



## HRI - Decision Support Tool

**Most vegetables within Europe are produced in intensive rotations, which rely heavily on large inputs of nitrogen from fertilizer or organic sources to maintain the yield and quality of produce.**

### Business Problem

Unfortunately, many field vegetable crops use nitrogen inefficiently, and often leave large amounts of nitrogen (either as unused fertilizer or crop debris) in the soil after harvest. Potentially, this can cause pollution to soil, water, and aerial environments.

The aim of this project is to develop and evaluate a model-based decision support system to optimize nitrogen use in both conventional and organic vegetable rotations across Europe.

This will help Member States to:

- Minimize hazards to the environment by adopting consistent approaches to improved efficiency of nitrogen use for different production systems and climatic regions of Europe.
- Optimize production of quality horticultural crops, while enhancing the economic sustainability of horticultural production within the EU.
- Identify crop management strategies which lead to both reductions in nitrate leaching, and control of diffuse pollution.

### Tessella Solution

HRI has developed a model over the past 20 years, called N\_ABLE, to quantify and optimize nitrogen use. However, the

EU-Rotate\_N project greatly extends this model so that it is applicable across Europe, and includes tools for planning nitrogen use and crop rotation. To develop an extensible framework and scalable front end, HRI teamed up with Tessella to deliver the decision support system. Written in Java under Linux and Windows 2000, this technically challenging project is ongoing.

Tessella's involvement is being phased over two years. The first year has been set aside to develop an abstract framework for the modelling subsystem and the associated database of model information, and the second year to develop the web based front end onto the underlying engine. Throughout this period, HRI will convert their existing N\_Able code (written in Fortran) into modular components that can be used within the model framework.



**The decision support system will add new mathematical models for root growth, new crop types, new soil types, and an economic modelling subsystem. The system to be developed must meet the following criteria:**

- Extensible for new crop and soil types
- Extensible for new mathematical models
- To provide a comprehensive database of entity and economic data
- To provide a robust and easy to use data loading subsystem
- To provide a Web-based decision support tool to be used across Europe
- To provide a standalone tool for use 'in the field'
- To provide interfaces for a range of target users, from scientists to farmers to agricultural policy makers
- To provide a cross-platform, license-free system, independent of large vendor buy in and costs

## Results

The first stage of work is now complete, and will be used by HRI to develop model scenarios and test new models. The Web based front end will also be developed using Java technologies, and will provide a sophisticated interface allowing users to:

- Define a range of crop-rotation scenarios
- Perform optimizations
- Ask "what-if?" type questions
- Run aggregations over fields, farms and counties
- Produce summary reports

Once completed and delivered, the EU-Rotate\_N decision support system will provide a unique, powerful, and groundbreaking tool to improve nitrogen use in field vegetable rotations across the European Union.

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