



Advancing Fiber Valorization from Food & Agro-Processing Waste in Kosovo: Scientific, Technological and Industrial Perspectives

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Economic and Social Impact:

Agriculture is a **key pillar of Kosovo's economy** contributes approximately:

7–8% of GDP

15–17% of exports

Critical for:

- a) Employment
- b) Rural livelihoods
- c) Food security

Rural areas are highly dependent on:

- ☐ *Smallholder farming*
- ☐ *Agro-processing activities*

Main agri-food sectors:

- 🍎 * Fruit and vegetable production & processing
- 🥛 Dairy production & processing
- 🌾 Cereal and bakery industries
- 🥩 Meat production & processing



Organic Waste Generation in Kosovo (Estimated Overview)

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Category	Waste Type / Source	Estimated Quantity (tons/year)	Share / Notes
Total Waste (All Sectors)	Municipal + Industrial	2.7 – 3.0 MILLION	Includes all waste streams
Municipal Waste	Household & similar waste	~480,000 – 530,000	Official reported range
Industrial Waste	Mining, energy, manufacturing	~2.2 – 2.5 million	Dominant waste stream
Food Waste (Municipal & Supply Chain)	Households, retail, food services	400,000 – 600,000	Largest share of organic waste
Agricultural Waste	Crop residues	200,000 – 400,000	Often not officially recorded
Agro-processing Waste	Dairy, meat, fruit & veg processing	100,000 – 200,000	Underutilized by-products
Total Agro-Food Organic Waste	Combined agro-food sources	700,000 – 1.2 million	Key circular economy potential (≈30% of total waste)

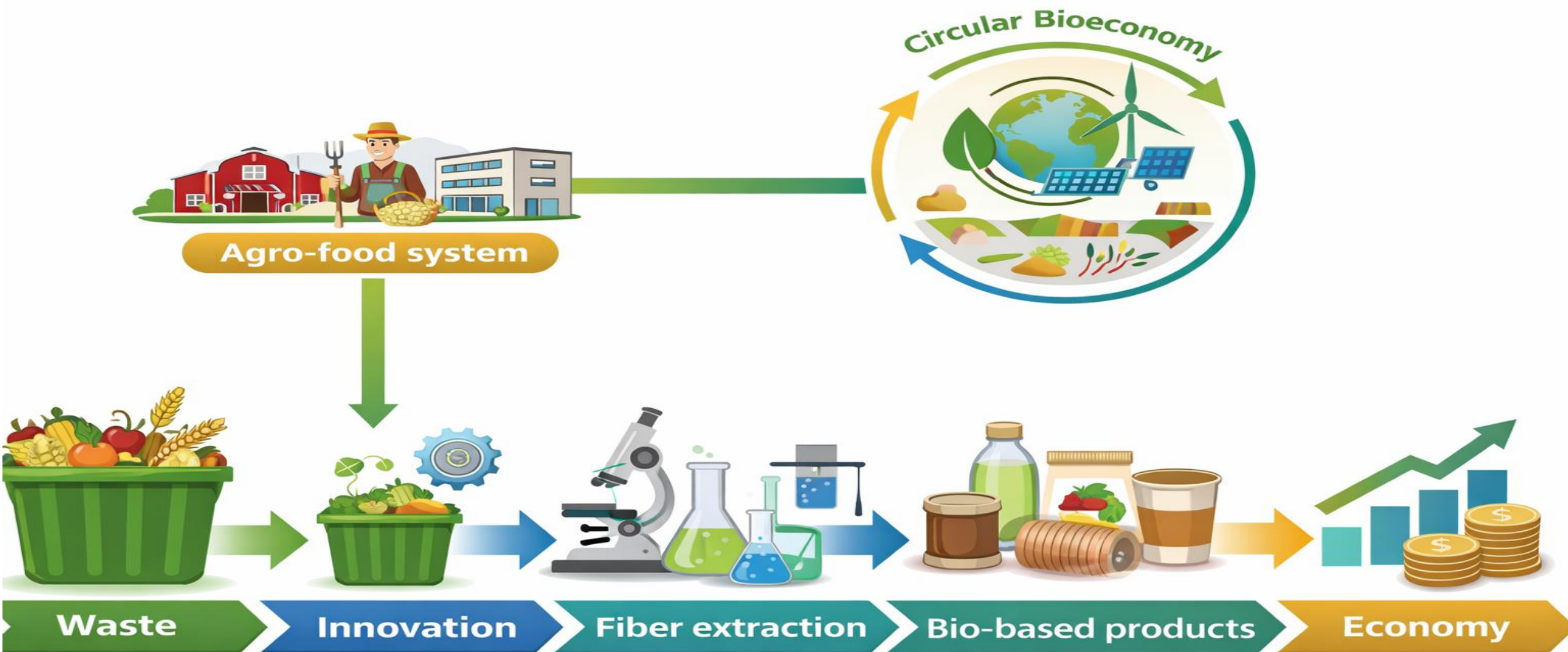
Key opportunities: Develop circular bioeconomy solutions

