



An experimental network to study “pesticide free” cropping systems in arable crops

Violaine Deytieux, Marie-Hélène Bernicot, Vincent Cellier, Caroline Colnenne-David, Anne-Laure Toupet, Jean-Noel Aubertot

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AN EXPERIMENTAL NETWORK TO STUDY “PESTICIDE FREE” CROPPING SYSTEMS IN ARABLE CROPS

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Introduction

New agriculture context and regulations in Europe requires to modify agricultural systems (e.g. Directive 2009/128/EC on sustainable use of pesticides). In 2011, the INRA/CIRAD Integrated Pest Management Network set up a “pesticide free” trial network, named Res0Pest. Its purpose is to produce new references and knowledge useful for the design of innovative cropping systems less reliant on pesticides by identifying technical barriers, testing innovative techniques and gaining knowledge on biological regulations and pest management. The Res0Pest experimental network has two main objectives:

- Designing and testing cropping systems under the constraint of using no pesticide, and assessing their agronomic, environmental and socio-economic performances;
- Analysing the effects of pesticide free cropping systems on pest populations and natural biological regulations.

In this paper, we present this “pesticide free” field trial network and its potential as a unique experimental support for new research programs.

Materials and Methods

In this network, tested cropping systems were designed using Integrated Pest Management principles and combining different techniques in order to limit damages caused by pests and to benefit from biological regulations, as proposed by Attoumani-Ronceux et al., 2011. All the considered cropping systems were adapted to their regional production situation (*i.e.* soil and climate conditions, social and economic drivers, local concerns). Nevertheless, they were all designed according to the same set of constraints and objectives:

-Constraints: no pesticide use (except for biopesticides), cultivation of the major crops of the considered region;

- Objectives: to maximise, under these constraints, crop production (yield quantity) satisfying market specifications (yield quality) while (i) reducing other environmental impacts such as fossil energy consumption or greenhouse gas emissions and (ii) maintaining economic profitability for farmers.

Results and Discussion

The network includes eight long-term experiments implemented in INRA experimental units and one agricultural high school, in different production situations in France (Figure 1). All the field experiments started in autumn 2012, except for one which is

located in Grignon and started in spring 2008 – it is one out of the four systems assessed in the "Innovative Cropping systems under Constraints" long-term field trial (Colnenne-David and Doré, submitted). For all experiments, the plot area is at least 0.5 ha, in order to be representative of commercial fields. Fifty per cent of crops of the rotation are tested every year. A set of protocols was written with experimenters, in order to standardise data collection and to allow (i) future agronomic diagnosis and performance analysis of the tested cropping systems, (ii) cross-cutting analysis within the network. In these tested cropping systems, biological diversity is enhanced by diversifying crop sequence (Figure 1), or by associating several species or cultivars in a same field. Many other technics are combined in the systems (e.g: sowing date and rate, false-seed bed tillage, mechanical weeding...).



Figure 1. Res0Pest sites in France and two examples of crop sequence of pesticide free cropping systems tested in Le Rheu (in Brittany region), and Grignon (in Ile de France region). Sites related to mixed systems are in grey; sites related to arable crop systems in black.

Conclusions

The pesticide free cropping systems tested in the Res0Pest network are prospective and ambitious and are implemented for a large range of production situations. The system approach used in long-term field experiments is also original and permits to analyse long-term effects of cropping systems on the environment. Thus, the Res0Pest network represents a unique experimental tool in France and probably in Europe for research programs related to disciplines related to agroecology. Currently, some specific protocols are being written to characterise pest injuries levels and the establishment of biological regulations, in connection with another specific project. New collaborations have to be initiated and developed in order to fully take advantage of the network.

Acknowledgements

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ABSTRACTS



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Welcome to 13th ESA Congress!

In the last few decades, several changes have occurred worldwide in the agricultural sectors of developed and developing countries, especially in the manufacturing of plant products. As a result of the “green revolution” that has been taking place in developing countries since the 1960s, yields have significantly increased, primarily in the case of cereals. Crop production in developed countries has also changed considerably. The results are definite and considerable, but at the beginning of the 21st century, we have to face new challenges and issues in crop production.

As a consequence of globalisation, economic challenges appeared in the crop production of the 21st century, which resulted in irrational technological solutions in favour of competitiveness and profitability. In the European Union, the development and introduction of an agricultural and rural development policy is expected from 2014. Agriculture, and especially crop production, face growing social expectations, which drive it towards environmentally friendly, sustainable production and mean a growing challenge in the field of food (fodder) safety.

New challenges need new solutions, which cannot be imagined without broad, multidisciplinary research. Today, more efficient and widespread innovation of the research results represents a basic task. Expanded and effective research is currently being done to the better understanding of the agro-ecological conditions of crop production, to reduce the effects of ecological stress, to realise the behaviour of new genotypes to the greatest possible extent and to optimise sustainable crop production technologies.

Our aim with the program of the XIIIth ESA Congress is:

- to introduce the latest scientific results in all the three divisions of the ESA
- to identify new scientific trends and put forward recommendations to political decision-makers
- to promote scientific collaboration and improve cooperation activities
- to give an overall picture of Hungarian plant cultivation and present the research activities in the fields of plant cultivation and other interdisciplinary fields which are carried out at the University of Debrecen
- to facilitate the integration of researchers from Central and Eastern European countries into the ESA

The congress will be academically and professionally beneficial not only to a wide range of professors, university teachers, researchers in the areas of crop sciences, but to PhD students, extensionists and other specialists alike who are interested in fields of study.

Hungary and Debrecen are beautiful all year round and give a nice hospitality. We hope you have a great time in the company and friendship of all our participants.

I hope you have a scientifically productive and fruitful stay and that the memory of your visit to Hungary and Debrecen will be a lasting and pleasant one.

Sincerely yours,

Prof. Peter Pepó
President of ESA



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