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Powering Agriculture, Growing Energy: Why Agrivoltaics matter now

Insights from Eurac Research

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Why agrivoltaics?

- **Fossil insecurities:** Three-quarters of the world's population live in fossil-importing countries. Net importers spent $1.7 trillion in 2024.[1] Volatility seems to have become structural (second major fossil fuel crisis in four years).
- **Solar is surging.** Decreasing prices for PV (LCOE went down by around 90% from 2010 to 2023)[1] and for BESS (40% drop from 2023 to 2024).[2]
- Almost half (44%) of the world's habitable land is used for agriculture vs. only about **1.1%** for **urban areas.**[3]
- Urban areas doubled size from 2010 to 2015, bioenergy crops production increased 50% since 2000[6]: points to ongoing **competition for land uses**. Rural areas hold the highest potential for renewables.[4]
- Water usage for agriculture irrigation is increasing (**72% of global freshwater** withdrawal in 2020)[6.]
- **Global temperatures** in 2025 with average temperatures of **1.19°C** above the 1951 to 1980 average.[5] **Climate change affects all dimensions of food security**, namely availability, access, utilization and stability, by disrupting food production, quality, storage, transport and retail activities. **These effects exacerbate competition for land, soil and water resources**[7].

Agrivoltaic configurations

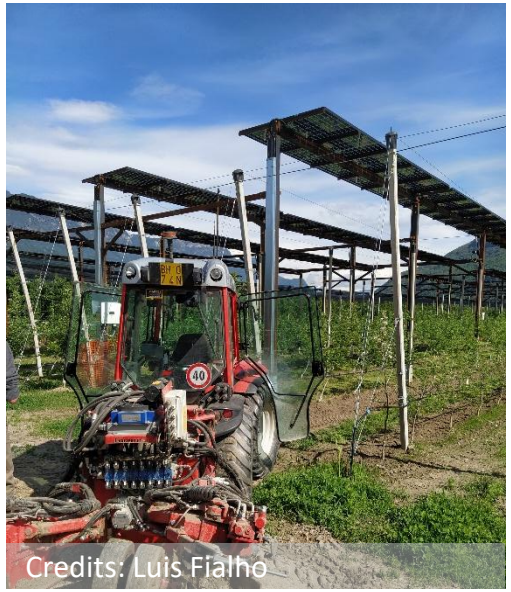
OPEN field

CLOSED field


Credits: Agrarheute

Interspace PV

Fixed, Single Axis Track.


Credits: Luis Fialho

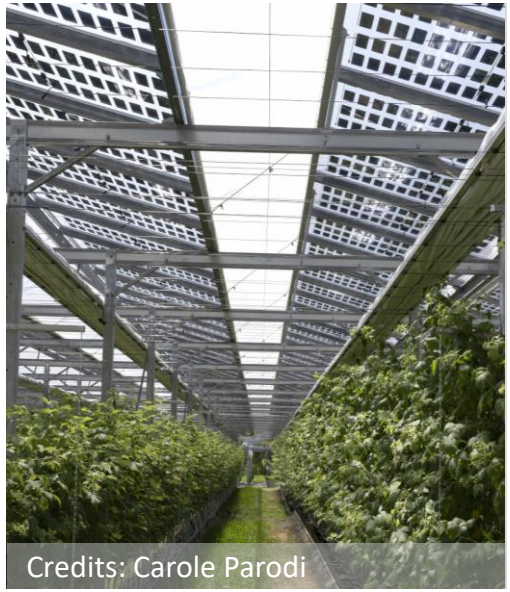
Overhead PV

Fixed, Single Axis, Dual Axis Track.


Credits: Elektrotechnik Leitinger

Fencing

Fixed, Single Axis Track.


