in the indoor air pollution when the stove is built and used indoors. The dual-purpose stove allows women to use both briquettes and firewood.

Beans being cooked with briquettes on a fuel-efficient cooking stove in a host community household in Imvepi Settlement in Uganda. Note the lack of smoke emitted from the stove (*photo:* IWMI).

A woman watering vegetables using greywater from soaking utensils at Kakuma Refugee Camp in Kenya (*photo:* Edwin Okoth/ICRAF).

Similarly, the introduction of mud-brick stoves has made the use of firewood more efficient, with women reporting that only three sticks of firewood are required for cooking beans for about 2 hours compared to the open-fire three-stone stoves that use much more firewood and take much longer to cook. The mud-brick stoves also produce less soot. There has been a tendency to import expensive and not very well designed cook stoves into a number of humanitarian settings in sub-Saharan Africa. However, in this case, the stoves constructed by the project use local materials, are often built by their final users, and cost almost nothing to manufacture, yet the impact they are having is very evident. As purchasing and/or collecting firewood has a constant financial, physical and time constraint for refugees, particularly for women, any intentions that reverse this trend can have a significant impact on the well-being of women, particularly female-headed households. As household members become more proficient in carbonizing techniques and briquette production, the benefits of the circular bio-economy approach will be maximized. Measuring and quantifying these processes form a part of the mid-project activities and later impact surveys, again building an evidence base for future intentions.

Lessons learned

- The regenerative activities of the project – home gardens, agroforestry and cooking energy (improved fuel use) – were met with great interest, particularly for women with extensive childcare responsibilities. Despite tough agronomic conditions, successful home gardens were evident on plots allocated for living space.

- There was evidence of peer-to-peer knowledge sharing particularly in the case of home gardens and vegetable production for sale. Consequently, the adoption of innovative home gardening by non-beneficiaries is high. It must be noted that knowledge sharing tended to be along gendered lines (women informing women, men sharing with men). While this was not unexpected, it demonstrated the importance of training both genders and this was a target of the project to ensure that peer information sharing would be inclusive.

- At all project sites, the feedback included requests for more tools, gum boots, fencing and seeds to allow more planting and an increased number of participants.

- Substantial innovation and entrepreneurship were evident among the participants. It was also evident that there was a clear desire to have a means to enhance their livelihoods. This was true among refugees and host community members even when the preexisting social and cultural context had not included agriculture. In Kenya, in particular, communities of pastoralists were cultivating extensive home gardens of vegetables.

- There is an urgent need for high-quality seeds. Seed saving can help and there was some evidence of such activity. Nonetheless, a next step would be to develop a local seed enhancement and replication effort to reduce the need to import seeds from outside the region.

- The provision of continuous extension services from the community-based facilitators in both the refugee camps and host communities could bring greater impact.

- Extensive uptake of the project training indicates the success of this project's definition of scale as a function of many participants rather than measuring success via the area cultivated or kilograms of vegetables produced.

Mango seedlings ready for distribution at Kakuma Refugee Camp in Kenya (*photo:* IWMI).

Reference

Woldetsadik, D.; Llorent-Martínez, E.J.; Gebrezgabher, S.; Njenga, M.; Mendum, R.; Castillo-Lopez, R.; Fernández-de Córdova, M.L.; Hailu, H.; Evans, C.T.; Madani, N.; Mafika, T.P.; Fleming, D.E.B. 2022. Okra *(Abelmoschus esculentus)* in a refugee context in East Africa: Kitchen gardening helps with mineral provision. *SN Applied Sciences* 4: 32. https://doi.org/10.1007/s42452-021-04898-6

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Project

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http://rrr-refugee.iwmi.org/
https://worldagroforestry.org/project/gender-responsive-innovations-soil-rehabilitation-alternative-fuel-and-agriculture

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More information

Podcast on 'Why the energy and food nexus is critical in refugee context: Gender-inclusive approach is critical to solving the puzzle': https://forestsnews.cifor.org/66077/why-the-energy-and-food-nexus-is-critical-in-refugee-context?fnl=en

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