Title of the paper

Sustainability, who cares? Identifying drivers of farm sustainability performance in organic farms in Switzerland

Introduction

Sustainability has become a muddled term. Increasingly, farmers, processors and food traders are claiming in different ways that their products are produced in a particularly sustainable way. As a consequence voluntary certifications, labels and standards (e.g. SwissGAP, Naturaplan, Organic, M-check, Terra Suisse and Fair Trade), as well as assessment methods (e.g. SALCAsustain, RISE, Life Cycle Sustainability Assessment and Farm Sustainability Assessment), have proliferated greatly in recent years (FAO 2014). These aim to measure, monitor, improve and benchmark products or production systems. Despite these laudable aims, different tools and standards target different aspects of sustainability. This creates division in the dimensions that are assessed (e.g. social, environmental, economic) as well as the detail and type of assessment (qualitatively or quantitatively, product or farm scale, etc.) This increases the risk that improvements in some assessed areas could lead to unseen impacts elsewhere (Schader et al. 2014). As a result, confusion among consumers and decision makers is unavoidable, possibly resulting in greenwashing and unsustainable consumption choices.

To improve transparency, the UN FAO developed the SAFA guidelines (Sustainability Assessment of Food and Agriculture) in an attempt to unify sustainability frameworks into one holistic and globally applicable system of nested dimensions (4), themes (21) and sub-themes (58). These sustainability themes are all defined as objectives that describe an ideal condition. They range from the frequently used (e.g. greenhouse gas emissions) to the uncommon (e.g. cultural diversity), yet each deserves credible assessment under a holistic framework in consideration of the diversity of societal values. To operationalize the SAFA guidelines and framework, the SMART-Farm Tool (Sustainability Monitoring and Assessment RouTine) was developed by the Research Institute of Organic Agriculture (FiBL) to facilitate the examination of sustainability claims by such labels and standard as well as provide an independent assessment method for agricultural production systems. The tool is under constant development and applied testing in a range of implementation projects, such as examining the sustainability claims of different standards and labels, comparing production systems and identifying system improvement potentials.

Under one project titled "*Representative sustainability assessment in Swiss organic Bud farms under the SAFA guidelines of the FAO*", a sample of 185 organic farms (3.1% of the national total in 2015) were assessed with the SMART-Farm Tool. This has provided a rich database of information on farm practices and outcomes related to sustainability performance, and delivered detailed reports for each farmer and the project as a whole on sustainability performance. This database offers the valuable opportunity of conducting detailed scientific research into the determinants and drivers of sustainability performance, as well as the limits, trade-offs and synergies in measuring and achieving sustainability.

Research questions and aims

The proposed paper aims to use these data to address three main research questions:

1) What is the overall sustainability contribution of organic production in Switzerland according to the targets set by SAFA, and how does this generate trade-offs and synergies across dimensions, themes and sub-themes?

2) What are the farm-level determinants of sustainability performance across SAFA themes based on farm structural (e.g. farm size, production system, employees), paedo-climatic/geographic (e.g. climate zone, topography, soil, geographic isolation) and socio-economic factors (e.g. income levels and sources, marketing strategy)?
3) What recommendations for best-practice guidelines can be drawn from the research to inform farmers on acceptable and effective improvement measures that strengthen and go beyond organic standards?

Methods

The SMART-Farm Tool is a multi-criteria assessment model employing over 320 indicators linked to all 58 sub-themes of the SAFA guidelines (Schader et al. 2016). It was applied to 185 representative organic farms covering all major production systems, farm types and locations in Switzerland. For the project, data was analysed on the farm level and summarized for an overall synthesis report. However, to answer our research questions, more in-depth analysis is needed.

To address research question one an overall analysis of the data will be conducted to assess trends in sustainability performance. Synergies and trade-offs will be identified by analysing the relationships between SAFA sub-themes across the sample using correlation analysis in order to assess if, and to what degree, performance increases in one dimension are associated with decreases (trade-off) or increases (synergy) in another. Farms will be classified and clustered based on their performance using multivariable statistics (e.g. PCA, multidimensional scaling) and clustering techniques to identify groups of similarly performing farms that demonstrate particular positive and negative examples.

For research question two, multiple regression will be used to associate a range of explanatory data (production system, agricultural practices, socio-economic variables, climate, location, etc.) with sustainability performance per sub-theme. This will identify the main determinants of performance for each subtheme. In a second step, aggregation methods in multi-criteria decision analysis (MCDA) will be explored to aggregate performance scores and rank farms in each dimension. Again, determinants of these aggregate sustainability scores per dimension will be correlated with explanatory data.

For the third research question, the results above will be used to identify key improvement measures at the farm level. This will take into account the findings on overall trade-offs/synergies (research question 1) the determinants of sustainability (research question 2) to deliver measures that have the highest net-positive effects, while being relevant and achievable for farmers.

