

 **O.33 - Insights of INRA's integrated pest management network**

Aubertot, J.N.¹, Cellier, V.², Deytieux, V.², Faloya, V.³

¹ Institut National de la Recherche Agronomique, UMR 1248 AGIR, B.P. 52627 Auzeville, 31326 Castanet Tolosan, France

² Institut National de la Recherche Agronomique, Réseau PIC, UE 0115, Domaine Expérimental d'Epoisses, 21110 Breteniere, France

³ Institut National de la Recherche Agronomique, UMR 1099 BIO3P, Domaine de la Motte, 35653 Le Rheu Cedex, France

Contact: videytieux@dijon.inra.fr

Abstract

Since 2004, the INRA IPM network has played a part in the organisation and the development of interdisciplinary research programs, on the topic of integrated pest management. The IPM network encompasses research programs that contribute to the development of innovative cropping systems that reduce the environmental impacts of agriculture with regard to pesticides. The activities of the network are based on four major themes: (i) Modeling and decision support systems for integrated pest management; (ii) Implementation and coordination of a network of field experimental sites; (iii) Promotion of sociological and economic approaches of IPM; (iv) Mobilisation of ecological concepts and approaches in IPM. Scientists from various scientific fields and backgrounds join forces to research these themes, creating an innovative environment in which different types of expertise and approaches are shared. The network of field experimental sites is made up of INRA experimental farms that implement long-term field experiments in order to evaluate the feasibility of IPM innovative cropping systems. This experimental network is coordinated in order to optimise the sharing of common objectives, tools, methods and protocols for experiments on cropping systems. It also aims at generating, managing and analysing data collected in the network. For example, the assessment of the environmental performances of diverse cropping systems using the same methods will allow the comparison of crop management strategies for diverse plant productions (major crops, vegetables, green house crop, orchards, and vineyards). The IPM network is involved in the ENDURE integrating activities.

Since 2004, the INRA IPM network has played a part in the animation and the development of interdisciplinary research programs, on the topic of Integrated Pest Management. In response to political and societal demands, research must contribute to the development of innovative cropping systems that reduce the environmental impacts of agriculture with regards to pesticide (Aubertot et al., 2005). The IPM network encompasses research programs that address this issue. This network includes over 160 scientists and engineers from six different INRA research divisions: Plant Health and Environment, Agronomy and Environment, Plant Breeding and Genetics, Science for Action and Sustainable Development, Social Sciences Agriculture and Food Rural Development and Environment, Forest Grassland and Freshwater Ecology.

The IPM network provides a structure to share knowledge and information on projects in progress among different INRA teams located in different sites. It also sustains the organisation of research programs, especially by promoting collaborative research. The strength of this network is the wide diversity of disciplines, the various spatio-temporal scales considered, and the variety of the studied cropping systems (major field crops, green house crops, vegetables, fruit orchards and viticulture).

The activities of the network are based on four major themes: (i) Modeling and decision support systems for IPM; (ii) Implementation and coordination of a field experimental site network; (iii) Promotion of sociologic and economic approaches of IPM; (iv) Mobilisation of ecological concepts and approaches in IPM. Scientists from various scientific fields and backgrounds such as agronomy, epidemiology, weed science, entomology, economy, sociology join forces to research these themes, creating an innovative environment in which different expertise and approaches are shared.

Modeling and decision support systems for IPM

This activity aims at sharing methods for the development of models that contribute to IPM. It aims at promoting existing models by extending their validity domain and encourages the development of new models based on a better understanding of the relationships between cropping systems, crops, pests, and the environment. Some of the models help design and assess innovative cropping systems (e.g. Colbach et al., 2007), and will permit the identification of promising cropping systems that will have to be tested in field experiments. Other models are designed to manage cropping systems in real time. Several seminars are organised jointly with the French Research Technology Network on modeling ("*Réseau Mixte Technologique Modélisation*", www.modelia.org) on specific methodological questions related to the modeling for crop protection. The aim of these seminars is to facilitate exchanges between INRA researchers and technical institute engineers, and to promote working groups on specific subjects.

IPM field experimental site network

The network of field experimental sites consists of INRA experimental farms that implement either IPM experiments to test innovative methods of crop protection or long-term field experiments (e.g. Debaeke et al., 2006) in order to assess the agronomic, economic and environmental performances and the feasibility of innovative IPM systems. This experimental network is coordinated in order to optimise the sharing of common objectives, tools, methods and protocols for experiments on cropping systems. It also allows the generation, the management and the analysis of data collected in the network. The assessment of the environmental performances of diverse cropping systems using the same methods (e.g. the Swiss Agricultural Life Cycle Assessment method, the method is presented in Nemecek et al., 2008) will allow the comparison of various strategies for diverse plant productions.

In addition, a methodological platform is currently under development to standardise the methods used to characterise pest injuries within the experimental network for contrasted cropping systems, soils and climates. This will permit the creation of a common database allowing to link production situations to injury profiles.

Sociologic and economic approaches

The network aims at promoting interactions between biotechnical science and social sciences. This action focuses on the promotion of sociologic and economic approaches for the acceptance of innovative cropping systems that will be less dependent on pesticides. One of the main objectives is to identify economic, sociologic and cultural barriers and boosters of the adoption of IPM principles at different levels of the production sector (from the farm to the whole production sector).

Mobilisation of ecological concepts and approaches

This action aims at encouraging the importation of ecological concepts in IPM research programs. For example, the concept of functional trait is promising to handle the multiplicity of species in pest communities. In addition, concepts of landscape ecology will be useful to promote crop protection strategies that concern not only the spatial distribution of fields, but would also take into account borders, hedges, and non cultivated areas.

The network is participating actively in the ENDURE network. Indeed, most of the members of the INRA IPM network are involved individually in the ENDURE network: they participate to many Endure research activities, either in case studies related to a specific crop or for the multi-criteria assessment of innovative crop protection strategies. The INRA IPM network is also involved itself in integrating activities, especially in the virtual laboratory. The INRA network of field experimental sites is embedded within the virtual laboratory and the IPM network is contributing to the reflexion on methods for sharing these facilities at the European level. The involvement of the INRA IPM network within ENDURE is beneficial because it could permit testing alternative methods that have already been validated by others European units, for different production situations. In return, the INRA IPM could share references and observations as well as provide validated crop protection strategies either at the crop management level or at the cropping system level.

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