Chapter N 116

The S-LCA applied in a research project: “smallholders including farmers” impact subcategory

**Abstract.** To overcome the difficulties of the market and some supply chains’ organic production more efficient and competitive, we contributed to research project “Innovations in organic agriculture to improve the sustainability of Apulian farms for cereals and industrial crops”. We aimed to define an agro-ecological model based on crop rotation of the main Apulian herbaceous crops: industrial tomatoes, durum wheat, and legumes. We used this model to measure organic crops’ sustainability. We assessed social sustainability using the Social-Life Cycle Assessment (S-LCA) methodology, which envisages the LCA approach. After the first UNEP/SETAC guidelines were published in 2009, they were update in 2020. Furthermore, these guidelines were integrated with methodological sheets in 2013 and 2021. However, these approaches do not include reference scales with specific indicators to assess every subcategory’s impact. We aimed to define the application of the S-LCA methodology to evaluate the new impact subcategory “Smallholders including farmers” (stakeholder “Workers”), introduced in the new 2020 guidelines. We also aimed to elaborate the relative reference scale to be adopted in the impact assessment.

**Keywords.** Social Sustainability, S-LCA, Innovation, Organic farming, Life Cycle Assessment, Sub-categories impact.

# N.1 Introduction

To overcome the difficulties of the market some supply chains’ organic production more efficient and competitive, we contributed to the research project “Innovations in organic agriculture to improve the sustainability of Apulian farms for cereals and industrial crops”. We aimed to define an agro-ecological model, characterized by the use of solutions/innovations, based on the rotation of the main Apulian herbaceous crops: industrial tomatoes, durum wheat, and legumes. This model is being tested in pilot farms to measure productivity gains and assess organic crops’ sustainability. We assessed social sustainability using the Social Life Assessment (S-LCA) methodology, which provides for the Life Cycle Assessment approach (LCA) according to ISO 14040: 2021 (ISO, 2021) and aims to achieve multiple objectives of the sustainable development goals (SDGs) of Agenda 2030. However, the implementation of the S-LCA approach for about 20 years has not answered critical questions regarding methods, frameworks, paradigms, and indicators (Huertas-Valdivia et al., 2020). If we use the S-LCA methodology makes according to UNEP (2020) and UNEP (2021), in a context of limited diffusion in the business system, we have not available specific reference scale to assess each subcategory’s impact. We aimed to define the application of the S-LCA methodology in the evaluation of the new sub-category “Smallholders including farmers” (stakeholder “Workers”), introduced in the 2020 guidelines (UNEP, 2020). We also aimed to elaborate the relative reference scale to be adopted in the impact assessment.

# N.2 Review of the literature

The first guidelines for the adoption of the S-LCA methodology were published in 2009 (UNEP/SETAC, 2009). The 2020 update (UNEP, 2020) proposed methodological solutions based on the experience gained. Furthermore, these guidelines were integrated with methodological sheets in 2013 (UNEP/SETAC, 2013), which were updated in 2021 (UNEP, 2021). The new guidelines introduced a new subcategory of impact: “Smallholders including farmers” (stakeholder “Workers”). Furthermore, these guidelines proposed the 'Reference Scale Approach' (also known as Type I or Reference Scale S-LCIA) for the assessment of social performance (UNEP, 2020). The evaluation of the results is associated with the quality of the data collected, which is not the subject of this study. Many of the useful indications and a scale reference for this evaluation are available in other suitable practice manuals for social-value assessment (Harmens et al., 2022). Finally, despite the scientific community’s growing interest (Arcese et al., 2018) (Di Cesare et al., 2018) (Huertas-Valdivia et al., 2020) (Mattioda et al., 2015) (Petti et al., 2018a) (Traverso et al., 2020), significant implementations of the S-LCA methodology in relation to food issues remain uncommon (UNEP, 2020).

# N.3 Material and methods

The selection of the S-LCA methodology to measure the social sustainability of the new agro-ecological model of research project aligned with the 2020 Guidelines (UNEP, 2020) and related Methodological Sheet 2021 (UNEP, 2021) as well as the assessment path of ISO (UNI EN) 14040 (ISO, 2021). Therefore, the goal and scope of the S-LCA study was the evaluation of the social sustainability of the model tested in the Soft project. The system boundaries are defined as the “gate of the farm to the gate of the product collection center, and any by-products”, according to the circular economy. The paper aims the adoption of the S-LCA methodology relating to the new subcategory “Smallholders including farmers” (stakeholder “Workers”) in the research project. The Subcategory Assessment Method (Sanchez Ramirez et al., 2014) was taken into consideration as it was already used for the production of tomatoes (Petti et al., 2018b) and was the subject of the experiments in the research project. Subsequently, we proceeded to select the inventory indicators to identify the “small farmers” on the basis of the characteristics envisaged by the reference documents and by the European and Italian legislation because there is no shared definition (UNEP, 2021). These indicators were the subject of the questions of the S-LCA questionnaire to be administered to the pilot farms (owner and workers) of the research project and in the verification of the related documents made available. Finally, based on the inventory indicators, we developed a reference scale aligned to UNEP (2020).

