SDC A+FS Network

Science for Food

A series of light & informal events on science in food systems

WELCOME !

01.07.2026

What’s on the menu ?

1. Welcome
2. Innovations for a waste-based circular bioeconomy across the rural-urban nexus – *Johan Six, ETH Zürich*
3. News & events
4. Opportunities for Sustainable Food Production using Black Soldier Fly Larvae – *Daniela Peguero, Eawag*

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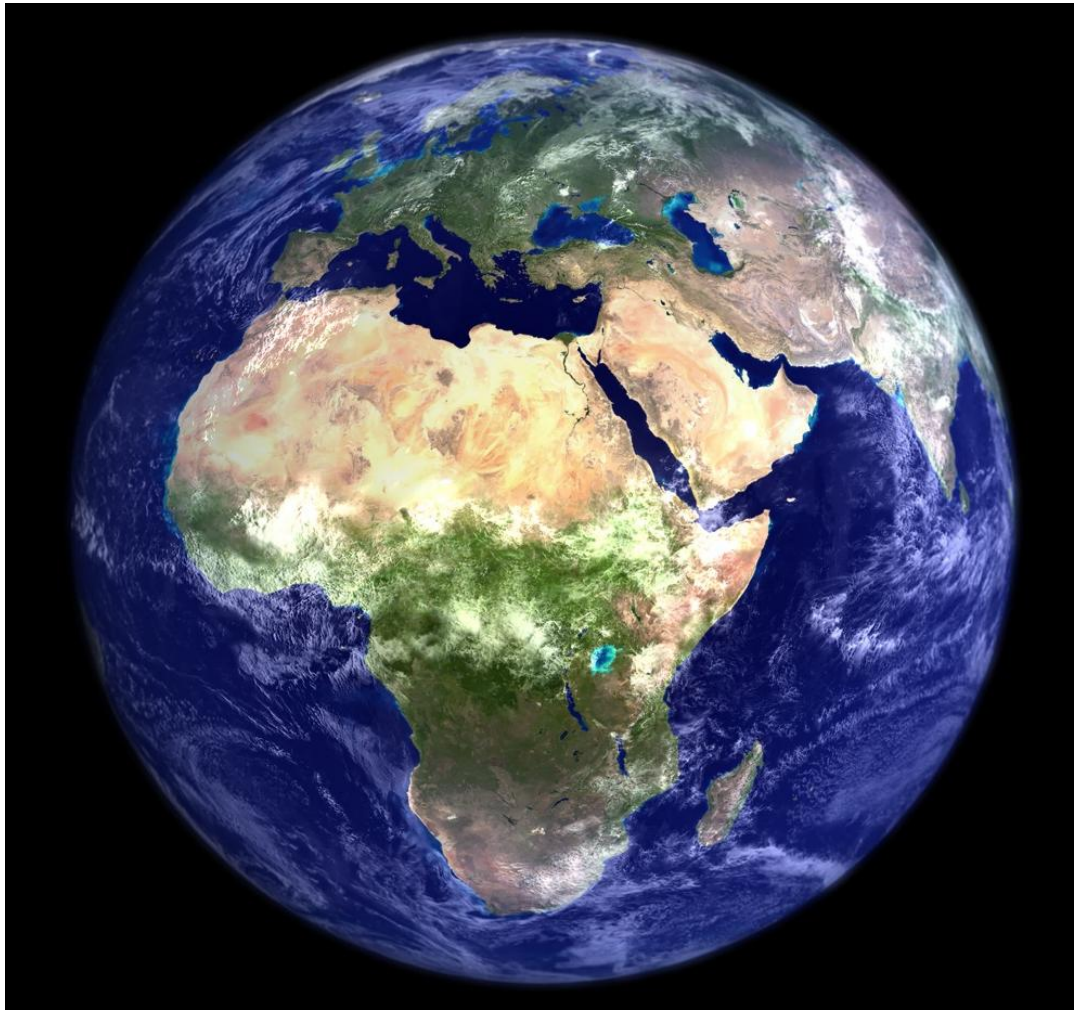
Circular Bioeconomy: Organic matter fluxes through the Urban-Rural nexus

