Experiences and insights with meta-models

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Heikki Lehtonen

MTT Agrifood Research Finland / Economic Research
Address Latokartanonkaari 9, 00790 Helsinki, FINLAND
heikki.lehtonen@mtt.fi
www.mtt.fi
Production situations and yield gaps – explaining current yield gaps and their evolution
- from Palosuo et al. 2013, in review

**POTENTIAL**

**ATTAINABLE**

- Gap I (20%) – e.g. water limitations due to soil structure, poor drainage – need for farm investments

- Gap II (10%) – e.g. inadequate liming

**ACTUAL**

- Gap III (20%) – e.g. inadequate crop protection, fertilisation due to discouraging policies, markets and risks

Gaps

I+II+III = 50%

Yield Potential

Water- and/ or nutrient-limited yield

Actual yield
<table>
<thead>
<tr>
<th></th>
<th>Low real prices – low policy incentives for productivity (baseline?)</th>
<th>Low real prices - high policy incentives for productivity (S1)</th>
<th>High real prices – low policy incentives for productivity (S2)</th>
<th>High real prices – high policy incentives for productivity (S3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross margins:</td>
<td>Low</td>
<td>Slowly increasing</td>
<td>Better, but not increasing</td>
<td>Better and increasing</td>
</tr>
<tr>
<td>Investments in soil structure and drainage:</td>
<td>Low and even decreasing</td>
<td>Increasing</td>
<td>Slightly higher</td>
<td>Significantly higher</td>
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<tr>
<td>Liming:</td>
<td>Too little compared to the needs</td>
<td>Slowly increasing</td>
<td>Increasing</td>
<td>Increasing significantly</td>
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<tr>
<td>Crop protection:</td>
<td>Too little but slowly increasing due to disease pressure</td>
<td>Increasing, but only gradually improving the yields</td>
<td>Increasing</td>
<td>Increasing by methods and volume</td>
</tr>
<tr>
<td>Fertilisation:</td>
<td>&quot;normative&quot; fertilisation, often not according to the needs of plant growing</td>
<td>Little change</td>
<td>Higher fertilisation</td>
<td>Higher fertilisation</td>
</tr>
<tr>
<td>Yield gap:</td>
<td>Expanding yield gap, most likely</td>
<td>First expanding, then stable yield gap ?</td>
<td>First stable, then slowly decreasing yield gap ?</td>
<td>First slowly decreasing yield gap, later higher yields with increasing rate?</td>
</tr>
</tbody>
</table>
Multi-scale integrated modelling framework AGRISIMU

**Modelling framework**

**Sector level**
*Dynamic regional sector model*

**Farm level**
*Static and dynamic farm economics models*
*Crop/cultivar specific agronomic practices*
*Region and farm-type specifics*

**Field level**
*Plant-soil models, other research results*

Climate scenarios
Crop/variety information
Soil data
Agronomic practices

Market and policy drivers

Environmental and economic impacts and land-use

Global scenarios specifying key drivers (market, climate, policy, etc.)

Sector model of Finnish agriculture (DREMFIA)

Landscape structure based biodiversity impact model (to be developed)

Catchment-scale nutrient leaching models (INCA-N) (WSFS-P)

Field and farm

Domestic prices (DREMFIA)

Attainable yields (WOFOST, COUP)

Farm level practices and economic production decisions (e.g. SAMA)

Land use, fertilisation (SAMA/DREMFIA)

Crop growth models (COUP) (WOFOST)

Nutrient leaching models (COUP) (ICECREAM)

ENVIRONMENTAL AND ECONOMIC IMPACTS AND LAND-USE