# N.4 Results and discussions

Regarding the definition of “Smallholders including farmers” (stakeholder “Workers”), we considered the following characteristics important: size, socioeconomic aspects, and the endowment of resources. This definition also includes farming companies, partnerships, and privately owned sole proprietorships that have fewer employees and/or lower annual revenues than a full-sized firm or company (UNEP, 2021). In particular, the inventory indicators taken into consideration are size, direct and/or family work contribution, level of CAP support, inclusiveness, productivity, access to services, commercial relations, type of farmer, and actions/interventions, including organic ones for data acquisition to calculate the indicators. The size indicator adopted is more than 2 hectares (with a focus on income crops) (UNEP 2021). Furthermore, in the preliminary phase, we assumed a size of less than 5 hectares is assumed for two reasons:

* small farmers scheme for EU CAP support (OJEU, 2013)
* new legislation on organic farming; this dimensional level allows for group organic certification (OJEU, 2018)

The latter reason becomes strategic for the purposes of the research project because the lead partner is represented by an organization of producers in the specific sector that represents over 60 organic farms. Another indicator that we considered for the definition of small business is direct and/or family work, which comprises at least 1/3 of the total workforce needed. We borrowed this indicator from the figure of the “small agricultural entrepreneur” in the Italian legislation (art. 2135 Italian Civil Code). In addition, for the definition of small business, we considered the “number of employees” indicator of about 2 employees, based on sector statistics (herbaceous crops) (Tarangioli and Pupo D’andrea, 2021**).** In addition, for the definition of “small agricultural enterprise,” we assumed a maximum EU support payment in the CAP of 1250 €/ha (OJEU, 2013).

Finally, we considered some inventory indicators from Seville et al. (2016) and UNEP (2021) concerning inclusivity, productivity, access to services, commercial relations, next-generation farmers, and actions/interventions that increase awareness of indicators and company results in the supply chain (Table 1).

Table 1 - Inventory indicators identified for the subcategory of “Smallholders including farmers” of the Workers Stakeholder

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| --- | --- | --- |
| **PRP** | **Scale level definition** | **Inventory indicators** |
| +2 | The farm has prioritized efforts to improve the results of indicators relating to smallholder issues in its organization and across the entire value chain, including customers, and can demonstrate its approach’s success. | Evidence of priority given to actions/interventions aimed at improving the results of the indicators measured in your organization and related successes;  Evidence of priority given to actions/interventions aimed at improving the results of the indicators measured in the entire value chain, including customers, and related successes. |
| +1 | The farm has a management system and raises awareness of indicators relating to the issues of small farmers within its organization, its subcontractors, and its first-level suppliers | Actions/interventions that raise awareness of the indicators measured within the organization, also among its subcontractors and its first-level suppliers. |
| 0 | Availability of a management system related to small farmers issues in which it is reported that family work is at least 1/3 of the total work, the maximum CAP support payment is 1250 €/ha for small farmers, ownership of <5 ha, <1.9 employees, in which the inclusivity indicators are positive, the availability of data relating to the indicators of productivity, service access indicators, trade relationship indicators and next-generation farmer/owner indicators. | Size indicators: >2 ha (income crops) and <5 ha.  Inclusion indicators: Participation in a farmers' organization, ownership of the farm/business, direct work contribution and/or the family providing at least 1/3 of the total workforce needed, the maximum CAP support not exceeding 1250 €/ha.  Productivity indicators: Proof of crop yield, proof of production per year.  Indicators of access to services: Evidence of access to services (e.g. inputs such as fertilizers and seeds), access to credit and capital at affordable prices, use of credit (in a given year), access to agronomic assistance.  Trade relationship indicators: Membership in or access to a farmers' organization, evidence of the quality of the relationship with the main buyer, traceability and understanding of quality standards and price premiums (if any).  Next-generation farmer/owner indicators: Level of education completed by the household members, age of the company’s/firm’s manager or of the person who generally makes the decisions, family unit (age, training, management of sales money, credit receipt), participation in cooperatives or an organized group of farmers. |
| -1 | Lack of data related to any of the indicators related to small farmers but the company has committed solving this problem with a corrective action plan with a clearly defined timeline. | Evidence of lack of indicator data on smallholder issues;  Evidence of the presence of a management mechanism that allows for the definition of measures/actions/interventions to collect missing data within a defined period. |
| -2 | Lack of data relating to any of the indicators relating to small farmers, and the company has not committed to solving this problem with a corrective action plan with a clearly defined timeline. | Evidence of the lack of indicator data on smallholder issues. |

Sources: Adapted from (OJEU, 2013), (OJEU, 2018), (Seville et al., 2016), (Tarangioli and Pupo D’andrea, 2021), (UNEP, 2021)

We used the inventory indicators to adopt the “reference scale approach,” which allowed for the development of a reference scale as an ordinal scales that contains 5 levels, each of which corresponds to a performance reference point (PRP) (UNEP, 2021) (Harmens et al., 2022). We checked the PRPs between -2 (extreme non-compliance) and +2 level (ideal performance), where level 0 (compliance with local laws and/or international standards) represents the minimum level of acceptability of the evaluation of the inventory related to the **“**Smallholders including farmers” subcategory(Table 1).

**N.5 Conclusions and future perspectives**

The identification of inventory indicators and the formulation of the related reference scale represent a concrete attempt to account for the lack of a shared and internationally accepted definition of “Smallholders including farmers” through experimentation in the research project. However, this definition represents a challenge in this subcategory to make the evaluation consistent in the implementation of multiple cases. Furthermore, bearing in mind that the collection of and accessing of data can be difficult, the results of the application in the research project can constitute a best practice for expanding the implementation to other farms associated with the lead partner. The results can constitute a specific database about social topic for organic agriculture and for the Apulian territory, an area where the social risks associated with agricultural work are high.

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**Contribution of the authors**

A.E. Di Noia carried out the bibliography, the collection and processing of the data, G.M Cappelletti and A.E. Di Noia carried out the application of the methodology, G.M. Nicoletti and C. Russo reviewed the paper.