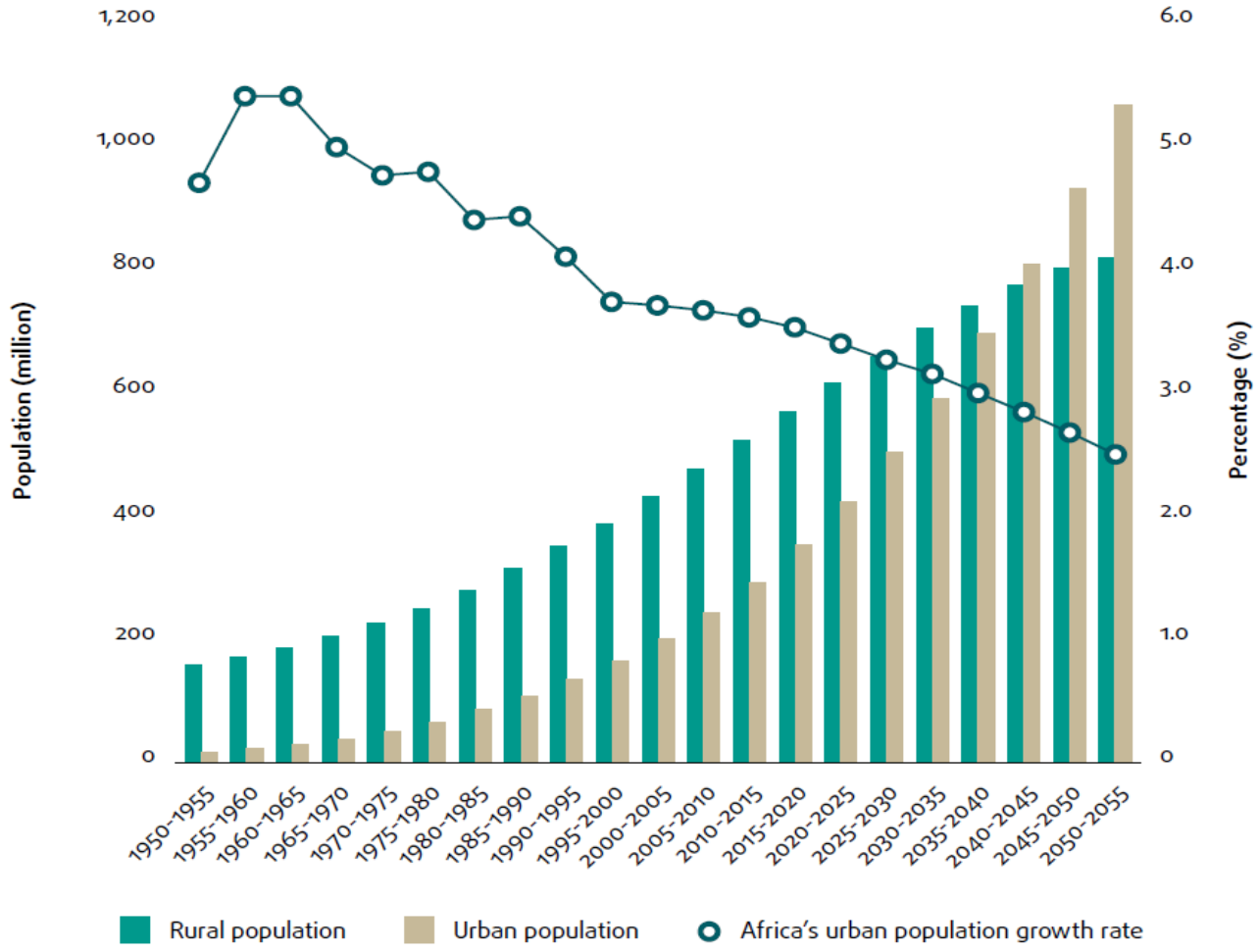
Prof. Johan Six

Sustainable Agroecosystems,
Department of Environmental Systems Science,
Institute of Agricultural Sciences, ETH Zurich
http://www.sae.ethz.ch/



Sustainable Agroecosystems

Urbanization in Africa



"Urbanization is increasingly being acknowledged as one of the defining issues of the twenty-first century."

WHO, 2015

Informal settlement Bukavu 2020

A big challenge

- Limited livelihoods
- Increasing public health challenges due to waste accumulation
- Poorly developed value chains from rural to urban
- Increasing food insecurity across the rural-urban nexus
- **Soil mining in rural areas**