- ◆ **High availability of biomass** (*Fruit pomace, cereal bran, vegetable residues, dairy by-products*)
- ◆ **Production of high-value products** (*Dietary fibers, bioactive compounds, biopolymers, natural additives*)
- ◆ **Growing market demand** (*Functional foods, nutraceuticals, biodegradable packaging*)
- ◆ **Technological advancement** (*Green extraction, enzymatic, ultrasound, biorefinery systems*)
- ◆ **Economic diversification** (*New value chains, SMEs, rural job creation*)

Improve sustainability and align with EU green transition goals

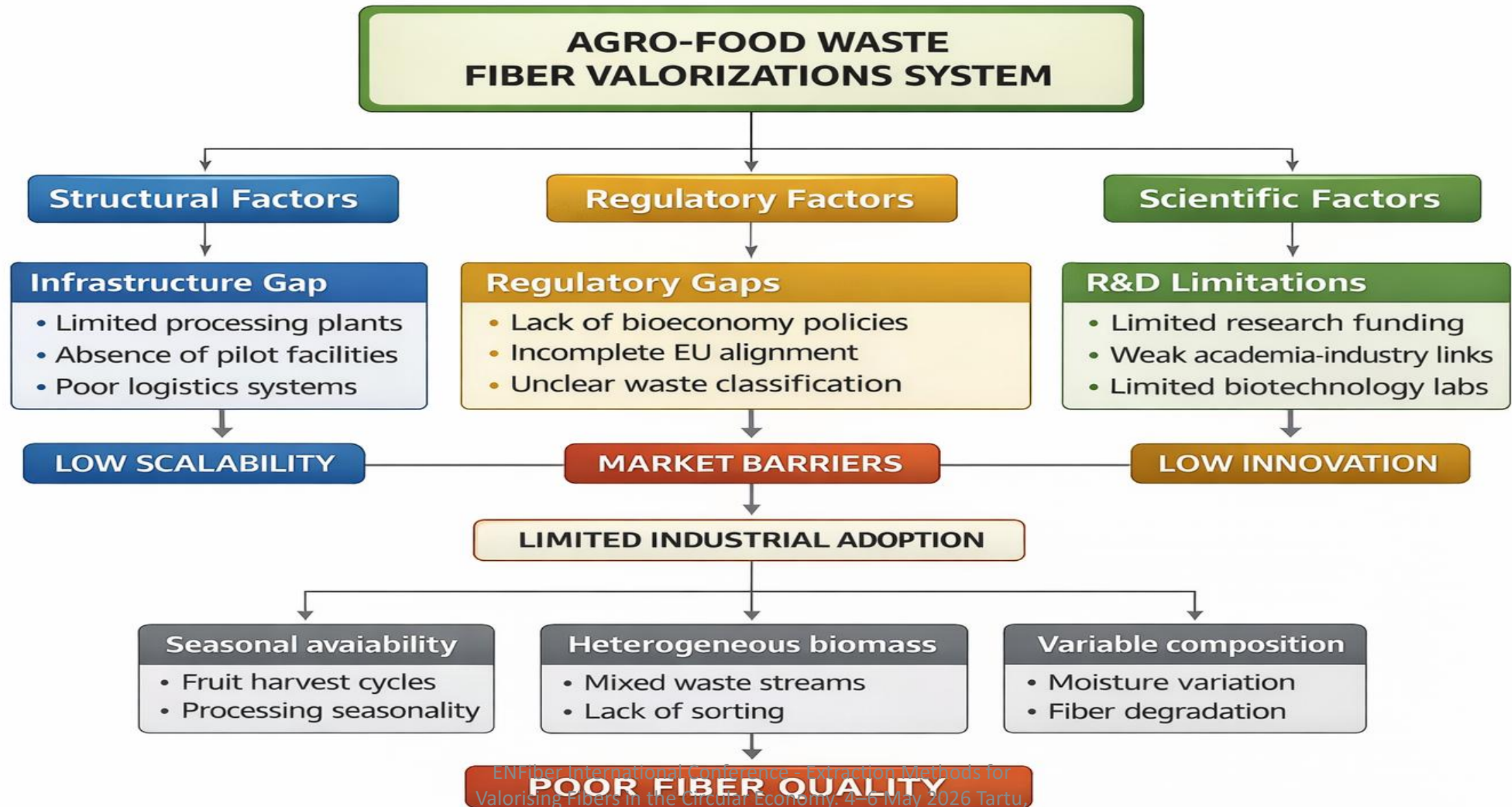


Agri-food Fiber Valorization & Circular bio-economy



Key Challenges Affecting Agro-Waste Fiber Valorization in Kosovo

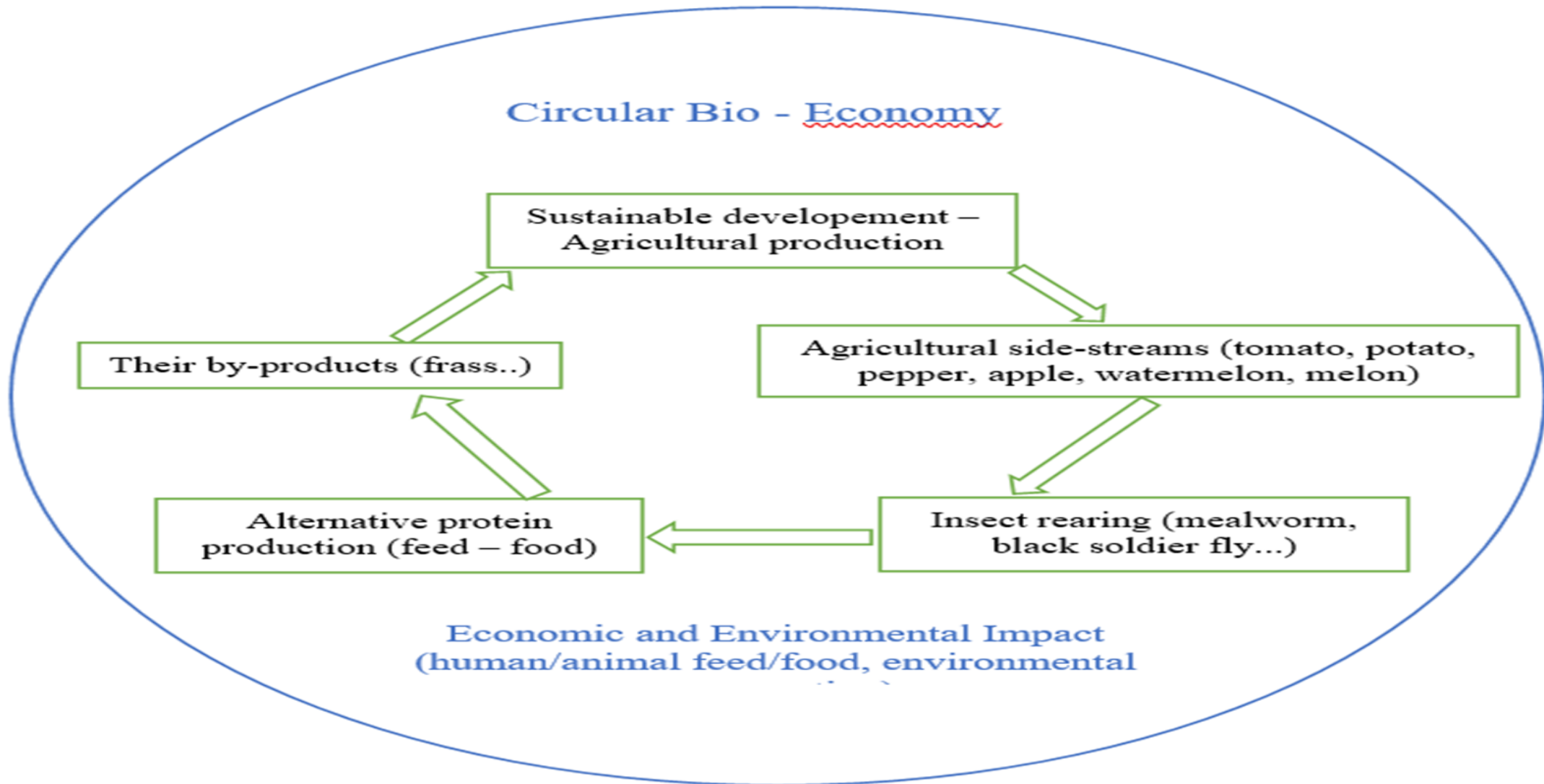
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P1: Production Side-stream from Total Agricultural Production (2025)

