MarginUp! | Growing value on marginal lands

HUNGARIAN USE CASE

Perennial Crops for Mushroom Substrate & SMS Valorisation

From marginal land to mushrooms, renewable energy and fertile soils.

OBJECTIVE

Demonstrate a circular bioeconomy model linking perennial biomass cultivation on marginal sandy land with partial substitution of wheat straw for oyster mushroom production and valorisation of spent mushroom substrate (SMS) through biogas production and digestate reuse.

THE VALUE CHAIN

PERENNIAL BIOMASS CULTIVATION
Sida (Virginia mallow), willow and perennial rye on marginal sandy land

→

BIOMASS HARVESTING & LOGISTICS
Harvesting, baling and short-distance transport (~3.2 km) to mushroom facility

→

MUSHROOM PRODUCTION
Partial substitution of wheat straw (25–35%) with perennial biomass for oyster mushrooms

→

SMS VALORISATION (VIA BIOGAS)
Conversion of spent mushroom substrate (SMS) into biomethane, electricity and digestate

→

CIRCULAR USE & REGIONAL BENEFITS
Renewable energy, digestate reuse, regional value creation and reduced reliance on conventional inputs

KEY FIGURES (2023–2025)

~1.5 ha
Perennial crops (Sida, willow, rye) on marginal land

25–35%
Wheat straw substitution in mushroom substrate

~742 t/year
Oyster mushrooms (from ~2,700 t substrate)

~1,500 t/year
SMS processed via anaerobic digestion

Renewable energy
Biomethane & electricity and nutrient-rich digestate

KEY GOALS & ACTIVITIES

1. Demonstrate oyster mushroom biorefinery using perennial biomass
   - Establish Sida, willow and perennial rye on marginal land
   - Substitute wheat straw (25–35%) in substrate
   - Demonstrate technical feasibility
2. Demonstrate short-distance logistics chain
   - Operate local logistics loop (~3.2 km)
   - Optimise transport and handling of biomass and SMS
3. Valorise SMS through biogas and digestate reuse
   - Process SMS via anaerobic digestion
   - Recover biomethane, electricity and digestate
4. Foster local cooperation and knowledge transfer
   - Multi-actor cooperation between farm, processing and energy actors
   - Knowledge sharing within the project
5. Replication and long-term impact
   - Document and disseminate results
   - Develop transferable business and technical models
   - Support regional replication

TRL PROGRESSION

TRL 4 → TRL 7
Oyster mushroom biorefinery (partial straw substitution)

TRL 2 → TRL 5
Logistics system (short-distance chain)

LOCATION

Great Hungarian Plain (Kiskunsági Sand Plateau), Hungary (Kujani Farm & Pilze)

GEOGRAPHICAL SCOPE

Regional pilot with potential for national replication

LEAD BENEFICIARY

Pilze Nagy – A LASKAGOMBA-TERMESZTŐ

KEY PARTNERS

Kujani Farm
BZN
Innomine

MAIN RESULTS & STATUS

- Perennial crops established – Operational (2023–2025)
- Straw substitution (25–35%) – Demonstrated
- Short-distance logistics loop – Operational (~3.2 km)
- SMS to biogas – Demonstrated (~1,500 t/year)
- Local cooperation – Established (~3–4 FTE)

ENVIRONMENTAL IMPACT & BIODIVERSITY

Feeding habitat for birds
Alauda arvensis
Motacilla alba
Falco vespertinus
Lanius collurio
Linaria cannabina
Upupa epops
Higher habitat value on perennial crops compared with annual corn.

Pollination service
Supports pollinators such as the common carder bee (*Bombus pascuorum*).
Higher activity on perennial crops compared with annual corn.

Carbon sequestration
Increased soil organic carbon and root biomass on perennial crops (Sida, willow, rye) compared with annual corn, contributing to climate change mitigation.

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Project partners (Hungarian use case)

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