Bukavu, DRC

Rural – Urban Nexus

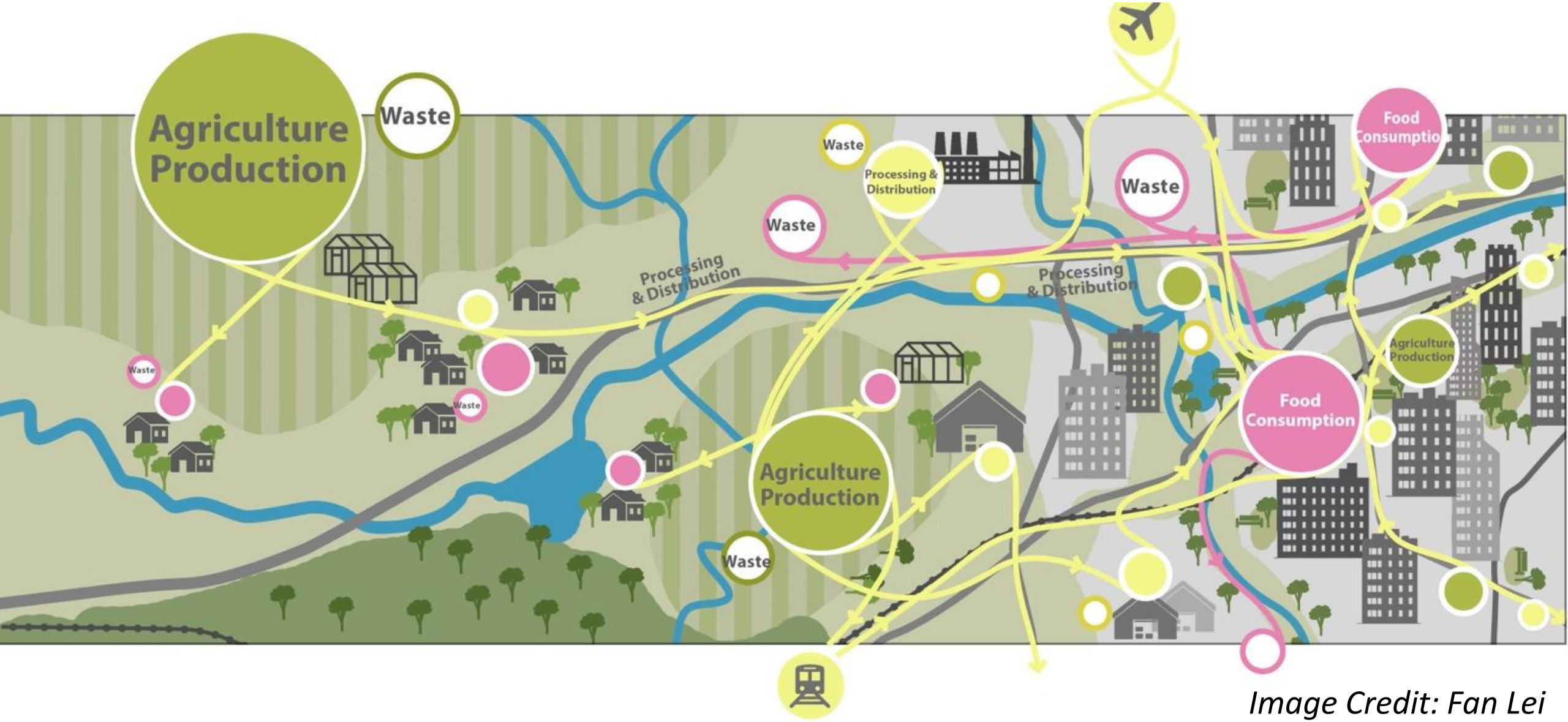
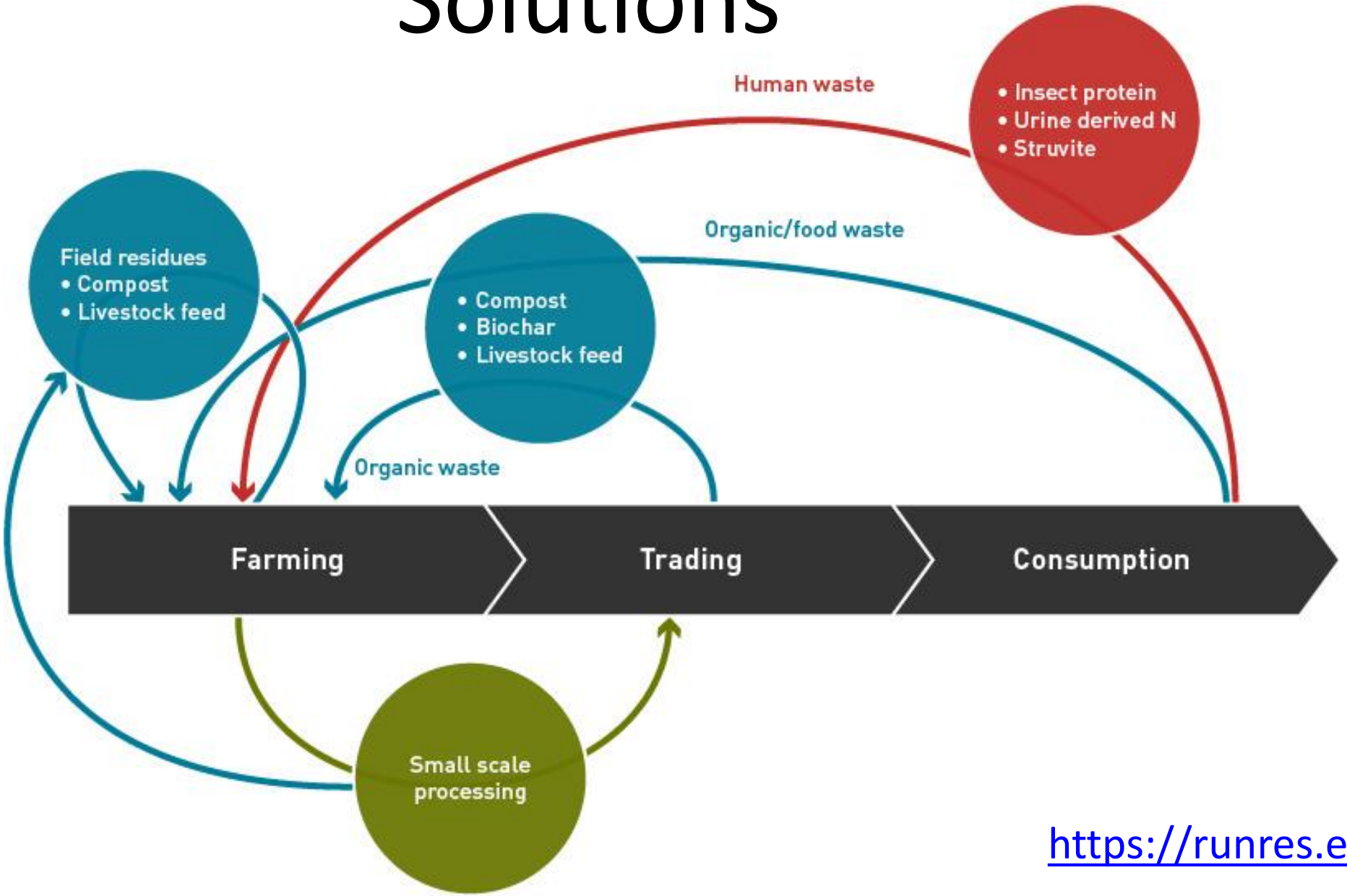


