



Exploring precision farming data: a valuable new source for official statistics?

A pilot with System-to-System data communication applied to John Deere data

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BigSurv20, Session: 'Volume and/or value?! Improving data quality in the era of big data'
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1. From H2S to S2S

4.4.1 Fosfaatproductie in dierlijke mest per landbouwgebied in 2016



7h1 Vaste mest: werkresultaat mesttoediening			
Geef 'per werkresultaat' het percentage vaste mest aan op bouwland en grasland.		% van totaal toegesende vaste mest op grasland	% van totaal toegesende vaste mest op onbebouwd bouwland
Bouwland	bewergronds toegesend, daarna ondergewerkt	n.v.t.	
Grasland en bouwland	mest ligt verdeeld over perceel na bewergronds toedienen		
Totaal			

7h2 Drijfmeest: werkresultaat mesttoediening			
Geef 'per werkresultaat' het percentage drijfmeest aan op bouwland en grasland.		% van totaal toegesende drijfmeest op grasland	% van totaal toegesende drijfmeest op bouwland
Bouwland	bouwlandinjecteur; d.m.v. injectiestanden direct in de grond gebracht	n.v.t.	
Grasland en bouwland	de mest ligt verdeeld over het perceel zoals bij breedwergig bewergronds toedienen of bij een machine voor boven de grond houden		
Grasland	de mest ligt op de grond in strookjes zoals bij juist gebruik van een sleepvoet-machine of bij gebruik van een sleepfouder of zodenbester die geen sleepje maakt of niet snijdt		
Grasland	de mest ligt gedeeltelijk in strookjes in de grond en gedeeltelijk op de grond zoals bij gebruik van een sleepfouder of bij ondiep werken met een zodenbester		
Grasland en bouwland	de mest is geheel in de grond gebracht in strookjes zoals bij juist gebruik van een zodenbester		
Totaal			

Pre-fill



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

Pre-filling:
How to make this work?



Pilot with
JOHN DEERE

Technoboer heeft de toekomst

200+ registries

Techno farmer has the future

Smart industries
Smart farming



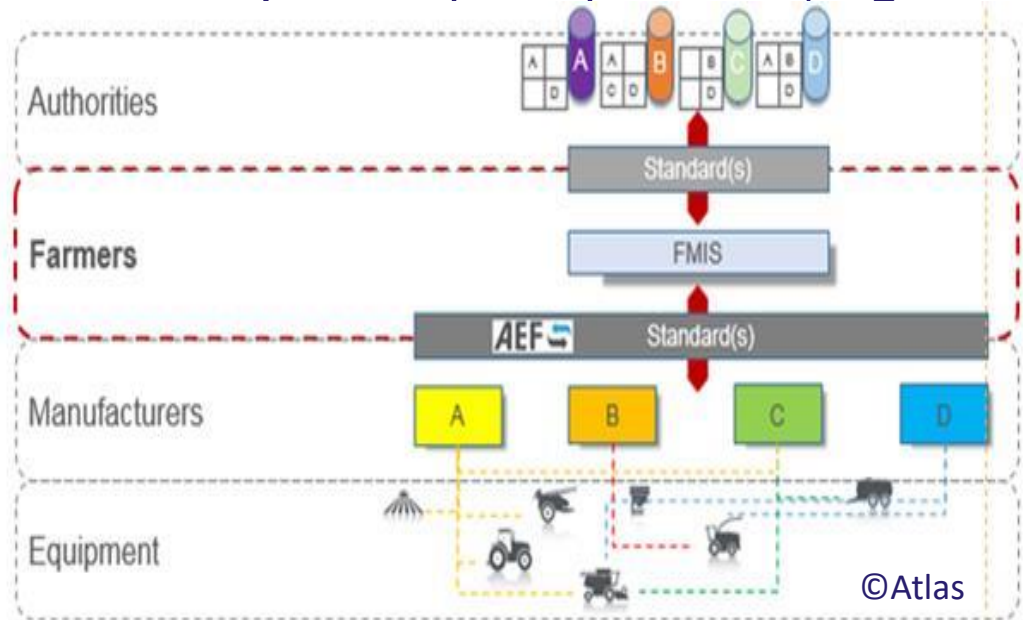
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2. Data explorations: H2S -> S2S

2019:

- Data from one farmer: first exploration of data
- Farm Management Information Systems (FMIS): Dacom, Agrovision

2020:



3. Data explorations: data challenges

- Privacy, security, data ownership, data sharing:
 - Trust!
 - Getting access to the data: Who owns the data? Data collection method? Money!
- Quality issues:
 - Metadata missing
 - Sensors as measurement instrument: valid measurements, missings
 - Unit issue: are the data about the correct unit (fields in Belgium)?
- Ubiquity & standardization of systems (interoperability):
 - Market penetration: Is the data widespread available in the sector?
 - Interoperability: interface standardization between systems
- Data Harmonization:
 - Merging data from multiple farmers/sensors into one coherent database?
- Stability of (meta)data delivery in the future



2. Data explorations

Valuable and promising new data sources, but ... still a long way to go ...

