System-to-System Data Collection in business surveys applied to an agricultural survey: a Proof of Concept

2022 UNECE Expert Meeting on Statistical Data Collection ‘Towards a New Normal?’, 26-28 October 2022, ISTAT, Rome

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General idea

“Why do I still have to do this manually?”

Pre-filling: How to make this work?

Techno farmer has the future

Smart industries

Smart farming

Techno farmer has the future
**MyJohnDeere data**

- Data: operations per fields
- Almost 100% overlap with data in questionnaire

**Crop Yield Survey**

<table>
<thead>
<tr>
<th>Grains</th>
<th>Harvested area</th>
<th>Total yield</th>
<th>Moisture content</th>
<th>Crop failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter wheat</td>
<td>hectare</td>
<td>Tons</td>
<td>Percentage</td>
<td>hectare</td>
</tr>
<tr>
<td>Summer wheat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter barley</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer barley</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rye</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tritricale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grain corn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Calculated Crops**:

- **winter_wheat**
  - harvest_area_ha: 70
  - production_t: 700

- **rye**
  - harvest_area_ha: 4
  - production_t: 40

- **corn**
  - (...)
The farmer’s completion process:
1. Comprehension
2. Data retrieval
3. Computation
4. Evaluation and reporting

Automation
System-to-system

Blaise Questionnaire

The farmer’s completion process:
1. Farmer logs in to Q
System-to-system data communication

1. Farmer logs in to MyJohnDeere cloud.
2. MyJohnDeere Questionnaire.

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The farmer’s completion process:
1. Farmer logs in to Q
2. MyJohnDeere?
3. Authentication
4. Blaise Q <-> Microservice <-> John Deere
5. Data are pre-filled
### Crop yield survey

<table>
<thead>
<tr>
<th>Grains</th>
<th>Yield</th>
<th>Crop failure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Harvested area</td>
<td>Total yield</td>
</tr>
<tr>
<td>Winter wheat</td>
<td>70.0</td>
<td>700.0</td>
</tr>
<tr>
<td>Summer wheat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter barley</td>
<td>4.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Summer barley</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rye</td>
<td>4.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Oats</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data are pre-filled into Q

Calculated answers by Data Collection Microservice (JSON output)

```json

```calculated_crops:

```json
- winter_wheat:
  - harvest_area_ha: 70
  - production_t: 700
  - no_harvest_area_ha: 5
  - humidity_prctn: 5

- rye:
  - harvest_area_ha: 4
  - production_t: 40
  - no_harvest_area_ha: 1
  - humidity_prctn: 5

- corn: 
- seed_onion: 
```
The farmer’s completion process:
1. Farmer logs in to Q
2. MyJohnDeere?
3. Authentication
4. Blaise Q <-> Microservice <-> John Deere
5. Data are pre-filled
6. Check, edit, and add
7. Submit
Sandbox

It worked!

- Open data from John Deere
- Virtual farm
Research questions

Expected effects:

- Reduced response burden
- Cost reduction
- Real-time statistics
- Better data quality
- More data, more details

- How does it work in practice? Small-scale pilot:
  - Farmers: data from the correct farmers (units), contracted businesses, linking the data (ambiguities), trust, user experience, take-up rate, ...
  - Stats NL: legal issues, system adaptations, maintenance, ...
  - Script/guidelines for future projects > New vision
Precision farming

- 10-15% of farmers use precision farming techniques

<table>
<thead>
<tr>
<th>Technology</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS-based steering system</td>
<td>&gt;85</td>
</tr>
<tr>
<td>Site-specific crop protection</td>
<td>Almost 19</td>
</tr>
<tr>
<td>Crop registration software</td>
<td>Around 50</td>
</tr>
<tr>
<td>Business administration software</td>
<td>33</td>
</tr>
<tr>
<td>Decision support</td>
<td>30</td>
</tr>
<tr>
<td>Variable nitrogen fertilization</td>
<td>12,4</td>
</tr>
<tr>
<td>Field maps</td>
<td>14,2</td>
</tr>
<tr>
<td>Precision weed removal</td>
<td>4,7</td>
</tr>
<tr>
<td>Soil scans</td>
<td>12,4</td>
</tr>
<tr>
<td>Moisture sensors</td>
<td>15,5</td>
</tr>
<tr>
<td>Sow / Plant / Paw variable</td>
<td>11,6</td>
</tr>
<tr>
<td>Crop sensors</td>
<td>8,5</td>
</tr>
<tr>
<td>Satellite images</td>
<td>11,6</td>
</tr>
<tr>
<td>Drone images</td>
<td>9,5</td>
</tr>
</tbody>
</table>

Source: Rabobank (2020)
Farm Management Information Systems (FMIS)

• ± 50% of farmers
• Two most-used systems in Netherlands:
  - AgroVision
  - DACOM FARM INTELLIGENCE

• 2\textsuperscript{nd} project: connect to these systems using S2S data communication
General idea

Pre-fill: Why do I still have to do this manually?

Pre-filling: How to make this work?

PoC met John Deere

FMIS

Techno farmer has the future

Smart industries Smart farming

AgroVision

DACOM FARM INTELLIGENCE
"Why do I still have to do this manually?"

Pre-filling: How to make this work?

Techno farmer has the future
Smart industries
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In the future

200+ registries

AgroVision

©John Deere

DACOM FARM INTELLIGENCE

FMIS

PoC met John Deere

Smart industries
Smart farming

Techno farmer heeft de toekomst:

200+ registries
What do you think?
- Is this a feasible data collection method?
- Experiences?

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