DATA SOVEREIGNTY IN AGRICULTURE
STATUS QUO, CHALLENGES AND SOLUTION CONCEPTS

Bernd Rauch, Fraunhofer ISE
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What is this talk about?

- **Data sovereignty as an essential factor** of digital transformation in the domain of agriculture

- Corresponding challenges in the **digital ecosystem** agriculture

- Discussion of the **overall requirements for solution concepts**
Data sovereignty as a key requirement for digitization

- **Data sovereignty is an important requirement for farmers** [Bi19] [Ka20] [Ga20]
  (in Germany, data sovereignty is often referred to as »Datenhoheit«)

- Not only for farmers: **other stakeholders** in the value network demand it as well

- Data sovereignty supports the **willingness to share data**, which is key for every data economy

- **Trust in digitization** is vital for the digital transformation of agriculture
Definition: Data sovereignty

- There is no comprehensive definition yet

- Data sovereignty is a difficult concept because it is not precisely defined and is understood differently from different perspectives

- We propose as a definition:
  - No data use without **consent** of the respective »owner«, which includes revocation of consent
  - **Transparency** regarding the use of data by third parties
  - Possibility for **exchange and flexible use** of »own« data across arbitrary systems

- However, just agreeing on data sovereignty is likely not sufficient...
Typical scenario in agricultural value networks:
data generation from production resources

Sensors and machines

Base production resources

»data«
Challenge: data and expectations of different stakeholders

"I want to use the data for my farming processes"

"We want to be sure, that our food is healthy and organic"

"We want to use the data to develop future technologies and services"

"We want to use the data to monitor compliance with the law"

"We want to ensure a sustainable production process"
Challenge: data sovereignty for different data “owners”

- Farmer
- Manufacturer
- Contractor

- Agronomical data
- Livestock data
- Operational and legal data
- Machine data
- Worker or service operator data
- ...
Challenge: distributed data

Sensors and machines

Basic production resources

FMIS A

FMIS B

Manufacturer C

Manufacturer D
Challenge: data sovereignty is more than granting access to data

“Okay, I grant you access to my data for offering services to me, but nothing more.”

How about revoking the access to data, once it was copied?

How to ensure that data is only used as originally agreed?

What if I only want to share parts of my data or anonymize it?
Consequences

- We have
  - A lot of **diverse data from different agricultural processes**
  - A **multitude of stakeholders**, each with their own interests in the data and respective requirements towards their own data sovereignty
  - A technological ecosystem with **distributed systems**, each with its own storage locations
  - Not yet a **technological framework** to fully enable data sovereignty in agriculture

- Challenges
  - Besides lack of interoperability, media breaks and no comprehensive data exchange
  - How to ensure (easy understandable) data sovereignty in such a complex setting?
Solution space

- Legal scope
  - (At least in Germany,) there is no legal ownership of data and you may not want to have any [Vo20]
  - Contracts between legal entities: possible, but especially demanding for farmers
    Terms and conditions, code of conduct, …

- Technological scope
  - Activities addressing data sovereignty as a core concept
    (Gaia-X [GX20] Domain Agriculture, International Data Spaces [ID20], Fraunhofer Lighthouse-project Cognitive Agriculture [FH19], …)
  - Technology can provide data sovereignty, but it needs a common ground
Exemplary solution concept: digital twins for agriculture

- Encapsulation of all data of a physical asset in a digital twin, which is a virtual representation of the real thing [Ra20]
- The owner of the physical asset has control over the digital twin, i.e. he or she can determine how the data may be used by third parties
- Benefits:
  - Consolidation of data and authorization in one place
  - Data sovereignty implemented in the twin object
  - Digital twins enable comprehensive data exchange
  - Enables, but does not require decoupling of data and originating systems or services
Solution requirements

- Data sovereignty is **one aspect** of the digital transformation in agriculture
- A concept like digital twins is **one possible building block** for data sovereignty
- How to implement one building block in a **huge and complex ecosystem** with its diverse value network?

- Solution concepts require holistic approaches. There is **no single aspect** that can address all challenges
  - Rather a **combination of multiple aspects** like law, contracts and technology
  - Talk to farmers and take farmers’ perspective
Conclusion

- Status quo: We have a highly complex technological ecosystem in huge value networks and a need for data sovereignty.

- Data is vital for digital transformation, be it digitization of processes or innovation.

- Stakeholder trust in digitization is essential for sharing data.

- There are many activities that address these challenges, but they require a holistic coordination, as do solution concepts.

- Covering single aspects does not solve challenges. It is the combination of aspects.
Thank you!

- Fraunhofer lighthouse project »Cognitive Agriculture«
- Envisioning an **agricultural data space (ADS)**
  - [www.cognitive-agriculture.de](http://www.cognitive-agriculture.de)
  - [https://www.dataspaces.fraunhofer.de/de/vertikalisierungen/agricultural_data_space.html](https://www.dataspaces.fraunhofer.de/de/vertikalisierungen/agricultural_data_space.html)

- Contact: [bernd.rauch@iese.fraunhofer.de](mailto:bernd.rauch@iese.fraunhofer.de)
Literature


- [ID20] International Data Spaces Association project page, https://www.internationaldataspaces.org/


