RRES Press Release 17 Mar 2023 **Farms producing wider range of produce would offset the impact of climate variability on food supply**

*Study underlines need for flexibility in future government agricultural policy*

The negative impacts of climate variability on food security and farm incomes could be offset by having farmers grow a wider range of produce, and by them using pesticide and fertiliser more efficiently, according to a [study of farms in England and Wales](https://www.sciencedirect.com/science/article/pii/S0921800922003378?via%3Dihub).

The report also shows that on some farms, government subsidies linked to environmental stewardship help make incomes and food production more stable, compared to schemes that just pay farmers for how much land they farm.

Produced by staff from Rothamsted Research, University of Reading and Newcastle University, the study examined cereal farms, arable farms, and farms that grew a mix of crops which, in some instances, also reared livestock.

The authors say their results highlight the need to consider, in concert, farming practices, government policy, and climate change when examining the outlook for UK food security.

Dr Caroline Harkness, who was a joint Rothamsted and Reading PhD student when she led the study, said: “Under current conditions, farm management decisions may provide opportunities for farmers, supported by policy makers, to tackle the instability caused by climate volatility which are outside their control.

“Our results show that greater agricultural diversity is associated with more stable farm incomes and food production. The relative strength of these associations, in comparison to the impact of other farming practices and climate conditions, indicates that maintaining or increasing agricultural diversity is very important for the future sustainability of farming systems and food security.

“Similarly, the intensity of farming has a larger relative effect on food security compared to the impacts of climate change. For general cropping farms in particular, use of agrichemicals had a larger impact than either subsidies or climate variability in influencing the variability in food production.”

The researchers linked 13 years of data on yields and incomes from 929 farms across England and Wales, with local climate data to understand the relative effects of climate variability, subsidies, and farming practices on the stability of food production and farm incomes.

The analysis showed variability in temperature and rainfall reduced the stability of farm income and food production.

However, farms with a greater variety of crops and/or livestock showed greater stability in both food production and incomes, whereas farms which spent more on chemical inputs (fertiliser, pesticide and concentrated animal feed) had more variable incomes but less variable yields.

“Spending more on chemical inputs therefore helps maintain food production but reduces the stability of income,” said Dr Harkness. “More precise application of pesticides and fertilisers, to where they are specifically needed, may help reduce costs and address this apparent trade-off, as well as, reducing negative impacts on the environment.”

The study found that agri-environment schemes improve stability for mixed farms, whereas the opposite effect was found for cereal farms - and the effect of subsidies is a much less important factor than what farmers produced or how intensively they farmed.

This underlines the need for flexibility in future government agricultural policy, said Dr Harkness.

“Future climate impacts and adaptation will vary between farm types, therefore agricultural policy targeting stability should be tailored to allow for different types of production.”

Larger farms were also associated with greater stability of both food production and farm incomes across most farm types.

“Farmers are facing a more unpredictable environment, with climate change affecting food production and global food prices. Government policy could be targeted to combat production risks, including those from climate variability, and move towards greater agricultural sustainability,” said Dr Harkness.

“Greater emphasis could be given to support agricultural diversification, as well as more precise chemical application. These factors improve the stability of food production and farm incomes and can have ecological and environmental benefits including to the soil and for pollinators.”

More information, training, and advice about the options for, and implications of, agricultural diversification could promote understanding, provide ecological expertise and access to different markets for farmers, she added.

Publication

Harkness, C., Areal, F. J., Semenov, M. A., Senapati, N., Shield, I. F. and Bishop, J. (2023) Towards stability of food production and farm income in a variable climate. Ecological Economics, 204 (Part A). 107676. ISSN 0921-8009 https://doi.org/10.1016/j.ecolecon.2022.107676