Results

The proposed research delivers highly relevant information on the contribution to and drivers of farm sustainability in the Swiss organic sector. Preliminary results indicate that overall, the organic sector performs very well across many SAFA sub-themes (Figure 1). Correlation analysis of performance across sub-themes indicate strong synergies among sub-themes in the environmental dimension relating to materials and energy, biodiversity and climate (S26-S16; Figure 2). In terms of trade-offs, there was a cluster of negative correlations between certain economic sub-themes (S41-43; Figure 2) and the environmental dimension. In terms of production system, energy consumption was higher for the production of special crops and milk production than other systems. Biodiversity was lowest for arable crops production (data not shown). Extensive farms appear to perform well due to high proportions of grassland and lower workloads. In addition, geographic location appears to influence sustainability: farms in the mountain areas perform better in the environmental SAFA themes atmosphere and water.

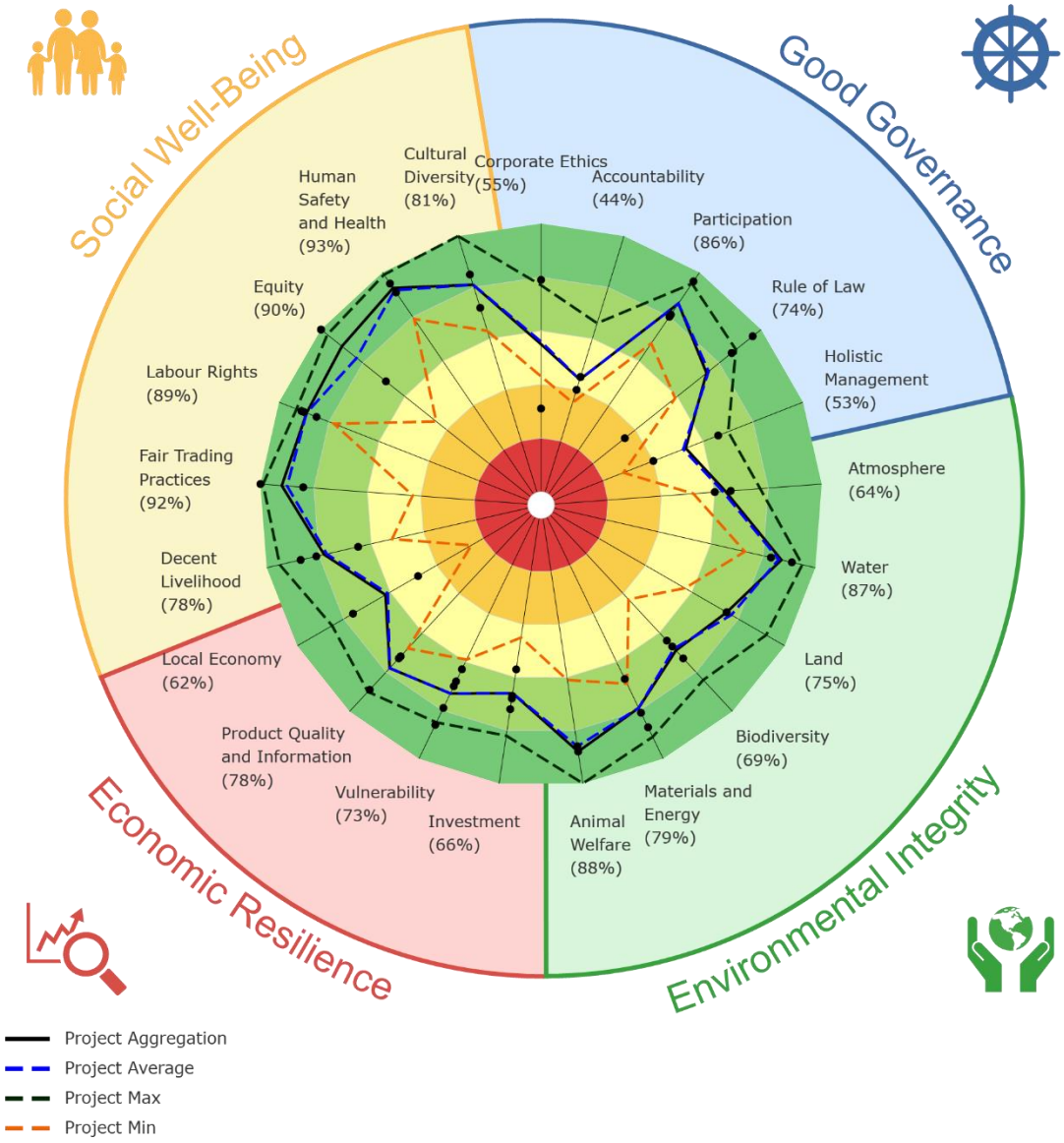

Figure 1. Sustainability polygon of the entire sample of farms. Results are aggregated to 21 SAFA themes (21) across four dimensions. Project Aggregation = median values across farms.

