A systems approach to assessing the viability of grazing legume systems across Europe

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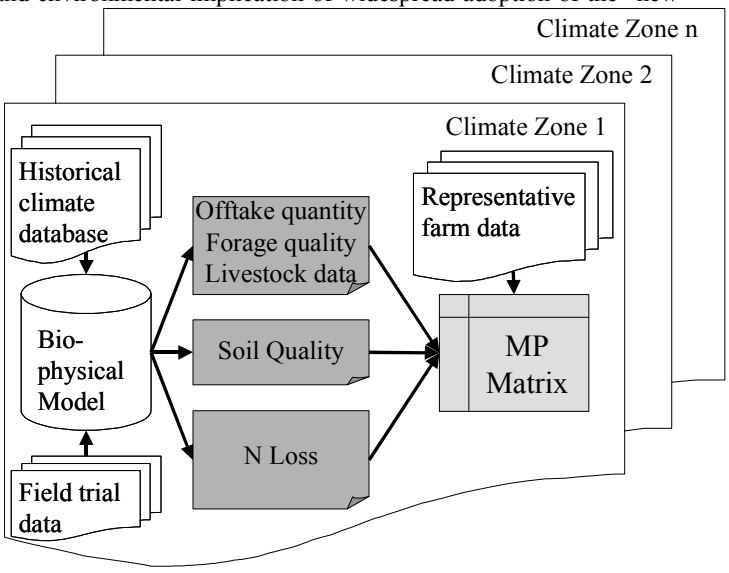
Introduction Forage legumes are important in grassland farming throughout much of the world because of their ability to fix atmospheric nitrogen, and hence they are expected to play an increasingly prominent role in low-input grazing farming systems in Europe. Nevertheless, the socio-economic impact of the adoption of the "new" legume based grazing technologies have been poorly researched (Rochon *et al*., 2004). Thus a methodology has been developed to:

- Assess the on-farm costs and benefits of including different legume crops for animal production;
- Determine the types of management systems and environmental conditions under which forage legumes may play a major part as grazing crops in production systems in Europe; and
- Determine the wider social, economic and environmental implication of widespread adoption of the "new" technologies.

Modelling methodology The methodological framework is outlined in the schematic diagram. Mathematical programming (MP) provides the ability to examine optimal resource deployment to competing and complementary enterprise activities. In order to supplement the historical records, a biophysical models system of grass–legume growth and animal production has been developed. The response to inputs and yields can be used to infer the normal expectations and variability for a specific grass-legume-animal system on a particular soil with particular environmental characteristics and outside inputs.



In this project, representative farms are defined in each partner country and parameterised at steady state, average input/output data for resource use and endowment. The field trial data has been processed through the biophysical modelling system to allow for suitable farm level information to be generated given modelled historical climate databases for a range of climatic zones across Europe (Topp & Doyle, 2004). This modelled production database is used to generate the representative data required for the MP models. In this way, the novel grazing technology systems can be plugged into a single year representative farm model and a comparative assessment made in terms of their financial competitiveness. Additionally, an exploration of the environmental trade off delivered can be made through applying multiple objectives to the model in more than the financial dimension (e.g. N Loss and soil structure).

Conclusions The modelling framework will thus assess the financial competitiveness and the environmental consequences of the "new" legume technologies. The model system will provide the opportunity to explore adoption scenarios as encouraged by differing policy options whilst at the same time exploring the environmental consequences.

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References

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