Extended Abstract
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Paper Title	Modelling the impacts of climate change, commodity prices and policies on farm land use decisions

Abstract prepared for presentation at the 98th Annual Conference of The Agricultural Economics Society will be held at The University of Edinburgh, UK, 18th - 20th March 2024.

Abstract	*200 words max*

This article explores the effect of past weather on French crop farm land use allocation decision, while controlling for prices and policies. We first develop a structural multi-output technology model that explicitly account for past weather influence on farmers crop allocation decisions. Equipped with our theoretical framework, we then derive equations for input demand, output supply and land allocation.

To estimate the farm level impact of past weather trends on land allocation decisions we take advantage of the French Farm Accountancy Data Network (FADN). Combining this data with weather information from MeteoFrance, we precisely know the past weather experienced by farmers. Our analysis concerns the period 1994-2003, in which farmers were eligible to crop specific area-based payments (CSAP). Thus, it enables us to use CSAP as implicit prices for different land allocations.

We expect to find new evidence on how past weather influence land use decisions at the farm level, and to quantify this effect.

Keywords	French crop farms, land use decisions, Weather trends
JEL Code	Q12, Q18, Q54 see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	*100 – 250 words*

Due to its natural link to weather conditions (temperature and precipitations are inputs for crop production), agriculture is probably the most scrutinized sector by the economics of climate change literature. However, most of these studies measures the overall impact of weather shocks on agriculture once farmers have adapted and does not allow to isolate adaptation strategies taken by farmers. Hence, it appears crucial to have a better understanding of climate change adaptation to put in place the right public policies.

On the one hand, recent research attempts to assess climate change impact on farm land use decisions, mainly for single crops (Miao et al. AJAE 2016), or even land use type: cropland vs. Grassland (Chen & Khana WP 2021). On the other hand, some articles try to model the impact of climate change and weather variation on farmers' input decisions using multi crop technology representations without modelling explicitly land allocation decisions (Bareille & Chakir AJAE 2023, Wimmer et al. AJAE

2023). Our objective is to contribute to both research lines by developing a framework to model the impact of climate change on farm land use decisions using a multi crop production function formulation. We base our estimations on French arable farms data.

Methodology	*100 – 250 words*

We build a structural model using multi crop production technology that explicitly considers land allocation decisions (Sckokai & Moro AJAE 2006, Lacroix & Thomas AJAE 2011). After deriving input demand, output supply and land allocation equations, we specify a normalized quadratic function to approximate the farm profit function (Lacroix & Thomas AJAE 2011). Among all advantages, this functional form makes the equations to estimate linear with prices.

We gather weather data from MeteoFrance. Based on Ramsey et al. AJAE 2021, we calculate rolling averages of past weather locally experienced by farmers to formulate weather expectations. We consider the previous 6 years of the realized year influence the land allocation decisions. The 3 more recent years are weighted more than the ancient past.

Results	*100 – 250 words*

Our analysis concerns cereal crops (maize, wheat, barley), protein crops (field peas, fava bean, lentils, dry peas), oil crops (rapeseed, soybean, sunflower, flax).

As our modelling framework allows us to control for prices and policies, we can isolate and quantify the effect of weather expectations on farmers crop allocation decisions. We expect to find a substantial impact of past weather on actual choice as farmers may have notice that some crops could be particularly more adequate to weather shocks/warm temperatures than others.

Discussion and Conclusion	*100 – 250 words*

This research aims to assess how past weather trends affect farmers crop allocation decisions within a structural multioutput production framework. This strategy allows us to control for prices and policies. We expect to find new evidence on how past weather influence land use decisions at the farm level, and to quantify this effect.

A very short-term perspective is to complexify the weather expectations, using more sophisticated indicators such as growing degree days, harmful degree days to capture the effect of temperature. We also plan to consider climatic intervals, as a change in weather variables may not be the same across all climatic regions. A possible extension would be to extend the model to other time periods with different policy regimes, to consider a longer data set.