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An analytical framework to measure the social return of community-supported agriculture

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Abstract

The lack of objective sustainability indicators and measurements leaves the performance of agricultural systems under-valued, limiting the possibility of communicating any evidence about promoting economic, social, and environmental values to food system stakeholders. In this study, a cost-benefit analysis based on the social return on investment (SROI) was designed and applied to five community-supported agriculture (CSA) initiatives. CSAs are local food supply chains becoming popular in recent years, characterised by characteristic features such as member volunteer commitment, reduction of synthetic inputs in food production, and shortening of the supply chain to reduce costs and environmental impact. Social and environmental outcomes related to the wider spread of impacts were comprehensively assessed in the study. Several ecosystem service (ES) indicators observed in the literature were considered fitting for CSA activities through a participatory assessment with CSA representatives. Findings revealed that the case studies analysed are characterised by a limited but positive socio-environmental performance compared to conventional food supply chains, thereby demonstrating that they can create real value in terms of social gains and mitigation of environmental impacts.

Keywords: local food, sustainability, urban and peri-urban agriculture, short food chains, social return on investment

1. Introduction

Urban and peri-urban agriculture (UPUA) is gaining relevance worldwide. Unlike conventional food systems, it supports agricultural operations based on local resources and local consumption at a small scale. UPUA is increasingly perceived as a tool for sustainable urban development (Zasada et al., 2020), potentially mitigating the negative environmental, social and health externalities associated with conventional production and consumption patterns linked to city life (Menconi et al., 2020).

Community-supported agriculture (CSA) is an increasingly popular example of UPUA promoting direct contact between farmers and consumers, who have the chance to easily know where, when, and how the food is produced. CSAs are non-profit organisations based on cost-based prices and fair wages (Henderson et al., 2009), favouring the diffusion of food production skills, labour, and responsibility among their members (Brown & Miller, 2008; Thompson & Coskuner-Balli, 2007) while creating social capital thanks to relationships based on reciprocity, trust, and cooperation (Van Oers, Boon, and Moors 2018).

However, the extent to which CSA and other examples of UPUA are really able to trigger social and environmental change is currently debated (Bellante, 2017; Graefe et al., 2019; Michel-Villarreal et al., 2019). On the one hand, they are deemed to be 'desirable' or 'sustainable' a priori, without any comprehensive critical analysis (Michel-Villarreal et al., 2019; Tregear, 2011). On the other hand, farmers' work and social outcomes arising from CSA activities often lay under-documented or undervalued (Emerson & Cabaj, 2000; Galt, 2013; Medici et al., 2021). This situation also limits the understanding and the appreciation of CSA by an external audience (Van Oers, Boon, and Moors 2018).

Yet, the identification and communication of CSA common values can represent a key factor in determining the community's long-term success and stability (Diekmann & Theuvsen, 2019). Getting a standardised measure of the socio-environmental impact of CSA would support evidence concerning the promotion of eco-social values, promoting the engagement of consumers, public authorities, input suppliers and other stakeholders while helping in clearing the field from unverifiable sustainability claims. Through a cost-benefit analysis, this study aims to design and apply an analytical framework to measure the socio-environmental performance characterising CSA. Accordingly, our primary objective was to identify and measure the implications deriving from individual decisions to become CSA members, i.e. switching part of food expenditure from conventional food networks to a CSA, while the secondary goal was to assess these implications with financial proxies.

2. Theoretical framework

Contemporary CSA initiatives originated in the 1960s from opposition movements against environmental pollution and heavy agricultural mechanisation. Over time, they have been focused on agricultural sustainability (Buttel, 2005; Lagane, 2013), which academics have assessed from multiple perspectives.

Some scholars have analysed CSA through the lens of conceptual models, along the dimensions of institutions and values (e.g., Plank *et al*. 2020) or those of food equity, social integration, and human capital (e.g., Macias, 2008). What emerged from such sociological models was a remarkable level of social inequality between farmers and members, which even nowadays calls for changes in the political-institutional system necessary to support CSA.

A relevant effort was invested in the definition of ecosystem services (ES) provided by CSA and other UPUA initiatives, such as food production, diet and well-being, microclimate improvement, rural landscape, waste and nutrient recycling, social cohesion and integration, recreation (Vanslembrouck et al., 2005; Gómez-Villarino & Ruiz-Garcia, 2021; Fan et al., 2011; Korpela et al., 2008; Tapia et al., 2021). Straying from pure sociological research, several environmental, land and energy footprint metrics were obtained through analytical frameworks like life-cycle assessments (e.g., Fisher & Karunanithi, 2014; Guo et al., 2019; He et al., 2016; Martinez et al., 2018; Medici et al., 2020; Pérez-Neira & Grollmus-Venegas, 2018).

