



**18th Congress of the
European Society for Agronomy**

**“Synergies for a resilient future:
from knowledge to action”**

Book of Abstracts

26 August – 30 August 2024

Rennes, France

The Couvent des Jacobins

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WELCOME MESSAGE

The European Society for Agronomy is a scientific society that aims to build bridges between scientists, not only agronomists, but also colleagues from different disciplines to address the major societal and environmental issues related to agriculture, and to promote the science of agronomy and its use in agriculture and rural development throughout Europe.

If the main audience remains European, with this new edition of ESA 2024, we were 310 participants, coming from 28 different countries worldwide, highlighting the international importance of the ESA network.

The last Congress in Potsdam (Germany; 2022) was dedicated to digitalization for the transformation of agriculture. This edition extended the discussions with synergies between technologies to face an uncertain future. For the new edition, we chose resilience to echo with the ability of agricultural systems to recover from unpredictable, sometimes extreme events, and to highlight the inventiveness of human management to build resilience in its many applications and definitions. At this point of rapid expansion and related promises of technological innovations, the Scientific Committee of ESA 2024 wanted to create a momentum to pause the rapid expansion of technical innovations in soil and crop management and to embed them with more social issues, such as the well-being of farmers and their social connectedness to society at large, over the long-term.

This is the essence of the science of agronomy, nourished by transdisciplinarity but transcending it to become an independent discipline with its own concepts and approaches to meet the challenges of the transformational change we need for a viable future.

The word synergy was also used to encapsulate the idea, perhaps idealistic, but certainly humanistic, of the supreme value of diversity.

We hope that the 18th ESA Congress inspired you to initiate or strengthen synergies. Together, we could promote the role of scientific voices for building a better world for next generation, represented during our conference by the numerous young researchers, PhD and Master students.

Prof. Dr. Edith Le Cadre

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The local organising committee would like to express its gratitude to the staff of l'Institut Agro Rennes-Angers and INRAE for their invaluable contribution to the organisation of the congress. In particular, we would like to thank: Michèle Béguinel, Sylviane Gilabert, Stéphane Guiges.

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Risk management in agriculture and crop insurance: implementation of a method for estimating reference yields in organic field crops in France (Poster #320)

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Keywords: risk management; crop insurance; yield determinants; reference yield; modeling

1. Introduction

Agriculture in France is subject to numerous constraints, notably increasing meteorological risks in recent years due to climate change. Faced with natural disasters and pressure from bio-aggressors, farmers in both conventional and organic production are confronted with a multitude of risk factors leading to variability in their agricultural yields (Arora 2019; Malhi *et al.*, 2021). Consequently, risk management is a key issue for the sustainability of agricultural activities. Crop insurance is considered an essential tool for safeguarding against these various risks and securing farmers' income (Folus *et al.* 2020; Frascarelli *et al.*, 2021; Koenig *et al.*, 2022). The objective of this study is to develop a method for estimating reference yields in large-scale crops (winter wheat, maize, spring barley) in organic agriculture, using statistical models, in order to determine the conditions and parameters to be considered for crop insurance pricing and the contractualization of Groupama Paris Val de Loire (GPVL) members.

2. Materials and Methods

To determine the reference yield, the first step is to study the determinants of yield in large-scale crops (winter wheat, spring barley, maize grain) to identify the factors that impact yield (Ponisio *et al.* 2015; Ben Zekri *et al.*, 2019). Then, statistical regression analysis was used to explain the variability of yields among members based on the factors determining yield. These factors primarily include climate, soil type, pressure from bio-aggressors, crop rotation, technical itinerary of the crop, as well as the farmer's expertise and landscape factors.

3. Résultats

The analysis of yield variability based on yield determinants has enabled the development of a method for estimating reference yields in organic agriculture using regression and prediction models such as Generalized Linear Regression (GLM), Partial Least Squares (PLS), Random Forest, and Gradient Boosting. The latter two models are the most effective and suitable for yield estimation, as determined through comparison using metrics and criteria such as R^2 and RMSE.

The yield estimation model was applied to predict the yields of insured members of Groupama Paris Val de Loire based on their location and the spatial intrinsic characteristics of the plots. The estimated average yield in organic farming for winter wheat ranges from 5.45 t/ha to 9.33 t/ha, spring barley ranges from 4.25 t/ha to 6.43 t/ha, while maize grain varies from 4.44 t/ha to 8.83 t/ha. This approach will facilitate a better assessment of risk factors and more precise crop insurance pricing, thereby helping to support farmers in the face of increasing uncertainty resulting from current climatic, agronomic, and environmental challenges.

4. Discussion

Each factor has its limitations and leads to a lack of precision regarding results. Several other factors have not been studied and may impact yields, including sowing date, bio-aggressor management, nitrogen management, soil cover, varieties used, and rotation duration.

5. References

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