Envisioning a forest-based circular bioeconomy in sub-Saharan Africa

Key messages

- Climate change and the pandemic have worsened existing inequalities in populations that bear the costs of impacts to which they contributed little. Sustainable, fair and equitable forest-based bioeconomy strategies can build resilience, protect against future epidemics, and contribute to climate mitigation.
- Bioeconomy-focused development initiatives are underway in sub-Saharan Africa, particularly related to value chain improvement, bioenergy and wild species cultivation, although not many address social sustainability issues. If they do, reported outcomes were mostly positive (45 percent) or mixed (38 percent). Positive outcomes were associated with improved livelihoods, profitability, inter- and intra-generational benefit capture, access to markets, education and training, conservation of natural resources, or land tenure rights.
- Negative outcomes were associated with loss of the natural resources needed for subsistence due to overexploitation, dispossession, inequalities in benefit sharing, gender issues, or elite capture.
- Problems that the – so far, largely informal – sector on its pathway to modernization needs to overcome include: closing legal and institutional gaps; forest tenure resolution; stakeholder participation in management and benefit sharing; and addressing elite capture and weak law enforcement.

Transforming forest-related economic activities to follow the principles of a circular bioeconomy – a long-term vision for using forests as a renewable resource, adding value to forest products and services, and optimizing value chains – could offer a win-win solution for forest conservation, sustainable management, and improved livelihoods for rural communities. However, bioeconomy strategies have so far focused on the technological and economic aspects of the concept, often ignoring or taking social sustainability for granted.

To understand the benefits and burdens to poor rural communities associated with a transition to bioeconomic principles, we examined the abstracts of 226 studies, published between 2000 and 2020, focusing on forest-based bioeconomy in sub-Saharan Africa. The studies encompass forest-based bioeconomy activities that are both traditional – such as household firewood collection and commercial timber logging – and new – such as technological innovations in biomass production and processing. Table 1 shows examples of traditional forest sectors and new forest-based bioeconomy sectors.

We sought to identify:

1. The socio-economic opportunities associated with a forest-based bioeconomy and the factors that may be enabling or hindering them.
2. The burdens and inequities that a forest-based bioeconomy might create or exacerbate.

Figure 1 shows the socio-economic framework and categories used to assess the impacts of a forest-based bioeconomy.

The study results show that social sustainability was often used to legitimize or contextualize the studies, rather than being the object of the study. Socio-economic sustainability elements most often mentioned were income creation, quality of life, and resource conservation.

When the socio-economic sustainability outcomes of forest-based activities were detectable in the abstracts of the analyzed papers (as they were in 66 percent of cases), outcomes were mostly positive (45 percent) or mixed (38 percent). Positive outcomes were associated with improved livelihoods, in the form