However, the main limitation of these approaches lies in the use of pre-selected indicators that can limit the sustainability value capture of the CSA stakeholders (Schmutz et al., 2018; Wellner & Theuvsen, 2017). Despite the numerous efforts in conceptualising analytical frameworks, self-assessment tools for capturing and measuring the socio-environmental impacts of CSA are still lacking. In addressing methodologies able to capture CSA socio-environmental performance, Wellner and Theuvsen (2017) remarked that approaches based on the ''theory of change'' could help mitigate the limits above and fulfil public expectations concerning the triple bottom line sustainability of CSA. Following this indication, the social return on investment (SROI) based on the theory of change and social accounting was adopted in this work. The SROI was recently applied to evaluate ecosystem services in similar contexts, for instance, in social farming (Guirado et al., 2017; Tulla et al., 2020), in rural development programs (Courtney and Powell, 2020), in communities' infrastructures (Pattison-Williams et al., 2018), but also to assess corporate social responsibility (Cordes, 2017; Solomon & Nelson, 2013) and public health interventions (Ashton et al., 2020; Edwards & Lawrence, 2021).

The paper is organised as follows. A description of the SROI framework for measuring the socio-environmental dimension of CSA is presented in Section 3, accompanied by working hypotheses; in particular, CSA inputs and outcomes were detailed (Section 3.1) and associated with financial proxies (Sections 3.2, 3.3). In Section 4, five CSA case studies are presented. In Section 5, SROI results are detailed. Sections 6 and 7 contain discussion and final remarks, respectively.

3. Methodology

This study considered the social return on investment (SROI) framework to design CSA socio-environmental cost-benefit analysis. The SROI framework is a close variation of the theory of change with which it shares the following categories to measure and report: activities, their inputs, their outcomes (i.e., ecosystem services). Analytically, the SROI translates into the assessment of a benefit-cost ratio highlighting the net social, environmental, and economic benefits generated by the activities performed (Lingane & Olsen, 2004). As such, the SROI accounts for a broad concept of value, and this circumstance was considered to fit the context of CSA, where holistic and multidimensional relationships among producers and consumers are researched (Flora & Bregendahl, 2012; Rejekiningsih & Muryani, 2017; Weidner, Yang, and Hamm 2019).

3.1. The change-implication paradigm

Generally used to consider whether the objectives of an organization are met, the change-implication paradigm represents the wide social gains originating from activities performed in an organisation and is central in applying the SROI (Nicholls, 2017).). In the context of CSA, the change-implication paradigm help shed light on the economic, social and environmental effects produced by the activities performed. In this study, several changes and implications about the CSA context were identified, as described below. The main questions that the use of this paradigm raised have been: what changes as a result of CSA activity? And, what does this change imply? Basically, the main changes belong to two essential facts: first, the demand for food, which switches from large distribution to local farms, and second, relations between the parties, as in a CSA an abandonment of the traditional consumer model in favor of more engaging approaches is being observed. Changes and implications are unraveled in the next paragraphs and summarized in Table 1. To evaluate implications, financial proxies are used: they provide an estimate of financial value for outcomes or benefits that have no market value (Gosselin, Boccanfuso, and

Laberge 2020; Nicholls 2017). Concerning food demand, the hypothesis made was to keep member payoff related to food purchases constant. In detail, CSA members agree to pay a yearly subscription fee to receive food, thereby redirecting at least part of their food purchase from conventional food networks; when comparing CSA subscription fees with conventional food purchases, the resulting monetary payoff can be positive, negative, or substantially in balance (Mazzocchi and Marino 2019).

Table 1. Matrix accounting for CSA changes and implications. Source: own elaboration

		IMPLICATIONS	
		For members	For individuals and the environment
CHANGES	Demand for local food	A Monetary switch of food purchase from conventional food systems. Volunteering.	D Reduced environmental impact from food production and distribution.
	Relationship	B Extended knowledge of food and agriculture. Sense of belonging to a community.	C Enlarged social benefits thanks to members' influence on individuals.

Members can obtain monetary savings in case CSA drop-off points are close to their places, and this was found to positively influence CSA members' satisfaction (Galt et al. 2017). However, member payoff derives from arbitrary choices, is price-dependent, and as so, it is hard to detail. For this reason, the monetary trade- off between CSA subscription and conventional food purchase was at first assumed to be in balance and subsequently evaluated ex-post by means of a sensitivity analysis (see Section 6).

Increased participation

Changes in relationships (for example, increased collaboration, cooperation, and recreation) are related to social innovation outcomes that were comprehensively assessed in this study. Two classes of social innovation were considered: member involvement and general public involvement.

