ENHANCING FOOD SECURITY THROUGH LANDSCAPE RESTORATION:

CASE STUDIES FROM CAMEROON AND PERU.

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Abstract

Land restoration provides a solution to the challenges that countries across the globe are facing as a result of land degradation. Countries are committing to restore millions of hectares of lands under global and regional initiatives such as the Bonn challenge, AFR100 and the Initiative 20x20. Enhancing food security is one of the objectives for land restoration initiatives. Projects involved in land restoration at community levels however may shape their objectives according to the contexts of the communities where they are implementing their projects. Through choices of species selected for regeneration, planting and to be protected, land restoration projects can enhance food security and livelihoods. This study assessed the extent to which restoration projects reflect the goals of food security that are set out in international restoration agendas with case studies from 12 land restoration projects from Cameroon and Peru. By illustrating the different pathways in which the species prioritized by local communities for restoration, provide food, firewood, timber, medicine and shade among other benefits, the paper shows the need for explicitly including food security in restoration projects at community level and also involving communities in restoration decision making.

Keywords: Food security, land restoration, land degradation, biodiversity and climate change.

Table of abbreviations

ANR	Assisted Natural Regeneration
AFRI100	African Forest Landscape Restoration
KII	Key Informant Interviews
FAO	Food and Agriculture Organization (of the United Nations)
FG	Focus Groups
FGD	Focus Group Discussion
FLR	Forest Land scape Restoration
FSN	Food Security and Nutrition
HLPE	High Level Panel of Experts
LR	Land Restoration

Chapter 1.

1.1. Introduction

About 25% of the world's agricultural land is currently highly degraded and land degradation continues to increase at the rate of 3% per year (Scholes et al. 2018; Thomas, 2012). This means that the world is continuously losing productive land for agriculture and ecosystem processes have been disrupted. Deforestation and unsustainable land cultivation practices are some of the main drivers of land degradation which are anthropogenic. Climate change worsens land degradation, with floods and droughts causing soil erosion and loss of soil fertility (Barbutt and Alexander, 2016; FAO et al. 2017). Land and soil are very important natural resources that support plant life, hold water and are a host to organisms important for land productivity, therefore need to be well preserved for our own wellbeing (FAO, 2018: Gupta, 2019).

Food is a basic need and the right to food requires that food is available (UNCHR, 1989). An estimated 97 percent of the food that is consumed in the world is produced-on land, which makes land a necessity for food security (Costanza et al. 1997). According to this year's report on the state of food security and nutrition in the world 2 billion people worldwide are estimated to be experiencing moderate or severe food insecurity (FAO, 2019). This poses a threat to the right to adequate food of one third of the global population. The productivity of land and its supporting ecological services are threatened by land degradation, increasing deforestation and desertification whose effects are amplified by climate change.

Yet, land degradation is reversible with sustainable land management practices and through restorative actions. Land and landscape restoration programs hold potential for enhancing food security by enhancing soil fertility, supporting biodiversity and improving ecological processes (Kumar et al., 2015; Dewees et al. 2011). Trees provide ecosystem services, such as carbon sequestration, and benefit animals and people direct by providing food, medicine and shelter. Reforestation, afforestation and planting trees in cropped fields (agroforestry) are some of the efforts that are being undertaken across the world aiming at restoring deforested and degraded lands.

In global restoration agendas, food security is commonly mentioned as a goal along with restoring biodiversity loss and improving the living conditions of people. The UN Decade on Ecosystem Restoration (2021-2030) "aims to massively scale up the restoration of degraded and destroyed ecosystems as a proven measure to fight the climate crisis and *enhance food security*, water supply and biodiversity" (UN Water: Online). At the side-event 'Landscape Restoration for Food Security and Climate Adaptation' of the High-Level Political Forum in New York, 2018, landscape forest restoration was described as a natural solution for food security, water scarcity, peace and security, poverty and livelihoods and climate change (UNDP, 2018; Mansourian and Vallauri, 2014). But to what extent are global concerns for food security reflected when restoration initiatives are designed and implemented at local levels? In particular, as restoration initiatives commonly center on tree planting, are tree species choices related to food security concerns?

To ensure that land restoration programs are sustainable and focus on the well-being of people it is important to encourage participation of all stakeholders, such as the local communities, governments and the private sector (Liagre et al. 2015; IPCC, 2019; Kumar et al. 2015). In restoration programs, decisions such as what species to prioritize in restoration, which areas to restore and what

approaches to use "are driven by gendered sets of knowledge, rights, roles and responsibilities" and the priorities different gender groups will have with respect to land restoration programs are related to the ways in which land degradation affects them, and to the benefits they stand to gain from its regeneration (Sijapati Basnett et al. 2017, p6). These priorities include the choice of tree species they would like to see planted in restoration initiatives.

In this paper, I interrogate the extent to which restoration projects reflect the goals of food security that are set out in international restoration agendas. Based on analyses from a small sample of projects in Cameroon and Peru, two countries with ambitious commitments to restore degraded lands, I argue that project objectives do not show concern for food security per se, but that several of the tree species that are planted or regenerated as part of restoration projects do hold potential for enhancing food security through different pathways. I mainly focus on the pathway that relies on direct provisioning of food, although I also consider provisioning of fuelwood, improvement of soil fertility, provision of income through the sale of timber and hosting insects and animals that are a major source of nutrition for the communities. Preferences for certain tree species depend on their functions, which should, in theory, align with the objectives of a given restoration initiative and with local priorities. Different tree species play different roles in providing ecological services, including water regulation, enriching soil fertility, pollination, and providing quality timber, medicine, firewood, or importantly for this study, food products for local diets and therefore preferences could be shaped by local needs.

I show that although local women and men in Cameroon and Peru also prioritize species that contribute to food security, these only correspond to a limited extent with those selected by the projects. Women's and men's priorities for tree species are mainly aligned but did not always align with projects' preferences which were shaped by the project objectives. Based on these findings, I conclude that greater efforts to integrate local preferences in tree species selection and to explicitly incorporate food security concerns in project objectives and strategies can help advance food security through restoration.

1.2. Conceptual Framework: Land Restoration for food security.

Food security was defined by the 2009 Declaration of the World Summit on Food Security as "to exist when all people at all times have the physical, social and economic access to sufficient, safe and nutritious food required to meet their dietary needs and food preferences for an active and healthy life" (FAO,2009, p1). Food security is multidimensional and basing on the definition provided, four pillars to food security can be identified as, food availability, food access, food utilization and food stability as illustrated in the figure 1 below.

Figure 1. The four pillars of food security and nutrition (Source: USAID 2010).

Food availability was the starting point in the definition of food security in the earlier years when food security concerns were gaining international attention (Sen, 1982). Food availability is concerned with production and the physical availability of food required by the people in a household, community or country. When a country or household does not have enough food available (demand higher than supply) then food insecurity is said to exist. For a long time, the topic of food security was largely focused on food availability as the main determinant of food security until Amartya Sen's "Poverty and Famines" in 1982, that gave a new perspective to food insecurity being also as a matter of food access and not solely food availability. Food availability is achieved by both local production and procurement (or in some cases donated).

Food access is a pillar that deals with the physical, socio-economic and financial capability that could make it possible or impossible for people to achieve food security (figure 1). Going back to the definition of food security as existing only when "all people" and "at all times" have access to food required to live a heathy and active life, food access as a concept studies the barriers that could prevent people or some groups of people in the communities from achieving this. Even though other people could have the financial capability to buy food on the market, but they are "outcasts" in their communities that they are banned from buying food from the market, then food security cannot be achieved. If cultural norms and other social factors prevent certain groups of people from participating in activities that help in achieving economic returns important for achieving food security, they will continue to be food insecure.

Food utilization studies the individual requirements from food in order to get the benefits from it. For example, a celiac person may not achieve the same nutritional results from consuming the same food as a normal person would. Another example is of a pregnant woman or a lactating mother who would require a different set of foods to meet her nutritional requirements. Food utilization also looks at other factors that can make people not get the full benefits out of the food that is available, and that they have access to because of lack of supporting facilities such as knowledge of food preparation and lack of safe drinking water and sometimes lacking fuelwood to prepare the food (FAO, 2008). All these are barriers to achieving food security with different degrees that can vary according to social statuses of people or the geographical locations as associated with the availability of resources.

