Comparing risk in conventional and organic arable farming in the Netherlands*

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Introduction and background

• Organic farming is recognized as a way forward to improve sustainability as organic farming is:
  “designed to minimize the human impact on the environment, while ensuring the agricultural system operates as naturally as possible” (EU, 2015)

• Prohibition of the use of synthetic fertilizers and synthetic pesticides and herbicides in organic farming makes organic farming more vulnerable

• Consequence is lower yields (confirmed by many studies) and probably more variation in yields (only scattered information) → Probably higher risk

• Also variability of output prices and of input costs contribute to risk
Objectives

• Compare income risk of conventional and organic arable farms in the Netherlands

• Trace back income risk to production and price risk of the main crops

Materials and Methods: Data

Data from Dutch arable farms for the years 2002 to 2011 recorded via the Farm Accountancy Data Network (FADN). Each farm has a weight in the sample showing the representativeness of the farm.

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total nr of farms in the database</td>
<td>271</td>
<td>47</td>
</tr>
<tr>
<td>Nr of farms &gt; 2 years in the database</td>
<td>196</td>
<td>29</td>
</tr>
<tr>
<td>Average nr of years in the database</td>
<td>6.9</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Data concern technical and economic variables
Materials and Methods: Selection of variables and their relation

Materials and Methods: Method

Risk included in a variable is measured by within farm standard deviation of that variable.

Farms are in the database for different periods, so variation following from generally observed phenomena should be removed.

For this the Error Components Implicit Detrending (ECID) procedure is used.
### Materials and Methods: Method ECID

Steps in determining the farm specific SD of a crop yield:

1. **Compute the yield difference ($\Delta$) between the farm and the national average for each year $t$ the farm is in the sample:**
   \[
   \Delta_t = Y_t - Y_{nat,t}
   \]

2. **Compute the average (av) yield difference over the years the farm was in the database:**
   \[
   \Delta_{av} = Y_{av} - Y_{nat,av}
   \]

3. **Compute the time variant farm specific deviation ($\varepsilon_t$):**
   \[
   \varepsilon_t = \Delta_t - \Delta_{av}
   \]

4. **The SD for farm $i$ can now be calculated as:**
   \[
   SD_i = \sqrt{\frac{\sum_{t=1}^{n} \varepsilon_{i,t}^2}{n-1}}
   \]
Results

Average SDs of farm level economic results ( ■ conv.  ■ organic)

* significant at the 0.05 level

Results

Percentage of farms that grow arable crops and the area devoted to each crops based on farms that grow the crop

<table>
<thead>
<tr>
<th>Crops</th>
<th>Conventional</th>
<th>Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of farms</td>
<td>Area (ha)</td>
</tr>
<tr>
<td>Total area</td>
<td>61</td>
<td>48</td>
</tr>
<tr>
<td>Crops:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar beet</td>
<td>95</td>
<td>13</td>
</tr>
<tr>
<td>Wheat</td>
<td>82</td>
<td>22</td>
</tr>
<tr>
<td>Seed potato</td>
<td>58</td>
<td>14</td>
</tr>
<tr>
<td>Barley</td>
<td>56</td>
<td>10</td>
</tr>
<tr>
<td>Ware potato</td>
<td>47</td>
<td>15</td>
</tr>
<tr>
<td>Seed onion</td>
<td>45</td>
<td>7</td>
</tr>
<tr>
<td>Starch potato</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>
Results

SDs of wheat variables (conv. organic)

- Wheat gross margin*
- Wheat revenues*
- Wheat yield
- Wheat price*
- Wheat costs*

* significant at the 0.05 level

Results

SDs of seed potatoes variables (conv. organic)

- Seed potato gross margin*
- Seed potato revenues*
- Seed potato yield*
- Seed potato price*
- Seed potato costs*

* significant at the 0.05 level
Results

SDs of barley variables (conv. organic)

- Barley gross margin*
- Barley revenues
- Barley yield
- Barley price*
- Barley costs

* significant at the 0.05 level

Results

SDs of ware potatoes variables (conv. organic)

- Ware potato gross margin*
- Ware potato revenues*
- Ware potato yield
- Ware potato price*
- Ware potato costs*

* significant at the 0.05 level
Results

SDs of seed onions variables (red: conv. green: organic)

- Seed onion gross margin*
- Seed onion revenues*
- Seed onion yield*
- Seed onion price*
- Seed onion costs*

* significant at the 0.05 level

Conclusions

- Income risk in organic arable farming is higher than in conventional farming
- All crops contribute to the higher income risk, just as labour costs
- A significantly higher yield risk exists only for organically produced seed potatoes
- Price risk is significantly higher for all organic crops
- Input costs pose a significantly higher risk for almost all organic crops (e.g. planting and seeding costs)