



# ENDURE

European Network for Durable Exploitation of crop protection strategies

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Dissemination Level	
<b>PU</b> Public	X
<b>PP</b> Restricted to other programme participants (including the Commission Services)	
<b>RE</b> Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b> Confidential, only for members of the consortium (including the Commission Services)	

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## Glossary

ENDURE	European Network for Durable Exploitation of crop protection strategies
IPM	Integrated Pest Management
IF	Integrated Framing
WCR	Western Corn Rootworm ( <i>Diabrotica virgifera virgifera</i> LeConte)
DEXiPM	A tool for assessing cropping system sustainability merging the abbreviations of Dexi (a program for multi-attribute decision making) and IPM
SZIE	Szent István University, Gödöllő, Hungary
INRA	Institute National de la Recherche Agronomique, France
JKI	Julius Kühne Institute, Germany
CNR	Center for National Research, Italy

## Summary

One of the key objective of the project ENDURE is to design innovative crop protection strategies. The aim of the key staff training was to:

- improve research and development capacity of ENDURE research staff
- using ENDURE generated methods and tools
- benefit of existing knowledge and competence at Partners (INRA, SZIE)
- contribute to IPM implementation through adaptation of new methods

SZIE as responsible Partner for this deliverable:

- collected information among ENDURE Partners for innovative methods in IPM
- selected relevant topics for training
- released training call via ENDURE website
- approached Partners via direct e-mails and personal contacts
- made arrangements for the conduction of the training
- identified and invited experienced Trainers
- finalised topics
- distributed training documents in order to allow preparation for the training.

Two relevant training topics were selected as follows:

- DEXiPM as a tool for sustainability assessment of cropping system for IPM development
- WCR, an invasive alien maize pest and its IPM control methods for modelling

INRA and SZIE research staff as Trainers offered their knowledge and capacity to conduct the training. Previous WCR and maize IPM activities coordinated or conducted by SZIE (EU-5<sup>th</sup> framework project, MC fellow supervised, EU 6<sup>th</sup> framework SSA project, FAO regional project, maize case study and maize based system case study in ENDURE as well as 6 years implementation of IPM/IF in Hungary) allowed us to select some innovative IPM elements and solutions to be shared and disseminated to ENDURE partners.

INRA has a history of widely known and acknowledged system analysis and methodological development related to pests, systems, IPM elements and complex evaluation.

Seven participants from JKI, CNR and from SZIE attended the training. Their background, as researchers are broad, covering various fields of IPM development, e.g. weed management, farming systems and farm management, landscape modelling of pests, natural enemies, WCR population modelling and management, training and training development.

INRA Trainers distributed a form for getting feedback from participants related to DEXiPM.

The training has been conducted according to the plans. Participants were interested in the topics, actively contributed to the discussions and brought their local experiences into the topics.

Several participants will further proceed with adapting DEXiPM in their research topic, on their farm assessment activities and PhD research program.

### Objectives

Organise training sessions for ENDURE Key staff on ENDURE tools, methods to ensure and promote them in favour of IPM development and implementation

We identified two relevant, innovative topics for IPM development and implementation, namely DEXiPM and WCR modelling. Therefore, the objectives were as follows:

- provide information to ENDURE research staff about DEXiPM model its structure and functions
- promote the usefulness of the model for ex-ante or ex-post evaluation of sustainability of cropping systems for future use in a research advisor and farmer level
- make the trainees aware about the current status of the model, its limitation and further improvements that are under development
- make them familiar with the model in practice, by actually using it to evaluate cropping systems provided by the trainers and the trainees
- increase and update knowledge on WCR
- increase knowledge on resistance issues related to WCR but relevant for several IPM tools
- introduce WCR modelling and area-wide IPM approach for this pest.

**Rationale:**

Training topics were made available in the call. Participants received manual and guide on DEXiPM in advance, were requested to consider their own data, systems and prepare accordingly.

The training consisted of plenary and small team workshop parts and was conducted in a participatory way.

**Teams involved:**

Lecturers: SZIE, INRA  
Trainees: SZIE, JKI, CNR,  
Organised by: SZIE

**Geographical areas covered:**

Italy, Germany and Hungary

## Researcher and staff training course

### 1.1. DEXiPM: A model for ex-ante sustainability assessment of innovative crop protection strategies: context, methodology, results

DEXiPM is a tool for the evaluation of cropping systems at different scale and time level. According to the objective of users, existing cropping systems at plot, field, farm or regional level can be compared. The impact of the changes in the given system can also be evaluated, so there is a possibility to compare current, advance and innovative systems. The comparison is made of economical, environmental and social point of view. The training met the objective of ENDURE to enhance the design of more sustainable crop protection strategies aiming the pesticide use reduction, make the participants familiar with the use of DEXiPM to enable them to evaluate their own systems.