3.1.1.1. Member involvement

CSA is associated with the promotion of social engagement mitigating social barriers (Audate et al., 2019; Corcoran & Kettle, 2015; Tapia et al., 2021) while offering leisure, recreation and outdoor activities that contribute to social welfare (Dieleman, 2017; Gómez-Villarino & Ruiz-Garcia, 2021; Hatchett et al., 2015; Medici et al., 2021). Several scholars have emphasised the existence of direct social benefits for people participating in the various farm festivals, open days, on-farm work and other training and educational experiences promoted in CSA (Chen, 2013; Farnsworth et al., 1996; Hinrichs, 2000). These activities are encouraged to improve agricultural practices and farm management expertise while raising member awareness of the community's social value (Maier et al., 2020; Spilková, 2017). Generally, most CSA members are not familiar with performing agricultural operations or managing the produce. Training and cultural events, presentations, and field visits fill these gaps, enriching participants' cultural heritage and letting CSA members experience volunteering. Volunteer action is the basis of any community (Martiskainen, 2017; Onyx & Leonard, 2011; Zanbar & Itzhaky, 2013). CSA also relies on generosity and trust between individuals (Martin & Upham, 2016).

3.1.1.2. General public involvement

Generally, CSAs promote events to expand their social network and attract new consumers and stakeholders who can visit the CSA and deepen their knowledge of food and agriculture. In fact, CSA members constitute the community's lifeblood, and part of the efforts are devoted in retaining existing members and attracting new ones. CSA allows people living in urban areas to become informed consumers and more engaged in supporting activities of common interest (Francis et al., 2005). In this regard, CSA value creation is important to build and maintain long-term relationships. It can be enhanced with strategies facilitating the delivery of product, emotional, and social benefits (Chen, 2013).

3.1.2. Mitigation of environmental externalities

The efficient use of agricultural inputs often characterising UPUA was found to play a role in mitigating environmental impacts (Solé and González, 2017; Wilhelm and Smith 2018). Generally, CSA adopts sustainable land use, considered a costly constraint for farmers (Schulz et al., 2014), and meets most organic agriculture requirements, excluding synthetic agronomic inputs (Medici et al., 2021). In addition, the direct contact between producers and eaters results in reduced supply chain steps, paving the way for the reduction of other inputs: food does not need to be enveloped, thereby the use of plastic is heavily reduced, and the proximity between the place where food is produced and the place of consumption results in a decrease of food miles, resulting in a mitigation of the environmental impact of distribution compared to large scale food distribution.

Individual inputs and outcomes

In light of the literature reviewed, four main panels collecting hypotheses according to the chance-implication mechanism were developed (Table 1) .Based on that, CSA inputs and outcomes were detailed and associated with financial proxies to build ES indicators and assess CSA social performance. This activity was conducted with the help of CSA staff, whose viewpoint wasuseful for setting up inputs, outcomes, and indicators (details are given in Section 4). Calculations are reported in Tables 2 and 3.

I.1. Individuals experience volunteering.

Unlike wage labour, which is assumed to be covered by membership fees, the voluntary commitment enters the SROI as an input. An hourly compensation of € 6.50, reflecting a net income of non-specialised farm workers, was considered to assess the volunteer commitment.

Table 2 – CSA social ecosystem service assessment

Ecosystem service	Type of change	Social individual indicators and financial proxies
ES.1. Knowledge of agriculture is extended	Participation in educational activities	Training course issued by farmer association: € 180[a] × 0.5 = € 90
ES.2. Knowledge of food is extended	Families with reduced food waste	Reduced vegetable waste (50%) per family: 7.3 kg[b] × 0.5 × 2 €/kg = € 7.3
ES.3. Transfer of knowledge to external visitors	Educational farm visits	Cost per person for a group guided tour in the city: € 7[c]
ES.4. Sense of belonging to a community	Memberships	Annual membership fee of a recreational association: € 13[d]
ES.5. Recreation	Participation in educational or recreative activities	Ticket for summer arena: € 5

Sources: [a]www.lombardia.confagricoltura.it/ita/corsi-attivi/corso-agricoltura-biologica [b]Vegetable waste for Italian households: www.sprecozerES.it/waste-watcher; [c]www.guidegaiabologna.it; [d]www.arcibologna.it.

Table 3 – CSA environmental ecosystem service assessment

Ecosystem service	Type of change	Environmental indicators and financial proxies
ES.6. Reduction of food packaging	Carbon emission savings	Plastic cost (per unit of food mass): 0.139 €/kg_{CO2} × 2.4 kg_{CO2}/kg × 0.014 kg = 4.7 × 10^{-3} €/kg
ES.7. Reduction of fuel	Carbon emission savings	Fuel cost (per unit of field area): 0.139 €/kg_{CO2} × 2.64 kg_{CO2}/l × 208 l/ha × 0.5 = 38.16 €/ha
ES.8. Reduction of food miles	Carbon emission savings	Retailing cost (per unit of food mass): 0.139 €/kg_{CO2} × 0.088 kg_{CO2}/kg = 1.2 × 10^{-2} €/kg
ES.9. Reduction of pesticides	Safeguard of human health and biodiversity gains	Pesticides cost (per unit of field area): 8.78 €/$kg_{a.i.}$[a] × 0.2 $kg_{a.i}$/kg × 4.90 kg/ha = 8.60 €/ha

ES.1. Knowledge of agriculture is extended.

