FOODLEVERS

Deliverable 2.1
Report on ecosystem services

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Leverage points for organic and sustainable food systems

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This is a pre-print version of a manuscript entitled ***Evaluating the sustainability of innovative organic and sustainable farming systems using the Public Goods tool*** submitted for possible publication in a scientific journal. A link to the original work will be updated after acceptance of the manuscript.

Summary

Conventional and modern-day agriculture emerged after the Second World War and brought us prosperity and food security at a time when this was most urgently needed. However, Industrial agricultural production mostly based on monoculture cropping systems and large amounts of external inputs such as chemical pesticides and artificial fertilizers also came at a huge cost for the environment. It is clear that it is time to rethink the way food production is organised.

Organic farming has been proposed as one solution to make agriculture more sustainable. Agroforestry and other regenerative farming methods have been proposed as more environmentally friendly methods of farming. The environmental benefits of organic farming and agroforestry have been demonstrated in many studies. In addition, Community-Supported Agriculture (CSA), an alternative model of food production and distribution can create many benefits for local rural communities and can be a driver for innovation in agriculture.

However, methods to assess the sustainability of farming generally require extensive research and currently there is a lack of easy-to-use assessment methods where the benefits of innovative farming methods can be demonstrated to the farmer, farm advisors and the general public.

Rethinking the organisation of sustainable and organic food systems value chains is necessary to increase the sustainability and efficiency of food systems and to reduce trade-offs between production and distribution stages. Apart from their primary production function farms provide many ecosystem services. Ecosystem services include all effects of ecological systems that provide benefits to humans in direct or indirect ways. They include provisioning services (e.g. provision of food), regulating services (e.g. regulation of climate, air purification, water) and cultural services (e.g. importance of nature for leisure and recreation, education). The evaluation of ecosystem services provided by agricultural value chains should be an essential part of any holistic sustainability analysis of and if we want to evaluate innovative ways of organic food production.

Understanding the range of positive and negative impacts of innovative organic farming systems is essential for further developing innovative practices and policies related to organic farming, and to avoid negative impacts such as increased labour costs and or reduced land availability. Assessing the sustainability of innovative organic case studies can provide information on the trade-offs and synergies between and can help define innovative solutions that work for a certain socio-ecological or socio-economic context. Benefits and cost of management of farming systems can be identified through this process to inform the development of support schemes, farmers and land managers and new markets for agricultural products. A sustainability assessment using a range of metrics and indicators can help to reveal benefits and drawbacks from a range of perspectives (social, environmental, economic).

Leverage points for organic and sustainable food systems

In this study, we analysed eight European case studies (Fig. 1) of innovative organic food systems using an existing sustainability assessment tool, the Public Goods Tool. The tool allowed us to assess various aspects of sustainability, and identify key practices and system characteristics that affect performance from multiple perspectives of resource efficiency such as environment, economy, social and governance. We used the leverage point theory to analyse the results from on-farm sustainability assessments and to identify which interventions are most likely to facilitate a transition to more sustainable farming systems. The main research questions were: 1) How do innovative organic farming systems compare across multiple dimensions of sustainability, and 2) what are the key leverage points within innovative organic farming systems and how do these influence sustainability performance in environmental, economic, social and governance domains?

