



Enabling scalable SAF production through feedstock innovation

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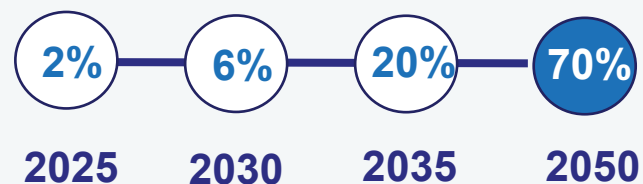


Scaling SAF starts with sustainable feedstocks

SAF SCALE-UP

ReFuelEU Aviation

EU minimum SAF shares



Scaling SAF production requires a reliable supply of sustainable feedstocks

FEEDSTOCK CHALLENGE

MORE BIOMASS

Increase feedstock availability

MORE FROM THE SAME LAND

Use land and resources efficiently

RIGHT QUALITY

Suitable for SAF conversion pathways

ICARUS INNOVATION

1 Intercropping system

2 Plant growth-promoting rhizobacteria (PGPR) application



To assess whether diversified cropping systems can enhance biomass availability, land use efficiency and feedstock quality for SAF conversion.

ICARUS innovation approach

1

CROPPING SYSTEMS

Sorghum-based intercropping system (2025-2026)

Monocrops:

1. Sorghum
2. Sunn hemp
3. Pigeon pea

Intercrops:

1. Sorghum + Sunn hemp
2. Sorghum + Pigeon pea

± PGPR



Sorghum monocrop



Sorghum + Sunn hemp



Sorghum + Pigeon pea

Pearl millet-based intercropping system (2026)

Monocrops:

1. Pearl millet
2. Sunn hemp

Intercrops:

1. Pearl millet + Sunn hemp



2

BIOLOGICAL ENHANCEMENT

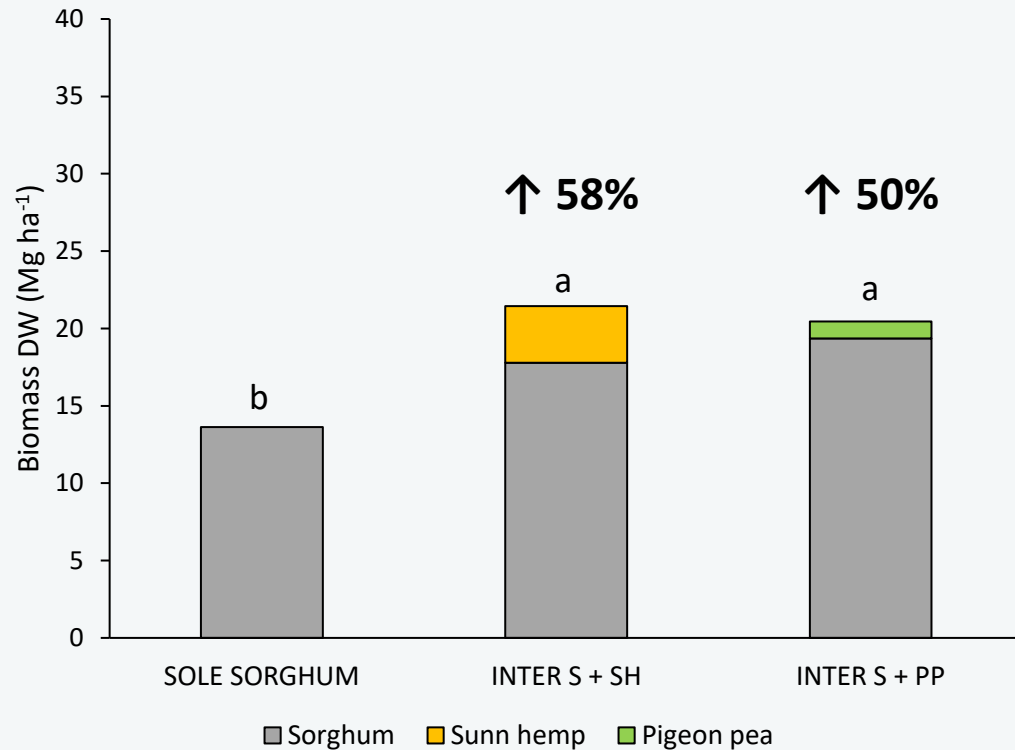
Plant growth-promoting rhizobacteria (PGPR)

