

Sustainability Implications of Stakeholders' Perspectives in Agroforestry Management in Manyu Division, South West Region Cameroon

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ABSTRACT

Agroforestry which focuses on the domestication and cultivation of Non-Traditional Forest Products (NTFP) has important sustainability implications for both livelihoods. Brundtland Report and subsequent international and regional instruments, sustainable development as epitomized in Agenda 2030 of the United Nations Organisation (UNO) has become the cornerstone of developmentalism. This study seeks to examine the interplay of sustainability from a stakeholders' perspective. The findings of this qualitative method which was conducted in 11 villages in Manyu Division of the South West Region revealed that there was a plethora of stakeholders involved in the domain of agroforestry in the study area. These stakeholders were composed of state institutions (Ministry of Forestry and Wildlife-MINFOR, Program for Sustainable Management of Natural Resources in the South West Region-PSMNR-SWR), international organisations (World Agroforestry Center-ICRAF, the World Wildlife Fund-WWF) and local community based institutions (EFOKHOYU), among others. Agroforestry related programmes implemented by these stakeholders ranged from the creation of training centers, allocation of funds and seedlings to farmers as well as the dissemination of knowledge on land conservation and the development of partnerships among farming communities. The findings revealed that this could be felt at the level of household food security with increased cultivation of species such as *Irvingia gabonensis* and *Irvingia wombulu* by nearly 62%. Such high rates of domestication and commercialisation of these species implied that the livelihoods of local farmers were assured without endangering over-exploitation of scarce forest resources. In conclusion, some challenges such as issues related with accessibility, high cost associated with domestication among others complicate the activities of stakeholders in Manyu Division. That notwithstanding, the study recommends that tailor made policy interventions should be deployed to address the challenges raised.

Keywords: Non-Traditional Forest Product (NTFP), Sustainability, Poverty Alleviation, Manyu Division, Stakeholders' Perspective.

INTRODUCTION

Environmentally conscious development which is emphasised by the Sustainable Development Goals (SDGs) has gained prominence in policy circles at the global, regional, national and local levels (Ministry of Economy Planning and Regional Development (MINEPAT), 2009; African Union Commission [AUC], 2015; UN, 2016). One way of actualising the policy objectives of sustainability through agroforestry has been to lay emphasis on domestication of Non-Timber Forest Products (NTFP). It is believed that, with domestication, livelihood practices which rely on unsustainable exploitation will be curtailed while simultaneously achieving conservation and sustainability. The 2016 switch from the Millennium Development Goals (MDGs) to the SDGs by the international community is a clear pointer of the position given to the concept of sustainability in mainstream development policy and practice. In September 2015, at the World Summit Agenda 2030 was setup with 17 SDGs built on the principle of 'leaving no one behind'. Agenda 2030 highlights important objectives which has serious implications on sustainability ranging from access to quality education, health, gender equality, management and conservation of marine life among others (UN, 2016). Amongst 17 SDGs 1, 13, 15 and 17 specifically aim to eradicate extreme poverty and hunger, achieve food security, promote climate action and sustainable forest management, halt land degradation and create partnerships to achieve the SDGs (Ibid). As a party to the SDGs, Cameroon is obligated to live up to its commitments by ensuring that programmes, policies and development priorities align with global and regional trends on sustainability (MINEPAT, 2009). This need is further reinforced by Africa's Agenda 2063 which seriously takes into consideration the concept of sustainability. Africa's vulnerability with regards to climate change mitigation and adaptation as well as other challenges hampering the continent's development highlights the need for sustainability to emerge as a linchpin of development policy and practice (AUC, 2015). In the same vein, Cameroon's development blueprint-Agenda 2035-was developed within the context of the SDGs and invokes the need for the county to reorient its development trajectory to reflect sustainable management of human, natural, and financial resources. Mimicking the spirit of sustainability invoked in the SDGs and Agenda 2063, Cameroon through its development blueprint has pledged to 'Leave No One Behind' in the pursuance and attainment of emergence by 2035.

The practice of agroforestry had existed since creation as the domestication and cultivation of wild food varieties can be directly associated with the practice of cultivating land (Wilson and Lovell, 2016:4). Food crops as well as fruit producing trees have been cultivated in tandem with raising livestock on the same piece of land. This has evolved over time to connote mainstream agricultural practices. For example, Cocoa was first introduced in Cameroon and by extension Manyu division in 1913 during German colonial administration (Takor, 2015). This cash crop which was cultivated alongside other food crops has become one of the most prominent cash crops cultivated in Manyu as well as other parts of Cameroon (Ibid). In view of the fact that domestication of NTFPs in an agroforestry setting is the focus of this study, it therefore becomes relevant to emphasize that such a hybrid cultivation practice focus in communities which are located within forest zones.

