European Network for the durable exploitation of crop protection strategies

IA3 Activity: *Human resource exchange*

ENDURE - Internal Mobility

Final activity report

(This form has to be completed and sent to the activity leader – the message should be sent to his p.a. elisa.scanzi@ibaf.cnr.it – within 15 days of the end of the visit)

Topic of the visit

SYNOPS model / Look for data Case Study Wheat

1. Information about researcher and sending partner

Name and surname: Kägi Thomas

Professional status: *(PhD student, post-doc, junior or senior scientist*) **junior scientist**

Sending partner: AGROS

Institute/Department/Research Unit: Agroscope Reckenholz-Tänikon

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*Supervisor information only for PhD student, post-doc and junior researchers

2. Information about hosting partner

Hosting partner: BBA

Institute/Department/Research Unit: Biologische Bundesanstalt, Institut für Folgenabschätzung im Pflanzenschutz

Address: *(street, postal code, city)* **Stahnsdorfer Damm 81, 14532 Kleinmachnow, Germany**

Supervisor name*: Jörn Strassemeyer

Supervisor e-mail*: J.Strassemeyer@bba.de

Supervisor phone number*:03 32 03/48-3 66

***** For senior scientist indicate the name of the collaborating colleague

3. Information about the visit

Duration: *(number of weeks or months)* **1**

Start date: 26.11.07

End date: 21.12.07

4. Description of the activities and outcomes

Background and context:

Life cycle assessment methodology is suitabe for an analysis in the context of the whole cropping system because it allows to assess impact of cropping and farming systems and pest control strategies and it considers the whole life cycle The challenges are to adapt existing tools and methods for the impact category ecotoxicity (terrestrial and aquatic) and to integrate them together with other assessment tools (a. o. environmental risk assessment, socio-economic indicators) into a multi-criterion approach.
Close cooperation is needed with groups assessing the environmental risks. Jörn Strassemeyer from the BBA in Germany was already staying at our research centre for a close collaboration between Risk Management and Live Cycle Assessment (LCA).

Objective:

1. Assessing the German scenarios during the stay at the BBA including collection of missing data
2. Use of specific pesticide data of the SYNOPS database as a base for the LCA methods EDIP+, Impact2002+ and USES-LCA.
3. Adapting the SYNOPS method in order to directly use the risk calculations for life cycle assessment
4. Elaboration of an interface between SYNOPS and Life Cycle methods to better exchange data
5. Area related LCA results
6. Colloquium

Activities carried out:

1 Assessing the German scenarios during the stay at the BBA including collection of missing data.
We designed three integrated and three organic production scenarios for apple production in the Lake Constance area. Due to still missing detailed data for organic apple production we designed the organic production scenarios using literature data and older data available in the BBA. The

three integrated production scenarios represent the various application scenarios. One with many, one with medium and one with few pesticide applications was chosen.
Due to missing data, we assumed that other input data necessary for life cycle assessment do not vary between the integrated production scenarios and were taken from the KTBL books about integrated apple production.
First results were calculated taking the Swiss application scenarios into account as well for comparison.

2 Use of specific pesticide data of the SYNOPS database as a base for the LCA methods EDIP+, Impact2002+ and USES-LCA.

Beside the assessment of the different application scenarios using the usual ecotoxicity methods EDIP and CML, we used the same database for the active ingredients as in SYNOPS in order to compare the methods. Implementing the data for the various active ingredients used in apple production into the LCA methods is possible but time consuming. For this comparison, only the pesticide applications of a normal yield-year in apple production of the different scenarios were considered because SYNOPS does not look at the whole life cycle but only at the yield-years having the highest risk.
Even with the same database the methods show sometimes completely different results depending on the kind of pesticides that are used.
There was no time so far to compare the LCA ecotoxicity method IMPACT2002+.

3 Adapting the SYNOPS method in order to directly use the risk calculations for life cycle assessment.

We worked on possibilities to use the SYNOPS results directly in the life cycle assessment. This enables us to add the pesticide values to the assessment fo non pesticide chemicals. The ecotoxicity method EDIP assesses the aquatic and terrestrial ecotoxicity in cubic meter water or soil that is needed to reach a non toxic concentration for the emitted chemicals looking at the amount in water and soil. As SYNOPS also calculates the fraction of the applied pesticide amount in water and soil, we could use these values and implement them into the EDIP method. We now can use the advantage of the detailed fate modelling in SYNOPS avoiding the too simple fate estimation of EDIP. There are two levels of implementation:

- SYNOPS can calculate the fate for all active ingredients looking at an application of one gramm using standard application parameters. These values can then be used to calculate the characterisation factor for each active ingredient in m3/g. this value then can be multiplied by the actual active ingredient application. SYNOPS only needs to calculate these values once which is an advantage. Although this fate calculation is much more detailed than in EDIP, some important factors normally considered in SYNOPS are still neglected.
- More precise and realistic, but much more time consuming is the calculation of each application scenario taking factors such as date of application, interception etc. into account. This means that we always need to calculate the scenarios with SYNOPS besides the normal LCA calculation, which is more time consuming and data demanding.

For the USES method, we can directly use the ETR (ecotoxicity risk value) value of SYNOPS dividing it by the ETR value of the reference substance 1,4-DCB. The same levels of implementation are possible as for EDIP.

4 Elaboration of an interface between SYNOPS and Life Cycle methods to better exchange data

On level one, we do not even need an interface, using the characterisation factors directly in TEAM.
On level two we used predefined excel data sheets. SYNOPS can generate and provide the data listed in a table which can be directly combined with the LCA excel sheets normally used to analyse the TEAM results.

5 Area related LCA results:

The SYNOPS method is strong in presenting field related risks on maps (GIS). Technically possible with normal GIS software the critical point is the geo-referenced calculation of agricultural

production. This means to calculate all application scenarios varying factors such as soil condition, temperature, etc. For the pesticide application scenarios available in apple production in Germany this means to assess at least 2500 different scenarios. With stronger computer and better LCA software which can handle the assessment of many scenarios, area related LCA would be feasible. Furthermore, detailed data for all the different application scenarios as well as many environmental data is needed. At the moment we can not handle area related LCA but it would be technically possible.

6 Colloquium

I presented the work done during the exchange visit in a colloquium at the end of my stay. In the discussion the BBA stated their interest to look beyond the pesticide risks. We considered the future option to provide the aquatic and terrestrial ecotoxicity values of non pesticides in agricultural production for SYNOPS. As the ecotoxicity of non pesticides does not strongly depend on the variation of the application scenarios, few standard calculations for each crop may be enough as a start. At the moment it is not clear how this would be integrated in SYNOPS. One option would be to assess, beside the pesticide risk, the volume of wasted water and soil similar to the EDIP method.

5. Links between visit activity and ENDURE

Describe links and relevance of your visit in relation to a specific ENDURE activity(ies) and sub-activity(ies) –
see Chapter 4.1 to 4.3 for relevance of visit activity and RA3.3/RA3.4

6. Impact

Added value for the researcher:
see Chapter 4.3 to 4.6

Added value for sending partner and hosting partner: ***Chapter 4.4 and 4.6***

Date of submission
29/02/2007

Dr. Maurizio Sattin
IA3 activity leader

Approved
06/03/2008