Bacillus sp. VWC18

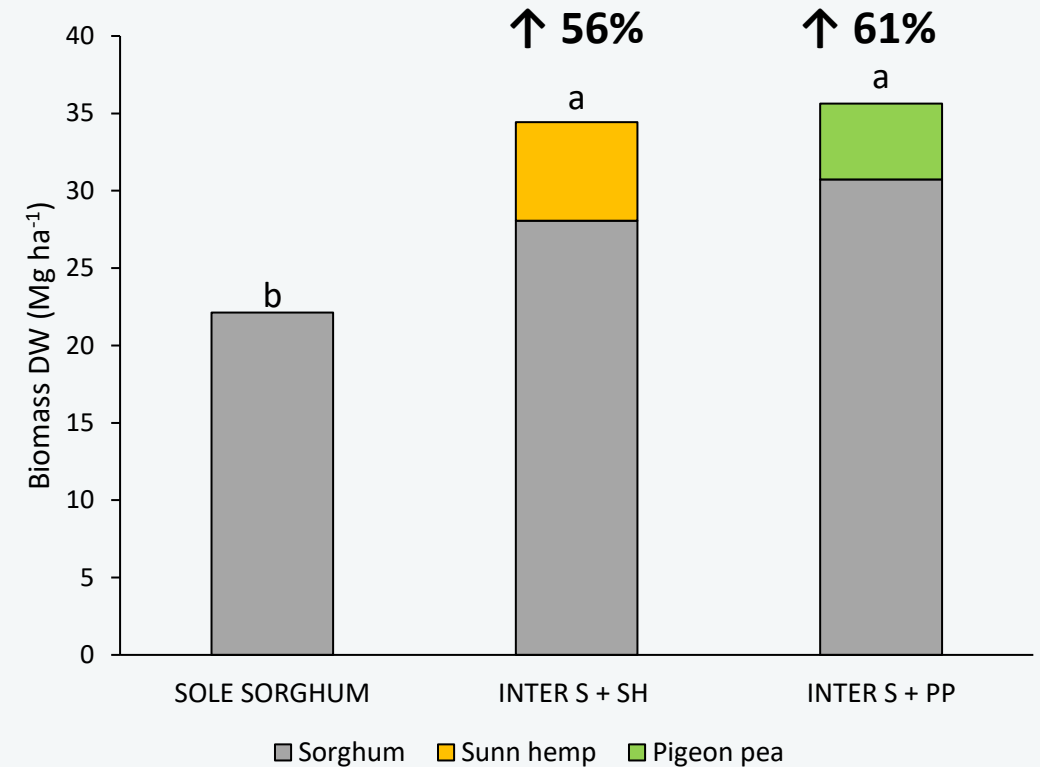
Seed coating + 3 foliar applications

Intercropping increases feedstock availability

FLOWERING



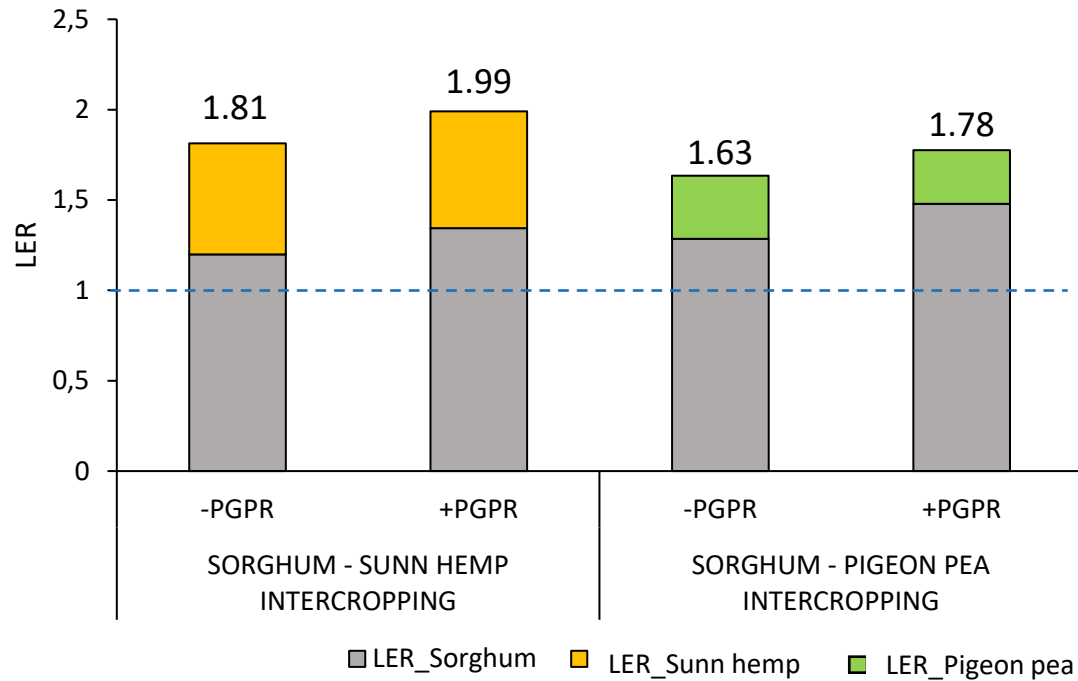