Credits: Carole Parodi

Greenhouse PV

Fixed


Credits: SpiritProd33

Support Infrastructures

Fixed

Potential Risks or barriers of Agrivoltaics

Legal and Land Use

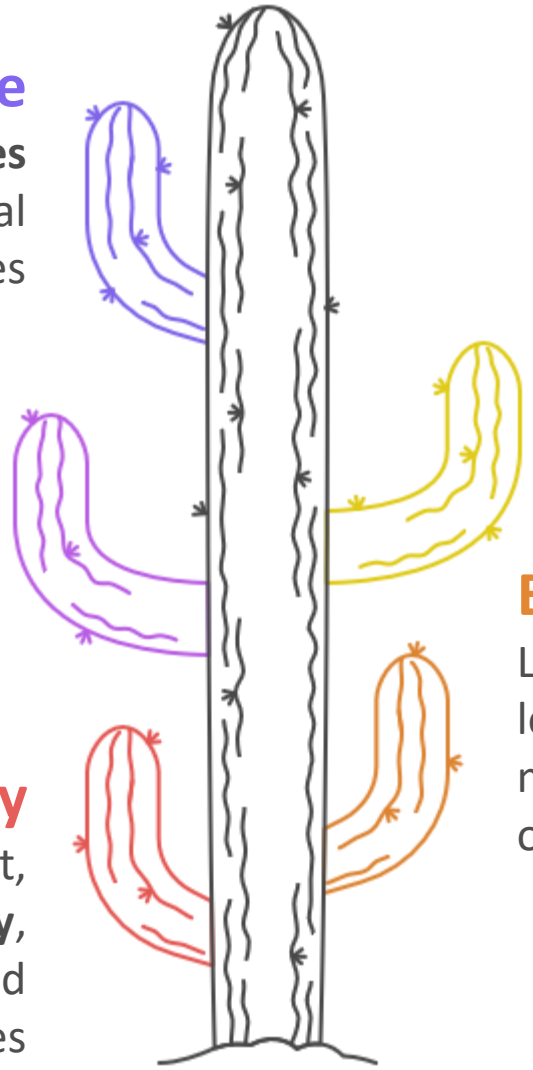
Unclear or insecure land-use rights, **disputes over asset ownership** and contractual obligations, unclear property related taxes

Social and Community

Landscape changes and fears of "**energy over agriculture**" remain key social barriers, farmer hesitation to invest, limited awareness, know-how, and technical education, conflicts of interest, poor stakeholder inclusion

Political and Regulatory

political instability, weak institutional support, **unclear regulations and policy uncertainty**, bureaucracy, slow, complex approval and permitting processes



Technological and farming

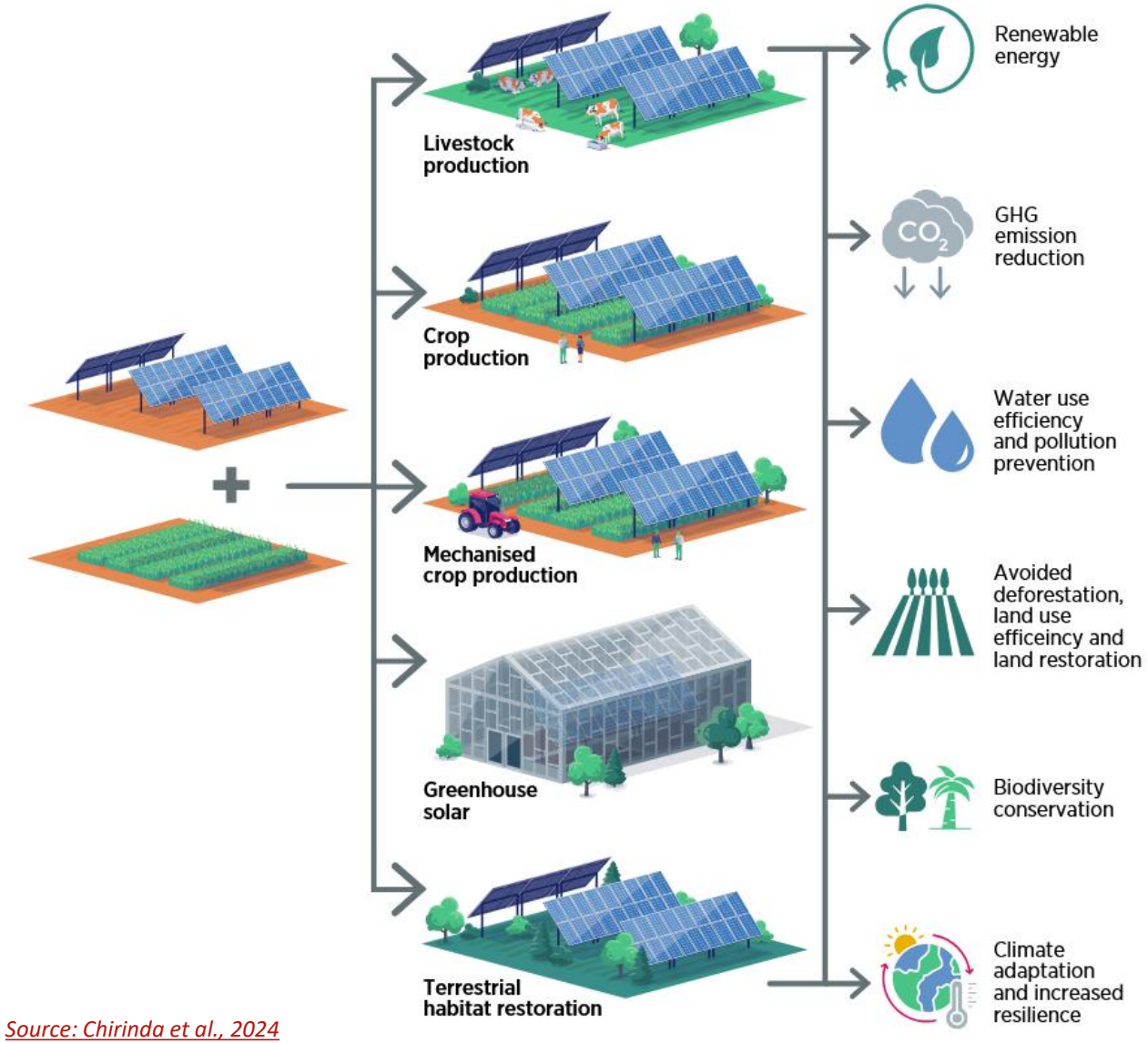
Poor design adaptation for culture type, delays in project development and mismatch with local conditions, shortage of skilled labour and quality-control limitations, maintenance challenges, theft risks, risk of inadequate shading design affecting crops and their yield

