INSPIRE AND COPERNICUS IN PRECISION FARMING

Ecological and economical synergies

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Motivations/user needs

Dimensions:
- economic
- environmental

Progress and Status – Interoperability

FOODIE Platform

- Marketplace
- Catalogue
- Mapping

APIs

- OGC WMS
- OGC WFS
- REST API
- OGC CSW
- OGC SOS
- Complex Event Processing
- WS Notification

Software A
Software B
Software C
Software D

Satellite data
Open Land Use
Open Transport Map
Sensor measurements
Vegetation indices

www.foodie-project.eu
Agriculture and aquaculture facilities theme
Data Model compliant to:
- Directive 2007/2/EC (INSPIRE) AF theme as well as data specification
- ISO standards 19100 series

Open and scalable
Holding attribute | Value
--- | ---
Identifier | http://foodie-project.eu/CZ/MJM/Trsicka
Function | agriculture
User identifier | 47674814
Name | Tršická zemědělská, a.s.
Valid From | 1993-12-13
Begin Lifespan | 2015-03-11
Data Model

Site attribute | Value
--- | ---
Identifier | http://foodie-project.eu/CZ/MJM/Trsicka
Activity (NACE code) | A1.1.1 - Growing of cereals (except rice), leguminous crops and oil seeds
Valid From | 2014-03-15
Begin Lifespan | 2015-04-07
Plot attribute | Value
--- | ---
Identifier | http://foodie-project.eu/CZ/MJM/Trsicka/Plot/001
Valid from | 2015-04-09
Origin type | manual
Crop species | wheat

Data Model

Intervention attribute | Value
--- | ---
Type | tillage
Status | ongoing
Intervention start | 2015-04-22
Supervisor | John First, senior manager, phone 7435
<table>
<thead>
<tr>
<th>Treatment attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention type</td>
<td>herbicide application</td>
</tr>
<tr>
<td>Status</td>
<td>ongoing</td>
</tr>
<tr>
<td>Intervention start</td>
<td>2015-04-22</td>
</tr>
<tr>
<td>Supervisor</td>
<td>John First, senior manager, phone 7435</td>
</tr>
<tr>
<td>Treatment quantity</td>
<td>70 litres</td>
</tr>
<tr>
<td>Application width</td>
<td>25 meters</td>
</tr>
<tr>
<td>Form of treatment</td>
<td>Application machine</td>
</tr>
<tr>
<td>Product</td>
<td>Roundup®</td>
</tr>
</tbody>
</table>

![Data Model Diagram](image_url)
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<th>Product attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product code</td>
<td>01475200</td>
</tr>
<tr>
<td>Product name</td>
<td>Roundup®</td>
</tr>
<tr>
<td>Product type</td>
<td>herbicide</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>MONSANTO®</td>
</tr>
<tr>
<td>Register URL</td>
<td><a href="http://agro-register.cz/?1475">http://agro-register.cz/?1475</a></td>
</tr>
<tr>
<td>Safety instructions</td>
<td>Eye contact: may cause pain, redness and tearing based on toxicity studies. ...</td>
</tr>
</tbody>
</table>

**Safety Instructions**

Eye contact: may cause pain, redness and tearing based on toxicity studies.
Environmental Monitoring Facilities theme
Environmental Monitoring Facilities

- Sensor measurements
  - temperature
  - humidity
  - machinery fleet monitoring
  - ...
- O&M (ISO 19156:2011)
- OGC SOS
  - modified
  - GeoJSON instead of XML for measurements

Machinery monitoring

MapLog Agri

ECU CAN/BUS

GPS

MONITORING UNIT

INTERNET

RFID

www.foodie-project.eu
Machinery monitoring

Tractors list

- CASE 140 M01-0110 MA7
- CASE 140 MA8
- CASE 140 MA9
- CASE 165 M01-0058 MA4
- CASE 165 M01-0059 MA3
- CASE 180 M01-1017 MA5
- CASE 285 M00-0474 MA2
- CASE 340 M01-1049 MA1
- STEYR 6230 M01-1103 MA6
Minimizing and Reporting Environmental Burden
Yield potential computing

Satellite images for last 8 years (Sentinel, Landsat)

Images filtering only for the second half of vegetation period

Derivation of vegetation indices (NDVI, EVI) applied together with clouds identification (CF Mask algorithm)

Yield potential index computing

Scenes combination and median value computation for yield potential
Yield potential

- Successful rate about 80%...and increasing

- Validated in the Czech Republic and Latvia
  - two farms with acreage more than 1’000 ha

- Ongoing OGC Web Processing Service (WPS) implementation
Conclusions

- Relationship to many others INSPIRE themes (LC, LU, OI, AM etc.)
  - feel free to ask

- INSPIRE-based data models together with Copernicus data
  - save money of farmers,
  - lower the environmental burden,
  - are more complicated than development tailored for one farmer,
  - enable real data interoperability.

- Cloud-based solutions working only in one country
  - Farmers are not supporters when they are in country A and their data on a cloud in country B (even if it is still Europe)

- Distrust of farmers when aggregating (big) data
THANK YOU FOR YOUR INTEREST!

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