METHODOLOGY AND CONCEPTUAL FRAMEWORK

Methodology

This paper adopts a qualitative design with direct observation, in-depth interviews and semi structure and literature review as our main data collection techniques (de Vaus, 2001; Creswell,

2014). Through observation, we were able to identify the activities of actors, such as types of agroforestry resources and practices, domestication in nurseries, harvesting and gathering from farms or forests, methods of preservation and marketing. Some of the agroforestry species were identified with the help of the farmers and FREEROM (Cooperative found in Mamfe center) staff. In-depth interviews were instrumental in revealing individual farmer's experiences in the agroforestry sector and its effects on their livelihoods with the help of the stakeholders on the field. The semi-structured interview gave room for open ended responses from key informants which helped to cover questions that were not perceived.

The respondents were selected through the snow ball sampling technique. This technique was adopted because agroforestry was not practiced by all farmers in the identified villages. These informants were selected on the basis of their mastery of the subject matter and the terrain. The key informants who participated in the study introduced other reliable informants which greatly facilitated data collection. Eleven villages were studied out of 238 villages Manyu division were randomly selected because Agroforestry is highly practiced in all the villages in Manyu as well as the similarities in their agricultural practices. In most of these villages, forestry species were already cultivated even in the backyards of many homes. It was discovered that the eleven villages selected for the study cultivated most of the forestry species found in Manyu division.

Data collected was analyzed using content analysis performed on primary data gathered with field interviews. Viewpoints from the interviews were condensed and coded into themes with Microsoft Office Excel which were used to display results and trend analysis to show the contribution of agroforestry to sustainable development in Manyu.

Table 1: Villages Selected from Study Site

Sub-Division	Villages Selected
Akwaya	Akwaya
	Bayangbu
Eyumojock	Eyumojock
	Nchang
	Egwekaw
Mamfe	Mamfe
	Bessong abang
	Ossing
	Okoyong
Upper Bayang	Bachuo
	Bachuo akabe

Source: Compiled by Author, 2020.

Conceptual Framework

The conceptual framework of this study is referred to as Agro-Africanism which draws inspiration from Africanism. Africanism implies a worldview encompassing languages, culture, among others that is characteristically embedded in African realities and modes of living. It is founded on the belief that Africans South of the Sahara and their culture should predominate the development of interventions such NTFPs and should be embedded in indigenous cultural processes/practices. From an agro-Africanism perspective, emphasis is laid on the cultivation of indigenous species for development. Some agroforestry species cultivated in Africa such as

cocoa, coffee, rubber etc. are rooted in external prices process which can be described as exploitative and unfair. Furthermore, the final product is more expensive as opposed to the price paid for the unfinished product. The idea of allowing the determination of market prices in the hands of economies that do not control the primary sector has adversely affected Africa's ability to develop and control the market for products for which it holds the primary production responsibility. This means that in the event of a drop in international market prices as was the case in the 1990's, livelihoods of local farmers and economies are adversely affected. As an illustration, the drop in the prices of coffee pushed many farmers to destroy their coffee farms and eventually replaced these farms with food crops in Manyu. However, many of Africa's NTFPs such as "eru, njansa, bush mango are highly sought both at the local and international levels. As such, scaling domestication and sustainable exploitation of these resource are imperative for Africa to guarantee and leverage income levels and livelihood of local African farmers. This will definitely contribute towards fighting unemployment as well as meeting Africa's aspiration to modernize agriculture in the coming decades.

It therefore goes without saying that, the concept of agro Africanism should be developed as a novel approach to ensuring sustainability of economies and livelihoods based on strictly African products and indigenous system which are rooted in local realities and address local issues. It depicts a new dawn characterised by local mechanisation of wild African species that are gradually becoming brands across the continent. Natural forest habits such as the Congo Basin forest located in Central Africa contains a huge diversity of biological resources including non-wood forest products (NWFPs), comprising two Gnetum species that are widely traded in the region, *Gnetum africanum* and *bucholzanum*, locally known as "Eru" in Cameroon.

