New value chains for green biorefinery waste stream.

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

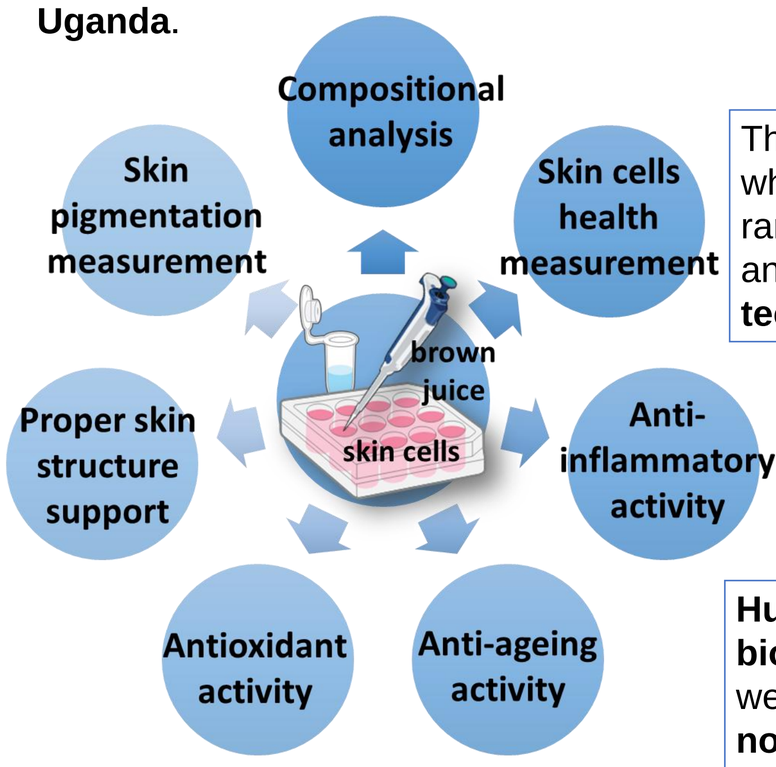
The UN projects that by 2050 **more than 25% of the world's population will be living in Africa**. Protein demand for food and feed will rise in parallel with the growing population. This will result in greater pressure on agriculture. **Green biorefineries may be a solution to this problem**. These multiproduct systems convert green biomass into **alternative protein products**. Biomass fractionation in a green biorefinery generates significant amount of residual liquid stream – whey (brown juice). This waste product is used mainly as a feedstock for energy production. Considering the nutrient-rich composition of brown juice, this does not exhaust its possible uses. In the Bio4Africa project, the **health-related bioactivities** of whey are analysed. **Valorising the biorefinery by-product can strengthen the economy, reduce environmental risk and create new value-chains and economic opportunities in rural Africa.**

Working across disciplines - Interdisciplinary Considerations

The BIO4Africa team involved in the green biorefinery trial consist of biologists, physicists, chemists, agricultural and environmental scientists and engineers. Technology is implemented in cooperation with local farmers and associations, rural communities and agri-food industry.

What is our approach to solving the problem?

The feasibility of residual biorefinery whey applications in pharmaceuticals, nutraceuticals and cosmetics was investigated. Tested samples, derived from **Pakchong** and **Alfalfa**, were generated in **Uganda**.



The composition of the tested whey was assessed using range of **biochemical assays** and **chromatographic techniques**.

Human skin health-related bioactivities of whey samples were investigated using both **non-cellular and cellular assays**.

Project Team and Key Collaborators

The BIO4Africa consortium includes research institutes/universities, extension and advisory services, agricultural demonstration centres, private companies, technology centres and clusters from 11 different European and African countries.

- **Côte d'Ivoire**: INP-HB
- **Ghana**: SavaNet, 0km Nomads, iHUB
- **Kenya**: EAFF
- **Senegal**: UASZ, SCPL SA, ASAPID, Energeco Afrique, GIE Country Farm
- **Uganda**: KRC, AFAAS
- **Denmark**: FBCD AS
- **France**: RAGT Energie SAS, CIRAD
- **Greece**: Q-Plan International, DREVEN
- **Ireland**: Celignis Ltd., MTU
- **Netherlands**: Stichting IHE Delft Institute for Water Education, Grassa BV
- **Spain**: BPE SL, CTA, SIE SL
- **United Kingdom**: AATF

Results / Achievements to date

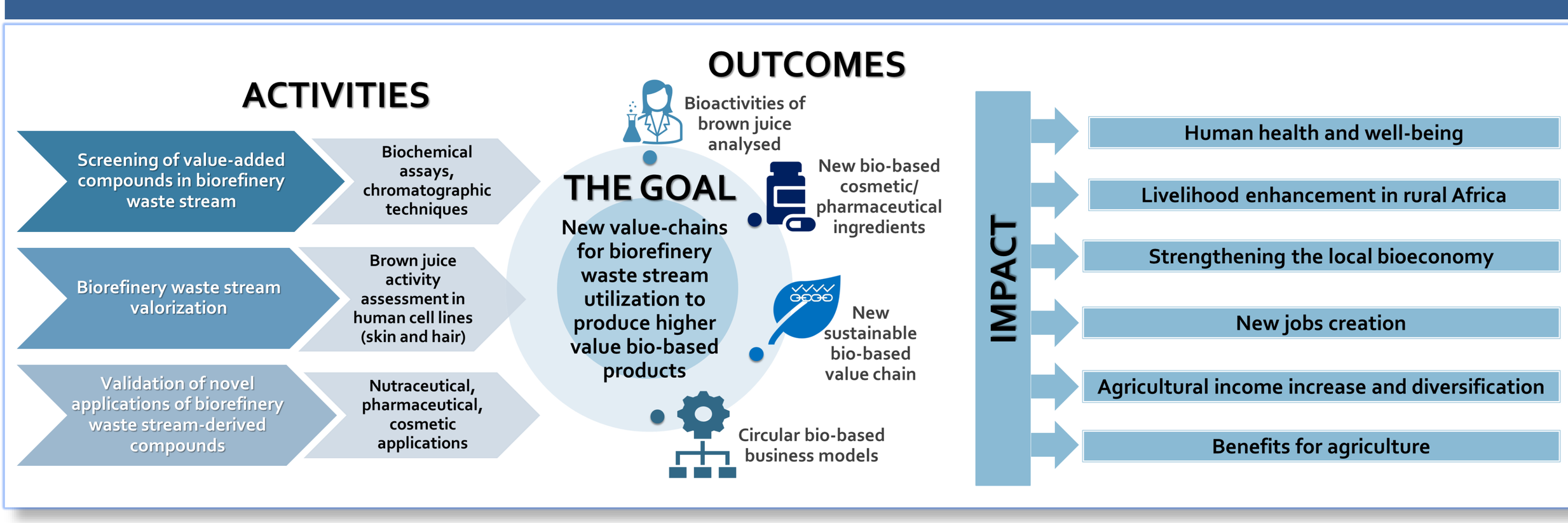
The obtained results show that tested biorefinery whey:

- ✓ is **not toxic** against used human skin cells
- ✓ has **antioxidant** activity
- ✓ **supports skin structure** (boosts elastin and glycosaminoglycans production, inhibits elastin and collagen degradation)
- ✓ supports proper skin pigmentation (inhibits tyrosinase activity)
- ✓ has **anti-inflammatory** activity (inhibits IL-6 production)

✓ non-toxic
✓ antioxidant
✓ anti-hyperpigmentation
✓ anti-ageing
✓ anti-inflammatory

→ **promising potential as a cosmetic, cosmeceutical, pharmaceutical ingredient**

How our research generates IMPACT



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