why some conventional systems outperform alternative systems, and *vice versa* [6], but also to assess the costs, benefits, and trade-offs of hybrid systems, such as organic with limited use of synthetic fertilizers, or combinations of ecological control with genetically improved pest-resistant varieties.

Partisan Rhetoric

By classifying agriculture into a conventional versus alternative typology, scientists are enforcing a partisan dialogue of 'us' and 'them', both within science and in wider society. Overcoming food system challenges will require collaboration across many disciplines, diverse types of farmers, and many stakeholders [7]. There are no silver bullets and we must try to ensure that we have all the tools in the box to engineer a multifunctional global food system. This means we must work together as a global community and not position our binary classifications to face up against each other.

Shifting Baselines

The food system is currently undergoing large changes. There is continued upsurge in the number and sales of ecologically certified and labeled products, and a renewed focus on nutrition and healthy living [8,9]. The 'conventional' and 'mainstream' of today is already working on biodiversity, soil health, water quality, welfare, waste, and human rights (Sustainable Agriculture Initiative Platform, http://www.saiplatform.org/), even if only to maintain a license to operate. In this changing landscape, outcome-based approaches to experimental design, rather than a conventional versus alternative divide, seem increasingly important to assess the costs and benefits of different farming choices.

System-Level Interactions

Finally, a conventional versus alternative agriculture binary ignores interdependencies among the diverse food systems of our planet. The planet is an interconnected and telecoupled system and our farming system types are dependent on each other in many ways [10]. For example, organic farms can rely on animal-based inputs, such as manure from conventional farms [11]. Conventional farms, in turn, are likely to benefit from knowledge translation of some best-management practices discovered in alternative systems. Acknowledging farming as a range of diverse systems that are interconnected and dependent on each other more easily allows a system-level perspective on sustainability.

We conclude that simplifying farming choices into comparisons of conventional versus alternative systems could hinder a mechanistic understanding of agriculture, places too much focus on a divisive discourse rather than identifying favorable outcomes, precludes the development of novel hybrid systems that can potentially deliver multiple beneficial outcomes simultaneously, and ignores the telecoupled nature of the world we live in today. This is not so much a critique of Garibaldi *et al.* because it is current scientific practice, our own work included. A transition towards more contextual and outcome-based experiments of farming practices might help to improve our understanding of the costs and benefits of different farm management decisions, provide a better understanding of our existing farming system classifications, and ultimately increase social equity and the environmental benefits of global agriculture.

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Letter

Multidimensional Performance of Farming Approaches: A Reply to Mehrabi *et al.*

Lucas A. Garibaldi,[1,*] Barbara Gemmill-Herren,[2] Raffaele D'Annolfo,[3] Benjamin E. Graeub,[4,5] Saul A. Cunningham,[6] and Tom D. Breeze[7]

The letter by Mehrabi *et al.* [1] provides interesting insights regarding the scientific framework and attitudes needed to support farming approaches for greater biodiversity, livelihoods, and food security. In general, we do not see a dichotomy between our point of view [2] and that put forward by Mehrabi *et al.* [1]. We share their view that the different farming systems we have described do not form distinct, non-overlapping categories. We

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do not seek to promote a binary choice between conventional and alternative farming. In fact, the purpose of Table 1 [2] in our original paper was to show that the systems differ by degree, usually because of differences in emphasis rather than categorical distinctions (see also Box 1). Moreover, the research program that we recommend is useful for comparing a range of different agricultural systems (two or more categories; e.g., diversified vs ecological intensified vs agroecological), farming practices, or any quantitative predictor. This can extend to 'hybrid' systems as well as to comparisons among different 'conventional' systems (e.g., different crop-tillage systems) or to any 'mechanistic' variable to understand the costs and benefits of conventional versus alternative systems. For example, our framework was recently applied to evaluate the socioecological impacts of the number of pollinator-friendly practices (a quantitative mechanistic variable) across coffee farms in Brazil [3]. In our original contribution [2], we also considered the idea of 'shifting baselines' (without mentioning this term explicitly) through the concept of adaptive management, so what was considered an 'alternative' system in a first comparison might be considered conventional in a subsequent comparison. Ultimately, our paper advocates for designing research to incorporate the multiple practices that are a reality for farmers and to assess multiple dimensions (social, ecological, cultural, etc.) of outcomes.

This does not mean, however, that there is no value in viewing different farming approaches at a 'system' level. The systems perspective (rather than a focus on discrete management practices) is useful because not all elements of practice can be varied separately. For instance, an increased emphasis on synthetic inputs is often linked to a reduced dependence on labor. It is also useful to recognize that the different farming systems can be linked to different cultural perspectives, as this influences their adoption (or lack of) in different communities. For example, participatory agroecological research in Malawi has led to community reflection on gender equity and child nutrition, neither of which can be linked to distinct practices but rather involve the process of applying holistic and inclusive principles to farming as a whole [4].

Theories or philosophies of alternative farming systems are by their nature aspirational, setting a high standard for which transitions are needed. In such a transition process, it is unrealistic to expect that all elements of a philosophy will be actualized at once. Many farmers may have reasons to adopt a particular system – for example, greater revenues with organic certification – but still employ some practices (e.g., large monocultures) that differ from the founding philosophy to suit their particular circumstances. Nevertheless, the goal of our paper [2] was not to advocate for particular farming systems but instead to highlight that the differences among farming systems in socioeconomic performance are poorly understood. We argue that this knowledge gap gets in the way of efforts to improve agriculture's effect on all dimensions of people's livelihoods.

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Letter

Ecologists Winning Arguments: Ends Don't Justify the Means. A Response to Begon

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In a recent refreshingly provocative opinion piece [1], Michael Begon makes a case for a drastic change in the way ecologists should communicate their scientific findings to the public and policy makers. He starts from the observation that ecologists are not successful enough in winning public arguments against what he calls the 'reactionary, antirational forces that we wish to overcome'. Begon's line of argumentation comprises several aspects, some of which we support, but others, we think, should not remain uncommented upon. In short, Begon urges ecologists (i) to improve their ways of communicating with the general public through the use of metaphors and catch phrases; (ii) to appeal therein to emotions rather than to keep aiming at generating rational understanding; and (iii) to advocate, as scientists, for particular interpretations of scientific findings to direct the public mood.

We Need to Improve Our Communication – But on the Right Grounds

First of all, we agree with Begon that it is imperative for ecologists to find more