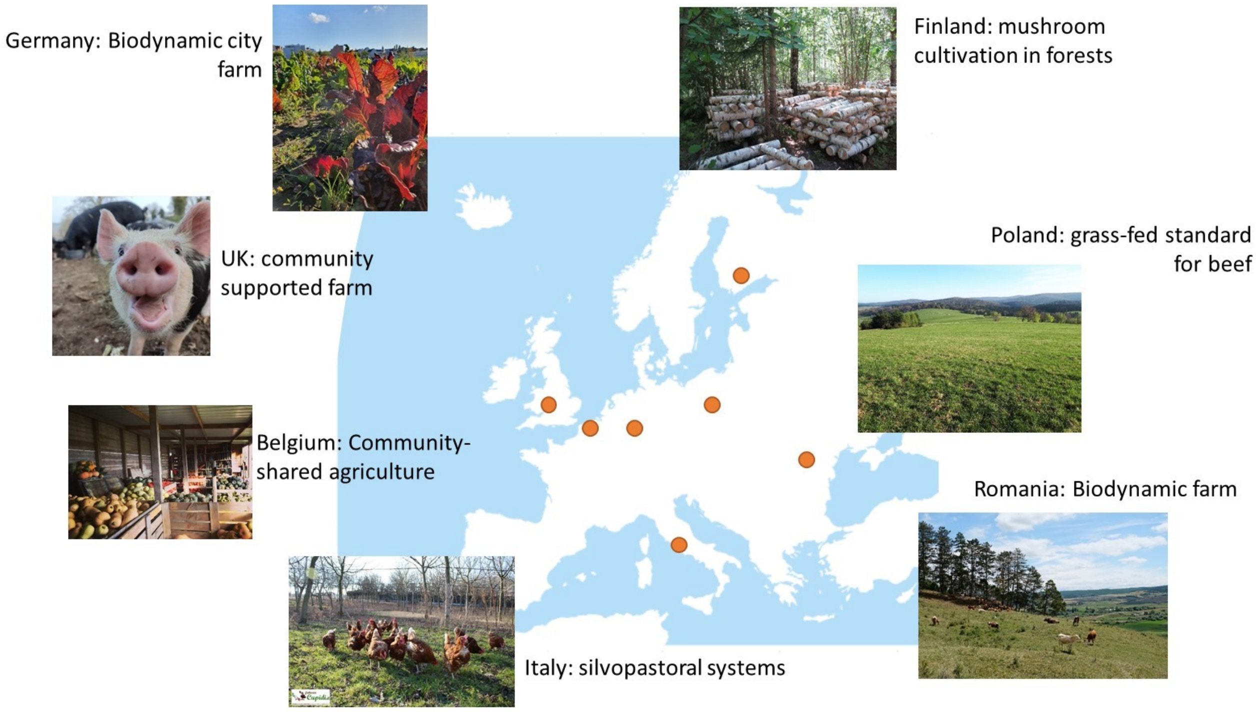
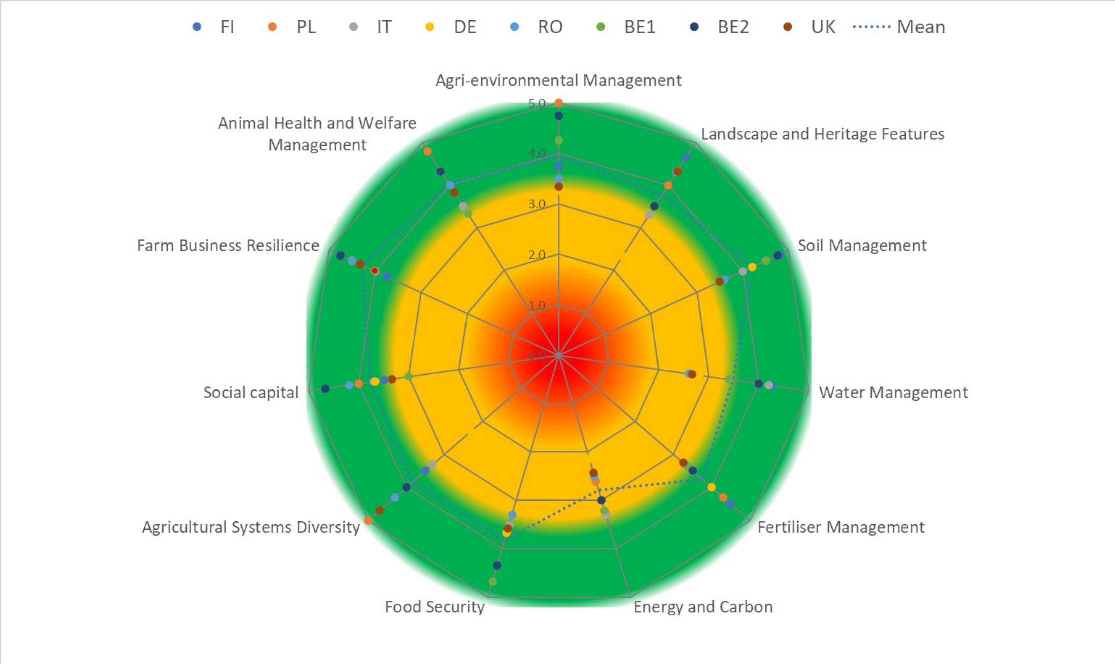


Figure 1. Location of the selected European case studies of innovative organic food systems

For this study we updated an earlier version of the PG tool (Gerrard et al. 2012) to make it more suitable to evaluate the specific characteristics of our innovative farming systems. To adapt the tool, a participatory approach was applied using a combination of literature review by the research team and stakeholder surveys across all case study countries which resulted in an adapted version of the PG tool.

The results of the ecosystem service evaluation provide information on the sustainability performance of the eight innovative organic case studies. Overall, the performance of the farms was above average in most of the sustainability dimensions (Fig. 2). There were however a few cases where improvements could be considered such as some aspects related to “energy and carbon” and “water management”.