Food stability is a cover pillar and important as it overlooks all the above-mentioned pillars. Food stability is concerned with the sustainability of the ways in which the other pillars could be achieved. Countries, communities and households are still considered food insecure if they are uncertain of having food available in the different seasons of the year even though they might have food available at some points (WHO, 2018). Food stability also seeks to study the potential of the communities to withstand vulnerability and shocks over time in achieving food security (FAO, 2008).

The four pillars of food security are linked to the right to adequate food which is realized "when every man, woman and child, alone or in community with others, has the physical and economic access at all times to adequate food or means for its procurement" (Committee on Economic, Social and Cultural Rights, general comment 12,1999). Land is an important natural resource for food production, and it is limited. Land degradation is a threat to all the pillars of food security as it hits most on the first two pillars (availability and access), which makes the last two (utilization and stability) automatically unreachable.

1.3. Land degradation and restoration

Land degradation and deforestation have for some time now been one of the world's major challenges, impacting on the global food security and wellbeing of about 3.2 billion people globally (Besseau et al. 2018). The world's poorest are in rural communities and in most cases, they largely depend on natural resources and cultivation, making them the most vulnerable to the effects of land degradation (Kumar et al. 2015; IPCC, 2019; Liagre et al., 2015). As the global population continues to rise more pressure is being exerted on the world's remaining natural resources. FAO (2009) argues that if the global population continues to rise at the current trend and the consumption and food waste habits remain unchanged, the world would need to produce 70% - 100% more food in the coming years which will require more clearing of forest and woodlands for agricultural production.

The good news is that land degradation is (even though costly and complex) reversible. As noted above, the United Nations General Assembly has declared 2021 – 2030 the UN Decade on Ecosystem Restoration to accelerate already existing restoration goals such as the Bonn Challenge, AFR100 and Initiative 20x20. These global and regional initiatives focus on restoring millions of hectares of degraded and deforested lands in the next decade. Under these governing efforts, countries, communities and institutions around the globe have committed to restore the degraded lands that they own or manage. Cameroon and Peru have both pledged to restore millions of hectares of their degraded land under the Bonn challenge. Both countries are home to numerous land restoration initiatives.

Launched in 2011 by the German government and the IUCN, the **Bonn challenge** has a goal of bringing 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030 (Bonn challenge: Online). Achievement of the Bonn challenge's 350-million-hectare land restoration objective is projected to gain the world $9 trillion as net benefits aside the ecological benefits that would come from improved food and water security (Besseau et al. 2018; Bonn Challenge,Online).

"The Bonn Challenge is an implementation vehicle for national priorities such as water and food security and rural development, while simultaneously helping countries contribute to the achievement of international climate change, biodiversity and land degradation commitments." (Bonn Challenge: Online).

Peru is among 17 Latin American and Caribbean countries that have committed to restore their degraded lands under **Initiative 20x20**. The Initiative aims to encourage the establishment of trees on agricultural land through agroforestry, silvopasture in order to improve the soil productivity, provide feed for animals and increasing enhance water retention which will in the long run help in rural development and improve food security (Verchot, et al. 2018).

Cameroon falls under the 31 African countries that have committed to restore 100 million hectares of its degraded and deforested land under the African Forest Landscape Restoration **(AFR100)** as a contribution to the Bonn Challenge. According to the 2nd AFR100 annual meeting report the AFR100 will accelerate restoration interventions that are aimed in enhancing food security, increase climate change resilience and mitigation, and combat rural poverty across African countries as they are currently facing land degradation and food security among other challenges (AFR100 2nd Annual partnership Meeting, 2017).

Land and landscape restoration are a process of regaining ecological functionality. In the international agenda, this is generally done with stated aim forest landscape restoration approach capitalizes on the direct and indirect benefits of forests and trees to people. Agroforestry, reforestation and afforestation are approaches to land restoration that harvest the benefits of trees and forests to human wellbeing. One important feature of agroforestry is that the trees provide protection to the soil against soil erosion and help in retaining and recycling nutrients in the soil, thereby increasing the productivity of the lands and improving crop yield. Agroforestry is an approach that is characterized by an intensive land use management approach that integrates trees, crops and often livestock to promote soil organic matter accumulation (Besseau et al. 2018; FAO et al. 2017). The trees used for agroforestry could provide direct benefits people such as providing food and medicine and oil (IPBES, 2018) or may provide products sold to generate income.

Restoration projects across the countries differ in scale, restoration strategy and objectives. The Bonn challenge, AFR100 and Initiative 20x20, have stimulated a lot of restoration projects, but sometimes the goals of individual restoration projects do not match up with the goals on the initiatives (Verchot et al. 2018). This could be because different stakeholders have different interests in restoration and some restoration projects are aimed at resolving the contextual problems of degradation that are faced in the particular area. This may make the projects seems disconnected to the larger initiatives, however they do end up contributing to their goals (Verchot et al. 2018).

Agroforestry may be performed through tree planting and/or assisted natural regeneration. Assisted natural regeneration (ANR) is argued to be low cost as it only involves accelerating the natural growth of trees by removing weeds that might compete with the trees for food, water and nutrients in the soil (Chazdon, 2008; Shono, Cadaweng & Durst, 2007). ANR is commonly planted on areas where there is already some natural revegetation happening. Fruit tree species and other food providing shrubs are commonly used in agroforestry because of their role in providing soil cover and food for consumption.

Looking at land degradation through a gender lens exposes that rural women and girls are commonly the most affected by the impacts of land degradation because of their socially constructed gender-specific responsibilities. For example, they are typically the ones to collect water and firewood and tasked with ensuring their household's food security (Collantes et al. 2018). For this reason, and because women and men have equal right to participate, women require a voice in the decision making as far as land restoration is concerned.

1.4. Restoration pathways to food security.

The 2018 State of food security and nutrition in the world estimated that the number of undernourished people in the world has risen to an estimated 821 million people in 2017 (FAO et al. 2017). In the same report the issue of land degradation and effects of climate change were raised with a call for people to adopt agroforestry techniques to restore soil fertility, reduce soil erosion and reduce desertification.

There are several pathways by which land restoration can enhance food security (Figure 2)**.** First, and of particular interest for this thesis, **land restoration could enhance food security through direct provision of food,** by increasing the abundance of fruit species such as *Musa sp*. (bananas) and fruit trees like mangoes, avocados and citrus fruits. The fruit trees can be a source of food during the 'lean' season, when household granaries are running low and other foods are out of season (Vira et al., 2015). Land restoration programs may encourage the planting of different species of trees, which are seasonal and fruit in different months of the year, thereby contributing to food availability and stability. Other tree products are used as a source of food for snacking during cultivation or harvesting seasons because they do not require time to prepare and during these times households are busy on the farms and therefore less time for food preparation (Arnod and Falconer, 1996).

According to Dewees et al. (2011) farmers appreciate the diversity offered by these agroforests not only for the range of nutritional and economic resources, which sustain the food security of their households, but also for the role of diversified production as a buffer against the market shocks and price fluctuations common to almost all agricultural and forestry products. The integration of trees and crops in agroforestry systems also mitigates the effects of climate change, such as unpredictability of seasonal rainfall and increasing frequency of extreme weather events (such as drought and flood), which affect annual crops much more than they affect perennial tree crops. (P. 45).

Trees are a source of fuelwood for cooking and heating. It is argued that 70% of the households in developing countries depend entirely on firewood and charcoal for their food preparation (Eba'a et al., 2016). Firewood is important for food preparation which is reflected in the pillars of food security for achieving utilization (Quisumbing et al. 1996). The sale of firewood is also

argued to be an informal industry which provides full-time employment for some rural households who trade, transport and collect the firewood for consumers (Eba'a et al., 2016). The role of firewood in enhancing food security is critical but under-recognized, as sometimes rural households, even though they have food available, are unable to prepare it because of lack of firewood.

Some projects aim at restoring trees for timber or other products to **improve household incomes**. If this income is used to procure food for the household then it could also be a pathway to achieving food security. Timber production could be a motivating factor to agroforestry because it is a longterm source of cash for the farming households apart from being a source of shade.

Trees can also provide **food when they act as a host for animals and edible insects, and provide fodder for animals that are used for meat.** Trees are a host to birds, snails and insects, which are a source of protein for communities who catch them. Bush meat (commonly found is Central and West Africa but also Brazil and Peru) is argued to be a source of protein for households where protein is important but scarce or too expensive (Swamy and Pinedo-Vasquez, 2014). The availability of all these products largely depends on forests and trees. Mainka and Trivedi (2002) and de Merode et, al (2004) argue that bush meat contributes to food security indirectly more than directly by the income that comes from the sale of the meat at the markets.