The great commercial value of "Eru", which represents an important product in the cross border trade between Cameroon and Nigeria has endangered widespread exploitation without corresponding efforts to replace, modernise or mechanise its cultivation. This, coupled with a lack of effective management of forest which provide natural habitat for these species has led to increased risks of extinction thus compromising the long-term sustainability of this important natural resource. Exports of NTFPs product from Cameroon to Nigeria according to Ndume, Ingram and Awono, (2009) were in excess of 4000 tons, up from about 428 tons in 1992. This accounted for about 4 billion CFA worth of Eru exported to Nigeria within the stated period. Cameroon's global Eru export is estimated at about 9.8 million dollars representing 0.3 per cent of the country's total exports.

By encouraging and protecting the mechanised and improved cultivation of local indigenous species, Africa will ensure sustainability of its local economies, strengthening competition as over reliance on foreign products will reduce. Furthermore, local communities will be protected from external influence engendered by fluctuating prices of products that are primarily African and should benefit from local consumption, and eventually promoted to a global brand. The structural adjustment program of the 80s that affected the prices of cocoa and coffee putting farmers in oblivion could also likely affect this rapidly emerging product in the global market (Ndume, Ingram and Awono, 2009). Agro Africanism like Pan Africanism will bring an all-new perspective to handling the production and commercialisation of typically local African species. It will encourage farmers to cultivate what satisfies the local market thus enabling them to influence price setting and stabilisation thereby improving their socio-cultural and economic wellbeing. While this is an exciting new concept with a solid future if effectively developed, it

must be mentioned that it requires more research and theoretical/scientific development to further demonstrate the added value of enhanced local promotion and production of typical African species that have proven their worth in the local and global markets over the years.

CONTEXTUAL ANALYSIS

Considering that this paper focuses on sustainability, it becomes relevant that an analysis should be carried out with reference to the SDGs vis-à-vis the objectives of this paper. As such SDGs 1, 2, 13, 15 and 17 which are directly linked to the concepts of sustainability, agro-forestry management, forest conservation and poverty alleviation are contextually analysed in this section. These goals are used to gauge Cameroon's current posture as the country mobilises to implement policies targeting the attainment of sectorial priorities to fulfil its obligations. In that regard, SDG 1 seeks to eradicate extreme poverty in all its forms for people everywhere. Poverty is currently measured as living on less than US\$ 1.25 per day (ICSU and ISSC, 2015). According to the World Food Programme (WFP) about 40 % of Cameroon's approximately 23 million population live below the poverty line, indicating that the country's Human Development Indicators (HDI) are low (www1.wfp.org/countries/Cameroon).

Goal 2 of the SDGs strives to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Globally, one in nine people (795 million) are undernourished, with the vast majority of the world's hungry people found in developing countries like Cameroon. The 2016 Global Hunger Index (GHI) score for Cameroon was 22.9 % with the level of hunger described as 'serious' (Grember *et al.*, 2016). Even though, multi-stakeholder interventions have targeted the eradication of hunger in Cameroon, the Growth and Employment Strategy Papers (GESP) reveals that the proportion of Cameroonians living below the poverty line in 2007 was 39.9%, while the nation's proportion of children less than 5 years old suffering from hunger stood at 19.3% in 2006 (Government of Cameroon, 2009). The United Nations Office for the coordination of Humanitarian Affairs reported a 189% increase in food insecurity between 2013 and 2016 and stated that 2.6 million people in Cameroon were found food insecure in 2017 (World Food Programme [WFP], 2017). In April 2018, the World Food Programme reported that the number had risen from 2.6 million to 3.9 million people.

Furthermore, SDG 13 aims to take urgent action to combat climate change and its impacts. Climate change is increasing the frequency and intensity of extreme weather events such as heat waves, droughts, floods and tropical cyclones, aggravating water management problems, reducing agricultural productivity and food security, increasing health risks, damaging critical infrastructure and interrupting the provision of basic services such as water and sanitation, education, energy and transport. Cameroon is particularly exposed to climate change impacts because of its territories in Sahelian zone, which are hard hit by desertification, and its territories in coastal areas that are threatened by rising sea levels. Due to the Cameroon's extensive ecological diversity, the nature of climate change and its impacts vary widely from one region to another. However, if current trends in climate change persist all agro-ecological zones will be affected in one way or another as their socio-economic well-being is largely dependent on the viability of the main development sectors.