A)



B)

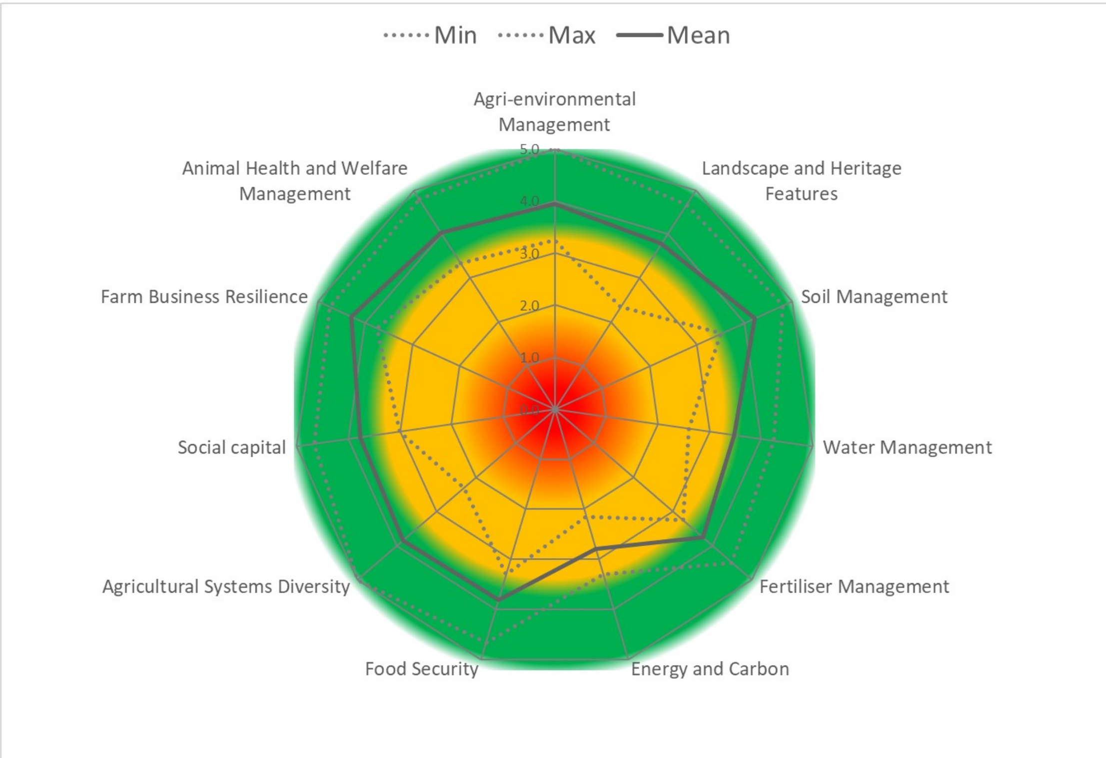


Figure 2. A) Overview PG tool scores for each case study and average (mean) scores and B) minimum, maximum and average (Fi = Finland, PL = Poland, IT = Italy, DE = Germany, RO = Romania, BE = Belgium, 1: West-Flanders, 2: Antwerp, UK = United Kingdom. See Figure S1 for more detailed results for each of the 8 organic farms).

The low score for energy and carbon is slightly surprising given that the majority of the case study farms are small and rely more on manual than mechanised labour. It may be that the PG tool's benchmarks are not appropriate for smaller more diverse farms and future iterations of the tool could pay attention to appropriate benchmarks for small farms.

The average score for water management scores was influenced by farms using irrigation for several vegetable crops. If a farm is not using irrigation, the water management score is only based on six indicators most of which relate to farm planning and systems (e.g. flood management system) which are more likely to be a feature of larger farms.

The highest average scores were seen in 'farm business resilience' and 'soil management'. All innovative case study farms have diverse and highly localised business models including direct sales. In addition, soil management was an important aspect on all farms. Examination of the interactions between different elements assessed in the PG tool data showed that overall there were more positive interactions than negative indicating that synergies between sustainability indicators are more common than trade-offs in our case study farms. A particularly strong positive relationship was seen between farm business resilience and social capital and these two aspects can therefore be highlighted as key leverage points. Future research could focus more on how to nudge people to more environmentally friendly behaviour and how to operationalize key leverage points as these could make farms and rural communities more resilient to both expected and unexpected challenges in food production.

References

Gerrard CL, Smith LG, Pearce B, Padel S, Hitchings R, Measures M, Cooper N (2012) Public Goods and Farming. Farming for Food and Water Security. In: Lichtfouse E (ed) Farming for Food and Water Security. Sustainable Agriculture Reviews, vol 10. Springer Netherlands, pp 1-22.