The background of the participants was different. Some of them were willing to evaluate cropping systems at European level, others were working on a 1800 hectare farm and interested in the introduction of new plant protection strategies and assessment methods. Some participants were preparing a new project to design alternative agricultural system in regularly flooded and social undeveloped area and use the DEX model for the planning and monitoring. There were participants interested more in the topic of modelling and in the technical part of building up such a model.

DEXiPM allows analysing a decision problem separated into smaller thematic attributes organized hierarchically in a decision tree. The attributes are scored on qualitative scale and aggregated by utility functions (if-then qualitative rules) which determine the weight of each basal attribute on the upper one. So DEXiPM is a multi attribute qualitative model which is user friendly, allows evaluating systems based on expert knowledge and the ex-ante assessment. A general situation can also be tested, which might not exists in reality but describe better the tendencies.

As an overall objective was to make the trainees aware about the current status of the model, its limitation and further improvements that are under process.

The training methods dealt with the challenge of the trainees diversity by using the model in practice and evaluating cropping systems provided by themselves and prepared by the trainers as well. The system approach of the participants was enhanced only by understanding and using the model. As an improvement in the training methods specific problems (like extreme cropping situations) could have been introduced to broad the mind of the participants.

The trainees gave feedback to the modellers about the usefulness, advantages and disadvantages of DEXiPM.

## 1.2. MODELLING: Improving IPM strategies using computer simulations

The western corn rootworm (WCR, *Diabrotica virgifera virgifera* LeConte) was first detected in Europe in 1992, since when it has emerged as a serious pest of maize crops across a large number of countries. Previous WCR and maize IPM activities coordinated or conducted by SZIE (EU-5 framework project, MC fellow supervised, EU 6<sup>th</sup> framework SSA project, FAO regional project, maize case study and maize based system case study in ENDURE as well as 6 years implementation of IPM/IF in Hungary) allowed us to select some innovative IPM elements and solutions to be shared and disseminated to ENDURE partners.

The increasing capacity of the everyday used computers provides the possibility to use them in modelling complex systems, for instance modelling agricultural practices in the framework of IPM. In this course we went through the initial steps of developing a simulation model of a pest management problem. The invasive pest of maize, WCR, and the possible management options were used as a case study, because the biology of WCR allows assuming such simplifications which can result an understandable and still reliable population dynamics model.

### 1.2.1. Abstraction of the life cycle of WCR

After an introduction of basic biology of WCR and the possible management options the participants collected the key factors of population dynamics of WCR and drew a life cycle as a template of further work. In this life cycle they clarified the target points of key factors of population dynamics including the management options. This template was assuming as a feasible tool to avoid endless discussion of raised ideas of possible factors with unclear connection to the population dynamics of WCR. The elements of the drawing evaluated to model objects; consequently, a clarified structure was available to develop a population dynamics model. Moreover, using this template the output of the model which covers the aim of modelling process became clear.

### 1.2.2. Modelling evolution of behavioural resistance

What happens when one of our basic assumptions is violated? How should we improve our model structure when WCR females not restricted to maize during laying their eggs? A development of a population genetics model following a scientific publication (Onstad et al. 2001: Modelling evolution of behavioral resistance by an insect to crop rotation; available at: [http://www.blackwellpublishing.com/specialarticles/eea\\_5.pdf](http://www.blackwellpublishing.com/specialarticles/eea_5.pdf)) was evaluated. Each participant was able to set the biological and agronomical parameters of the model. As a special task evolution possibility of 'rotation resistant' pest was tested for different crop rotation strategies assuming the European rotational practices differ from the US Corn Belt situation.

### 1.2.3. Spatiotemporal models investigate innovative crop rotation strategies

The evaluated model structure was placed in space to investigate the effect of different crop rotation strategies at landscape level. The spatial layer of the model was a lattice with cells of continuous maize, first year maize and non-maize. A possible output of this spatiotemporal model as an extension of the non-spatial model was discussed.

## Conclusion

We expected more participants from ENDURE partners since the topics of the training are highly relevant for IPM development. Maybe time constraints, other duties of potential participants and relatively late announcement of the training did not favour broader participation. However, those attended the training were well prepared, interested for the topics and very active.

Hungary has a 6 years experience of IPM/IF implementation at national level, including guidelines, regulations, financial compensation, etc. Thus, Hungarian participants have more experience of their own on IPM implementation and are encouraged for improving it in coming years.

We do hope that WCR and DEXiPM related materials, increased knowledge level of participants will allow them to adopt tools in IPM development, maintain communication among them in the future.

## Attachments

### Attachment 1 Training Call released:



## CALL FOR PARTICIPATION

in

### Researcher and staff training course

#### "Innovative Methods and Tools for IPM development"

The Plant Protection Institute (Szent István University, Gödöllő, Hungary) in cooperation with INRA France organises 2 days training course for ENDURE researchers.

Topics: DEXiPM: Assessing Cropping System Sustainability

- software, use for cropping systems,
- analysis and evaluation of results.