Discussion

Holistic farm-level sustainability assessments enable the identification of trade-offs and synergies between sustainability dimensions and topics. This is relevant to guide transformation towards more sustainable food systems. Beyond these preliminary results, the research will identify the main drivers for the subtheme performances and concretize these results with best-practice recommendations, e.g. local sourcing of external inputs. These resulting measures are valuable contributions to the efforts to develop practicable strategies towards more sustainable food production systems.

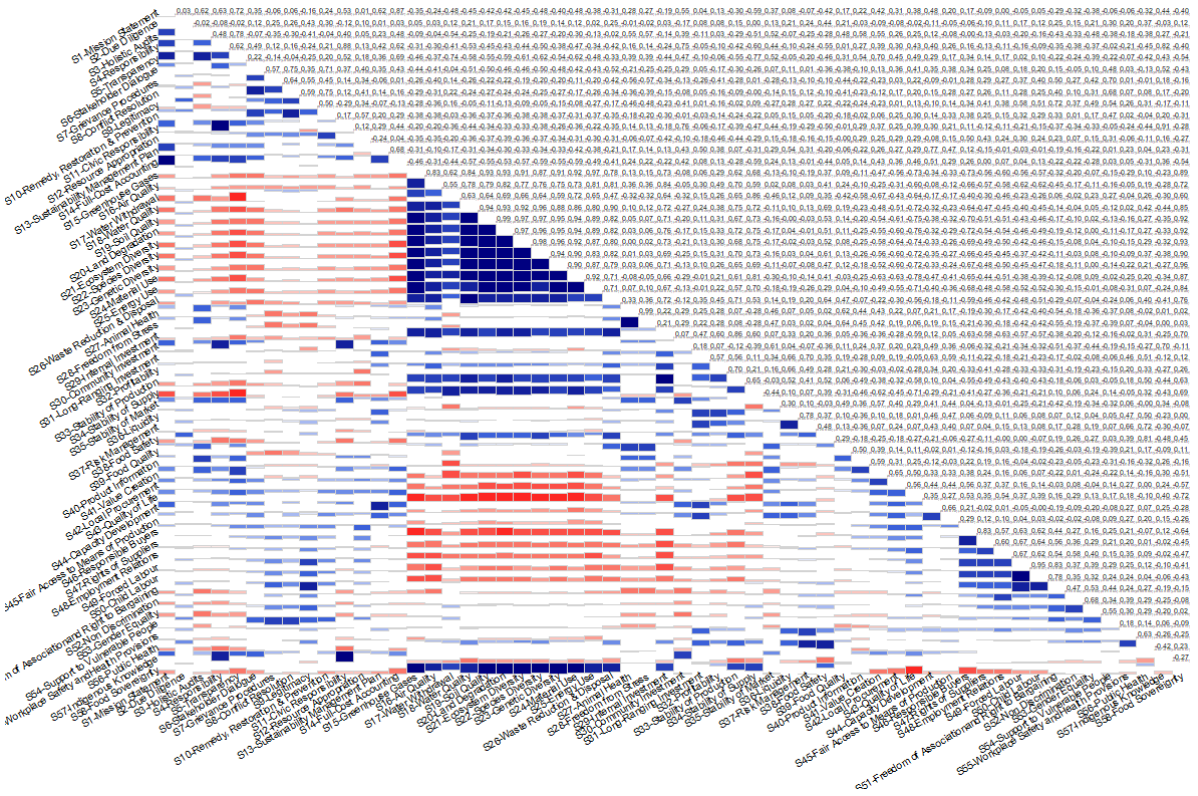

Figure 2. Trade-off analysis (Spearman's correlation matrix) between different SAFA sub-themes in the data. In lower side of matrix, the colour (red = negative, blue = positive) and size of the box indicates strength of correlation. Upper side of the matrix contains correlation coefficients and confidence intervals.

References

FAO, 2014. Sustainability Assessment of Food and Agriculture systems (SAFA). Available online at: http://www.fao.org/nr/sustainability/sustainability-assessments-safa/en/ . Food and Agriculture Organization of the United Nations (FAO), Rome.

Schader, C., Grenz, J., Meier, M.S., Stolze, M., 2014. Scope and precision of sustainability assessment approaches to food systems. Ecology and Society 19.

Schader, C., Baumgart, L., Landert, J., Muller, A., Ssebunya, B., Blockeel, J., Weisshaidinger, R., Petrasek, R., Mészáros, D., Padel, S., Gerrard, C., Smith, L., Lindenthal, T., Niggli, U., Stolze, M., 2016. Using the Sustainability Monitoring and Assessment Routine (SMART) for the Systematic Analysis of Trade-Offs and Synergies between Sustainability Dimensions and Themes at Farm Level. Sustainability 8, 274.

Contact information

Gianna Lazzarini (presenting), Michael Curran, Lukas Baumgart, Christian Schader

Department of Socioeconomic Sciences

Research Institute of Organic Agriculture FiBL, Switzerland

Email: gianna.lazzarini@fibl.org