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Get real: agronomists and breeders should review agricultural science

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How will agriculture adapt to a changing climate? It's an important question and, as more governments start worrying about future food security, one that's worth trying to answer.



Credit: Carl Davies/scienceimage

Many well-known scientific journals frequently publish papers that claim to predict global crop yields or offer guidance on how farmers can adapt. But most of these papers are written in an academic bubble, and this seriously undermines their usefulness.

The most recent of these papers **has just been published** in *Nature Climate Change*.

It claims its findings 'reveal that the use of seasonal climatic forecasts to predict crop failures will be useful for monitoring global food production and will encourage the adaptation of food systems to climatic extremes'.

While the pathway to those findings is unfathomable to someone not deeply immersed in the arcane techniques of modelling chaotic systems such as the weather, its claims are wide open for debate.

It is a common characteristic of the authors of such papers that they do not ask potential users of their findings – agronomists, breeders, marketers – to comment on the claims. Reality therapy is not something they usually seek.

This comment applies not only in modelling, but also to most of the many papers in the experimental plant sciences that claim to be useful for improving food production.

What is to be gained from a new technique for predicting crop failures? The large financial industry based on grain futures relies on information about currently growing crops around the world. Good information is valuable to it. But does this recent paper improve this information?

To find out, the authors would have had to compare the usefulness of their model with currently used techniques of forecasting the yield. And one cannot tell from the paper if they have.

If there is no demonstrable improvement, why bother with the exercise? Is the paper a work in progress, an advance towards

something that will eventually be demonstrably useful? If so, why is it not published in a more appropriate journal?

The second part of the paper's claim to usefulness is that it 'will encourage the adaptation of food systems to climatic extremes'. Who will do this adapting, exactly, and be encouraged by this paper?

First-rate breeders and agronomists are already hard at work solving problems of grain crops subject to volatile environments, not least in Australia. Is there anything that they would do differently if they read this paper? I would say not.

Our wheat breeders test their potential new cultivars in a wide range of environments across Australia, from the driest to the wettest parts of the wheat belt, sampling extremes of risk of frost damage and of heat damage.

Our agronomists keep making substantial improvements in farming systems that **are substantially increasing yields** per unit of rainfall.

There is really no serious basis for the claims of usefulness in this paper and the thousands of others that make similar vague claims of being agriculturally helpful. This is not a matter of fraud but of naivety, not only of the authors but of the institutions that support them. It highlights a serious problem with our system of peer review in agricultural research. It is a problem that can be readily solved.

Certainly reviews by peers in the given field remain essential. What is missing is additional review by people further along the value chain of agricultural R&D, the potential users. They are the ones who can check the promise of a given piece of work, because they are aware of the constraints and requirements of current practices and understanding in their own domains.

Involving them would be enormously beneficial. Their role would be much more than that of a filter. Just as importantly, they could provide guidance on what would make for substantial improvements in their own domains, including where the best opportunities may lie.

It is now common for our agronomists to work in tandem with designated farmer groups and their management consultants. Such collaborations are **proving to be very effective**.

The way is open for laboratory scientists to embrace similar close collaborations – not with farmer groups, for that would be a step too far, but with field scientists, the agronomists and the breeders.

Knowledge of what would potentially work in the field would then be available to them, thereby greatly enhancing the potential usefulness of their research.

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