MATURITY



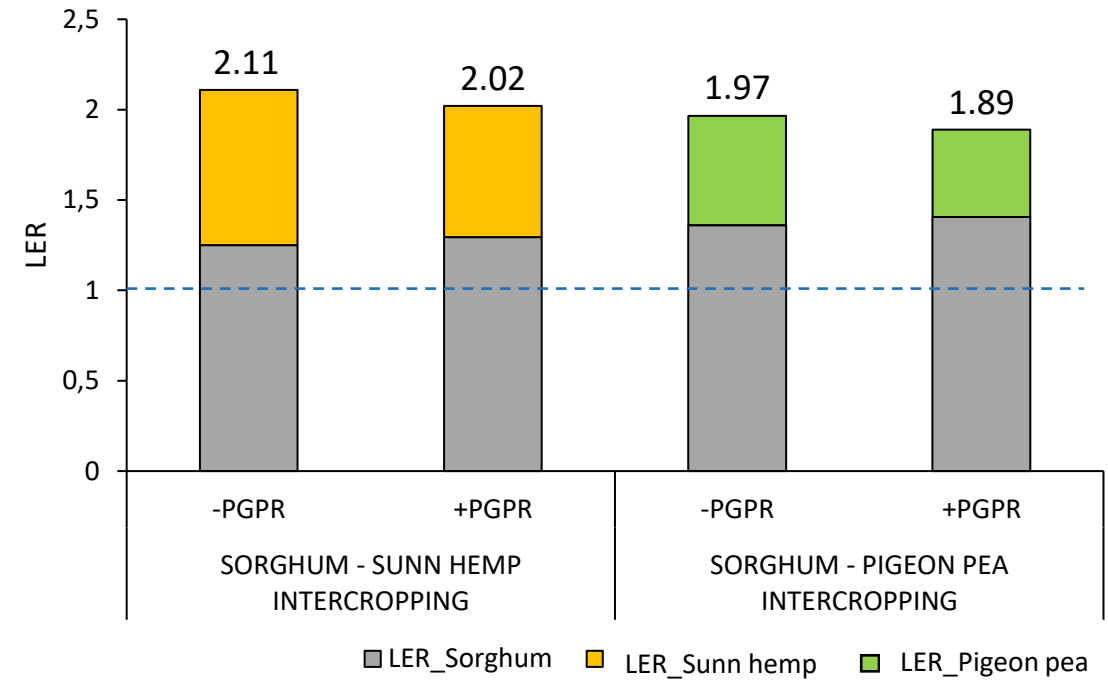
Intercropping increased biomass production by 50-61%, expanding feedstock availability for SAF production.