Goal 15 seeks to promote sustainable forest management, combat desertification, and halt and reverse land degradation and stop biodiversity loss through agroforestry. Cameroon has

extremely diverse ecosystems and is signatory to several international environmental conventions, including the Convention on Biological Diversity. The country's biodiversity and biological resources have been subjected to considerable pressure by both legal and illegal forest exploitation (Africa Development Bank [AfDB], 2018). An estimated 35 % of overall log production in Cameroon in 2013 was illegal (Hoare, 2015). About 27.5 % of forest is degraded yearly in the country (ADB, 2009). Its annual deforestation rate of 0.9 % is among the highest in Africa. Continuously decreasing available arable land area per inhabitant leads to more deforestation (AfDB, 2018). Despite the increase in number of protected areas in Cameroon to preserve biodiversity, environmental degradation continues to increase because a high proportion of the population is dependent on fuel wood for energy and more forest continues to be allocated as logging concessions (Atyi *et al.*, 2016).

DEBATES ON SUSTAINABILITY, AGROFORESTRY AND LIVELIHOODS

Sustainable development is a concept that finds its roots in the publication of the United Nations Commission on the Environment of 1987 titled "Our Common Future" and also known as the Brundtland Report. Stemming from the challenges of the post-World II war era on the world economy and the environment, there was need to develop a programme of action for the future that could guarantee sustainable development. This was because the contribution of agricultural production and productivity to welfare was declining due to social, economic and environmental challenges (Entete and Amusa, 2010; Alao and Shuaibu, 2013)

Kuhlman and Farrington, (2010) view agroforestry as a three dimensional concept qualified as multifunctional, with economic development, environmental protection and social equity pillars as its dimensions. If any one of the pillars is weak, then the system as a whole becomes unsustainable (Adams, 2006). Recently added to these dimensions is the transversal pillar crossing-cutting these three pillars and dealing with management decisions. In fact, the Brundtland Report defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Agroforestry is rooted in the three pillars of sustainability and should be: (i) economically viable - structuring and managing forest operations so as to be sufficiently profitable, without generating financial profit at the expense of the forest resource, ecosystem or adjacent communities (Forest Stewardship Council [FSC], 2014). (ii) socially beneficial - helping both local people and society at large to enjoy long term benefits and also provide strong incentives to local people to sustain the forest resources and adhere to long-term management; and (iii) Environmentally suitable for ensuring that harvest of timber and non-timber products maintains the forest biodiversity, productivity and ecological processes (Emas, 2015). The history includes landmark international events such as the 1987 Brundtland Report, the 1992 Earth Summit in Rio de Janeiro, the 1997 Rio+5 Conference and the 2000 Millennium Summit in New York, and the 2002 World Summit on Sustainable Development in Johannesburg (Drexhage and Murphy, 2010). The concept of 'sustainable development' is now central to the programmes of many governments, businesses, educational institutions and non-governmental organisations around the world. The 2016 switch from the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs) by the international community is a clear pointer of the position given to the concept today.

The commitment to equity and fairness is that priority should be given to improving the conditions of the world's poorest, and decisions should account for the rights of future

generations. The second is a long-term view that emphasizes the precautionary principle that “where there are threats of serious or irreversible damage. Lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation (Drexhage and Murphy, 2010). The book titled “Silent Spring” by Rachel Carson (1962) on environmental degradation was considered a turning point in global understanding of the interconnections between the environment, the economy and social well-being. The analysis of Rachel Carson’s work provides lasting solution for achieving sustainable development based on environment, land use systems and technologies.

Agroforestry, being land-use systems and technologies deliberately used on the same land-management unit in some form of spatial arrangement or temporal sequence sustains systems that nurse sustainable ecological and economical interactions between the different components (Lundgren and Raintree, 1983). Traditional agroforestry practices are studied in the understanding of resource use by satisfying needs and sustaining the environment that provides a plethora of these environmental goods and services (Godfray and Garnett, 2014). According to Lundgren and Raintree (1983) and Drexhage and Murphy (2010), sustainable development concerns suggest that meeting the needs of the future depends on how well we balance social, economic, and environmental objectives- or needs- when making decisions in the contemporary world situation on environment and society. It is therefore very important to consider all (environmental, economic and socio-cultural) components in Agroforestry systems.

A critical study on the examination of the relationship between preservation of natural resources and industrial growth with respect to agroforestry raises the following puzzling questions: Can the long term economic objective of sustained agricultural growth be met if the ecological objective of preserving biodiversity is not? What happens to the environment in the long term if a large number of people cannot afford to meet their basic household needs? If people do not have access to safe water, and needed wood to boil drinking water to prevent sickness will they worry about causing deforestation to obtain wood? If people have to drive long distances to get to work each day, would they be willing to move or get new jobs to avoid polluting the air with their car exhaust? If we do not balance our social, economic, and environmental objectives in the short term, how can we expect to sustain our development in the long term (UN document, 05/08/2017, <http://www.un-documents.net/ocf-02.htm>).

