

Perception of the potential ecosystem services derived from the introduction of innovative practices of organic orchard management

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Abstract

Knowledge about ecosystem services and their values can be used to inform farmers and improve their decision-making process particularly when cropping system changes are concerned. A social science study, based on a questionnaire, was carried out to evaluate the perception of professional stakeholders toward some innovative practices (i.e. temporary net system, living mulches, cover crops and locally available fertilizers) in relation to nine ecosystem services. From the answers gathered it emerged a diversified perception depending on the country and the practice concerned. The analysis of the questionnaire indicated a high consideration of the added value of the living mulches in terms of aesthetic value and marketing claims for farmers selling directly their products on-farm

Keywords: living mulches, alternative fertilizers, cover crops, temporary nets.

Introduction

Current conventional-like approach in input uses and application of soil management methods in organic fruit production are considered not fully in line with the basic principles of organic farming (Darnhofer et al., 2010). However, it is becoming clear that plant and soil functional groups rather than diversity govern the interactions between soil organisms and plants (Birkhofer et al., 2011). Therefore, moving from the goal of a “greater biodiversity” to the setting of a “functional biodiversity” shall improve ecosystem services and functions in the agro-ecosystem.

Ecosystem services can be evaluated by considering the potential reduction of external inputs and increase of ecological benefits deriving from the (new) agricultural practices. Agronomical innovations would thus be expected to integrate the management of ES into the crop production system, as conceptualized by the cascade model (Potschin and Haines-Young, 2011), which suggests that to understand the relationships between the environment and the economic system we need to identify both the functional characteristics of ecosystems that give rise to services and the benefits and values that they support.

Material and Methods

Four agronomical innovations were proposed by the DOMINO project (<http://www.dominocoreorganic.eu/>) for the management of organic orchards: i) living mulches for the management of the tree understory as an alternative to tillage or natural cover; ii) use of leguminous cover crops for the management of the tree alley in alternative to natural soil cover; iii) application of locally available organic fertilizers to avoid the use of contentious fertilizers; iv) installing temporary nets to foster a reduction of pesticides use for the protection of the orchard.

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A selection of the ES that could be affected by the innovative practices was performed through a participatory approach during a workshop organized with members of the Polish Association of Organic Fruit Producers. Nine services were selected within the four ecosystem services categories (MEA, 2005), which were listed in a questionnaire asking respondents (organic farmers, advisors, and researchers) to provide a qualitative answer to the following question: “How do you perceive/believe that the new agricultural techniques proposed/tested by DOMINO Project will affect these ecosystem services?”. Data were analysed based on Grounded Theory applying an approach conceptualising the knowledge as context-specific (Raymond et al., 2010).

Results and Discussion

A quite diversified perception of the relation between the proposed innovations and the impact on ES emerged from the analysis of the answers to the questionnaire (Figure 1). The temporary net covering system resulted to be perceived with the most diversified impact on the different ES considered, having overall a negative impact also when compared to the organic baseline (i.e. the common method of organic orchard management). This perception recurred in all locations and concerned both cultural services and the supporting service “photosynthesis”. The impact on provisioning services and on the soil nutrients (supporting service) was variable depending on the country of the respondents, but in general either neutral or slightly positive/negative. In all countries the respondents considered positive the impact on the two regulating services associated with plant protection; the impact perception was neutral or negative, depending on the country, on pollination and water-related services. The perception of the cover crops, row living mulch and alternative fertilizers was overall positive for the different ES considered, even though some slight differences emerged depending on the country of the respondents. Interestingly, all respondents did not perceive the use of alternative fertilizers derived from waste recycling as highly impacting on the regulating service for waste treatment, being in general scored as neutral or slightly positive. A very interesting outcome concerned the impact of the practices on the food production, i.e. on the fruit yield of the orchard. The baseline, i.e. the common organic management of the orchard was always rated at a higher level than any other innovative management.

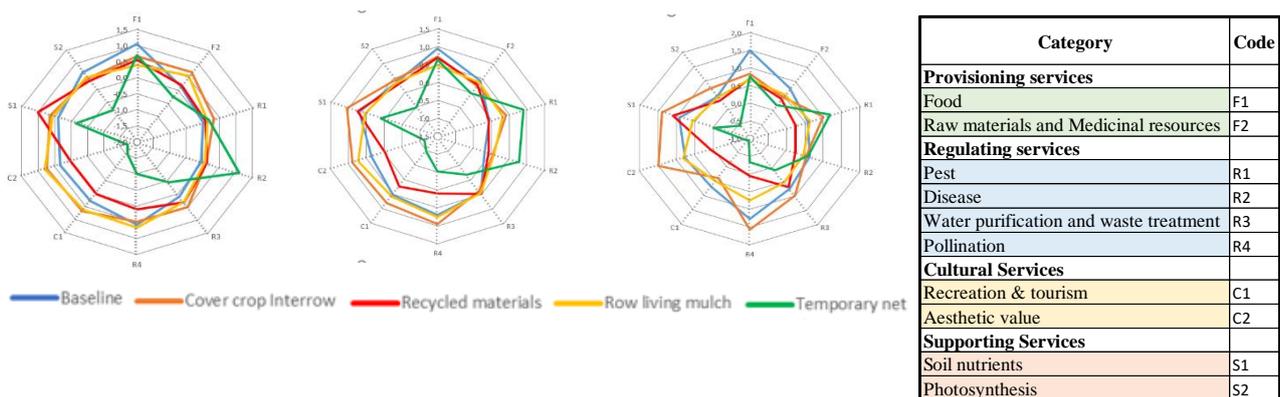


Figure 1: Perception of the potential impact of different innovative orchard management practices on specific ecosystem services in a) Switzerland and Germany, b) Northern Italy and c) Poland.

It is known that social (e.g., gender, education) and local ecological (e.g., land use and climate) characteristics play roles in influencing people’s perceptions of which ES are important (Quintas-Soriano et al., 2018). However, it is remarkable that in general the respondents indicated a positive score of the practices toward provisioning and regulating services. Contrasting perception emerged in case of the impact from different practices on

cultural services. The result of the analysis indicated a high consideration of the potential added value provided by the living mulches in terms of aesthetic value, which could be exploited for marketing claims by farmers, particularly those selling their products on-farm (Adams, 2018). This aspect could be a key economic element fostering the adoption of such practice for farmers able to transform and valorise the secondary products that could provide an additional income to farmers introducing living mulches. On the other hand, the general negative perception of the temporary net systems on cultural services could highlight the importance given by stakeholders involved in organic farming about the environment and landscape features, which could reverberate on touristic activities, as well as to the environmental impact due to the use of plastic (Boschiero et al., 2018).

The results highlight the importance of a direct involvement of professional stakeholders in identifying solutions to improve the effectiveness of an innovation, as emphasized by several studies (Ingram et al., 2018). The perception analysis carried out on the four innovations would thus also shade light on the likelihood that they could be introduced into practice, as there is a general acknowledgment of the value of the ecosystem services particularly among organic producers (Maas et al., 2021).

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