Image Credit: Fan Lei

Solutions



RUNRES
Nutrient Cycles – Rural Urban Linkages

https://runres.ethz.ch/

Composting (scaling)

Wind-row composting

Vermi-composting

Bin-composting

Compost advantages and challenges

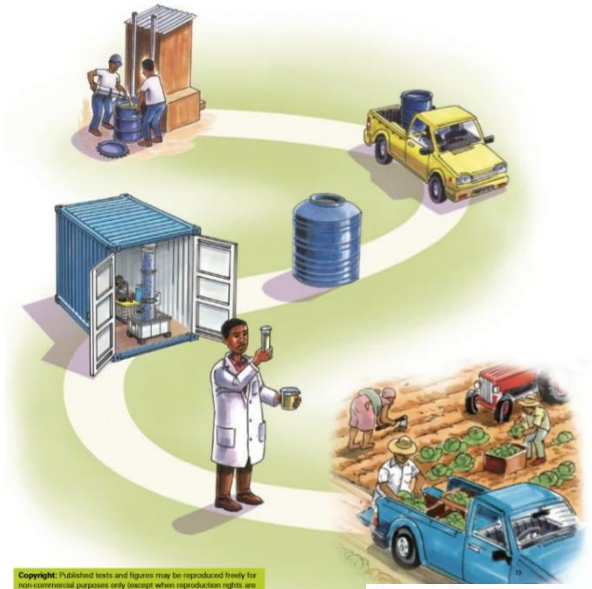
Advantages

- ❑ Increased yields compared to no amendment
- ❑ Increased soil organic matter
- ❑ Mitigation of climate change due to the sequestration of carbon (and possibly reduction of N_2O emissions)
- ❑ Increased soil pH, CEC, (soil moisture)
- ❑ Low cash requirement

Challenges

- ❑ Sustainable source of high quality feedstock
  -> source separation at household level!
- ❑ Low nutrient content (0.5% N; 0.1% P; 0.5% K); Low fertilizer efficiency
- ❑ Very labor intensive
- ❑ Not economical on grain crops
- ❑ Need water available to moisten heap (dry season)

Human Waste (Urine)



Nitrified human urine

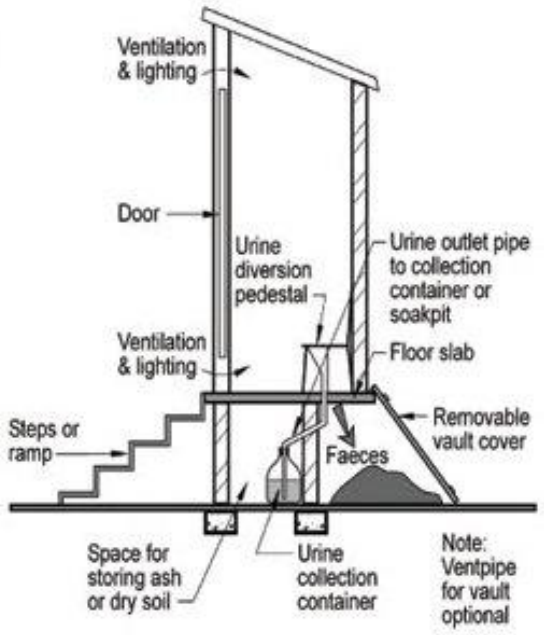
3 STAGE PROCESS:

1.) Nitrification

2.) Distillation

3.) Carbon filtration

Nitrification reactor: Newlands Mashu, South Africa



NUF Properties	
Ammonium	19.7 g N l^{-1}
Nitrate	18.3 g N l^{-1}
Nitrite	0.02 mg N l^{-1}
Chloride	45.5 g Cl l^{-1}
Phosphate	2.6 g P l^{-1}
pH	3.7
Potassium	9.7 g K l^{-1}
Sodium	25.4 g Na l^{-1}

NUF advantages and challenges

Advantages

- ❑ Increased yields compared to no amendment
- ❑ Safe product: no pathogens or pharmaceuticals
- ❑ Odorless because NH_3 is removed