2019:

- Data from one farmer: first exploration of data
- Farm Management Information Systems (FMIS): Dacom, Agrovision

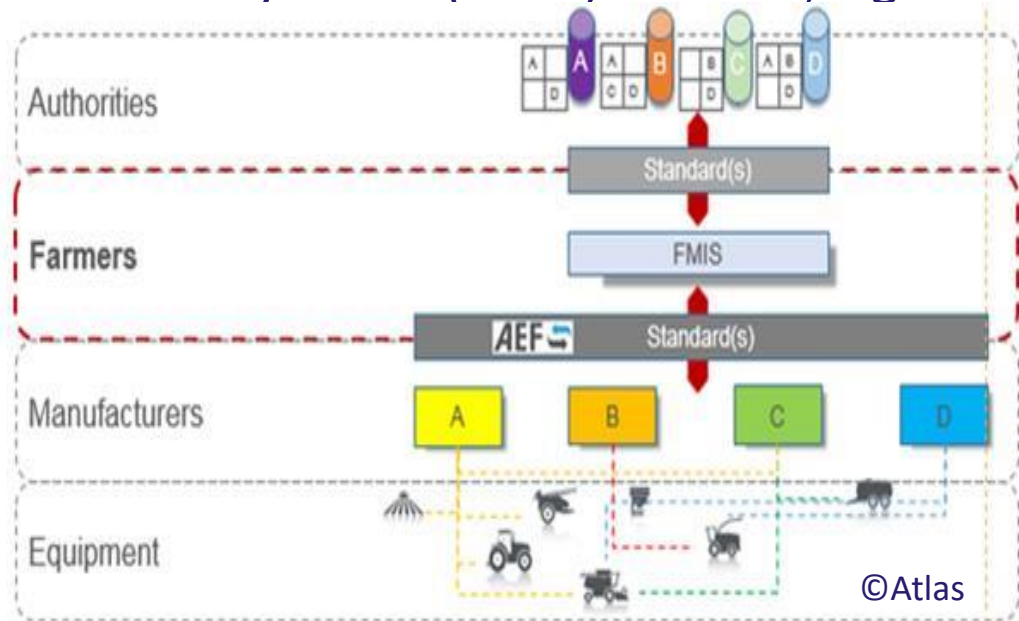
2020:



ATLAS
AGRICULTURAL INTEROPERABILITY
AND ANALYSIS SYSTEM



JOHN DEERE

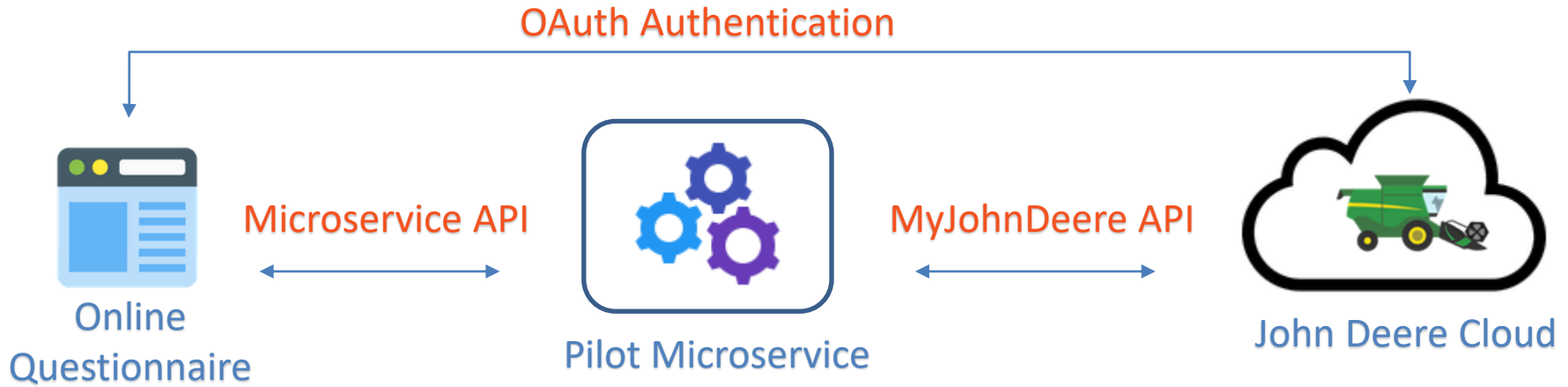


3. Pilot with MyJohnDeere

- Our goal: reduce farmers response burden by questionnaire prefilling
- Solution: S2S data communication
- Pilot: Crop yield survey questionnaire
- Almost 100% overlap with JD data: **field operations**
- Other available data: machine data, agronomic service providers activity, soil and environmental conditions.