Intercropping improves land-use efficiency

FLOWERING



MATURITY



LAND EQUIVALENT RATIO (LER)

LER compares the productivity of the component crops in intercropping with their respective sole crops.

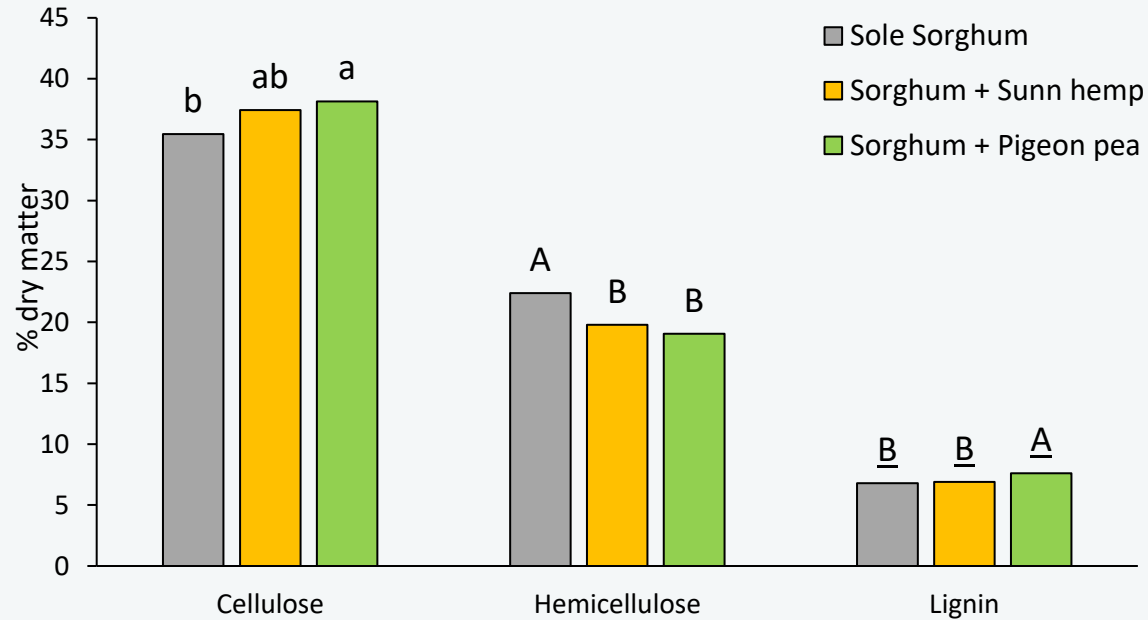
LER > 1
= land use advantage

LER = 2 → 100% land-use advantage
1 ha intercrop ≈ 2 ha sole crop

LER remained consistently above 1 (1.63-2.11), demonstrating a clear land-use advantage across intercropping systems and harvest stages.

