Circular Bioeconomy Systems for
Concurrently Delivering Solutions to Climate Change, Biodiversity Loss and Food Security

United Nations Environment Program
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15:30 –17:00 EAT
Program in brief:

- Moderator – A.G. Kawamura, farmer: Co-Chair Solutions from the Land (SfL)
- Dr. John Reid- Professor, University of IL, Chair ASABE CBS Institute
- Margaret Munene- Palmhouse Dairies, Kenya
- Ana Carolina Zimmermann- farmer/rancher, Brazil
- Lois Wright Morton- farmer, Outwash Terrace Farm, USA
- Isabel Albinelli- FAO, Rome
- Ernie Shea- President, SfL
Circular Bioeconomy Systems for Concurrently Delivering Agroecosystems Services and Food & Nutrition Security

Dr. John F. Reid
Research Professor in Computer Science, Ag and Bio Engineering, Electrical and Computer Engineering
University of Illinois at Urbana-Champaign
Heartland Bioeconomy

- Highly productive linear bioeconomy
- 80% farmland, with 355,000 farms covering 175.6 million acres
- In 2021, produced 53% of corn receipts ($37.7 billion), 45.6% of soybean receipts ($22.4 billion), and 24.5% of wheat receipts ($2.9 billion) in the United States
- Agriculture in the region accounts for an average of 6.6% of the GDP and approximately 2.2M jobs (in Food and Agriculture).
- Significant ag-related industry located in the region

Similar opportunities for creating impact exists across other viable CBE systems
Agricultural Circular Bioeconomy

- The CBE is a complex system of systems
- Sustainable Precision Ag is a critical first step
- Regenerative Ag opportunities need to evolve
- The role of Digital Technologies is pivotal
Vision

A thriving circular bioeconomy requires:

- *Reducing, recycling, and reusing* waste productively
- *Optimizing* production systems
- *Displacing fossil fuels* with renewables
Areas of Critical Investment

Enabling Investments in…

- Use-Inspired Research
- Translation of Research into Practice
- Workforce Development

Across major dimensions of impact

- Precision farming and regenerative agriculture
- Biomanufacturing and bio-derived material production
- Resource recovery and reuse
- Farm to market sensing, tracking, and supply-chain optimization
Innovation is required across the ecosystem

Use data to drive outcomes:
- Sustainable precision ag through machine system optimization and power management
- Digital ag to enable traceability from farm-to-fork

Innovative Resource Recovery (RR):
- Understand the RR opportunity space (biorefineries, food production systems)
- Accelerated learning on viable recovery

Creating value-added products for bioresources:
- Aggregation of waste streams
- Novel approaches to convert waste to value-added products

Building a circularity mindset:
- Consumer education
- Quantification of the challenges/benefits
- Prepare for CBE
Margaret Munene, MBS

CEO

Palmhouse Dairies Ltd.

Service to Humanity is Service to God
FARMERS TRAINING:

- Farmers are trained periodically on best animal breed selection.
- Good animal care and husbandry.
- Increased milk production and reduction on the number of cows on the farm.
GREEN ENERGY:

- Biogas production for cooking.
- Cheap and safe energy that protects the environment.
- Organic manure for the farm.
AGRICULTURAL CIRCULAR BIOECONOMY SYSTEMS; DAIRY SECTOR.

SOIL TESTING:

- Increased food sustainability on the farm.
- Increased animal fodder production.
- Improved soil conservation on the farm.
- Better soil management on the farm.
AGRICULTURAL CIRCULAR BIOECONOMY SYSTEMS; DAIRY SECTOR.

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QUESTION SESSION?

THANK YOU!
SCALING CIRCULAR SYSTEMS TO
A DIVERSIFIED SMALL-HOLDER FARM

Lois Wright Morton, PhD., Specialty crop grower NE Ohio, USA
Professor Rural Sociology Iowa State University; SfL Board of Directors
Ashtabula County Scenic Rivers Council-ODNR

United Nations Environmental Program; 6th Assembly UNEA-6
SfL UNEA-6 Side Event Green Room Nairobi, Kenya 2024 February 28
Agricultural Circular Bioeconomy Systems for Concurrently Delivering Solutions
to Climate Change, Biodiversity Loss and Pollution and Food Security
DIVERSIFIED SMALL-HOLDER FARM

East Branch the Ashtabula River, flows N to Lake Erie

20 ac (8 ha) corn-soy; 3 ac (1.2 ha) hay;
3 ac (1.2 ha) specialty crops (blueberries, raspberries, vegetables, cut flowers); 4 ac (1.6 ha) wetland, river & bottom lands; 21 ac (5.5 ha) woodland

Total 51 ac (20.6 ha)
What does a small-holder farm look like when it uses productive, efficient, nature positive farm level circular systems?*

*SFL model of Smart Agriculture circular systems (2022)
What is the value of circular systems to farmers?