Sustainable development is vital for the empowerment of rural and indigenous people to restore and protect tropical ecosystems. The preservation of biological diversity, ecosystems and the natural environment is critically important for the survival of mankind, plants and animals ((Atangana *et al.*, 2002). In addition to the intrinsic value of nature and wildlife, biological diversity and healthy ecosystems provide mankind with many things that sustain lives, including clean air and water, fertile soils, a stable climate, food, medicines, materials and technologies, and a diversity of genes and species - not to mention recreational opportunities and natural beauty (www.ecologic.org 04/07 2016).

It has been argued that sustainable development helps local communities to identify, evaluate and prioritize their conservation and natural resource needs. To meet these priorities and objectives, development agencies are forced to work with these communities to get what they need to restore and conserve the tropical ecosystems where they live and on which they rely

for basic necessities and well-being (Drexhage and Murphy, 2010). Meeting these objectives requires a combination of skills, finance, materials, access to decision makers and experts, hands-on experience, and other forms of support.

According to Drexhage and Murphy (2010), it is a visionary development paradigm; and over the past 20 years governments, businesses, and civil society have committed to sustainable development goals. Maurice Strong, former Secretary-General of the Rio Summit, remarked in 1998 that sustainable development "has been embraced by people throughout the world." Despite recognition of and commitment to the principles of sustainable development, action has not moved beyond the margins and certainly has not led to the core changes needed to support a transition to sustainable development. Since the Brundtland report (1987) and the Rio Summit, governments and organizations have taken up sustainable development as a desirable goal and developed metrics for sustainable development, but implementation has proven difficult especially in developing countries. Matthews and Hammill (2009) argue that the main difficulties encountered by countries in meeting up sustainable development since the Rio Summit has been "in designing the move from theory to practice, where the tenacious grip of technological, political and other constraints becomes clear." Rural communities engaged in agroforestry are examined in this respect with their available methods of resource exploitation, community needs and limitations in terms of resource degradation which helps in identifying a gap between forestry policies and practice as occurs in many areas practicing agroforestry in Cameroon (Ayuk *et al.*, 1999; Awono *et al.*, 2002).

The world has made little progress in implementing programs and policies to improve the lives of the poor (Moyo, 2009). The integration of the three pillars of economic, social and environmental improvement remain the greatest challenge in most human communities. Victor (2006) pointed that UN summits have resulted in broad documents, policies, and goals; and the action plans tend to be "sprawling documents that offer something for everyone." High-level international meetings - such as under the CSD and UNFCCC avoid concrete discussion on how to shift to a more sustainable, low carbon world economy and international talks are increasingly disconnected from real world policy (Holliday *et al.*, 2002; Hodas, 2010). Many poor people and poor countries do not have adequate access to technology; possess inadequate resources, infrastructure, among others. Likewise, the quality of governance and the high risk business environment act as barriers to attract foreign investment and stimulate sustainable development (ECA, 2002). Part of the reason for the lack of implementation is that actions have tended to emphasize the symptoms of environmental degradation and not the underlying source of the problem (McNeill, 2007). These difficulties and others serve as barriers towards implementing sustainable actions in agroforestry and improving livelihood.

RESULTS AND DISCUSSION OF FINDINGS

The results and discussion of findings in this study are organised into four sub sections which are (a) the role of stakeholders; (b) impacts and sustainability implications and; (c) building resilience through agroforestry.

The Role of Stakeholders

The results of this study revealed that stakeholders involved in the domain of agroforestry implement a wide range of programmes. For example, Divine Providence a school of Agriculture situated at Bachuo Akagbe teaches farmers to plant, nurse and cater for young trees for

domestication and integration into farms. The institution provides enormous assistance to youths to take initiatives in agroforestry through tree domestication. Findings from interviewees in institution revealed that the school allocates land and capital of up to 2 million francs xfa to youths involved in domestication of forest trees. The aim of such funding initiatives are meant to target the establishment tree nurseries including support materials like plastic bags for seedlings and grafted plants to be used in the allocated land for agroforestry. According to respondents, youths are provided with necessary training to acquire managerial skills to run such schemes. In addition to providing resources for agroforestry, the institution also trains beneficiaries in domains like local crafts and small trade.

