A protocol for designing a database based on production activity concept: a case study using a bio-economic model

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Describe and discuss steps to build “activity components” and a database in order to assess a scenario targeting the reduction of N use in the Midi-Pyrenees region, France.
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Methodological approach
Conceptual framework for « Activity » definition and performance evaluation

1. Definition of agricultural activities

- Specify the purpose of the study;
- Determine the activity « dimension »;

2. Activities’ input-output coefficients

Data collection VS data availability/data quality to quantify technical coefficients from:

- Experiments;
- Bibliography;
- Statical data;
- Expert knowledge;
- Farm surveys;

3. A bio-economic model to assess farmer’s production strategies

Bio-economic model

- Based on linear programming;
- Optimizes the farmer’s utilities which includes the revenue and the risk aversion coefficient;

4. Scenarios definition

S0 « Reference scenario »
Current nitrogen use constraint = 180 kg N/farm;

S1 « Reduction scenario »
Limiting nitrogen use at 90 kg N/farm;

Results/scenarios VS stakeholders expectations
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Methodological approach
Case study: farm type specification

<table>
<thead>
<tr>
<th>List of activities</th>
<th>Activity dimension</th>
<th>Input coefficients</th>
<th>Output coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activity dimension</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crops</td>
<td>Previous crops</td>
<td>Soil type</td>
</tr>
<tr>
<td>Activity 1</td>
<td>Sunflower</td>
<td>Winter barley</td>
<td>clay</td>
</tr>
<tr>
<td>Activity 2</td>
<td>Soya</td>
<td>Meadows</td>
<td>clay</td>
</tr>
<tr>
<td>Activity 3</td>
<td>Soya</td>
<td>Soft wheat</td>
<td>clay</td>
</tr>
<tr>
<td>Activity 4</td>
<td>Winter barley</td>
<td>Durum wheat</td>
<td>clay</td>
</tr>
<tr>
<td>Activity 5</td>
<td>Durum wheat</td>
<td>Soya</td>
<td>clay</td>
</tr>
<tr>
<td>Activity 6</td>
<td>Soft wheat</td>
<td>Grain Maize</td>
<td>clay</td>
</tr>
<tr>
<td>Activity 7</td>
<td>Soft wheat</td>
<td>Sorghum</td>
<td>clay</td>
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<tr>
<td>Activity 8</td>
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<td>clay</td>
</tr>
<tr>
<td>Activity 9</td>
<td>Soft wheat</td>
<td>Soya</td>
<td>clay</td>
</tr>
<tr>
<td>Activity 10</td>
<td>Grain Maize</td>
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</tr>
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Results and discussion

![Chart showing area (ha) of crops]

- Sunflower
- Soya
- Winter barley
- Durum wheat
- Soft wheat
- Grain maize

Crops
- Reference scenario
- Reduction scenario (-50% N)

![Chart showing gross margin (€) and TFI]

- Global Gross Margin
- Global TFI

10% decrease
1.4% decrease
The use of the « activity concept » does not only allow the exploration of complex scenarios, but also the building of a large and shared database with local stakeholders.
Thank you for your attention

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