In agroforestry systems, which are one type of land use that is promoted through land restoration, trees provide cover for soil, thereby maintaining humidity in the soil. Trees when mixed with shade tolerant crops have proven **to improve crop productivity by improving nutrient cycling in degraded land**, as well as directly providing edible products (Warlop F, 2016) where the trees used provide fruits, or leaves or their seeds provide oil for human consumption. The trees in agroforestry can assist in food production also by providing support for crops that need it, such as climbing species (Dawson et al., 2013).

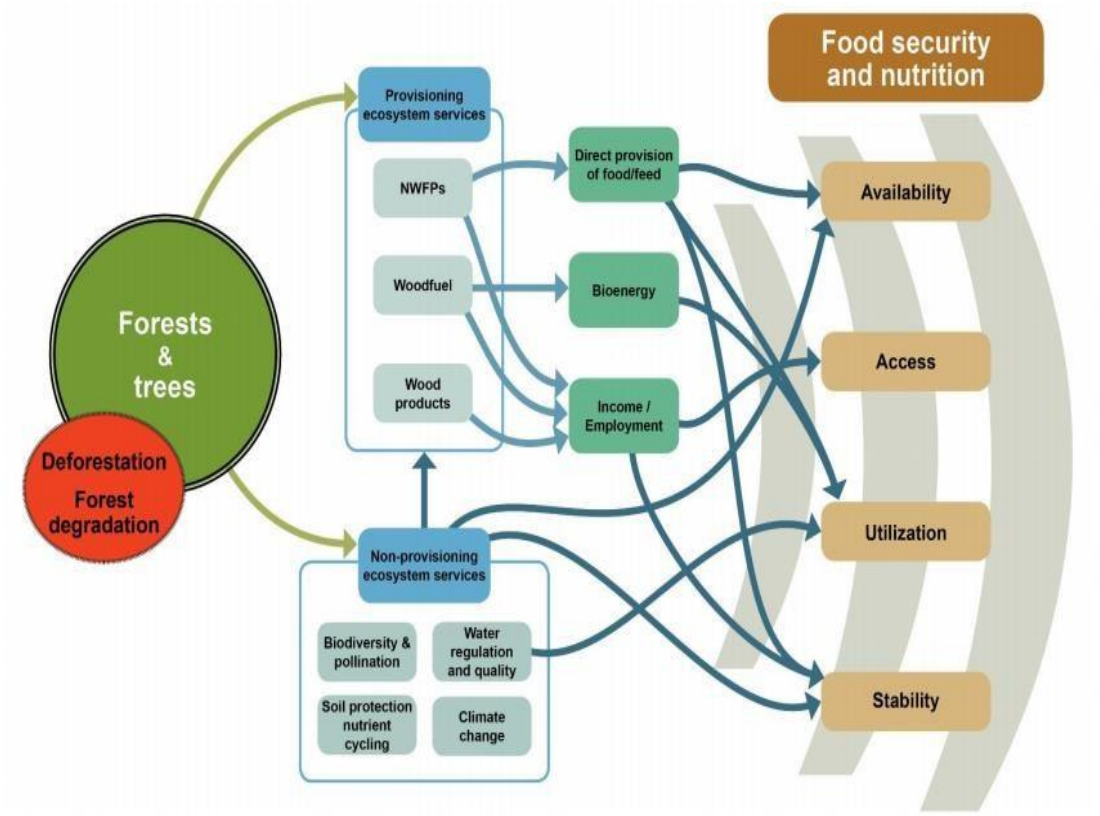

Figure 2. The direct and indirect roles of forests and tree-based systems for food security and nutrition. (Source: FAO et al. 2017).

Figure 2 displays the pathways that forests, and trees contribute direct and indirectly to food nutrition security (FSN) through the provision of food and energy for preparing the food. Forests and trees are also a source of income through employment and sale of tree products. The figure also shows an important role of trees in its contribution to human health by providing medicinal products.

Chapter 2.

2.1. Research aim

The aim of this paper is to study the extent to which land restoration projects are motivated by food security and the direct and indirect pathways by which land restoration programs enhance food security. This will be studied by looking at the degree to which food security as goal of land restoration initiatives is reflected at project level by looking at the different tree species that a sample of land restoration projects in Peru and Cameroon selected for protection, regeneration or planting. The paper will further study local community engagement and how their tree specie preferences are motivated by concerns for food security. Lessons learned from these case studies can help to identify ways in which land restoration projects can be made more sensitive to and effective in achieving enhanced food security in the communities in which they are implemented.

2.2. Research questions

Through an analysis of the information obtained from the case studies, interviews and a literature review, the paper will address the following research questions:

- Are the land restoration projects in Peru and Cameroon motivated by food security concerns?
- Do the tree species selected for restoration projects contribute to different pathways for achieving food security, and in particular to the direct provisioning pathway that relies on tree-derived foods?
- Do project objectives and the choice of tree species correspond with those of local women and men from participating communities?

2.3. Methodology

This paper is part of a larger cross-country comparative study led by Bioversity International, where is am currently doing an internship. For the purposes of this paper, only data collected from 11 communities in Cameroon, and 6 communities in Peru, is analyzed. In each country, 6 projects working on landscape restoration were selected based on a set of criteria, such as: tenure regime of land on which restoration occurs (e.g. government, communal, or individual holdings), which is related to the size of area to be restored by the initiative; and restoration approach (e.g. based on tree planting, natural assisted regeneration, etc.). These typologies have been used to guide project selection, with selected projects falling under different categories.

Focus group discussions (FGD) and key informant interviews (KII) were used to collect data. Two FGDs were made for every community, one for women only and the other for men only. The participants of the FGDs were selected randomly, and the key informant interviewees were selected on the basis of their knowledge of the projects and availability The FGDs were made up of a minimum of 7 people and a maximum of 18 people, but for each focus group 12 people were invited to join. The participants came from farming households.

Descriptive statistics were used to analyze and present the results from the information collected, checking the species cited by men and women's focus groups in both countries and their local uses. I used secondary data from a desktop literature review and contributions from conferences for further information. I gathered information from interviews with E. Lukanga, on her advice with

experience from land restoration in Tanzania and A. Shatou, on her experience with farmers knowledge on diversity and land laws in Sri Lanka, to reinforce my theoretical framework in establishing the links between land restoration and food security.

2.4. Limitations of the study

The raw data indicates the tree species that were local women and men would have liked to have planted or regenerated as a result of restoration projects, as well as the species selected and planted by the 12 projects across both countries. However, the study does not explore the reasons why some of the tree species indicated by local women and men were not planted by the projects. The data presented are based on the perceptions of project staff and local communities, and not on measured outcomes or impacts on food security of the communities. The data offer some information on the direct tree food provisioning pathway by which land restoration could enhance food security, but little information on the other pathways.

2.5. Study sites

The 12 projects studied in this paper range from small scale to large scale. Restoration strategies include assisted natural regeneration and planting trees either in forests or in cultivated fields, as part of agroforestry systems.

2.5.1. CAMEROON

Cameroon is a central African country, with a 45% off the land covered with forests (CED et al. 2017). The forests in Cameroon are a source of livelihood for many people as well as a source of employment, biodiversity and home to animals and a lot of birds. The deforestation rates are relatively low in Cameroon, but they are increasing with time. Evidence shows that the main causes of deforestation in both Cameroon as in Peru are agriculture conversion (coffee and cocoa), fuel wood and illegal logging (Ndobe and Mantzel, 2014). Other major contributors of deforestation in Cameroon include livestock farming and infrastructural development which can also be tied to population increase.

To curb the effects of land degradation and deforestation Cameroon pledged to restore 12.06 million hectares of land by the year 2030 under the Bonn challenge initiative. The pledge also contributes to the African landscape restoration initiative (AFR100), whose aim is to bring restore 100 million hectares of degraded and deforested land across Africa.

By the time this information was collected in 2018, the six projects were implemented in 11 communities for more than 5 years. The objectives of the six projects are mostly to restore the degraded areas and fighting deforestation as it was indicated to have been on an increase in the recent years. Through reforestation, agroforestry and natural regeneration the results from these efforts were meant to improve the well-being the people living in these areas whose livelihoods depended on natural resources (Table 1).

