Supporting sustainable development with a circular bioeconomy approach in rural sub-Saharan Africa

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In collaboration with the Bio4Africa consortium (see "Project Team" below for details)

What's the problem we are addressing & why is it important?

Sub-Saharan African communities face multiple livelihood challenges, including agri-food systems that are under pressure to sustain a growing population, in the context of **environmental change**, including **climate change**, and **rising fuel and food prices** due to global market prices shocks. For smallholder farmers, **agri-food systems** are not just sources of income, they are vital for **sustainable livelihoods**, including food security, sanitation, and access to education and healthcare.

What is our approach to solving the problem?

In rural areas in four sub-Saharan African countries, **Uganda, Ghana, Côte d'Ivoire and Senegal**, we are supporting the deployment of robust, **small-scale technologies** that utilise **bio-based materials**, e.g. from agri-food residues and invasive plant management, to produce products for use in agriculture, construction, packaging and health sectors, and domestically. **Figure 1** describes how these technologies will support farmers and local businesses to sustainably produce a **variety of higher value bio-based products** from agriculture and food processing residues, including products that can contribute to sustainable local community development, e.g. by addressing **household energy needs with** biochar-based cooking fuel.

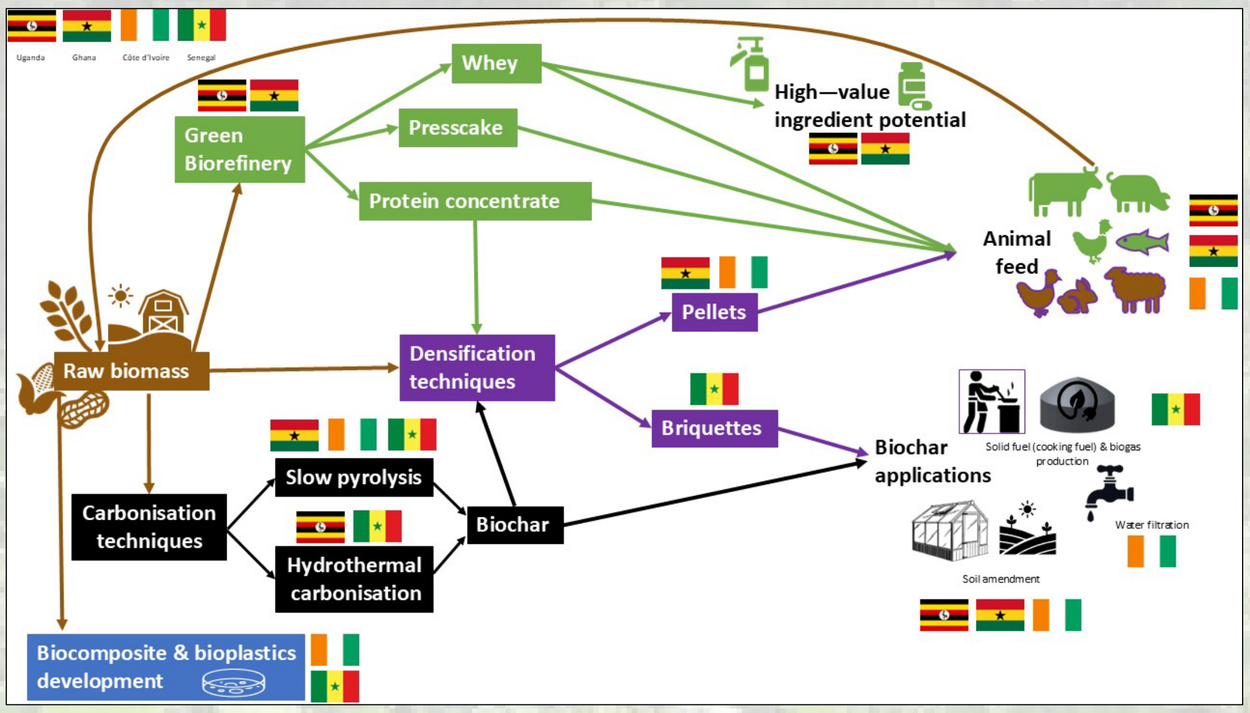

Fig. 1 Circular bioeconomy approach deployed in the BIO4Africa project, describing transformation of raw biomass to bio-based products, via robust. small-scale technologies adapted to regional conditions.