A portion of CSA members benefits from the community's training, cultural, and educational activities. As suggested by CSA staff, participation in field visits, training activities and external presentations were considered among the many activities offered. The value of training courses issued by farm associations was considered to measure the value of these activities; however, since training offered in most CSAs cannot be truly equivalent to the training provided by any farmers' association, a weight of 50% on the training cost was applied.

ES.2. Knowledge of food is extended. The reduction of food waste was considered when assessing the knowledge of food gained by CSA members. Indeed this outcome is a key success factor in many CSA, and it is emphasised during field visits and training activities (e.g., when members are suggested how to clean food and prepare meals; also, CSA members largely accept 'ugly food'). Food waste reduction was modelled, considering a 50% reduction in vegetable waste compared to the average amount of food waste per household.

ES.3. Transfer of knowledge to external visitors. Knowledge of agriculture can also be extended to external people visiting the farm and the fields, guided by farmers and expert members. Some CSAs are registered as educational farms, an activity of public relevance recognised by local administrations. The monetary value of a group guided tour in the city was considered a benchmark because, albeit belonging to another field of knowledge, it can have similar cultural relevance.

ES.4. Sense of belonging to a community. The involvement in CSA recreational activities also strengthens the sense of belonging to a community and satisfies people's need for sociality, which are common CSA features (Zoll et al., 2018). The sense of community is also associated with mental health (Shields, 2008). It was decided to measure this ES considering the annual membership fee of a recreational association.

ES.5. Recreation. Many members who join CSA activities spend more time with others, feel secure to share ideas and goals, not just concerning food and agriculture, and have the chance to make new friends. The average participation in field visits, training events, open days, and summer festivals was considered to assess this ES, and a summer arena ticket was used to assess this value.

Environmental outcomes

CSA environmental ESs were assessed compared to conventional food systems. In doing this, indicators based on impact categories like global warming, human health, and biodiversity were

monetised. Regarding the monetary measure of carbon emission, several attempts have been made in the last few years to measure the damage associated with the emission of carbon dioxide and other greenhouse gases into the atmosphere. Even if a globally agreed method to assess carbon emission has not yet been achieved, a popular method for doing so has been the introduction of carbon credits (Ayres, Turton, and Casten 2007; Golosov et al. 2014; Nordhaus 2008). In this study, an average value of 139 €/tCO2 (Bachmann 2020) was considered a benchmark for assessing global warming performance associated with the outputs ES.6, ES.7 and

ES.8, as described below. Instead, to evaluate the impacts associated with the use of pesticides (ES ES.9), which are much more related to the categories of human health and biodiversity rather than climate change, a monetary value for pesticide damage equal to € 8.78 per kilogram of the pesticide's active ingredient was considered (Leach and Mumford 2008). CSA outcomes affecting the environment are summarized in Table 3 and then described further..

ES.6. Reduction of food packaging. Food packaging is often reduced in CSA since the food is not packaged but just boxed, with boxes constantly re-used. An emission factor equal to 2.4 kg_{CO2} per kg of polyethylene was considered to model the impact of plastic use on the climate change category (WSTP, 2012). This study benchmarked a standard 14-grams plastic packaging per kg of food produced.

ES.7. Reduction of fuel. The agricultural techniques adopted by CSA often include extended soil covering, crop rotations, and the strong re-use of mulches, allowing to reduce tractor use; moreover, CSA with small acreages do not even own heavy agricultural machines. For these reasons, fuel consumption was modelled to be 50% of the average for similar operations provided by the Italian National Association for Agriculture and Agricultural Mechanization, equal to 208 litres per hectare (ENAMA, 2005). Carbon-equivalent emissions were assessed considering the standard diesel emission factor of 2.64 kg_{CO2} per fuel litre.

ES.8. Reduction of food miles. Unlike conventional food systems, the contact between farmers and consumers is direct, with no intermediaries. We modelled the relative reduction of the environmental impact considering the carbon emissions associated with a local distribution system, estimated at 0.088 kg_{CO2} per kg of food, as indicated in (Pérez-Neira & Grollmus-Venegas, 2018).

ES.9. Reduction of pesticides. The use of pesticides mostly impacts categories such as human health and biodiversity. This study considered a monetary cost for pesticide damage equal to € 8.78 per kilogram of pesticide's active ingredient (Leach & Mumford, 2008). Also, an average active ingredient content of 20% was assumed to model the impact of pesticide products. An average value of 4.90 kg/ha for Italy was considered as a conventional scenario to model the use of agrochemicals in CSA (Legambiente, 2019).

