

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 conflict and other global market prices shocks, e.g. the Covid-19 pandemic. For the more than 60% of sub-Saharan Africans who are 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, and can drive **inclusive, locally-led sustainable development within rural communities**.

How our research generates IMPACT

We aim to support the deployment of the bioeconomy in rural areas in four sub-Saharan African countries: **Senegal, Ghana, Uganda and Côte d'Ivoire**, through the development of bio-based solutions and value chains with a circular approach to drive the cascading use of local resources and diversify the income of farmers.

During the four-year term of the project:

- ▶ **small-scale bio-based technologies** will be adapted to local needs and context, and piloted in the target regions,
- ▶ technology pilot cases will be supported by **laboratory analysis and field trials** of the resulting bio-based products with the target consumers, e.g. farmers and rural households, to evaluate replicability and potential impact,
- ▶ technologies and products will be **demonstrated to local producers and businesses** in the relevant value chains,
- ▶ interested businesses will be supported to **develop plans to integrate the technologies and products within their business activities**,
- ▶ Local, regional and national policy-makers and public bodies will be engaged to **support and deploy the bioeconomy in their areas of jurisdiction**.

Results / Achievements to date

- ✔ Local needs and agri-food system analysis
- ✔ Co-definition of suitable bio-based technologies and feedstocks
- ✔ Development and adaptation of eight bio-based technologies: *green biorefinery, pyrolysis, hydrothermal carbonisation, briquetting, pelletising, bioplastics and bio-composite production*.
- ✔ Development and laboratory testing of bioplastics and biocomposites
- ✔ Field trials underway of animal feed (*sheep, rabbits*) and biochar-based soil amendment (*greenhouse and field trials*)
- ✔ Co-design of inclusive and sustainable business models
- ✔ BIO4Africa Business Accelerator workshops initiated with 20 local businesses



Figures: a) Biorefinery technology, KRC; b) pelletizing technology, INP-HB; c) 5L biofermentor for bioplastic production, INP-HB; d) empty palm fruit from UASZ being processed for biocomposite production; e) pyrolysis kiln model being constructed by SavaNet and INP-HB; f) hydrothermal carbonization equipment, UASZ

What is our approach to solving the problem?

BIO4Africa will empower smallholder farmers to generate **new sources of income** by creating value from locally available biomass, utilising **agricultural and food processing residues** in a **circular, bio-based approach** to economic development. Our focus is on developing simple, small-scale and robust **bio-based technologies** adapted to local needs and contexts, including biomass types. These will support farmers and local businesses to sustainably produce a **variety of higher value bio-based products** from agriculture and food processing residues (*animal feed, fertiliser, pollutant absorbents, construction materials, packaging, solid fuel for cooking and catalysts for biogas production*). Products developed through this project will further contribute to sustainable local community development, by addressing **food production, household energy, and health needs**, e.g. *bio-based soil improvement, cooking fuel, and water filtration products*.

Circular bioeconomy approaches offer opportunities for income generation from agricultural and food processing residues, e.g. corn cobs, while also guiding fossil fuel-free pathways for sustainable community development, e.g. *reducing waste directly and over the product life cycle, displacing fossil-based products such as plastics with bio-based alternatives, and developing novel products, e.g. forage-based protein extracts*. Developing and strengthening circular bio-based value chains in sub-Saharan Africa can support rural communities to access **ecologically and socially sustainable economic opportunities**.

Project Team and Key Collaborators

Côte d'Ivoire: Institut National Polytechnique Félix Houphouët-Boigny (INP-HB)

Denmark: Food and Bio-Cluster Denmark

France: RAGT Energie SAS & Centre de coopération Internationale en Recherche Agronomique pour le Développement

Ireland: Celnignis Ltd. & Munster Technological University

Ghana: Savannah Young Farmers Network (SavaNet), Okm 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 (UASZ), SCPL SA, Association d'Appui aux Initiatives de Paix et de Développement, Energeco Afrique, GIE Country Farm

Spain: Barcelona Plataforma Empresarial SL, Fundación Corporación Tecnológica de Andalucía, Sustainable Innovations Europe SL

Uganda: Kabarole Research and Resource Centre (KRC), African Forum for Agricultural Advisory Services

United Kingdom: African Agricultural Technology Foundation

Working across disciplines - Interdisciplinary Considerations

The BIO4Africa project involves scientists from physical, chemical, biological and social sciences, agricultural and environmental scientists, engineers, technology developers, rural and sustainable development specialists, and community and farming organizations. The project partners work with local women, farmers, agri-food and fuel businesses, and policy-makers in Senegal, Ghana, Uganda and Côte d'Ivoire to achieve the aims of the project.