Table 1: List and characteristics of selected projects in Cameroon

No	Category name	Project	General Objectives (Essouma, 2018)
1	Smallscale plantings in humid zones	***Cam-1***	The sequestration of atmospheric CO2 in biomass through the creation of biological carbon sinks / Energy wood/ poles and poles / logs for lumber. With the goal of improving the environment and living conditions of the populations
2	Largescale humid zone plantings	***Cam-2***	Support the development of forestry and forest reforestation to provide an answer to endemic poverty in the commune
3	Agroforestry in humid zones	***Cam-3***	Increase arable land and diversify crops by transforming destroyed areas into cocoa agroforestry by gradual planting of trees at the base of forest origin
4	Largescale plantings in dry areas	***Cam-4***	Restoring several areas of land affected by drying up in a context of desertification and climate change
5	Soil restoration and restocking of the forest massif	***Cam-5***	Rehabilitation and conservation of the productive capacities of Lake Chad Basin ecosystems in the context of adapting production systems to climate change.

6	Agroforestry in dry land	***Cam-6***	Biomass production before cultivation in savannah areas, regeneration of agro pastoral resources and control of desertification

2.5.2. PERU

Peru is the third largest South American country. Worldwide Peru ranks as the ninth country with the largest forest resource, and second largest in South America where Brazil ranks first, and its forests are among the ones with the most biodiversity (Cossio et al. 2014). Peru has been affected by deforestation and degradation as a result of overpopulation in the small settlements, agriculture (international demand for agricultural commodities) and livestock management which often times leads to overgrazing (Zambrano et al., 2010).

As part of its effort to restore degraded and deforested lands, in 2014, Peru pledged to restore 3.2 million hectares by the year 2030 under Initiative 20x20 which contributes to the Bonn challenge (Bonn Challenge, online) which will promote both food security and rural development in return (Scherr et al., 2017). The landscape restoration programs in Peru are to benefit local communities and small holder farmers through their contributions in mitigating climate change and enhancing biodiversity conservation (Dewees et al. 2011; Scherr et al., 2017).

Six projects (ER 1-6) were studied for the interest of this paper. As shown in the table 2, most of the projects have agroforestry as their restoration strategy and the restored land ownership types were small to medium scale property and community ownership and the most outstanding benefit from the projects in Peru was, they were all focused on the gains from the restoration projects for the local communities.

Table 2. The project descriptions in Peru.

No	Category	Project name	General Objectives (Ikeda, 2019)
1	Agroforestry in the humid zone, small-scale private property	ER1	Promotion of agroforestry aroma fine cocoa systems in the Palcazu and Pichis valleys in Pasco
2	Agroforestry in the humid areas. Small-scale private property	ER2	Recovery of degraded areas with agroforestry cocoa systems in Chazuta-San Martin
3	Agroforestry in the humid zones. Medium-scale private property.	ER3	Recovery degraded areas with agroforestry systems with cocoa in Juanjui
4	Exotic pine plantations in the humid zones.	ER4	Pine afforestation participatory project in Community

	Community ownership.		Tayancani, Ccarhuayo
5	Assisted natural regeneration in the dry lands. Community ownership.	ER5	Regeneration assisted in the New Annex Hope - Jose Community Ignacio Távara Pasapera
6	Agroforestry, reforestation (seed dispersal) and natural assisted regeneration in the dry lands. Community ownership.	ER6	Peasant and communal promoters participate in the comprehensive management of dry forest

Chapter 3. Results and Discussion

3.1. Cameroon

3.1.1. Objectives of projects

As shown in Table 1, the main objectives of the projects in Cameroon target the general need for restoring degraded lands using different strategies to achieve ecological benefits. They do not focus on the direct benefits of restoration projects to the wellbeing of the communities. Staff from each project provided additional information on these objectives (Table 3) through the data key informant interviews. These sub-objectives shed light on what the objectives translate into in terms of benefits to the communities. Concerns about improving livelihoods – and so also food security - are implicitly listed as part of the desired goals and outcomes of the projects when implemented at community level. For example, in one project, which was a communal forest reforestation, purchased seeds for restoration from the community members to increase their incomes. It also employed the community members for restoration activities.

Table 3: Project sub-objectives

Project	Project sub-objectives
Cam-1	-Participatory implementation of the project -Install and create an organic carbon sink -Creating jobs -Tackling greenhouse gases and climate change -People's well-being -Introduce the population to environmental management.
Cam-2	-Create a source of income for the municipality; -Regenerate forest plots -Recreating a forest heritage for suroonding communities
Cam-3	-Assessing the socio-economic, environmental and ecological impact of trees associated with cocoa trees more specifically: (i) Improving cocoa income with associated trees; (ii) Enhancing the savannah and restore the savannahs through agroforestry. -Train on plant production techniques and setting up a cocoa plot in combination with fruit trees

Cam-4	-Strengthening the capacity of the municipalities and rural communities in the fight against desertification in order to improve the living conditions of the people of these communes Specifically: 1.Increased capacity of municipalities and communities in the restoration and management of green Sahel sites 2.Increased valuation of green Sahel sites by the community. 3.Increased participation of young people and women from target communities and communities in the fight against desertification
Cam-5	-Refilling the forest massif -Soil restoration -Conservation and improvement of wildlife (birds) and floristic biodiversity -Improving land and water cycle -Redevelopment of herbaceous.
Cam-6	-Restoring and protecting soils by planting legumes in particular; -Propose new agricultural techniques for soil fertility management; -Water management techniques / promote the water cycle; -Development of CVS (vegetation-covered seedlings) for soil management; -Creating forest pockets to promote the water cycle.

3.1.2 Tree species selected and planted, regenerated or protected by the projects and their uses.

Despite the fact that project objectives do not explicitly focus on food security, a majority of the species planted by projects in Cameroon have the role of providing fuelwood. In general, all trees can be used for firewood, however there are certain species that are preferred by communities for firewood for reasons such as burns slower or do not produce a lot of smoke (Nyoka, 2003). The role of firewood in enhancing food security in Cameroon is a clear one but underrepresented in literature as 83% of the people in Cameroon, a rate similar to most African countries, depend exclusively on firewood and charcoal for their food preparation (Eba'a et al., 2016). Lack of access to fuelwood causes households to avoid making meals that are energy consuming such as legumes (dried beans) which are a good source of protein, and this could affect their nutrition (Arnold et al. 2011). The wood fuel sector is also a source of almost 1 million full time jobs in the country (Eba'a et al., 2016). By restoring these tree species, the women in these communities are able to prepare their food and boil water as well as save time that they would have used to travel longer distances to collect firewood, which most of the times is a woman's task. One of the projects in Cameroon planted species that provide good fuelwood such as the *Acacia ssp.,* because they realized that fuel wood was becoming scarce in the communities as a result of deforestation.

Figure 3 shows the uses of the species that were planted in Cameroon. The size of the bars shows the number of species that planted that could be used for the categorized use. The figure below displays that most of the species planted by projects are mainly a source of food, soil fertility and timber. In contrast, the top three uses prioritized by men and women are food, timber, and fuelwood as well as medicine for women.