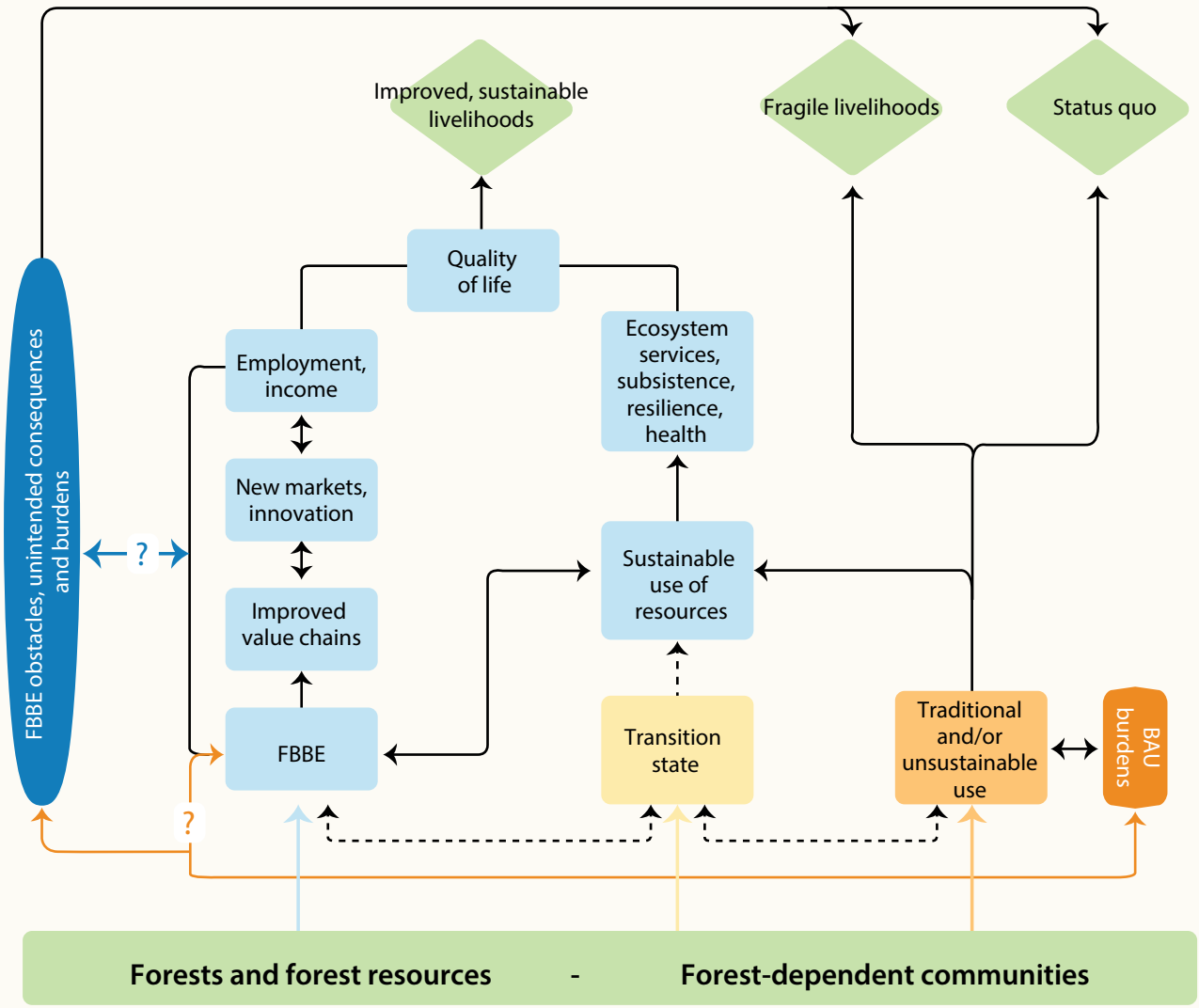
Table 1. Examples of traditional forest sectors and new forest-based bioeconomy sectors

<table>
<tr><th colspan="2">Traditional forest/ forest-based bioeconomy (FBBE) sectors</th><th colspan="2">New FBBE sectors</th></tr>
<tr><td colspan="4">Forestry- and industry-related services (research and development, education, training, sales, marketing, IT, legal services, extension, forest management planning, forest inventory, communications consulting, corporate governance, patents and licensing)</td></tr>
<tr><td>Use of woody biomass</td><td>Forest services</td><td>Novel or improved use of woody biomass and side streams from traditional sector</td><td>Novel forest services</td></tr>
<tr><td>Examples: forestry agroforestry, woodwork, pulp and paper, bioenergy</td><td>Examples: recreation, tourism, provisioning, regulating, and cultural ecosystem services, non-timber forest products (NTFP)</td><td>Examples: value-added wood-based products, biorefinery models to produce biochemicals, biofuels, biopharmaceuticals, cosmetics, textiles, novel wood-based materials (e.g. plastic and packaging), engineered wood products (e.g. construction)</td><td>Examples: ecotourism, eco-certification, Payment for Environmental Services (PES), Reducing Emmissions from Deforestation and Degradation (REDD+), biodiversity and carbon schemes (stewardship), social forestry</td></tr>
<tr><td colspan="2"></td><td colspan="2">Novel business models and social innovations (servitization, open innovations, value co-production, business ecosystem concept, industrial symbioses, communal engagement such as social biomass plants)</td></tr>
</table>

Sources: Hetemäki 2014; Pelli et al. 2017; Hurmekoski et al. 2018; Hetemäki and Hurmekoski 2019; Ludvig et al. 2019.

of higher incomes, higher profitability, improved inter- and intra-generational benefit capture, better access to markets, education and training, conservation of natural resources so that use is sustainable, or land tenure rights.

Negative outcomes were associated with loss of the natural resources needed for subsistence due to overexploitation, dispossession, displacement, inequalities in benefit sharing, gender issues, or elite capture.