Another stakeholder consulted to obtain information for the study was the Program for Sustainable Management of Natural Resources in the South West Region (PSMNR-SWR) which is supported by the German Cooperation for International Development (GIZ). The program is implemented by the Ministry of Forestry and Wildlife (MINFOF) which works in partnership with Worldwide Fund for Nature (WWF) and World Conservation Society (WCS) as well as other stakeholders. These stakeholders through collaborative management approach with the MINFOF South West Region (SWR) park service work with local communities around Korup, mount Cameroon and Takamanda national parks. The aim is to ensure the long term protection of these areas as well as the development of the neighbouring populations. Through the landscape approach, technical cooperation units of Korup-Ndongere, Takamanda and mount Cameroon bring together various stakeholders such as the civil administration, local councils, logging and agro industrial companies to exchange on potential land-use conflicts and conservation issues. Some aspects of the landscape approach involve the distribution of seedlings to farmers to engage them in tree conservation and re-forestation. This is particularly for farmlands and degraded secondary forests or landscapes resulting from deforestation by logging companies and agro industries in the area. According to stakeholders contacted during this study, tree planting protects the environment from direct radiation from the sun and also absorbs the greenhouse gases responsible for climate change and global warming. Respondents asserted that, domestication and cultivation of forest trees alongside cocoa plants provide shade for cocoa and implies important environmental changes such as soil fertility improvement and erosion control. These results are in sync with an earlier study by Mweta et al., (2007) where Agroforestry and small doses of inorganic fertilizers have been shown to produce food crop yields greater than when farmers use inorganic fertilizers alone and have additional benefits of helping recuperate soil nutrient balance over a period of years.

According to ICRAF (World Agroforestry Centre) sources, its objective mainly focuses on developing a strong partnership which target thousands of farming communities in different divisions and sub-divisions in localities where agroforestry is practiced. It was revealed from the same sources that the purpose of ICRAF is to combine tested agroforestry practices, effective partnership and informed policies. This aims to increase food security and income, as well as improve livelihood opportunities for rural communities in Cameroon, through accelerated adoption of fruit, fodder and fuel-wood trees. To accomplish these objectives, ICRAF provides farming communities with planting materials (tree seeds and seedlings), and the know-how to care for and effectively combine them with food crops. Some of the beneficiaries of the project identified in the study testified to have witnessed dramatic increase in household food security and nutrition.

The foregoing is in line with previous research by Ayuk *et al.* (1999), who discovered that most farmers maintain mature *I. gabonensis* trees that are growing on their land and also plant trees for domestic and commercial purposes. Similarly, the World Agroforestry Centre (ICRAF) has been promoting domestication of *I. gabonensis* for more than 15 years. *I. gabonensis* is considered to be cultivated in Cameroon and Nigeria and semi-domesticated in Benin. As of the year 2000, less than 10 percent of total annual fruit and kernel crop in Nigeria was harvested from planted trees. This percentage is increasing slowly as trees continue to be planted. Farmers in the South West Region of Cameroon manage their trees by applying fertilizer and pruning. Tchoundjeu *et al.* (2006) identified *I. gabonensis*, *R. heudelotii* and *Gnetum* spp. among others, as candidates for participatory domestication because they are important sources of income for most forest communities.

Difficulties are encountered in the timely transportation of tree seeds and seedlings across different villages due to the poor quality and seasonal nature of the road network linking the various communities. Where roads exist, there are problems of transportation due to scarcity of vehicles to transport seeds and seedling in bulk, and in managing the flow of reporting and disbursements of funds among the large group of collaborators. As of 2017, the number of villages covered by ICRAF activities are still very limited compared to the numerous villages in the different subdivisions of Manyu division which are yet to be covered by the activities of the organization. Results from respondents also reveal that one of the limitations to the project is the cost of procuring these improved breeds that mature in the shortest possible time. These are expected to improve household income and nutrition. It was revealed that a grafted plant costs a minimum of 2,000 FCFA to 2,500 FCFA (between \$4 and \$5). Thus, for a farmer to plant 50 grafted seedlings in a hectare of farm, he requires at least a 100,000 FCFA (about \$200) in addition to the cost of tending the plants to grow to maturity in 3 to 5 years. Much sacrifice is needed from acquiring seedlings to planting, pruning, use of herbicides, pesticides to harvesting and marketing. Most of the agroforestry farmers contacted appreciated efforts made by ICRAF with respect to providing seed for domestication. However, the respondents complained that the cost was prohibitive and only a limited number of farmers could raise capital for nursing, planting and caring of the plants. As an illustration of this situation, an interviewee notes that;

It is really difficult to get grafted seedlings for bush mango. This is because of financial limitations. Most of us don't have enough money to buy these seedlings which takes lesser time to mature.