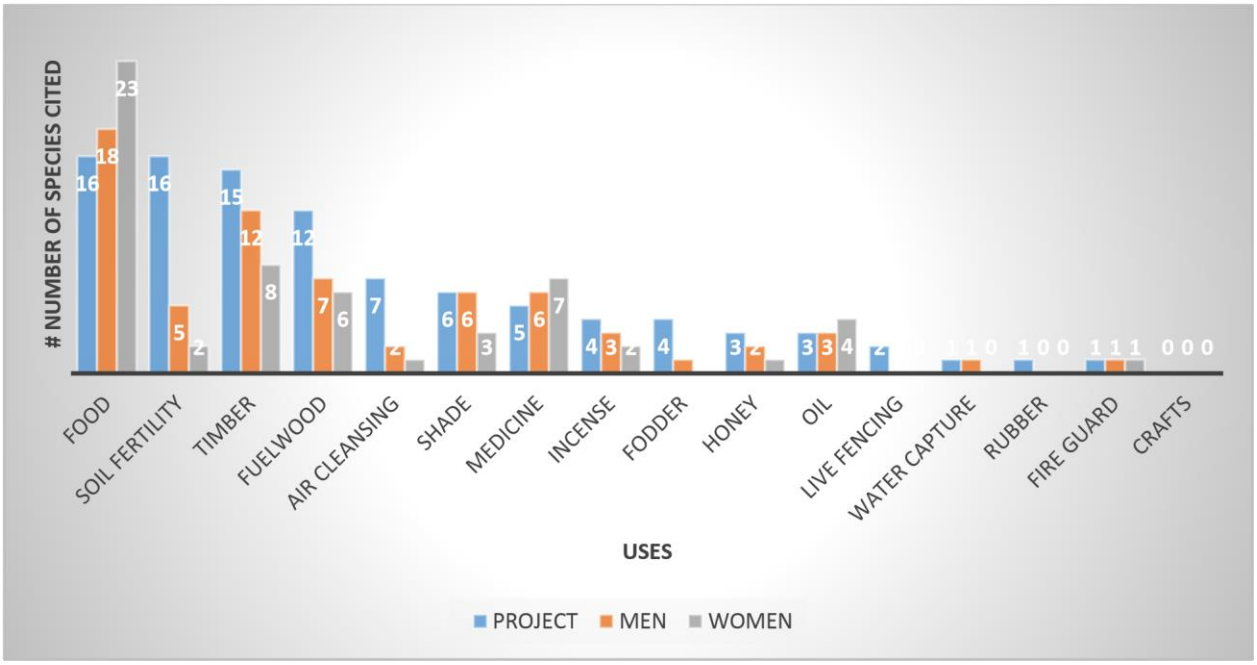

Figure 3. Usages of all tree species cited as planted and protected by projects or preferred by communities in Cameroon and their frequencies.

One common feature of most species planted in both countries was the provision of a wide range of products and services to the communities. Most of the tree species selected indeed provided more one service to the community (Table 4). For example, in agroforestry systems, some of the species used provide shade for the crops, improve soil fertility, capture water, and provide fruits and nuts (Dawson et al., 2013). The species used for agroforestry in both Cameroon and Peru play multiple roles and enhance food security both direct and indirectly. The tree species used for shade in this study such as C*anarium schweinfurthii* (ayele/ fruit noir) *and Afzelia pachyloba* (pachy) in Cameroon are all also fruit trees. The cash derived from the sale of tree products to the households could help enhance food security, and the ecological benefits can increase yield in other subsistence crops if grown around the same area. Other species such as the *Irvingia gabonensis, Dacryodes edulis, Ricinodendron heudelotii, Garcinia kola, Cola spp., and Prunus africana* have been cited in the focus groups discusion as having soil entriching properties and therefore great options for agroforestry.

Table 4. The uses of the species planted by the projects.

Common names	Sc.name	Uses
Acacia	*Acacia spp*	1, 2, 7
	Acacia nilotica	1, 2, 7, 8
	Acacia senegal	1, 2, 7
	Acacia seyal	1,2, 7
Gommier	*Acacia spp.*	1,2, 7,
Anacardier	*Anacardium occidentale*	3, 7,
Avocatier	*Persea americana*	3, 7
Ayous	*Triplochyton scleroxylon*	5, 2
Balanithès	*Balanites aegyptiaca*	1, 3, *
Ambarella or Golden apple/ carcimanga	*Spondias cytherea*	3,
Cassia siamea	*Cassia siamea*	1, 2,
Cocotier	*Coco nucifera*	3,
Njangsang	*Rocinodendron heudolotii*	3, 2
Eucalyptus	*Eucalyptus sp*	5,2
Federbia	*Faidherbia albida*	1, 2,
Fruit noir/ Ayele	*Canarium schweinfurthii*	3,
Gmelina	*Gmellina arborea*	1, 6
Manguier	*Mangifera indica*	1, 3,
Moabi (very rare)	*Baillonella toxisperma*	1, 2,3,5,
Moringa	*Moringa oleifera*	3, 6,
Neem	*Azadirachta indica*	1,2, 3, 6, 7
Palmier à huile	*Elaeis guineensis*	3,
Pin	*Pinus sp*	1, 5,
Plantain	*Musa paradisiaca*	3,
Safoutier	*Dacryodes edulis*	3,
Sapelli	*Entandrophragma cylindricum*	5,
Tali	*Erythrophleum ivorense*	5,
Tamarinier	*Tamarindus indica*	3,
Teck	*Tectona grandis*	5,
(missing common name)	*Prosopis africana*	3,4
(missing common name)	*Leucaena leucocephala*	2,4
(missing common name)	*Dalbergia sp*	2,4
(missing common name)	*Leucaena leucorpus*	2,4
(missing common name)	*Albizia sp*	2,4
(missing common name)	*Khaya senegalensis*	1, 2
(missing common name)	*Psorospormum*	3,
(missing common name)	*Annona senegalinsis*	1,

Keys

1 Firewood	2 Soil fertility	7 Shade
3 Food	4 Forage	8 Live fencing
5 Timber	6 Medicinal	

There is a difference in the motivations behind the species selected for restoration by projects and the communities. The motivations coming from the projects were mostly aligned to the stated objectives of the projects. Soil fertility for example is the most cited use of the species that projects in Cameroon planted which corresponds to an overarching objective of the projects which was to improve soil productivity (figure 1).

3.1.3. Correspondence between local preferences and planted species.

The communities under this study indicated that they depend on forest and trees for the provision of fruits and and vegetables from the leaves of species like, *tané, hilvi, toumbour, ambaka, karotié, ougass, gonokoui* as well as **firewood** for cooking, straw for feeding their animals and honey farming. The women groups also indicated that the forests and trees provided them wild animals such as, francolin, mice and hedgehog. Mushrooms, insects and medicinal species (e.g neem and moringa) were also named as products that were provided by the forests and trees in the communities in Cameroon, but all were either reducing in quantity and some completely disappeared as a result of deforestation and a sharp reduction of forest cover which forced the animals to go to other places.

A total of 34 tree species were used for restoration in Cameroon's restoration projects. The projects in Cameroon planted an average of 8 species per project, with a minimum of 4 and maximum of 14 tree species per project. Implementing a diverse number of tree species could provide a wider range of benefits to the communities because different species of trees provide different services (Nyoka, 2003).

Out of the 34 species selected, only 14 corresponded with the species that the focus groups discussions cited as the species they preferred to be restored (Figure 3). Only one project in Cameroon did not implement any tree species that were preferred by the local community in which they were restoring. The data we have cannot explained why there is this difference between the species communities prioritize and those selected by the projects. Could it be explained by lack of planting material for the species local women and men prioritize, or for a lack of consultation of local people?

3.1.4. Species preferred by the local communities and their uses.

As noted above, most of the species that women and men (community preference) preferred for restoration in Cameroon were species that provide food, such as fruit trees or the trees whose leaves were used for vegetables and sometimes both vegetables and fruits (Table 4). Fruits from species such as the *citrus spp, Annona senegalensis, Ficus spp, balanites aegyptiaca* and *Adansonia digitata* are commonly used for direct consumption. Other species are either processed or cooked in other main dishes to improve the taste of meals, such as R*icinodendron heudelotii* and *Canarium schweinfurthi.*

Other species are used for extraction oil from their seeds, this oil is used for cooking and sometimes for cosmetics. The species used for oil for cooking include *Azadirachta indica (Neem oil) and Elaesis guineensis (palm oil).* Fruit trees such as these have demonstrated to play a double role in enhancing food security as they provide both nutrition and income from their sales. Edible parts of the fruit can be the pulp, or in some cases the seeds and sometimes both the pulp and the seeds can be used for consumption. An increase in the income of a household from the sales of the fruits could provide a possibility of the household to procure more foods for the house, depending on how it is spent.

Medicinal species were also common among the species selected by women. Some trees planted in the projects are used for fodder for livestock which is used for household consumption and sale in some cases (Dawson et al., 2013; Mohamed-Katerere & Smith, 2013). In Cameroon the *acacia spp* and *proposis Africana* have been cited for the same reason. The nutrients derived from leaves of shrubs and trees for animal feed have been argued to contain more protein which assists in growth and productivity of the animals than the nutrients derived from grass (Leng, 1997).

The women and men from the study have indicated that the causes of land degradation in the communities in Cameroon have been a rising rate of tree cutting without replacing and bush fires which have caused a reduction in soil fertility and this caused an increase in use of chemical fertilizers which again damage the soil creating a vicious cycle of degradation. About 50% of the species planted by projects in Cameroon, were indeed for regeneration of soil among other uses. Tree species like the *Acacia spp, Dalbergia sp* and *Triplochyton scleroxylon* among others were select because of their properties in enhancing soil fertility.