4. The case studies

The activities of four CSAs from last years were considered and described to assess the adapted SROI methodology. The year 2020 was not considered since most CSAs limited their educational, training, and recreational activities due to COVID-19-related restrictions. CSAs' main figures are detailed in Table 4.

Case studies 1 and 2. Cases 1 and 2 represent the CSA 'Arvaia', whose activities were monitored in the years 2018 and 2019. The community, located in Bologna's urban area (Northeast Italy) and composed of approximately 200 members, can be considered the biggest CSA in Italy. Food is produced on 47 hectares. CSA information was retrieved from CSA annual budgets, with additional details obtained from CSA staff, who has been interviewed four times between May 2019 and March 2021, and whose availability was essential to interpret and merge data for setting up inputs, outcomes, and indicators (Section 3.2).

Table 4 – Main figures of the CSAs (original data from CSA websites and staff interviews)

General characteristics	Case 1 ARVAIA 2018	Case 2 ARVAIA 2019	Case 3 ISIDE 2019	Case 4 AMAP 2021	Case 5 SEMI 2019
Member shares	214	210	55	42	50
Full/part-time workers	6/1	6/4	2/0	0/2	1/2
Total waged labour (hours)	8,910	8,894	4,000	700	4,500
Total volunteering (hours)	9,373	9,846	2,000	600	1,750
Land extension (ha)	47	47	6	0.5	1.5
Food Produced					
Vegetables (kg)	66,600	61,276	7,000	7,000	13,000
Cereals, legumes (kg)	40,451	54,363	-	-	-
Processed food (kg)	5,851	3,987	200	-	-
Total (kg)	112,902	119,626	7,200	7,000	13,000
Training and recreational activities (participations)					
Field visits	8 (93)	10 (83)	2 (40)	2 (25)	4 (40)
Training	7 (62)	6 (103)	2 (60)	-	10 (50)
External presentations	18 (527)	19 (541)	-	-	1 (50)
Welcome and open days	-	3 (50)	2 (70)	1 (61)	-
Summer festivals	1 (411)	1 (163)	-	-	-

Case study 3. For this case, activities performed in 2019 by the the CSA 'Iside' were considered. Iside is located in Sulzano (Brescia), on the shores of Lake Iseo, and started its activities in 2016. Vegetables, fruits, and olives from which olive oil is obtained, are produced on about 6 hectares. The number of members is regularly over 50 units. CSA figures were taken from their website and integrated with an interview with CSA staff in January 2022.

Case study 4. Case 4 accounts for the 2021 activities of 'AMAP Madre terra', a project supported by the Italian Caritas, the charitable arm of the Italian Bishops Conference. AMAP proponents have already experienced a CSA in the past. This community rely on a plot of 1.5 hectares located in Rozzano, a small municipality at the gates of Milan. AMAP grows vegetables and hops plants. The staff was reached for an interview in January 2022.

Case study 5. This case is represented by the CSA 'Semi di comunità', located in the municipality of Rome, with activities spanning the year 2019. This CSA is also devoted to other activities concerning the social inclusion of young people who offer part of their time in exchange for vegetables; this contingency was modelled in the SROI calculation to relieve the weight of effective volunteering, considering it at 50%.

In interpreting CSA figures, volunteering was considered as the main input, as described in Section 3.2.

Concerning social outcomes, ES.1 (knowledge of agriculture) was modelled considering the average participation rate for field visits, training, and external presentations (the latter at 50%), as suggested by CSA staff. ES.2 (knowledge of food) and ES.4 (sense of belonging to a community) were assessed through the number of member shares. ES.3 (transfer of knowledge to external visitors) was calculated considering the sum of the participation in welcomes, open days, and summer festivals, net of member shares to consider people external to CSA only. Lastly, ES.5 (recreation) was assessed considering participation in field visits and welcome and open days, which are occasions characterised by an increased chance of social interactions. All these quantities were multiplied with social indicators listed in Table 2.

Turning to environmental ESs, the total amount of food produced and CSA land extension were used to calculate ES.6 and ES.8, and ES.7 and ES.9, respectively (Table 3).

In applying the SROI, the period during which the outcome is expected to endure must be considered. The time dimension serves to discount input and output flows and calculate the social return of CSA. In this work, a 5-year duration for environmental ESs (ES.6-ES.9) was supposed: time periods characterising global warming potentials last decades, but the longer the duration, the more likely the ESs will be affected by other factors. Similarly, the enhanced knowledge of agriculture originating from educational activities (ES.1) was supposed to last 3 years, while the other ESs were considered to expire within the year. A discount rate of 3% was considered to discount inputs and outcomes; it models a low risk, in line with most SROI applications (Nicholls, 2017).