4. Microservice architecture & process seq.*



Process sequence:

1. Online Q login
2. MyJohnDeere?
3. Authentication
4. Online Q <-> Microservice <-> John Deere
5. Prefilled questionnaire
6. Submit?

(*) Assuming no ambiguities.



5. JSON output example

Calculated answers about this crop season

Data collection quality indicators

Ambiguities details

Calculated answers about the next crop season

```
▼ calculated_crops:
  ▼ winter_wheat:
    harvest_area_ha: 70
    production_t: 700
    no_harvest_area_ha: 5
    humidity_prct: 5
  ▼ rye:
    harvest_area_ha: 4
    production_t: 40
    no_harvest_area_ha: 1
    humidity_prct: 5
  ▶ corn: {...}
  ▶ seed_onion: {...}
  ▼ exceptions:
    fields: 0
    client: 0
  ▼ ambiguous_crops:
    ▼ 0:
      harvest_area_ha: 60
      wet_mass_t: 600
      water_t: 36
      harvest_start_date: "2020-08-05 17:05"
      harvest_end_date: "2020-08-05 19:45"
      field_name: "Field_2"
      jd_crop_name: "wheat_white"
      ▼ options:
        0: "winter_wheat"
        1: "summer_wheat"
  ▼ seeding_next:
    ▼ winter_barley:
      seeding_area_ha: 25
```



6. Data quality & software engineering

- Fault tolerant system based on software exceptions
- Software exceptions → data collection quality indicator
- Automated integration & unit tests → data processing quality
- Microservice log → audit trail

```
▶ calculated_crops:  {...}
▼ exceptions:
  fields:            0
  client:            0
▶ ambiguous_crops:  [...]
▶ seeding_next:     {...}
```



7. Ambiguities

```
▶ calculated_crops:      {...}
▶ exceptions:           {...}
▼ ambiguous_crops:
  ▼ 0:
    harvest_area_ha:    60
    wet_mass_t:         600
    water_t:            36
    harvest_start_date: "2020-08-05 17:05"
    harvest_end_date:   "2020-08-05 19:45"
    field_name:         "Field_2"
    jd_crop_name:       "wheat_white"
  ▼ options:
    0:                  "winter_wheat"
    1:                  "summer_wheat"
▶ seeding_next:         {...}
```



Please select the harvested crop in "Field_2":

- summer_wheat
- summer_wheat
- winter_wheat

Submit



Asynchronous microservice
API call



Prefilled
questionnaire

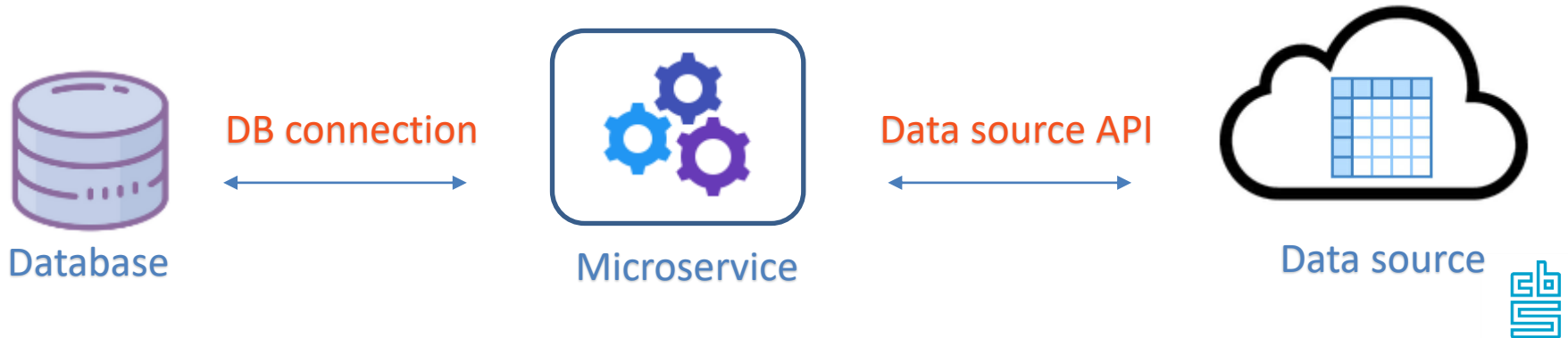


8. Results

- Production software for automatic crop yield data collection:
 - Tests 2020
 - Production 2021
- New S2S data collection methodology → many fields
 - Significant overlap
 - Data source API
 - Authentication protocol

9. Going beyond the questionnaire

- Data source for new statistics
- PoC for real-time S2S data collection



Thanks!!!

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Facts that matter