Socio-economic categories leading to improved, sustainable livelihoods

1. Resource conservation/environment
2. Food - water security
3. Energy security
4. Land/forest/tree access rights/tenure
5. Quality of life (incl. human rights, gender issues, equity, corruption, beneficial environment, enabling policies and institutions, benefit sharing, cultural values, poverty reduction actions, resilience, subsistence)
6. Health and safety
7. Inclusive, fair and safe workplace
8. Employment
9. Household income
10. Profitability
11. New markets and business opportunities
12. Social acceptability
13. Access to knowledge, education, transparency
14. Stakeholder participation; local knowledge

Figure 1. Socio-economic framework and categories to assess forest-based bioeconomy impacts

The abstracts described the forest sector in sub-Saharan Africa as one that remains largely informal – meaning enterprises, jobs and workers are not regulated or protected by the state – and mostly traditional – such as in extractive industries like sawmills, plantations, pulp mills and paper mills.

As seen in Figure 2 below, 51 percent of the studies described traditional forest bioeconomy activities and only 8 percent were focused on aspects of novel or modern forest use, which include the development of value chains and value-added products or bioenergy from forests. Forty-one percent of the abstracts described activities in transition from traditional to modern.

Of the recurring themes, which emerged in the abstracts, the role of non-timber forest products in income generation was central, followed by value chain improvement and the importance of forests for livelihoods and well-being. Among the abstracts that addressed novel forest activities, the recurrent themes were bioenergy, value chain improvement, governance and initiatives, and economic policy tools.

Considering their importance and their regular occurrence in some of the studies, non-timber forest products and value chain improvement-related activities present good opportunities for ushering in a bioeconomy in rural sub-Saharan Africa. Likewise, a shift from bioenergy to bioeconomy could benefit sub-Saharan Africa's poor energy security, which is associated with environmental degradation, and health, gender and equality issues.

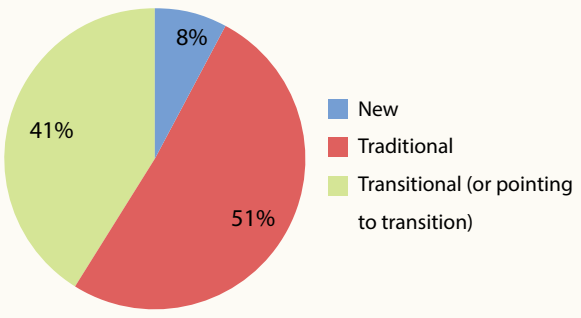


Figure 2. Ratio of forest-based bioeconomy types, as observed in the eligible studies

Were socio-economic impacts considered in forest-based bioeconomy initiatives?

Results showed that social sustainability in forest-based bioeconomy initiatives is mostly a concern in sub-Saharan Africa, even in traditional forest activities. Benefit sharing is skewed, practices of elite capture and land grabbing are common, tenure rights are often undefined, and access to markets, which remain largely informal, is unequal. A lack of governmental support to rural populations, conflicting and inappropriate policies and forest reforms, and a scarcity of local involvement in decision-making have also hindered development.

There is encouraging evidence of efforts to better include multiple stakeholders in bioeconomy-related decision-making and policy development. Examples are documented in Namibia's National Programme on Research, Science, Technology and Innovation, South Africa's Bio-Economy Strategy, and Tanzania's National Biotechnology Policy. However, the road to equal benefit sharing and equal opportunities remains long and rocky, particularly since these efforts are not matched with parallel efforts to equip communities with the physical and financial means to manage forest sustainably.

Challenges preventing forest-based bioeconomy from improving rural livelihoods

The abstracts we reviewed underscored the unresolved dilemma of reconciling poverty alleviation alongside pursuing forest conservation goals. For example, some communities rely on forests for 30 percent of their total household revenue. We argue that restricting access to forests to conserve degraded areas would increase poverty.

Some 36 percent of the abstracts mentioned subsistence economy and income diversification through forest-based products, which cover a wide range of activities such as wild harvesting,

plantation and cultivation, agroforestry and home gardens. These activities cannot contribute sufficiently to incomes because of challenges in sustainable forestry management, and challenges in the processing and marketing of the products.

Eleven percent of the abstracts referred to agroforestry systems that have challenges associated with the development of appropriate tree crops and silviculture practices.

There were limited and subtle references to modern or emerging forest industry markets, such as attempts to improve value chains and identifying value-added products. More detailed examples include domesticating trees for new tree crops for food, cosmetic and pharmaceutical industries. While this type of activity generates business and employment, the issues of benefit sharing, rights over genetic resources and intellectual rights, and risks of monopolistic exploitation by ruthless entrepreneurs persist.

