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Symbiosyst

# Enhancing Agrivoltaic Sustainability: Proposing an SDG-Based Lifecycle Assessment Methodology Beyond Traditional LCA

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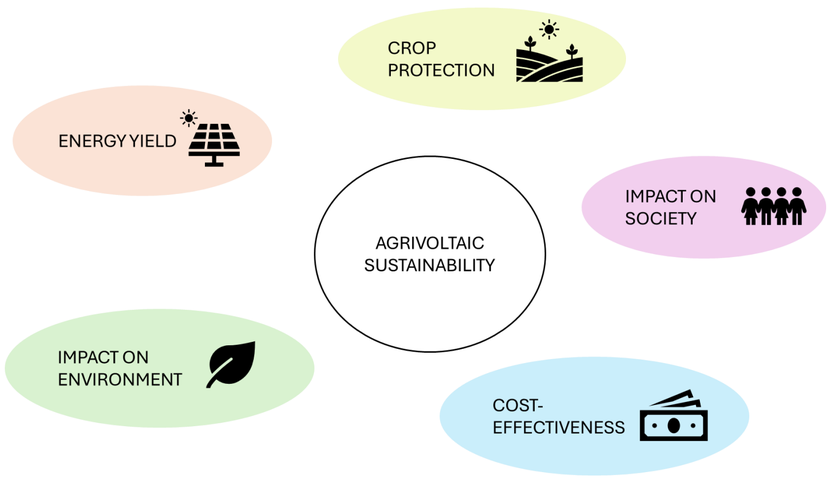



*Figure 1. Representation of the key aspects related to agrivoltaics sustainability*

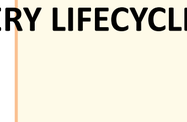
The study proposes a **holistic methodology** that includes environmental sustainability and social aspects. This new approach aims to **complement traditional LCA** by engaging stakeholders and experts to ensure all relevant sustainability aspects are considered.

The methodology is tailored to specific applications and **aligns Key Performance Indicators (KPIs) with the Sustainable Development Goals (SDGs)** [1] to enhance communication and understanding of the results.

**Agrivoltaic** applications were selected as case study, as part of **SYMBIOSYST** project [2]. The final goal is to provide a framework that accounts for the complex nature of a multi-output system, which produces both agricultural products and energy.

## METHODOLOGY

1. **GOAL AND SCOPE DEFINITION**
2. **STAKEHOLDERS AND EXPERTS' ENGAGEMENT AND LITERATURE REVIEW**
3. **IDENTIFY SUSTAINABILITY HOTSPOTS FOR EVERY LIFECYCLE STAGE**
4. **TRANSFORM HOTSPOTS INTO KPIS AND QUESTIONNAIRE CREATION**
5. **QUANTIFY INDICATORS AND DEFINE SCORING METHOD**
6. **ASSOCIATE KPIS WITH SDGS**
7. **ITERATIVE REFINEMENT WITH AGRIVOLTAICS EXPERT'S FEEDBACK**