Agriculture Crop	Total land cultivated year 2022 (h)*	Yield (t/ha)*	Total production per year (t)*	Percentage of agriculture side-stream (%/ha) Analysis of Variance (P ≤ 0.05)	Total agriculture side-stream generated (t/year)
Apple	3.091	12.95	40,029	9.3 e	3,723
Watermelon	1.316	20.89	27,491	12.0 cd	3,299
Melon	329	13.59	4,471	11.2 cd	501
Pepper*	3.154	17.55	55,353	13.6 bc	7,528
Potato	3.884	19.44	75,505	10.5 d	7,928
Tomato**	805	25.1	20,206	32.9 a	6,648

Project: Organic Side-stream Emergence in Agriculture and Circular Economy: Challenges and Opportunities



P2: Sustainable use of organic side streams in Kosovo

Concept development and implementation paths using the example of the municip. of Viti



Per household ~ 0.64 kg/day
Per household ~ 233.6 kg/year

Per person ~ 0.128 kg/day

x

Viti 35.566

=

Per day: ~4,552 kg (4.55 t)
Per year: ~1,661,644 kg (1,661.6 t)



Unlocking Kosovo's Future Through

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Key Messages

- Research drives growth
- Evidence-based policy
- Strong partnerships
- Support talent & systems

Strategic Actions

- Invest in infrastructure
- Promote collaboration
- Use data for policy
- Build innovation system

Research

Institutions

Growth

Sustainability

Phase

Key action

- | | |
|---------|--|
| Phase 1 | Food waste valorization - Waste mapping & characterization |
| Phase 2 | Fiber extraction technologies - Laboratory extraction optimization |
| Phase 3 | Circular bioeconomy in Kosovo - Pilot-scale facilities |
| Phase 4 | Sustainable food systems - Industrial scaling & commercialization |
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Final Thought:

"Food waste fiber valorization concept should not just stay in the lab, but be valorized and used to benefit those who need it most"

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