There were two mentions of ecotourism in the literature. One abstract underscored the appropriation of large parts of village land for exclusive access and control that undermined the land rights of an entire village, which also represents an ethnic minority.

Abstracts that mentioned forest-based bioeconomy governance highlighted direct and indirect burdens. Examples include extensive legal and institutional gaps, including a lack of stable and equitable forest tenure; a lack of stakeholder participation in forest management and benefit-sharing schemes; facilitation of elite capture; weak law enforcement; contradictory or uncoordinated policies and regulations disincentivizing sustainable development; displacement; and conflation of illegal with informal trade.

Forest-based bioeconomy opportunities

In sub-Saharan Africa, noteworthy efforts to transition towards a modern forest-based bioeconomy are visible in studies examining value chain improvement, bioenergy options and the cultivation potential of wild species. These strategies can significantly increase opportunities for new markets, enterprises, employment and income.

Forest-based solutions to bioenergy production could be developed with national or regional energy security in mind, rather than exclusively serving global biofuel needs which often negatively affect social outcomes. Therefore, transitioning to a modern forest-based bioeconomy must prioritize social sustainability.

The reviewed abstracts also identified the potential of forest-based bioeconomy strategies to contribute to the well-being of forest-dependent communities. This can be done through diversification of rural economies, new employment, and income possibilities, as well as through improvements in the sustainable management of natural resources. More often than not, forest activities were associated with positive outcomes for the rural population.

Gaps in the literature

Our study uncovered gaps in the range of forest sectors covered in the literature. The overall lack of explicit links between bioeconomy and forests in the retrieved publications suggests that bioeconomic activities in sub-Saharan Africa are still mostly associated with the bioeconomy potential of agriculture.

The sectors of forest- and forestry-related services are not found in the literature. Studies on forest services are limited to provisioning ecosystem services (such as non-timber forest products), leaving aside recreational activities or ecotourism, which may boost international tourism and strengthen links with urban communities. Examples of novel business models and social innovations were equally scarce in the peer-reviewed literature. These gaps indicate that existing forest activities are still mostly related to traditional forestry, and that so-far missed development opportunities could be explored.

However, an examination of the academic literature alone overlooks innovative bioeconomy initiatives that exist without having been subject to research; this warrants further exploration of gray literature and original field research of on-the-ground development projects. Overall, the survey did not yield a significant number of studies on the management of forests for extractive resources, pulp and paper activities or biorefinery. This might be due to our use of a search string focused on social sustainability elements, thus excluding from our selection technology-oriented studies that did not consider social impacts.

Recommendations

Traditional and novel forest uses are tightly linked and hold common sustainability challenges. Aiming for modern bioeconomy without resolving these issues would only reproduce—and perhaps worsen—the current pattern of burdens and inequalities in sub-Saharan Africa's rural populations.

The region critically needs more research on how forest bioeconomy applications could yield positive socio-economic impacts for vulnerable rural populations. Likewise, a socio-economic sustainability analysis of past and current undertakings might shed light on which directions to follow, while providing 'good' and 'bad' practice examples.

Considering the potential role of sub-Saharan Africa in responding to the foreseen increase in global biomass demand – resulting from a more generalized transition towards bioeconomy – the social sustainability issues of the traditional forestry sector suggest that any innovations toward novel forest-based economy must put social sustainability front and center.

Acknowledgments

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Further reading

Rosa, S.F.P. and C. Martius. 2021. Forest-based bioeconomy in sub-Saharan Africa: Looking at benefits, barriers, and burdens from a social sustainability standpoint. *Occasional Paper 219*. Bogor, Indonesia: CIFOR.

This document synthesizes Rosa, S.F.P. and C. Martius. 2021. Forest-based bioeconomy in sub-Saharan Africa: Looking at benefits, barriers and burdens from a social sustainability standpoint. Occasional Paper 219. Bogor, Indonesia: CIFOR.
https://www.cifor.org/knowledge/publication/7951/

CGIAR RESEARCH PROGRAM ON Forests, Trees and Agroforestry

The CGIAR Research Program on Forests, Trees and Agroforestry (FTA) is the world's largest research for development program to enhance the role of forests, trees and agroforestry in sustainable development and food security and to address climate change. CIFOR leads FTA in partnership with ICRAF, the Alliance of Bioversity International and CIAT, CATIE, CIRAD, INBAR and TBI.

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