## AGRIVOLTAICS CASE STUDY

*Goal*

**Objective**:
Analyse sustainability level of an agrivoltaics system

**Target audience:**
Policy makers, Agrivoltaics organizations

*Scope*

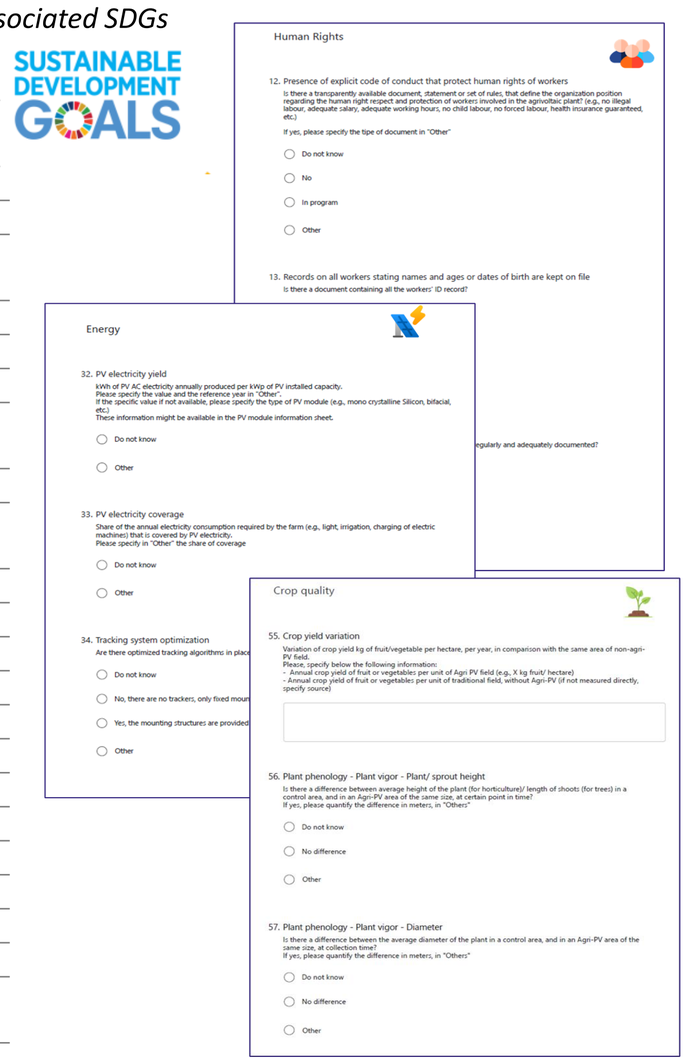
**Impact categories:**
Social and environmental impact

**System boundaries:**
All lifecycle stages of an agrivoltaics system

**Stakeholders and experts engaged:** Photovoltaics, agricultural, social sciences, survey and biodiversity
**Literature references**: European legislative framework (e.g., [3], [4]) and available guidelines (e.g., [5], [6], [7], [8])

*Table 1. Schematization of the selected KPIs into categories and subcategories, with associated SDGs*

| Category | Subcategory | Associated SDGs |
|---|---|---|
| Social | Diversity and gender equality | 5 – Achieve gender equality |
| | Health and safety | 8 – Promote economic growth |
| | Fair working conditions | 8 – Promote economic growth |
| | Suppliers social responsability | 12 – Sustainable consumption patterns |
| | Stakeholder engagement | 11 – Sustainable cities development |
| | Product certification | 12 – Sustainable consumption patterns |
| | Energy community | 11 – Sustainable cities development |
| | Communication and transparency | 5 – Achieve gender equality |
| Environmental - Photovoltaic | Material supply | 12 – Sustainable consumption patterns |
| | Environmental screening of suppliers | 12 – Sustainable consumption patterns |
| | Circularity and Eco-design | 12 – Sustainable consumption patterns |
| | End-of-life | 12 – Sustainable consumption patterns |
| | Electric efficiency | 7 – Affordable energy access |
| | GHG emissions | 13 – Combat climate change |
| | Landscape integration | 15 – Protect terrestrial ecosystems |
| | General | 13 – Combat climate change |
| Environmental - Agricultural | End-of-life | 12 – Sustainable consumption patterns |
| | Water | 6 – Sustainable water management |
| | Land use | 15 – Protect terrestrial ecosystems |
| | Biodiversity | 15 – Protect terrestrial ecosystems |
| | Testing | 15 – Protect terrestrial ecosystems |
| | Crop quality | 15 – Protect terrestrial ecosystems |
| | Soil improvement and preservation | 15 – Protect terrestrial ecosystems |
| | Machinery | 15 – Protect terrestrial ecosystems |




The questionnaire has been sent to **six agrivoltaic** plant demonstrators within SYMBIOSYST, and it is currently in its first revision phase. After this initial round of refinement, a second version of the questionnaire will be sent to another set of agrivoltiaic demonstrators external to the SYMBIOSYST project. The results of **this final iteration** will be available at the end of the project in the project website.

**REFERENCES**

*[1] SDGS webpage, https://sdgs.un.org/goals*
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*[4] DIN, 2021. DIN SPEC 91434:2021-05 Agri-photovoltaic systems - Requirements for primary agricultural use. 1st Edition 2021.*
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