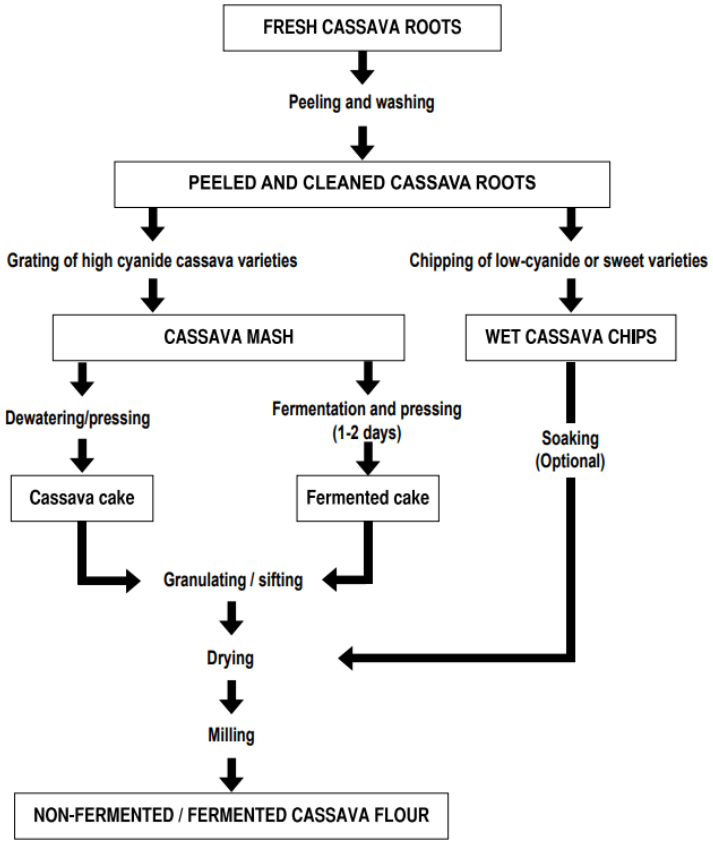
Challenges

- ❑ High investment costs for reactor
- ❑ Low Phosphorus content, but high salt (Na+) content
- ❑ Easily leached

Faeces do have more nutrients and especially carbon, but also much more pathogens
=> more tricky

Improved Cassava Processing with cassava peels for animal feed

Cassava flour production



Abass, 2014

"This trial revealed that five types of wastes from cassava tubers with ample nutritional potentials are being discharged to the environment on a daily basis… at least three of them could be used as non-conventional feed resources to alleviate the perennial scarcity of feed for livestock and the unhealthy competition between man and his livestock for the available conventional feed ingredients."

Aro, 2010

Cassava peel processing advantages and challenges

Advantages

- ❑ High quality animal feed without cyanide
- ❑ Lot's of carbohydrates
- ❑ Easier transport
- ❑ Cassava peels are otherwise wasted and contaminating the environment

Challenges

- ❑ Investment costs, especially for larger scale units
- ❑ Acidic water waste needs to be handled
- ❑ Drying during the rainy season
- ❑ Is only a supplement

Thank you!

Thanks to all my students, postdocs, technicians, administrative personnel, collaborators, and agencies

And all the people around the world from whom I have learned

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WHAT'S NEW?

International Institute for Applied Systems Analysis
IIASA

From waste to resource: Uganda launches its first organic waste strategy.