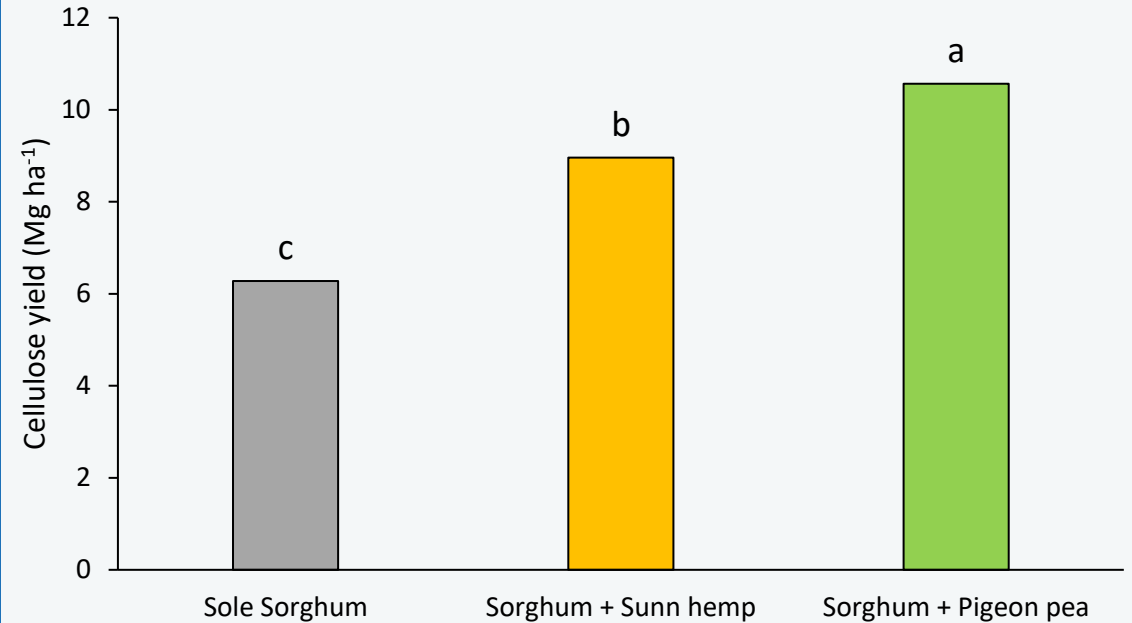
Feedstock quality for biochemical pathway

Biomass composition



- Cellulose content was maintained or slightly higher in intercropping systems.
- Hemicellulose content decreased in intercropping systems.
- Lignin content was higher in S+PP, while similar between sole sorghum and S+SH.

Cellulose yield



6.3 Mg ha⁻¹

↑ **43%**
vs. sole sorghum

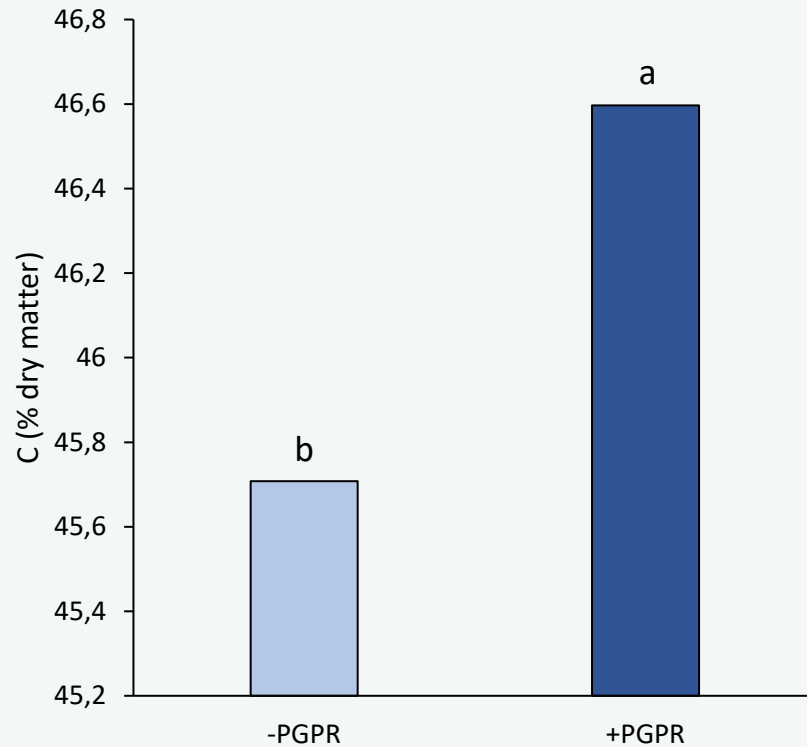
↑ **68%**
vs. sole sorghum

Higher biomass production translated into greater cellulose yield per hectare in both intercropping systems.