5. Results

5.1. Individual inputs and outcomes

The monetary value associated with inputs and ES indicators (Net Present Value - NPV and

Benefit-Cost Ration - BCR) is reported in Table 5. The SROI analysis revealed that all CSA were characterised by a positive social performance, with an NPV greater than zero. The BCR spanned between 1.01 (lowest value, case 2) and 2.21 (highest value, case 5), meaning that for the observed case studies, the social return of CSA is greater than the initial commitment provided by members.

Table 5 – The net present value (NPV) and benefit-cost ratio (BCR) of CSAs input and outputs, values in k€

	Case 1 ARVAIA 2018	Case 2 ARVAIA 2019	Case 3 ISIDE 2019	Case 4 AMAP 2021	Case 5 SEMI 2019
I.1. Individuals experience volunteering	60.92	64.00	13.00	3.90	11.38
Total inputs	60.92	64.00	13.00	3.90	11.38
ES.1. Knowledge of agriculture is extended	36.45	39.86	13.11	6.56	9.96
ES.2. Knowledge of food is extended	1.56	1.53	0.40	0.31	0.37

ES.3. Transfer of knowledge to external visitors	1.38	0.02	0.11	0.13	0.00
ES.4. Sense of belonging to a community	2.78	2.73	0.72	0.55	0.65
ES.5. Recreation	0.47	0.67	0.55	0.43	0.20
ES.6. Reduction of food packaging	2.50	2.65	0.16	0.16	0.29
ES.7. Reduction of fuel	8.46	8.46	1.08	0.09	0.27
ES.8. Reduction of food miles	6.39	6.77	0.41	0.40	0.74
ES.9. Reduction of pesticides	1.91	1.91	0.24	0.02	0.06
Total output	61.90	64.60	16.77	8.63	12.53
Net Present Value (NPV)	0.97	0.60	3.77	4.73	1.16
Benefit-cost ratio (BCR)	1.02	1.01	1.29	2.21	1.10

The SROI framework revealed a relatively high voluntary commitment (I.1), calculated considering total volunteering hours and the hourly compensation, for CSA 'Arvaia' (cases 1, 2), the largest Italian CSA (Table 5).

In general, individual ESs affected 69-92% of the total net value created by the CSAs. Figure 1 shows the relative importance of each individual and environmental ES. The highest proportion of benefits is generated through ES.1 (comprehensive knowledge of agriculture), spanning between 59% (case 1) and 79% (case 5); in fact, this is the most relevant outcome generated by CSA. Of the remaining knowledge outcomes, the impact of ES.2 (comprehensive knowledge of food) spans between 2% (case 2) and 4% (case 4). In contrast, ES.3 (external transfer of knowledge) remained much less highlighted (0-2%). ES.4 (sense of belonging to a community), calculated considering member shares, resulted in between 4% (cases 1,2,3) and 6% (case 4) of the value of the total outcomes. ES.5 (recreation) ranged between 1% (cases 1,2) and 6% (case 4).

5.2. Environmental outcomes

Overall, the environmental impacts mitigation covers 8-31% of the total net value created by the CSAs. ES.6 (reduction of food packaging), directly dependent on the mass of food produced, resulted in a range of 1 to 4%. The closeness between where food is produced and consumed accounted for 2-10% of the total value (ES.8, food miles reduction). ES.7 (fuel use reduction) and ES.9 (pesticides reduction), calculated considering farm extension, accounted for 1-14% and 0-3%, respectively.