Retained value ...

Farm products are re-circulated through farm and ecological systems and offer retained value (e.g. manure, straw, cover crops, recycled water, biogas, seed production, etc) as co-products that can substitute for production inputs and be marketed off-farm as outputs.

[UN Environment Program draft Global Strategy for Sustainable Consumption and Production (2023-2030)]

What does “retained value” look like? $$$$$

Co-products that have intentional, planned structures and processes around them (whereas by-products are not intentional)
Retained Value

Rain barrels recycle water

Augmentation box draws parasitic wasps to discarded fruit & SWD larvae

Co-product fresh berries: jams and jellies

Hummingbirds eat pest insect larvae

Bees & butterflies pollinate berries

Co-product of pollination: honey

On-farm market stand reduces labor costs
One farm’s output is another farm’s input

Community Circularity

...and Regional Circularity
Wholesale 2 local grocery stores; retail 2 farmer markets; and farm stand

direct & indirect effects on rural economic and social well being

**Off-farm outputs and farm outcomes**

.. impact local economies and labor market

.. stimulates sense of community
Small-holder farmers are part of the solution: protect & enhance biodiversity, food & nutrition security, changing climate
The global population suffers from some form of malnutrition in 2020 (SOFI, 2022). 30% of the world’s agricultural production is lost (FAO & UNEP, 2022). 13.2% of available food is wasted (FAO & UNEP, 2022). 17% of global food demand is projected to surge by 60% by 2050, necessitating sustainable approaches to preserve natural resources and ecosystems.

FAO Programme Priority Area “Sustainable Bioeconomy for Food and Agriculture”

- Using existing biological resources more efficiently and wasting less
- Producing and consuming in a more environmentally friendly and healthy way
- Creating circular and inclusive value chains and local economic opportunities that leave no one behind
Country support – The enabling environment

Country support – Tools for mainstreaming sustainability and circularity

- **21 countries and 3 regions** with a bioeconomy dedicated strategy, **17** under development
- Almost all strategies contain actions related to **circularity**
- Austria, Estonia, Ireland, Portugal and East African regional bioeconomy strategy – around **30% of the actions are related to circularity**
- The circular aspect of the bioeconomy is highly present in several **national food, climate, biodiversity policies and report** (NDCs, NAPs, LT-LEDS, NBSAPs..)
FAO’S WORK – BIOINNOVATIONS LEVEL

150 bioeconomy-related projects worth almost USD 330 million in the past biennium (2022-2023).

**BIOFIBRE FOR CLOTHING (PAKISTAN)**

Turning non-edible waste from the banana value chain into sustainably produced fabrics to reduce waste from banana production, estimated at two-thirds of the overall biomass, while reducing chemicals requirements in the manufacturing.

**UPCOMING GLOBAL BIOECONOMY PROJECT “ScaleUpBio”**

Barbados, Bolivia, Côte d’Ivoire, Viet Nam

Test four bioinnovations in selected value chains that are able to concurrently deliver environmental, social and economic benefits.
BIODAF – CIRCULAR BIOECONOMY IN ABIDJAN

THE ISSUES

**Waste**
- The district produces 4,000 t of food waste per day
  - No efficient collection and valorisation

**Agricultural inputs**
- Imported
- Costly
- Unsustainable

**Job creation**
- 6 million inhabitants
- +187,000 inhabitants/year

THE CIRCULAR BIOINNOVATION

- Feed for poultry and aquaculture
- Organic fertilizer
- Urban and peri-urban agriculture
- Business opportunities for women and vulnerable people
- Collection of food waste at urban markets
- Food distribution
- Food security
- Biodegradation using black soldier fly larvae
- Larvae
- Frass
BIODAF CIRCULAR MODEL – THE IMPACTS

**BioDAF Farm at 50% capacity**

- Quantity of waste reduced per day: ~960 KG
- Quantity of larvae produced per day: ~120 KG
- Quantity of organic fertilizer produced per day: ~200 KG

**People – Job creation**

- People currently employed on the farm: 8
- People trained on the farm: 10

**Scalability**

- Cost-effective
- Low initial capital
- Low know-how
- Easy to replicate in several contexts
THANK YOU!

ISABEL.ALBINELLI@FAO.ORG

FAO BIOECONOMY WEBSITE
Farmers Sharing their CBE Experiences:

- SfL white paper featuring farmers experimenting with CBS across the globe
- Produced in partnership with FAO, GACSA, ASABE and other partners
- Will focus on:
  - local and global climate and market conditions
  - climate smart management strategies
  - farmers experiences with CBS producing multiple benefits
To Apply:

- Send your name, geographic location, and a brief summary of your farm operation and willingness to participate to:

  Ernie Shea, Solutions from the Land
  eshea@solutionsfromtheland.org
Join us in advancing our vision!

solutionsfromtheland.org