Greening and producing: an economic assessment framework for integrating trees in cropping systems

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Promotors:
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Greening the CAP:

* Crop diversification
* Maintenance of permanent pasture
* Ecological Focus Areas on 5% of the arable land
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Objectives of the study:

• Effect of hedgerows and tree rows on crop yield

• Assess the impact of hedgerow and alley cropping EFAs on farm profitability:
  - hedgerow and alley cropping layout
  - economic impact on parcel level
  - economic impact on farm level

(Kort 1988)
1. Effect of hedgerows and trees on crop yield

- \( H = \frac{\text{distance from the tree row}}{\text{tree height}} \)

- \( R = \frac{\text{crop yield affected by trees}}{\text{crop yield without tree influence}} \)
1. Effect of hedgerows and trees on crop yield

- \[ H = \frac{\text{distance from the tree row}}{\text{tree height}} \]
- \[ R = \frac{\text{crop yield affected by trees}}{\text{crop yield without tree influence}} \]

\[ \ln(R) = \alpha \times \log(H)^2 + \beta \times \log(H) + \gamma \]

\[ \ln(R) = -0.76 \times \log(H)^2 + 0.91 \times \log(H) - 0.16 \]

- \( H=0.5 \Rightarrow R=61\% \)
- \( H=1.64 \Rightarrow R=100\% \)
1. Effect of hedgerows and trees on crop yield
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Crop yield loss
R = 70%

Crop yield gain
R = 107%
2. Farm economic impact

Representative farm: 45 ha => EFA: 2.25 ha

**BAU**
- 15.5 ha winter wheat
- 11.5 ha maize
- 3 ha winter barley
- 6 ha beets
- 9 ha potatoes

**Hedgerow option: 1.125 ha**

**Alley cropping option: 2.25 ha**
2. Farm economic impact
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<table>
<thead>
<tr>
<th>EFA option</th>
<th>% of BAU discounted gross margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedgerow option – without subsidies</td>
<td>91%</td>
</tr>
<tr>
<td>Hedgerow option – with subsidies</td>
<td>102%</td>
</tr>
<tr>
<td>Alley cropping option – without subsidies</td>
<td>98%</td>
</tr>
<tr>
<td>Alley cropping option – with subsidies</td>
<td>108%</td>
</tr>
</tbody>
</table>
Conclusions

• Relative crop yield over the whole range is positive! Without taking into account arable surface loss

• Despite their numerous ecological benefits, EFA layout requirements do not promote the implementation of hedgerows

Recommendations

• Better linking of subsidies to ecological benefits?