Geophysical Research Abstracts
Vol. 19, EGU2017-18815, 2017
EGU General Assembly 2017

Visualisation of uncertainty for the trade-off triangle used in sustainable agriculture

Paul Harris (1), Taro Takahashi (1,2), Michael Lee (1,2)

(1) Rothamsted Research, SSGS, Okehampton, United Kingdom (paul.harris@rothamsted.ac.uk), (2) University of Bristol, School of Veterinary Science, Langford, Somerset, BS40 5DU, UK

Agriculture at the global-scale is at a critical juncture where competing requirements for maximal production and minimal pollution have led to the concept of sustainable intensification. All farming systems (arable, grasslands, etc.) are part of this debate, where each have particular associated environmental risks such as water and air pollution, greenhouse gas emissions and soil degradation, as well as issues affecting production efficiency, product quality and consumer acceptability, reflected in the development of agricultural sustainability policies. These challenges necessitate multidisciplinary solutions that can only be properly researched, implemented and tested in real-world production systems which are suited to their geographical and climatic production practice.
In this respect, various high-profile agricultural data collection experiments have been set up, such as the North Wyke Farm Platform (http://www.rothamsted.ac.uk/farmplatform) to research agricultural productivity and ecosystem responses to different management practices. In this farm-scale grasslands experiment, data on hydrology, emissions, nutrient cycling, biodiversity, productivity and livestock welfare/health are collected, that in turn, are converted to trade-off metrics with respect to: (i) economic profits, (ii) societal benefits and (iii) environmental concerns, under the umbrella of sustainable intensification. Similar agriculture research platforms have similar objectives, where data collections are ultimately synthesised into trade-off metrics. Trade-offs metrics can then be usefully visualized via the usual sustainable triangle, with a new triangle for each key time period (e.g. baseline versus post-baseline). This enables a visual assessment of change in sustainability harmony or discord, according to the remit of the given research experiment.
In this paper, we discuss different approaches to calculation of the sustainability trade-off metrics that are required from the farm platform data collections. Then via simulated trade-off metrics, rather than the actual trade-off metrics from the farm platform, we present novel visualizations of the sustainability triangle demonstrating ways to separate uncertainties related to agricultural production (e.g. soil and animal/crop heterogeneity) from uncertainties related to data collection (e.g. measurement errors). The visualizations are general and can be applied to any agricultural data collection experiment that intends to use sustainability triangles to relay trade-offs. We also consider how these visualizations can be honed to suit different audiences.