In spite of these difficulties the effects are being felt with examples being replicated and expanded in different villages in the study area. Consequently, agroforestry technology and innovations are gradually being adopted in farming communities of the study area with a slow but steady progress noticeable through improvement of household incomes and food security.

According to ICRAF integration of agroforestry practices into farming systems improve the livelihoods of farm families by increasing the range of available products and opportunities to earn an income. ICRAF West and Central Africa in Cameroon set up trials to better incorporate species into food crop systems. *R. heudelotii* was identified as a priority species for domestication under ICRAF's Humid Lowlands of West Africa project, which evaluated farmer and user needs, assessing the species currently grown and their uses, and ranking the importance of tree products according to food and nutrition security, and current and potential market values (Tchoundjeu *et al.*, 1999). It also lowers risks associated with climate change and

at the same time improves biodiversity, nutrient and water cycling in the agro-ecosystem. Although the benefits to livelihoods and ecosystems may be clear, there is a one to three-year lag between the first use of agroforestry practices and the appearance of benefits. Similar studies by Ajayi and Babayemi (2008) revealed that though benefits of livelihoods and ecosystems are clear, the poorest farmers may lag in adoption of the systems despite knowing the benefits. This is because their priority is to meet immediate household food and income needs. It is believed that projects that offer free tree seeds and seedlings, and training on how to plant, tend and integrate trees with cropping systems help to overcome the barrier to adoption among the poorest smallholders. According to this study, the major sources of costs for investing in agroforestry for smallholders is the cost of seed and seedlings as well as labour for land preparation and tree establishment. Most of these related costs are incurred upfront, while farmers have to wait for a year or more before they start to realize benefits. Poor farmers more often lack financial resources for meeting the upfront costs of investing in agroforestry. However, once established, the trees produce seed that farmers can collect and use to expand the size of their plantations and for replanting in the future.

Overall the effort of ICRAF has been to target, prioritize, adapt and demonstrate fodder, fruit and fuel-wood trees portfolio options in areas with suitable biophysical, geographical and social niches for agroforestry interventions. These include vulnerable sub-populations (food insecure, poor, women); engage partners in developing and applying strategies for sustainable supply and delivery systems of quality tree germplasm to meet potential massive demand by smallholder farmers. It also engages, mobilizes and sensitizes policy makers to formulate appropriate policy mechanisms and instruments for mainstreaming agroforestry and catalysing its adoption at the district and national levels.

Impacts and Sustainability Implications

Based on this study the impact of stakeholder intervention is greater in terms of household food security, scale of operations and production in the participating villages. Agroforestry cropping systems increased the yield of *Irvingia gabonensis* and *Irvingia wombulu* by nearly 62% under smallholder conditions. The fertilizer, fruit, and tree systems which have simple seed management requirements are easily sustainable among smallholders, as they can produce tree seeds for future use within the farming system. Sustainability of fruit tree systems is more complex because of the need for grafting. However, demand for fruit trees is also high, and will give incentive to efforts to maintain the flow of grafted seedlings to smallholders. Overall, ICRAF is improving food security and livelihoods among targeted communities. Over the longer term, because of improved soil nutrient and water cycling, these systems should also improve ecosystem function and the resilience of the food production system. Lessons learned in institutional arrangements can easily lead to improvements in the future. Figure 1 indicates the success rate of agroforestry by adopters. Statistical evidence from this study shows that 62 % of farmers that have adopted and grown grafted tree seedlings attest to an increase in their production. The impacts are overwhelming with regards to household food security and livelihood improvement. Only a minor segment of adopters (38 %), principally late adopters are still waiting for the time lag for their trees to mature before assessing their productive success. This is noticed across the various age groups of farmers embracing agroforestry through domestication of forest fruit trees.