March 2026

→ More information

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World Food Programme

2026 Global Report on Food Crises - *Global hunger has nearly doubled over the past decade*

2026

→ More information

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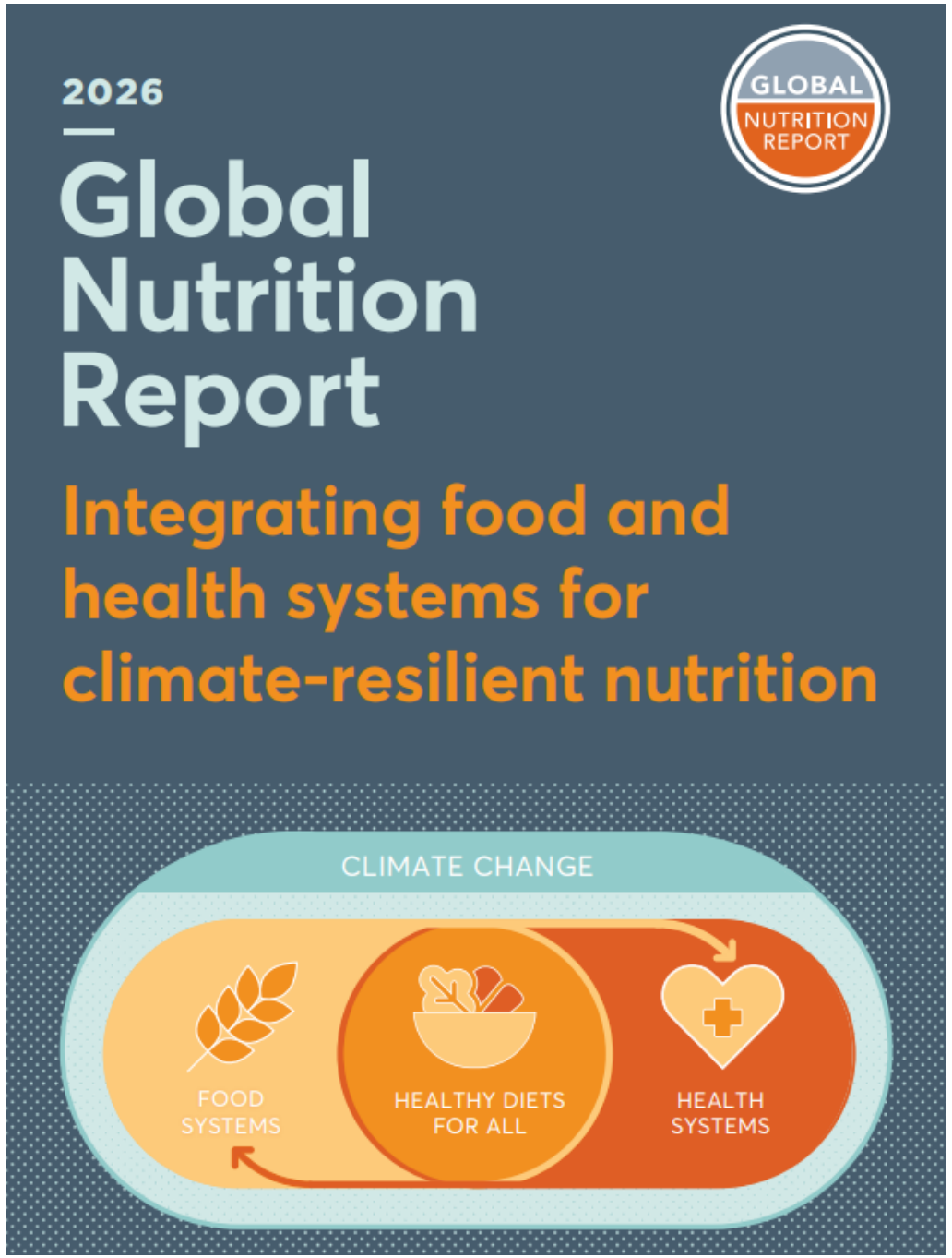

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Global Nutrition Report - *2.6 billion people cannot afford a healthy diet.*

2026

→ More information

Desertification and Drought Day June 17: Countries are advancing smarter solutions to protect food security

June 2026

→ More information

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AFS Network new webinar Series: Deep Dive series

- Nutrition - with Health Network : July
- Sustainable Land Management : August

→ More information

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Solution-oriented Research for Development Programme

The overarching goal of the SOR4D programme is to produce better knowledge, solutions and innovation by needs-driven, transdisciplinary research that opens up new ways for advancing sustainable development and reducing poverty in the least developed, low and lower middle-income countries. **www.sor4d.ch**

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Swiss National Science Foundation