[www.endure-network.eu/about\\_endure/all\\_the\\_news/dexipm\\_assessing\\_cropping\\_system\\_sustainability](http://www.endure-network.eu/about_endure/all_the_news/dexipm_assessing_cropping_system_sustainability)

Improving IPM strategies using computer simulations

- a case study of the invasive pest of maize, the western corn rootworm (*Diabrotica virgifera virgifera*),
- Modeling evolution of behavioral resistance,
- Spatiotemporal model for innovative crop rotation strategies.

[http://www.endure-network.eu/about\\_endure/all\\_the\\_news/guide\\_to\\_tackling\\_wcr\\_now\\_available](http://www.endure-network.eu/about_endure/all_the_news/guide_to_tackling_wcr_now_available)

Location: Szent István University, Gödöllő, Hungary

Date: 23-24 June 2010.

Expenses: NO Registration and Training Fee

Travel and cheap hotel room should be covered by the participant (EUR 60/night in Gödöllő)

Registration: send an e-mail to: [jozsef.kiss@mkk.szie.hu](mailto:jozsef.kiss@mkk.szie.hu) latest by 10<sup>th</sup> of May

Participation is restricted for ENDURE members.

Maximum number of participants: 20



## Attachment 2: Agenda and program



**endure**<sup>®</sup>  
diversifying crop protection

**Training Course on Innovative Methods and Tools for IPM  
development:**

# **DEXiPM and Modelling**

## **Agenda**

*23-24 June 2010*  
*Szent Istvan University, Gödöllő, Hungary*

### **Lecturers:**

Elisa Lo-Pelzer, INRA  
Fortino Gabriele, INRA  
Mark Szalai, SZIE  
Szilvia Kövér SZIE  
Stefan Toepfer SZIE/CABI

### **Day 1. 23 June 2010 (08:15 – 16:30)**

- 08:15 Departure from the Hotel Erzsébet Királyné
- 8:30 – Plenary 1:
  - presentation of DEXiPM: context, aim, etc.
  - presentation of the software DEXi and how to use it
  - Workshop 1:
  - design of a decision tree for the evaluation of the sustainability of cropping systems
- **Please prepare :**
  - **a short list of simple criteria (around 10) that you think important to account for the assessment of agricultural sustainability**
- 10:15 – 10:30 **COFFEE**
- 10:30 – 12:00 Workshop 2:
  - Work on DEXiPM tree
- 12:00 – 13:00 **LUNCH**
- 13:00-15:00 Workshop 3:
  - Work on cropping systems proposed by participants
- **Please prepare :**



**Attachment 3: Participants****Registration to Key Staff Training 23-24 June 2010, in Gödöllő**

	<b>First name</b>	<b>Last name</b>	<b>Partner Inst.</b>
<b>Trainers</b>	<b>Elise</b>	<b>LO-PELZER</b>	<b>INRA FR</b>
	<b>Gabriele</b>	<b>FORTINO</b>	<b>INRA FR</b>
	<b>Szilvia</b>	<b>KÖVÉR</b>	<b>SZIE HU</b>
	<b>Stefan</b>	<b>STOEPFER</b>	<b>SZIE HU</b>
	<b>Mark</b>	<b>SZALAI</b>	<b>SZIE HU</b>
<b>Trainees</b>	<b>Silke</b>	<b>KRÜGENER</b>	<b>JKI</b>
	<b>Vasileios</b>	<b>VASILEIDIS</b>	<b>CNR IT</b>
	<b>Andrea</b>	<b>VERES</b>	<b>SZIE HU</b>
	<b>Mate</b>	<b>MAJOROS</b>	<b>SZIE HU</b>
	<b>Mihály</b>	<b>ZALAI</b>	<b>SZIE HU</b>
	<b>Judit</b>	<b>PAPP KOMAROMI</b>	<b>SZIE HU</b>
	<b>Szabolcs</b>	<b>MONOKI</b>	<b>SZIE HU</b>

Attachment 4: Feedback form



## DEXiPM Training

### Feedback from participants

23 June 2010, Szent Istvan University, Gödöllő, Hungary

Please send to [Gabriele.Fortino@rennes.inra.fr](mailto:Gabriele.Fortino@rennes.inra.fr) and/or [Elise.Pelzer@girignon.inra.fr](mailto:Elise.Pelzer@girignon.inra.fr)

**Name and email (optional):**

**What advantages did you find with DEXiPM**

- **In the use of the tool:** DEXi software, options descriptions (including the table describing the input attributes), results analysis, adaptation of the assessment according to the context or to the preferences of the user
- **More generally:** advantages of a qualitative assessment tool

**What limits did you find with DEXiPM?**

- **In the use of the tool:** DEXi software, options descriptions (including the table describing the input attributes), results analysis, adaptation of the assessment according to the context or to the preferences of the user
- **More generally:** limits of a qualitative assessment tool

**What kind of uses of DEXiPM (or qualitative assessment models) could you have in your research?**

Research tool, tool for discussions with farmers or advisors, etc.

**Other comments, remarks**

DEXiPM is still under development. Please add any comments or advice that you think could be useful to improve the model