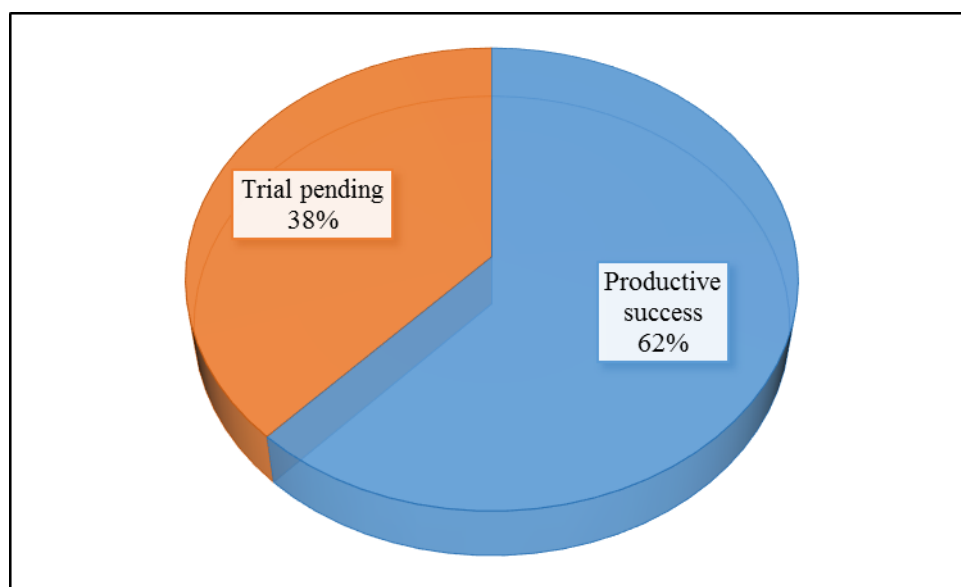


Figure 1: Productive Success of Agroforestry by Adopters on their Production.
Source: From Field Survey, 2020.

Building Resilience through Agroforestry

A significant proportion of the region's population who are vulnerable to climatic variations, economic crises and challenging environments can reduce their vulnerability through greater use of agroforestry. The area needs to adapt its agricultural knowledge and skills particularly in agroforestry if its thousands of farmers are to cope successfully with the challenges brought about by climate change and economic difficulties. Challenges associated with climatic variations could be severe resulting to shortages in food supply throughout the area. Agroforestry is relatively safe from the risk of crop failure, more resistant to market fluctuations and more resilient to the impacts of climate change than other systems (Noordwijk, 2013). Moreover, agroforests are buffers against biophysical, economic and social pressures. They can ensure the sustainability of the livelihoods of farmers within the framework of a green economy. Manyu division is well placed to take advantage of the benefits of agroforestry because the agrarian society in Manyu through its indigenous agricultural practices has intuitively known and practiced agroforestry for decades. Agroforestry has been proven to effectively improve livelihoods while at the same time preserving the environment and the beauty of the landscape. It is therefore obvious that the practice, which is commonly known as a 'mixed tree garden', has long been applied in many areas of the division in different circumstances. Cocoa tree crop has been the main cash crop but the new dimension of domesticating indigenous fruit trees is an increasingly growing trend of the socio-economic landscape.

One important component of agroforestry observed in this study is the domestication of local tree species that have commercial potentials in local, regional and international markets. The priority species here are *Irvingia gabonensis* (rainy season bush mango), *Irvingia wombulu* (dry season bush mango) and *Ricinodendron heudelotii* (commonly referred to as Njansa in the local language). Other species include *Afrostryax kamerunensis* (country onions), *Piper guineensis* (bush pepper) to cite these cases. It is thus a growing process that the Ministry of Forestry and wildlife, logging companies like SEFECAM, CAFECO and ICRAF are pursuing in Manyu division.

Previous research carried out by Shanley et al., (2015) to assess the food value of wild species, potential for genetic improvement and reproductive biology address this issue. In contemporary Manyu society, the marketability of the wild species can only be assessed by their position in the local rural and urban marketplaces, since few have attracted international commercial interest. To meet the objective of poverty alleviation, market creation and expansion should be crucial aspects in this process. This falls in line with the result of Sills et al., (2011) who observed that the bulk of Non Traditional Forest Product (NTFP) trade takes place at local and regional scales where local people engage with the market on a part-time, seasonal, or full-time basis as their livelihoods require. For example, it is important to determine which marketable traits are amenable to genetic improvement. While some traits are relatively easy to benefit farmers, there are undoubtedly others that are important to the food, pharmaceutical and other industries that require more sophisticated evaluation.

CONCLUSION

Agroforestry has been increasingly acknowledged as one of the most effective ways of addressing the challenges of sustainable development because it contributes immensely to incomes of the poor, facilitates environmental stability or restoration after deterioration, and stabilizes societies/communities that suffer traumatic or turbulent socio-economic and environmental stress. Within the context of this study, findings have demonstrated that a stakeholders' perspective represents an important strategy that can be scaled to ensure that Cameroon fulfils her global environmental obligations generally as it relates to Agenda 2030 and particularly in relation to Vision 2035. In a nutshell, it has been amply demonstrated that one of the most important aspects of sustainable development is environmental sustainability. Policies which lay emphasis on the promotion of NTFP represents an ideal approach to achieve the dual objectives of sustainable development and environmental protection.

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