3.1.5. Local community consultation

In general, although there is an important discrepancy between the species prioritized by women and men and those selected by projects, women and men participants state that communities were consulted in the restoration projects., However the women in Cameroon explained that even though there is an increasing participation by women in the land management decision-making settings, most feel like they are not well represented in comparison to men. Most women indicated that they do not own land on their own. They use their husbands' lands as they are the one who inherit the land. When they use the land, they are given instructions on how to use it by their husbands and they are also not core decision makers on the proceeds from the farms.

As explained in one female focus group in Cameroon, "It is the husband who decides on the big expenses but at the end of the harvest, the husband gives a part of the harvest to his wife so that she can solve his small financial problems."

On the benefits of the restoration projects in Cameroon the communities mentioned the improvement in soil productivity and availability of firewood, fruits, medicine, straw, fruits and vegetables. In another female focus group in Cameroon it was indicated that, "Because they have helped with agricultural production, there is better food security."

3.2. Peru

3.2.1. Project objectives

As shown in Table 2, the main objectives of the projects in Peru are mainly agroforestry and regeneration of degraded lands. As in the case of Cameroon, the stated objectives in the project documents do not focus on the benefits of the land restoration projects for the community members. Project staff from Peru also provided additional information on these objectives (Table 5). These sub-objectives focus mainly on the goals and outcome of the restoration projects to the households. Livelihoods and food security concerns are implicitly stated in the sub objectives as they are focused on the benefits of land restoration to the community members.

Table 5: project sub-objectives Peru.

Project	Project sub-objectives
ER1	-Generate economic benefits from the cultivation of cocoa alternative -Diversify and improve the performance of bread wear products -Produce and market cocoa products such as chocolate
ER2	-Swap the illicit cultivation of coca for a package of alternative crops (cocoa, beans, cassava and banana). -Implement an agroforestry system with alternative crops associated to improve soil and productivity. -Generate economic benefits for Chazuta farmers. -Training on different topics: forest management, agricultural practices, phytosanitary management of cocoa plots, strengthening of organizations, gender among others.
ER3	-The main objective of the Cocoa project in the Juanjuí area was the production of organic cocoa in the long term. -Manage producer qualification to sell the legal lumber. -Promoting agroforestry with fruit trees for increasing incomes
ER4	-Improving the quality of life of the comuneros with the different activities -Recovering soils that were just for grazing -Social: An empowered community and women leaders. -Economic: Export of harvested mushrooms and sale of wood from managed plantations.

	-Environmental: Landscape forest that provides multiple environmental services and business. -Improving the landscape in the upper zone -Empowering communities on afforestation issues -Providing community members with alternative activities to mining.
ER 5	-Natural regeneration is a form of reforestation. -Improve quality of life. -There has been illegal logging, burning, etc. So, the goal was to restore those deforested areas.
ER6	-Protection of natural regeneration, seed collection and dispersion, trained promoters, marketing modules of non-wood producers.
	(Beekeeping and jam making) -Preserved and managed forests -Organic production in agroforestry plots - Improved soils -Protection of species such as carob, toad, faique, Palo verde

3.2.2. The tree species selected and planted, regenerated or protected by the projects and their uses.

An average of 5 species per project were planted in Peru with a minimum of 2 and maximum of 8 species. Like in Cameroon the tree species provided served more than one purposes. For example, the species used for agroforestry provided shade for cocoa and also fruits used for consumption such as avocado and guava. Some timber providing trees which were also known to grow fast were used in the agroforestry farms in Peru as a long-term source of income when the crops were out of season.

Table 6. List of all species planted in Peru and their uses.

Common name	Sc. Name	Use
Algarrobo	*Pale proposis*	3, 4, 5, 8
Bolaina	*Guazuma crinita*	5, 7
Capirona	*Calycophyllum sprucaenum*	5, 7, 8

Cedar	*Cedrela odorata*	5, 7, 8
Charán	*Caesalpinia paipai*	3, 4
Chuncho Pine	*Schizolobium amazonicum*	5, 7, 8
Eucalyptus	*Eucalyptus sp.*	1,5,8
Faique	*Vachellia macracantha*	3, 4, 7, 8
Palo verde	*Aculeata Parkinsonia*	3, 4
Lupuna	*Ceiba pentranda*	5, 7, 8
Mahogany	*Swietenia macrophylla*	2, 5, 7
Oje	*Ficus sp.*	3, 5,7
Overo	*Cordia lutea*	5, 2, 6
Paliperro	*Vitex sp*	5, 7
Pine	*Pinus spp.*	5, 7
Pine chuncho	*Pinus spp.*	5, 7
Quillasisa	*Vochysia sp.*	5, 7
Sapote	*Colicodendron scabridum*	3, 5
Tornillo	*Cedrelinga cateniformis*	5, 7
Shihuahuaco	*Dipteryx micrantha*	5
Shimbillo	*Inga spp.*	2,3, 8
Teca	*Tectona grandis*	5, 6,7

Keys

1 Firewood 2 Soil fertility 7 Shade

3 Food 4 Forage 8 Live fencing

5 Timber 6 Medicinal

In Peru, food ranked fifth among the top 8 reasons that species were selected as preferred species for restoration by the projects. The topmost ranked use of the species in Peru was timber (figure 3). The food providing tree species include *Colicodendron scabridum* locally known as Sapote which was planted by 50% of the projects, *ficus sp.*, locally known as Oje fruit and *pale prosopis,* whose leaves are also used as fodder animals and the tree is commonly known as “algarrobo” or carob in English. In Peru *Persea Americana* (avocado) and *Inga sp* (guaba) are all also used for consumption apart from their role in proving shade when mixed with cocoa.

Shade is on the top uses in Peru which corresponds with the project objectives (table 6) as most were focusing on agroforestry in cocoa production. Common species used for shade in Peru include the i*nga spp*., *pinus* spp and eucalyptus spp. These species are used to shade *Theobroma cacao* (cocoa) which is an important cash crop in Peru (Ehrenbergerova et al., 2016). The trees used for shade also play an important role in carbon sequestration and as a host for insects, birds and other animals that are an important part of the ecosystem.

Figure 3 shows the uses of the species that were planted by the projects in Peru. The size of the bars shows the number of species that planted that could be used for the categorized use. The data shows that most of the species planted by projects are mainly timber producing species, shade trees

and tree species used for live fencing which corresponded with the uses of the tree species that were preferred by men and women.

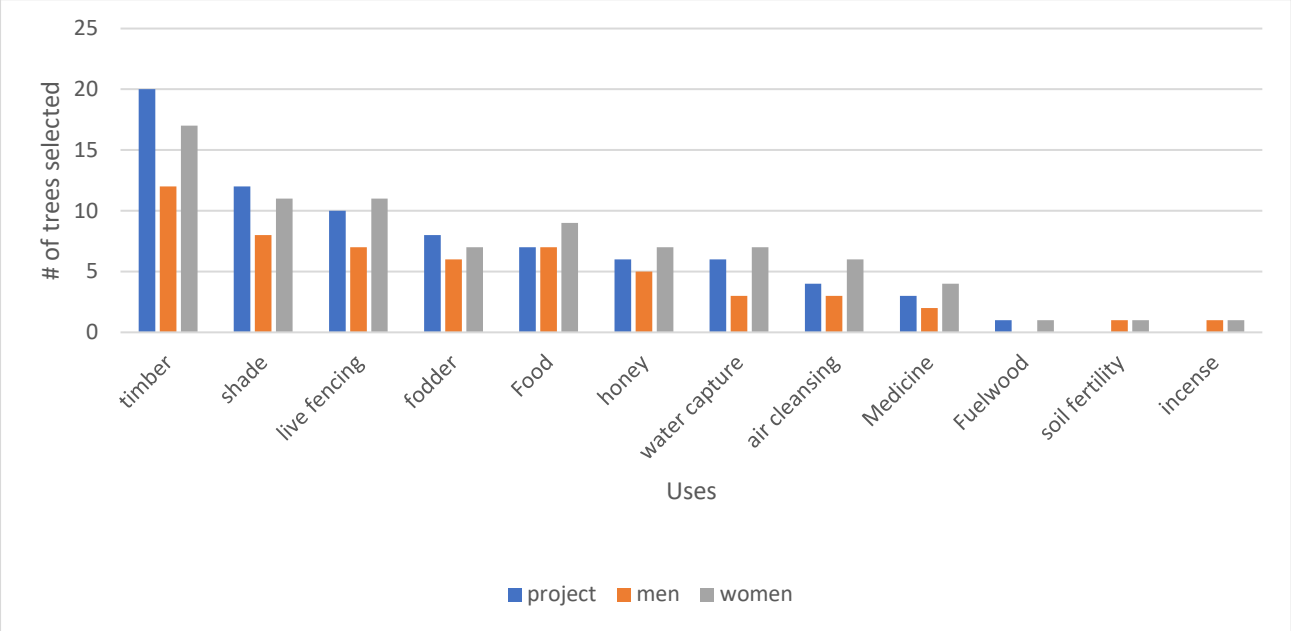

Figure 4. The uses of species planted by projects.