Feedstock quality for thermochemical pathway

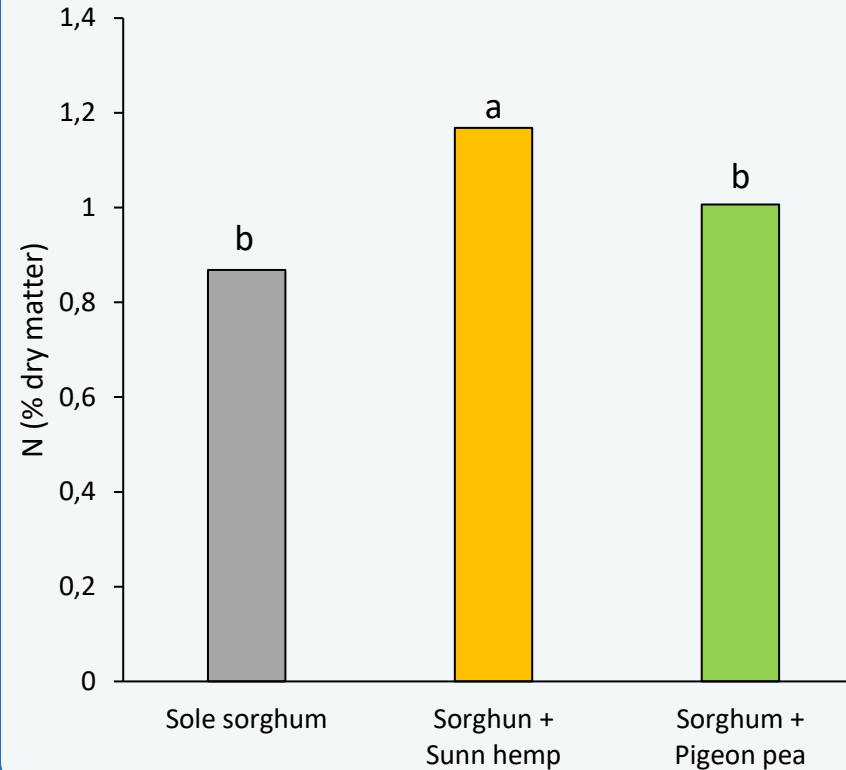
Carbon content

Effect of PGPR application



Nitrogen content

Effect of cropping system



Ash, sulfur and chlorine

No significant differences among treatments



Ash

5.85% DM

Literature¹: 4.1–8.2%



Sulfur

0.155% DM

Literature¹: 0.068–0.111%



Chlorine

2490 mg kg⁻¹ DM

Literature¹: 3741–7199 mg kg⁻¹

Key thermochemical feedstock properties were largely unaffected by cropping systems, while PGPR increased carbon content and the sorghum + sunn hemp system showed higher nitrogen concentration.

Conclusions

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MORE FEEDSTOCK

+50 – 61%

biomass production

Sorghum-legume intercropping substantially increased biomass availability across harvest stages.

MORE EFFICIENT LAND USE

LER = 1.63 – 2.11

100% land-use advantage

All intercropping systems showed a consistent land-use advantage over sole cropping.

CONVERSION-RELEVANT QUALITY

+43 – 68%

cellulose yield

Higher biomass production translated into greater cellulose production per hectare, while ash, S and Cl concentrations were not significantly affected by cropping treatments.

Diversified sorghum-based cropping systems can expand feedstock availability and land use efficiency while maintaining conversion-relevant biomass characteristics, providing a promising agronomic strategy to support scalable SAF feedstock supply.

Thank you

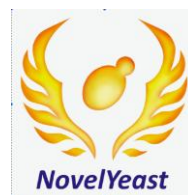
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Partners



Associated Partners



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