Economic and Financial

Limited local market capacity and lack of reliable local data, dominant national utilities restricting market access, **Higher CAPEX**, limited financing options, long payback periods

- → Increased cost mainly due to mounting system -> ~360€/kWp (4m height) or ~140€/kWp (interspace) vs ~70€/kWp (typical ground mounted PV)[7]
- → Slightly higher costs on installation (mainly if retrofitting existing permanent crop)

Potential Co-benefits of Agrivoltaics



Source: Chirinda et al., 2024

PEOPLE

- Social Acceptance
- Rural jobs & development
- Stronger food-energy resilience
- Reduced crop heat stress
- Better water efficiency
- Extreme weather protection
- Farming diversification

PLANET

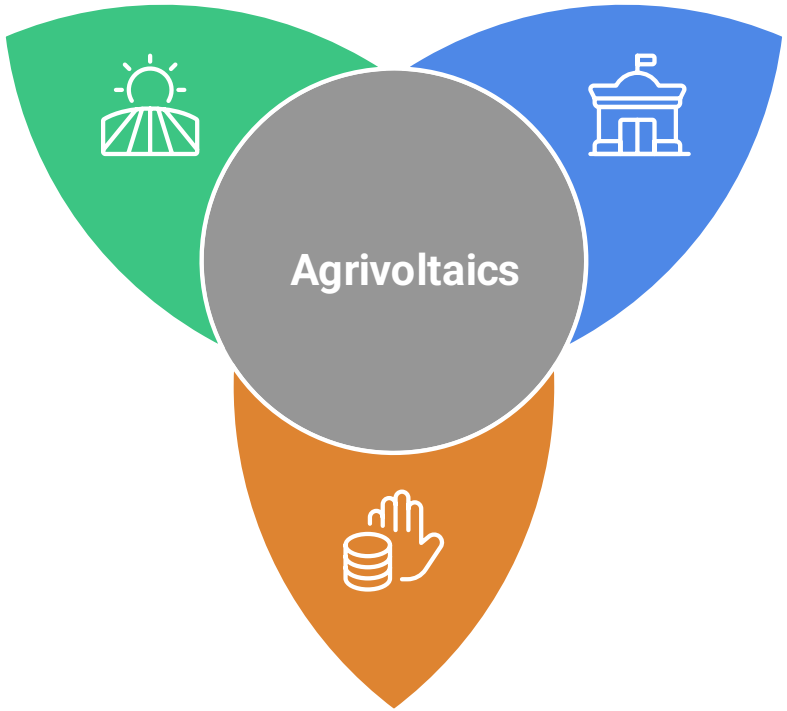
- Local renewable energy
- No extra land use
- Less exposure to energy volatility/crisis
- Supports decarbonization targets
- Improved grid resilience
- Lower soil erosion
- Moderated microclimate

PROFIT

- Additional revenue streams
- Dual-income risk reduction
- Higher long-term land value
- Attractiveness for ESG finance
- Lower operational energy costs
- More stable farm business models
- Increased farm competitiveness