SWIFT
WASTE-BASED INSECT FARMING

From Waste to Treasure trove: Learnings from SWIFT

July 1 2026


E. Lupfaya


S. von Hoerner


A. Komakech


F. Mnthambala


C. Zurbrügg


D. Peguero


St. Diener

Entry point waste management

BSF lifecycle

SWIFT
WASTE-BASED INSECT FARMING

Eggs

500-900 eggs
3-4 days

Larvae

13-18 days

Prepupae

~ 7 days

Pupae

>10 days

Adult BSF

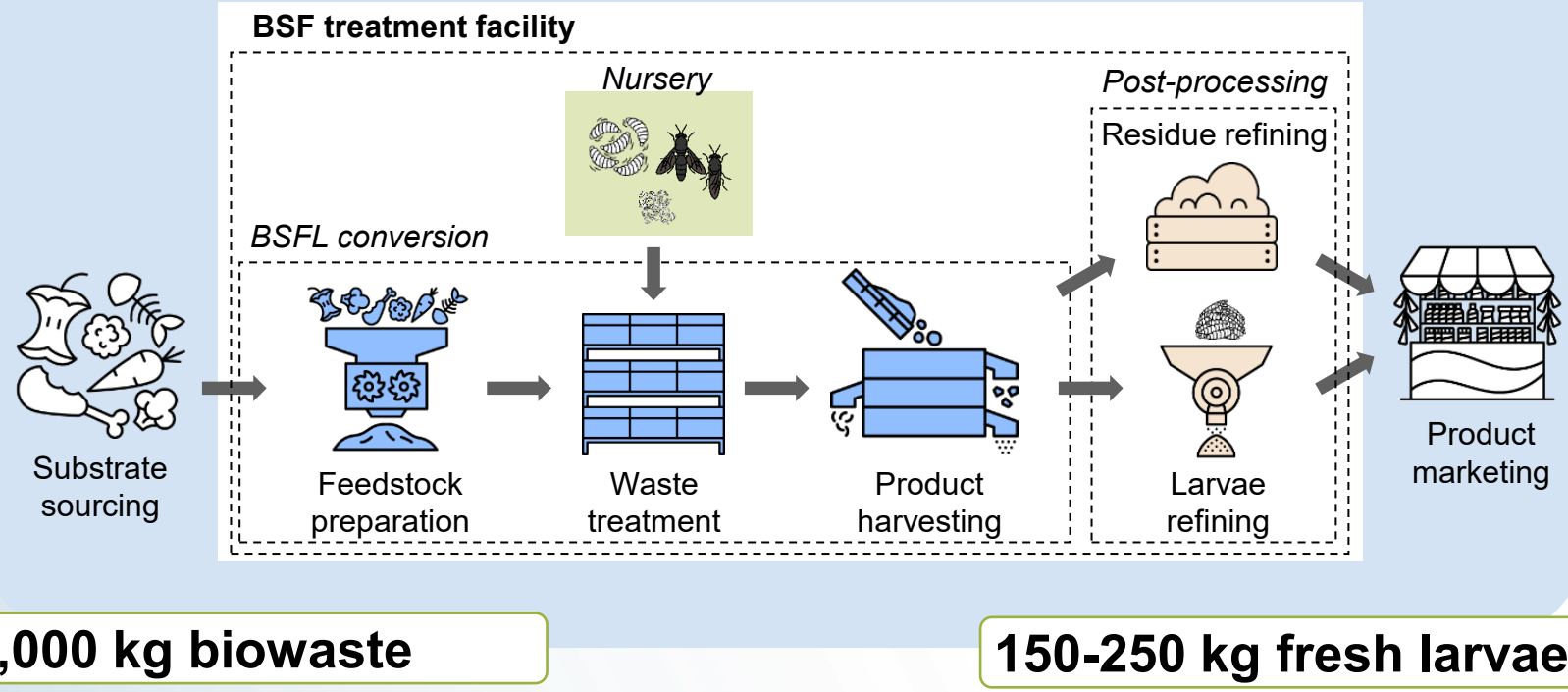
5-9 days

BSF farming and its enabling environment

WP1 WP2 WP3 WP4

1-1.5 million larvae

~400 kg residue (frass)



1,000 kg biowaste

150-250 kg fresh larvae

- Socio-cultural acceptance
- Government support
- Legal and regulatory framework
- Institutional arrangement
- Financial arrangements
- Skills and capacities

Operating with smallholder farmers in Malawi

Operating more medium scale in Uganda

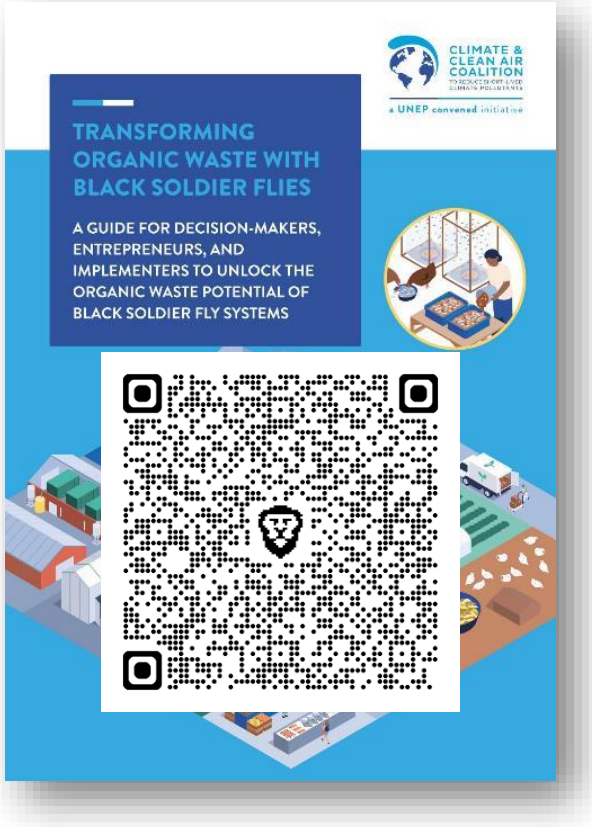
4 tons of waste per day

Where research meets application

SWIFT
WASTE-BASED INSECT FARMING

Uganda: Policy impact on Animal Feeds Bill 2024

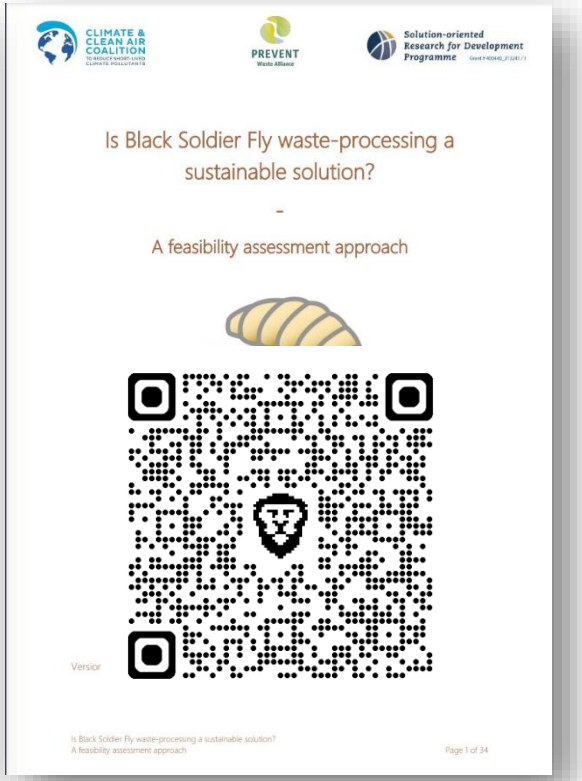
Knowledge Base and Source Documents



Climate and Clean Air Coalition (2025). **Transforming Organic Waste with Black Soldier Flies**