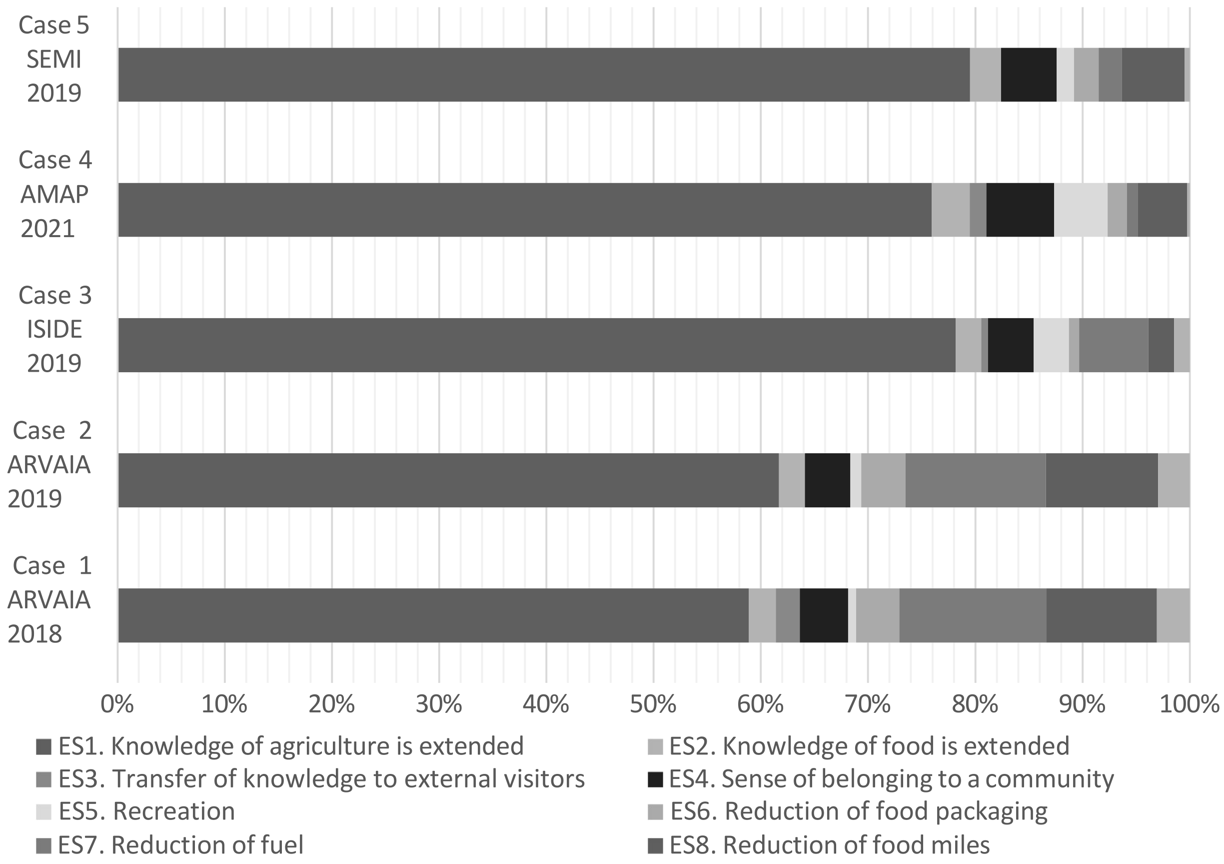

Figure 1 – Relative weight of CSAs' outcomes

6. Discussion

This research applied a cost-benefit analysis evaluation approach based on the social return on investment (SROI) and tested on five CSA case studies. The SROI was able to value (monetise) a range of outcomes that flow from people's participation and a reduced environmental footprint.

The study reveals that all CSAs were characterised by a small but positive social performance, demonstrating that UPUA instances like CSA can create value in terms of social gain and respect for the environment compared to the conventional food supply. This result is in line with other social farming initiatives (for instance, those reported in (Guirado et al., 2017).

Member commitment constitutes the main social input to every community; overall, it has proven to be repaid by the noumerous social ESs. Albeit necessary, the spotty availability of volunteers places CSAs in a fragile condition, like other grassroots groups (Nost, 2014).

The magnitude of ES.1 and ES.2 indicate that the increased knowledge experienced by CSA members constitutes the largest social gain attributed to a community, which is in line with (Grebitus et al., 2017; Hanson et al., 2019). In fact, the comprehensive knowledge of food and agriculture are part of people's cultural heritage and represent a key factor in increasing people's awareness concerning food production and food attributes, including its impacts related on people (farmers, members, and their families) and natural goods (farm, soil, and inputs). The relatively low impact of ES.3 highlights how the capacity to transfer knowledge to others depends heavily on the effectiveness of CSA ancillary activities like dissemination and organisation of open days, which are inevitably restricted to a few days during the year. On the other hand, involving existing members and attracting new ones represents two of the main issue of CSAs in Italy (Medic, Canavari, and Castellini 2021). Not surprisingly, sociality and recreational activities (ES.4 and ES.5) were found to play a minor role: although involving people in educational and recreational activities ensures that individuals fulfil part of their social needs, including contentment and satisfaction (Diekmann & Theuvsen, 2019), the sense of belonging to a community already appeared low on reasons on becoming a member (Cone & Myhre, 2000; Pole & Gray, 2013).

Albeit less than individual outcomes, the environmental performance is remarkable. Agronomic approaches combining principles of organic agriculture and less energy-intensive methods favour fuel and pesticide reductions. CSA environmental ESs are also associated with the absence of intermediary actors in the value chain. Reducing food miles and production inputs compared to conventional food systems can be considered a key success factor of CSA. The environmental ESs identified and measured in this study strengthen the "local" attribute of food and represent key performance indicators of the food supply chain, for which the extended meaning related to production inputs and distance are viewed as peculiar characteristics (Granvik et al., 2017). In general, they contribute to expanding the conceptualisation that allows local food to be regarded as "authentic" products that symbolise the place and culture of the destination (Sims, 2009; Torquati et al., 2021). Environmental ESs measured in this study also contribute to unravelling the ecological intensification associated with CSA, which was recognised as a rational strategy for small but growing farms (Mann, 2005).