What it takes to Scale: Systems, Impacts and Partnerships

The Synergy of Agrivoltaics Scaling



Technology
Innovative solar and farming solutions

Define agrivoltaics standards and requirements

Raise awareness on agrivoltaics and promote partnerships farmers-energy producers-States

Capacity building initiatives and knowledge transfer to stakeholders

Policy
Supportive regulatory frameworks

Define clear regulations for dual-use of land

Recognize agrivoltaics in the National Strategies and Plans

Introduce agrivoltaics in the energy policies, regulations and laws

Finance
Investment and funding mechanisms

Set financing instruments and incentives to support its deployment

Source: Eurac

References

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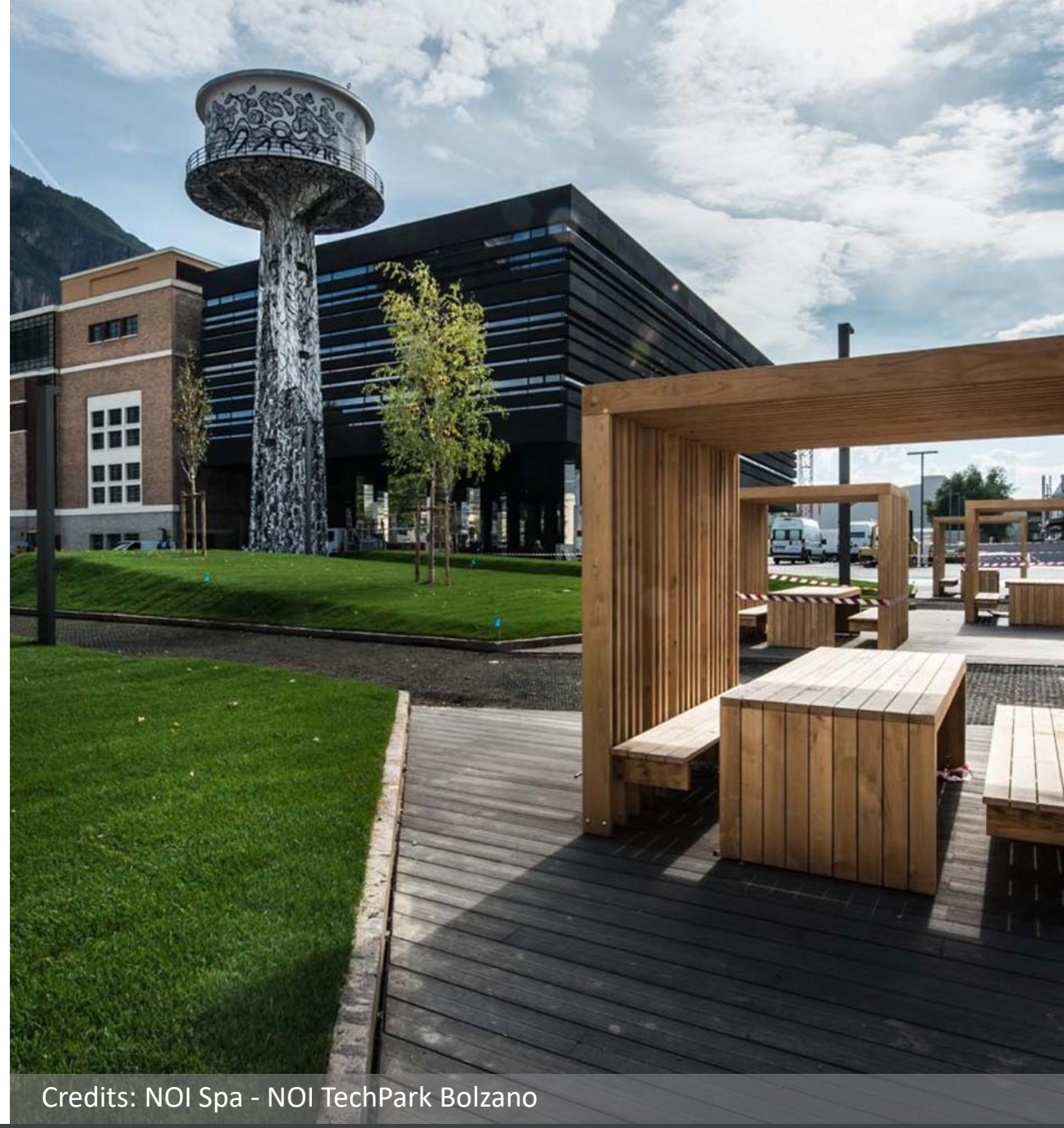

Credits: NOI Spa - NOI TechPark Bolzano

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