Both men and women focus groups indicated that that there had been a major decrease on the vegetation cover which caused among other things animals to go far from the surroundings. The land degradation in Peru according to the focus groups was caused by deforestation which was mainly used to sale as a source of income for the families which could potentially affect their household food security.

3.2.3. Reflection of local preference in species planted

The projects in Peru planted a total of 22 species, out of which 16 were species that were mentioned as preferred species in the men and women focus groups (Figure 4). As for Cameroon, it is not clear why there is such a disjuncture between the species the projects selected and those that local women and men prioritize. It should be noted that the motivations for specie selection in the collected data did not vary much. As a result, even though the projects planted different species, their uses in most cases would be the same uses as the ones selected by local communities.

3.2.4. Species preferred by local communities and their uses

The communities in Peru would have prioritized species that provide fruits, wood for cooking, wood such as *Vochysia sp.* (quillessia) for building houses, flowers used for medicine (e.g *Cordia lutea* a shrub commonly known as “overo”) and feed for animals. In Peru species such as P*ale prosopis, Caesalpinia paipai* and *Cordia lutea* have been cited as used for fodder in the communities.

Timber has been the most cited use of trees that were preferred in Peru by both local communities and the projects. Smallholder farmers in Peru produce timber derived from the timber species used in agroforestry in cocoa farms. The timber derived from the species is a long-term source of income for the community (Garrity & Mercado, 1994). Fast growing timber trees such as *Guazuma crinita* commonly known as bolaina, C*alycophyllum spruceanum* (capirona) and *Ceiba pentranda* (lupuna) in Peru, are all examples of a timber species that are believed to be fast growing wood and they are all species that were planted by most projects in Peru but also mentioned by men and women as the preferred species for restoration (Annex 2). These species are also used as shade for cocoa and as live fences assisting in keeping moisture in the soil for increasing crop yield (Putzel, et al., 2013). *Cedrela spp* (cedar), whose top motivation for selection was use for timber was most selected women (50%) of the female focus groups followed by *Colicodendron scabridum* (sapote) and *Swietenia macrophylla* (mahogany) which were also most selected among the men in Peru. The most selected tree species in Peru were for timber, shade and used as borders for agroforestry systems in the cocoa farms.

3.2.5. Local community consultation

As compared to Cameroon, in Peru women showed confidence in their participation and they indicated that they were consulted in the restoration activities by the projects. Men in both countries held positions in the community organizations that were involved in environmental management and these organizations were consulted by the restoration projects. This put an advantage for men in Cameroon because women were not represented as they mostly did not own land therefore, they were rarely part of community organizations. The case was a little different in Peru where there had been an increase in women being involved in the organizations therefore even not sufficiently represented there were some women consulted by the projects. One woman in a focus group in the ER4 project considers that this is: *"Because we also have our experience in the forest, how to identify the species of trees that grow or serve and above all choose what we need most."*

3.3 Across countries

3.3.1 Gendered differences in tree selection.

There are no clear patterns on gender and tree species selection in Cameroon and Peru. Women cited in general more species than men in both countries (Annex 1 and 2) but in most cases the uses of the species selected by both men and women were similar. The uses of the species were also similar across countries, timber, food, shade, firewood, soil fertility, medicinal, air cleaning, honey production, incense and art. There was also no tendency that could be associated to gender, they are mentioned similar uses.

The knowledge about the tree species and their benefits was in general high across both men and women focus groups. Knowledge of benefits of tree species is a major motivating factor in the selection of trees that communities could prefer to plant as different trees have offer different properties to the soil (Li and Lou, 2012). From her experience with farmers in Sri Lanka, Shatou (2019), indicated that farmers are aware of the different species and the importance of diversifying crops on the farm.

The participants from both Peru and Cameroon could mention benefits for the species they preferred to be planted around their area. *Moringa oleifera (*moringa), *Psidium guajava* (guava) and *Persea Americana* (avocado) which are all fruit trees were the most preferred tree species in Cameroon by the women focus groups while *Manguifera indica* and *Persea Americana* (avocado) again were the most preferred species for restoration for men in Cameroon for their nutrition benefits which were known to both men and women.

3.3.2 Project objectives and preferred species

There is a tendency in the types of species that the projects selected for restoration in both countries which relates largely to the objectives of the projects. Cameroon has more tree species planted per project and overall. This could be as a result of the larger area covered by the projects as compared to Peru, since in Cameroon the six projects were planted in 11 communities as compared to the six communities in Peru thereby giving a wider coverage of land, as well as the greater biodiversity of the Cameroon sites. There is a similarity in the species selected by the FGs in Peru while in Cameroon the species preferred varied a lot across FGs, the motivations for preference of species were however similar across FGs from all countries (Annex 1&2). Even though Cameroon implemented more species in general and more species per project, the species selected did not correspond well with the local communities' preferences (Anex 1) which could be a result of lack of consultation on species selected as already shown by the women focus groups.

Not all land restoration projects have food security part of their goals, and this has been displayed in the dataset analyzed in this paper. Comparing the two countries, all projects in Peru had more sub objectives more directly linked to providing benefits to the community members as compared to Cameroon. Most of the subobjectives of the projects in Cameroon were more centered on ecological benefits than community benefits. However, overall the restoration efforts can contribute to **availability** of food, because of the improvement in soil productivity as a function of trees planted, and fruits from fruit trees which enhances **stability and access.** Availability of firewood from trees that is used for food preparation contributes to **utilization.** However, **in** one project in one KII in Cameroon, a project staff member agreed that even though the project was indeed achieving its ecological objectives, benefits of land restoration to the community members were not optimized.

4. Conclusion

The global land and forest restoration agenda refer to food security as a desired outcome, but to what degree is this concern reflected when restoration is operationalized in projects on the ground? What steps could be taken to improve synergies between environmental and food security objectives?

This paper has addressed these big questions by examining how different tree species planted or regenerated in restoration projects contribute to different pathways by which land and landscape restoration contribute to food and nutrition security in Cameroon and Peru.

The objectives of the projects under review focus on ecological benefits of land restoration, thereby missing out on the chance to incorporate meeting people's needs in the process of land restoration. To advance food security and broader livelihood objectives, the choice of species used in land restoration programs is important. A careful selection of species would help meet felt needs of the communities without diminishing the ecological benefits.

In selecting these species, it is important to recognize the people who live in the communities where restoration programs are going to take place and stand to benefit or lose from restoration. Although the projects selected species that had many of the same uses as those prioritized by the communities, the species themselves were different. Further research is needed to understand why that is the case.

Land and landscape restoration projects have the potential of contributing directly to food security and nutrition for example by incorporating species that provide food and by diversification of crops in agroforestry systems that builds resilience in cases of unfavorable weather conditions since some crops are more tolerant than others. They can also contribute indirectly, for example by generating income that could be spent on improving the family diet or by improving soil fertility or providing a habitat and food for wildlife, birds and insects.

Food security impacts of land restoration projects could be enhanced by:

- Including food security among the stated objectives of the project; Spelling out the pathways by which food security objectives can be attained in a particular project;
- Ensuring that the choice of tree species is driven by food security concerns as well as others;
- Considering the conditions that influence whether or not species which could indirectly contribute to food security actually do so, for example who controls the use of profits generated by sale of timber or tree products;
- Ensuring that the selection of appropriate tree species is discussed and decided with and by both women and men in the concerned communities.