This **circular bioeconomy** approach emphasizes **cascading use** of local resources and can **strengthen and diversify agri-food value chains** and **create novel value chains from bio-based waste**. The circular bioeconomy focus offers opportunities for **income generation from agricultural and food processing residues**, e.g. corn cobs, while also **reducing the role of extractive industries** in industry and among communities and households, e.g. displacing wood-based cooking fuel with fuel from agri-food residues..

Results / Achievements to date

- **8 bio-based technologies** developed and deployed in **12 test sites** across **Uganda, Ghana, Côte d'Ivoire** and **Senegal**
- Agri-food and ecological management wastes used to create **bioplastic for use as packaging**, and **biocomposites for use in construction**
- Green biorefinery whey screened for **cosmeceutical potential**
- **6 field trials completed of animal feed** from agri-food residues and green biorefinery
- **6 field trials completed with biochar products**, including soil amendments, water filtration, cooking fuel, and anaerobic digestion additives
- **Strong engagement of local farmers and households** in biomass collection and processing and product testing (>1,000 farmers engaged to date)

How our research generates IMPACT

Short-term impact (lifetime of the project)

- **More than 1,000 farmers** have been involved to date in the piloting of **8 small-scale bio-based technologies** in **12 different regions**, across **Uganda, Ghana, Côte d'Ivoire and Senegal**
- **8 Joint PhD/MSc theses** carried out at partner Universities
- Technology pilot cases will be supported by a total of **22 field trials and laboratory analyses** of the resulting bio-based products
- **10 business models** based on the tested products developed with **local and national stakeholders** in Uganda, Ghana, Côte d'Ivoire and Senegal
- **70 policymakers** engaged to date in **4 regional policy workshops**
- **10 policy briefs** developed
- **1 international policy workshop** and **final conference** planned in **Brussels** bringing together European and African policymakers

Long-term impact (beyond the life of the project)

Developing and strengthening circular bio-based value chains in sub-Saharan Africa can support rural communities to:

- access **ecologically and socially sustainable alternatives** to products sourced from extractive industries
- **diversify economic opportunities** and **build sectoral strengths and capacities**
- **build regional resilience to resource scarcity**, e.g. price shocks
- **strengthen innovation and entrepreneurship capacity** of individuals and organisations

Working across disciplines - Interdisciplinary Considerations

The BIO4Africa project involves an international team **of interdisciplinary scientists, engineers, technology developers, business development and rural development organizations**, and **farmers' associations**. Beyond this, the team works with **local women**, **farmers and farming cooperatives**, **agri-food and fuel businesses**, and **policy-makers** in **Senegal**, **Ghana**, **Uganda** and **Côte d'Ivoire**.

Project Team and Key Collaborators

Côte d'Ivoire: Institut National Polytechnique Félix Houphouet-Boigny
Denmark: Food and Bio-Cluster Denmark
France: RAGT Energie SAS & CIRAD: Centre de coopération Internationale en Recherche Agronomique pour le Développement
Ireland: Celignis Ltd. & Munster Technological University
Ghana: Savannah Young Famers Network, 0km Nomads, Agri-Business Innovation Hub
Greece: Q-Plan International Advisors PC, Draxis Environmental SA
Kenya: Eastern Africa Farmers' Federation Society
Netherlands: Stichting IHE Delft Institute for Water Education, Grassa BV
Senegal: Université Assane Seck De Ziguinchor, SCPL SA, Association d'Appui aux Initiatives de Paix et de Développement, Energeco Afrique, GIE Country Farm
Spain: Barcelona Plataforma Empresarial SL, Fundacion Corporacion Tecnologica de Andalucia, Sustainable Innovations Europe SL
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