Overall, the hypothesis concerning member payoff for food purchases was verified. The comparison between CSA subscription fees and conventional food purchases was made considering an average price of 2.0 €/kg for conventional food purchases and the total food quantities from Table 4. As shown in Table 6, a negative payoff of up to 10% does not affect the positive performance of case studies 3 and 4; the SROI of case 5 is close to 1 in case of a 10% CSA price increment, while cases 1 and 2 suffer from relevant price variation, mainly because the total value of outcomes is close to the value of inputs. It can be concluded that the monetary trade-off between CSA subscription and conventional food purchase can be assumed to be in balance. Still, SROI values close to 1 should lead to further investigations concerning the food price charged.

Table 6 – Sensitivity analysis concerning food purchase payoff (CSA food price Vs conventional food price at 2.0 €/kg)

	-10%	-5%	0	+5%	+10%
Case 1	1.61	1.25	1.02	0.86	0.74
Case 2	1.61	1.24	1.01	0.85	0.73
Case 5	1.43	1.24	1.10	0.99	0.90
Case 3	1.45	1.37	1.29	1.22	1.16
Case 4	3.45	2.70	2.21	1.88	1.63

At the methodological level, using SROI can mitigate the tendency to judge UPUA and other alternative food chains a priori using unverified claims. Rather, the SROI framework applied to the context of CSA offers an opportunity to evaluate and support farmers' work characterised by low-level wages (Galt, 2013; Medici et al., 2021) while overcoming limits and barriers characterising the use of pre-selected indicators from the triple bottom line sustainability (Wellner & Theuvsen, 2017). Also, it can be used by farmers to attract and motivate members, simply showing the public that money spent on CSA is not wasted, and this can help overcome prejudices against UPUA (Maier et al., 2015). Moreover, the methodology adopted in this study can allow local food systems to communicate to other food supply chain actors and government institutions in a "business-like" language, ultimately stimulating the public debate about the worth of alternative food supply chains in the local production of food. As highlighted by other authors, the SROI process reveals its benefit in increasing consciousness regarding the social impact produced (Corvo et al., 2022; Hervieux and Voltan, 2019). In this regard, CSA members can perceive their role as crucial in delivering social benefits offsetting monetary returns.

The findings highlighted in this study can be extrapolated to other Italian CSAs. In general, the proposed methodology can be applied to CSA initiatives and other grassroots organisations in other countries by tuning context-specific social and environmental indicators (Tables 2, 3) and/or considering additional inputs or outcomes.

Some limitations must be acknowledged in this study. First, the choice of both social individual and environmental indicators can be subjected to distortions, asymmetric information and indicator values can fluctuate yearly. In addition, social ESs often reflect one's intimacy that may vary from person to person and could be particularly hard to assess; conservative monetary values were used to mitigate this issue. In this study, we adopted a cautionary approach in evaluating inputs and Ess to limit bias-driven methodological implications (i.e. the tendency to highlight mostly positive relationships and outcomes). The SROI model can be criticised for the selection and measurement of financial proxies, but, on the other hand, it must be considered that diversity characterising CSAs and stakeholders does not allow the use of a universal set of indicators for the measurement of the socio- economic performance. The design of indicators falls in a trade-off between specificity, to account for entity singularities, and generalisation, to better explain models and make comparisons (López- Arceiz, Bellostas, and Rivera 2018).

Conclusions

Understanding and evaluating broad social impacts is gaining importance in scientific research. Little by little, valuing social impacts is gaining relevance, although there is still a long way to work on (Alomoto et al., 2022). This study attempted to conceptualise the socio-environmental performance of five CSA case studies with a cost-benefit analysis based on the social return on investment (SROI). Intuitively, buying food from CSA can generate economic, social, and environmental returns to a greater extent than the initial labour force and money invested. Our findings indicated that a small but positive social performance characterised all CSAs. Specifically, the value of social benefits exceeded members' voluntary commitments by a factor between 1.01 and 2.21, with variations depending on various factors, such as the number of CSA members and their attitudes, the number of training, educational and recreational activities and their attendance rates, the amount of food produced, farmland extension and other indicators accounting for the environmental impact of food chains. The most relevant social ESs identified and measured deal with the transfer of knowledge of food and agriculture from farmers to members and from members to the public. The present analysis highlighted that the more the roles of food producer and food eater overlap, the more CSA could develop and extend benefits to the surrounding environment. The measurement of non-profit value creation introduced by this study can fulfil public expectations concerning sustainable food production in UPUA areas and favour bottom-up responses to the problems of conventional global food systems.

However, some limitations accompanied this pioneering research, particularly concerning the choice of financial proxies; the use of more objective evaluation approaches like stated or revealed preference methods, which ultimately consist in exploring what members are willing to pay to get a social outcome (or asking them directly about the outcome) that can contribute to making SROI application to CSA valid also in other settings. This is an issue for nearly half of the studies using SROI (Gosselin, Boccanfuso, and Laberge 2020)

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