Diener, S., et. al., (2025). **Standard operating Procedure: Reproduction Unit.**

Diener, S., et. al., (2025). **Standard operating Procedure: Growout Unit.**



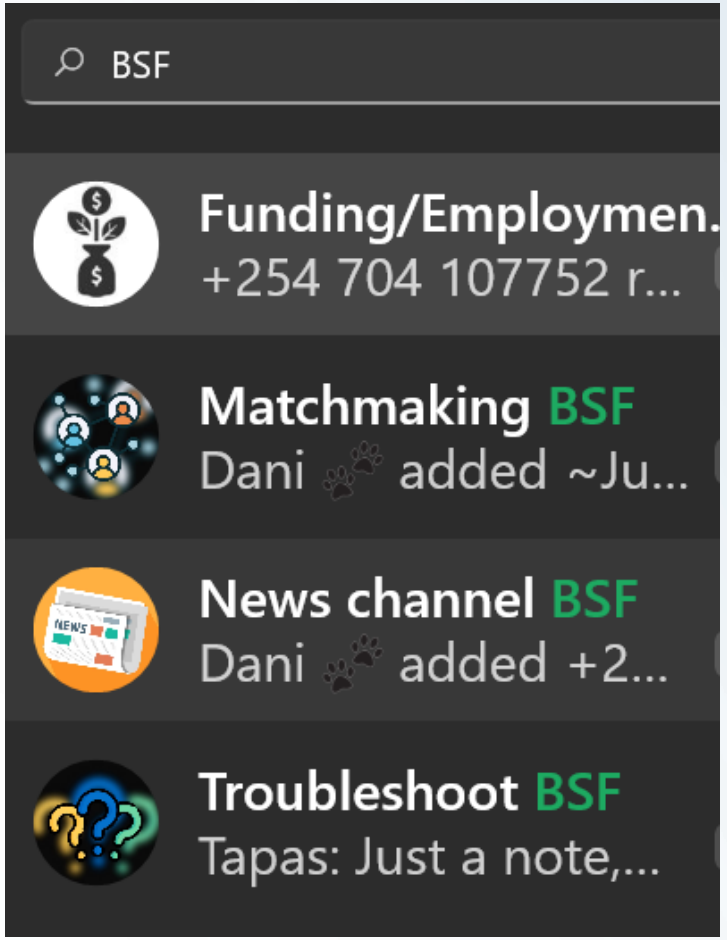
Zurbrügg C., et al. (2024). **Is Black Soldier Fly waste-processing a sustainable solution?** A feasibility assessment approach

Community of Practice – BSF Africa

Around 1600 members

WA tool

Eng + French + Spanish



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Swiss National Science Foundation

SWIFT
WASTE-BASED INSECT FARMING

THANK YOU

eawag aquatic research

BIOCONVISION

MZUZU UNIVERSITY
SELF RELIANCE SERVICE PERFECTION

SFHC
SOILS, FOOD AND HEALTHY COMMUNITIES

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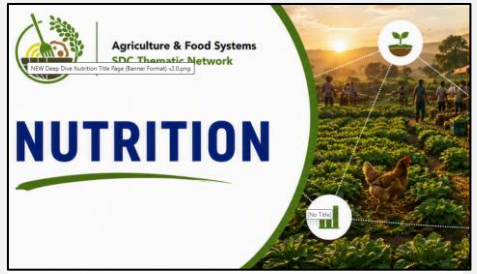
ANNOUNCEMENTS

- Presentations soon available on our website : https://www.sdc-foodsystems.ch/en/thoughts-for-food
- Upcoming events : https://www.sdc-foodsystems.ch/en/upcoming-events

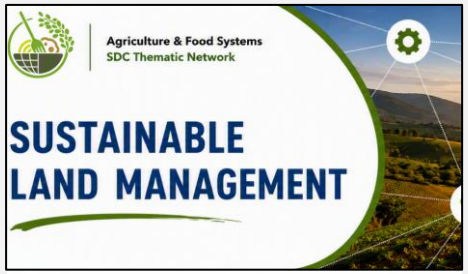


AFS & Health Network

Measuring Healthy Diets - Expert Input

End of July

Zoom



AFS Network

Deep Dive: Sustainable Land Management

August 5

Zoom

AFS Network

Knowledge Fair: Sustainable Land Management

August 11

Zoom

Don’t hesitate to share news, topics and ideas with us!

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Thank you!
Stay well, and stay connected!