More sensitive knowledge of the links between land restoration and food security is necessary for equipping decision-makers and the different stakeholders involved to integrate food security and livelihood improvements into the land restoration programs.

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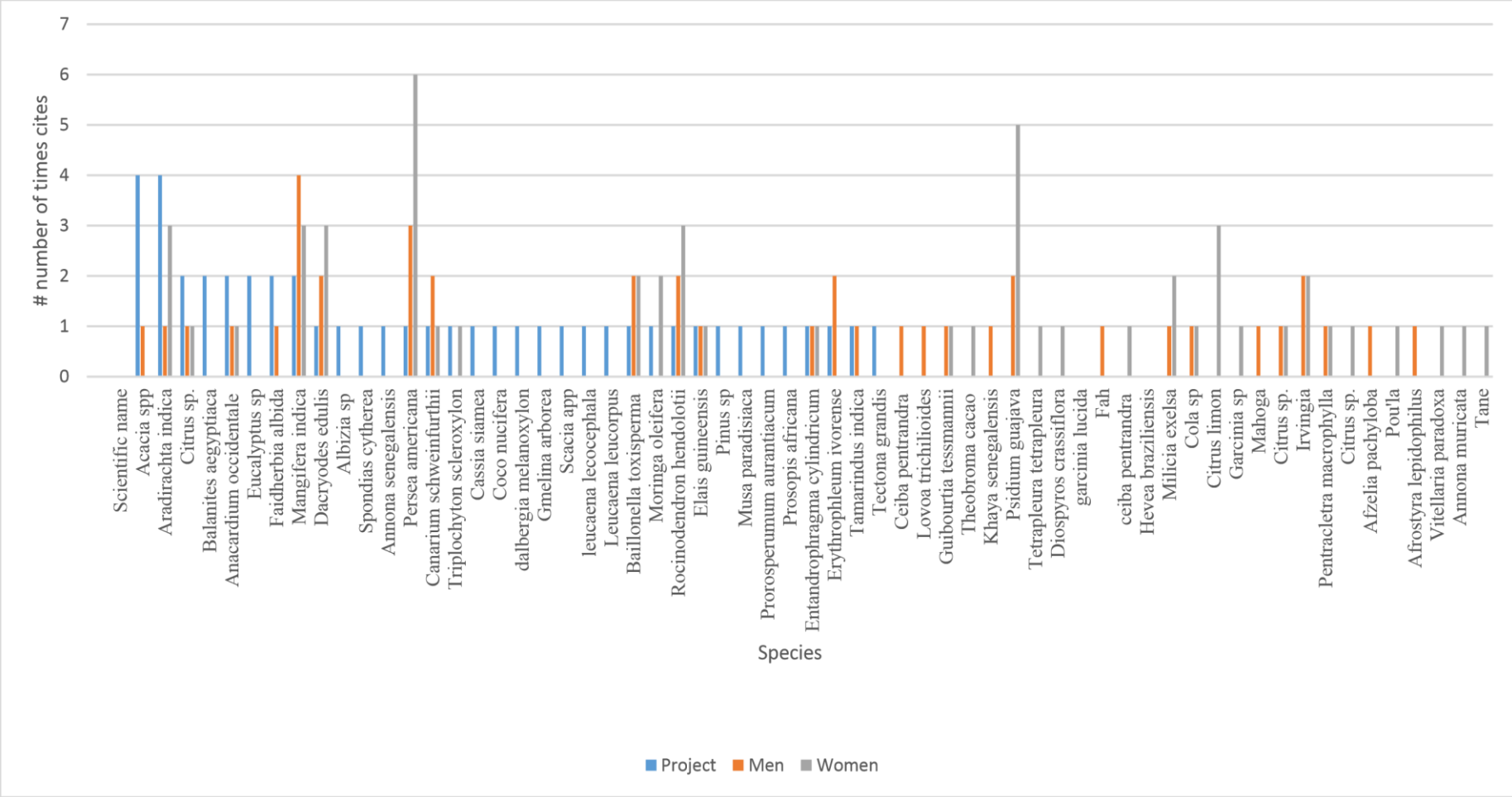
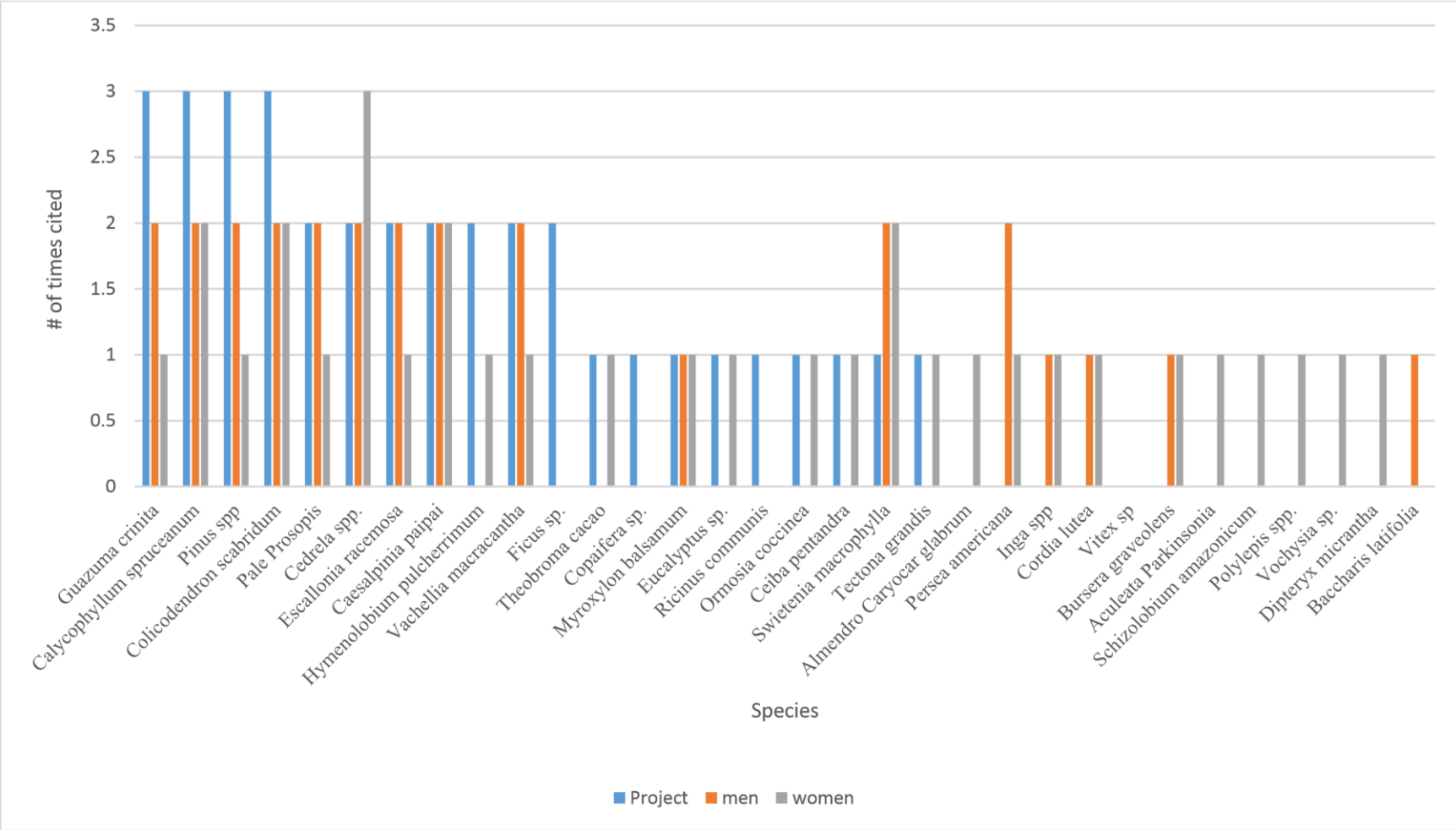
6. Annex



Annex figure 1. All species cited in Cameroon and the number of times cited.

The Annex figure 1, shows a list of all the species cited in Cameroon by men, women and also the ones implemented by projects. The size of the bars indicates the number of times the specie was selected by a group.



Annex figure 2. All species cited in Peru and the number of times cited.

The Annex figure 2, shows a list of all the species cited in Peru by men, women and also the ones implemented by projects. The size of the bars indicates the number of times the specie was selected by a group.