Aspects of Digitization in Agricultural Logistics in Germany

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Development of Data Management in agriculture

- Germany: „Industry 4.0“ is en vogue (digital networking of all production processes)
- In agriculture: „Digitization“ more common
Challenges for Agricultural Logistics in Germany

- Structural changes:
  - farm size ↑
  - nr. of trading sites ↓
  - quantities of transported goods ↑
  - distances ↑

- Consumer demands traceability and more diverse qualities

- Farmers, Traders, Processors & Wholesale strive to optimize their processes
  - Cost ↓
  - Efficiency ↑
## Particularities of Agricultural logistics

<table>
<thead>
<tr>
<th>General logistics</th>
<th>Agricultural logistics</th>
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<tbody>
<tr>
<td>Machines optimized for road use</td>
<td>Machines used for infield &amp; road transport (mainly tractors due to historic circumstances)</td>
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<tr>
<td>Start point and target specified</td>
<td>Sources &amp; sinks of goods move during logistics process</td>
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<tr>
<td>Fixed locations for overloading</td>
<td>Precise location forecast of machines is difficult. Influencing factors on time, place and amount of goods for overload:</td>
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<tr>
<td></td>
<td>- Yield</td>
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<td>- Driving patterns on field</td>
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<td>- Soil properties</td>
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<td>- Driver's operation</td>
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<td>- Vehicle movement during overloading etc.</td>
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<tr>
<td>Long term planning</td>
<td>Dynamic real-time planning processes</td>
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</table>

- Agricultural Logistics need smart algorithms, powerful Information Systems, smart Software & Hardware solutions and reliable information sharing throughout the value chain
Hardware
Hardware in agricultural logistics

- Navigation Systems (dirt-roads, bridge loads, one-way rules) – dynamic influencing factors
- Yield recording (inside harvester too late, preferably by satellite imagery or drones)
- Automated steering systems for overloading
- Vehicle identification in Telemetry Systems: Bluetooth & RFID Chips

Data Transfer Models for tracking commodities during agricultural logistics:

1. Data is uploaded to a central cloud service and updated during the process steps
2. Data stays with the commodity and undergoes several transmission processes during overload between machines/facilities
Software
Farm Management Information Systems

Farm Management Information Systems are the basis for planning and decision making. They deliver documentation, processing, analysing of:

- Process flow
- Locations
- Technology
- Employees
- Costs
- Etc.

Problems:
- Conflicting objectives
- Unknown influences of parameters in decision support
Example FMIS Decision Support Systems - Infield Logistics

a. Most efficient way of working for material neutral operations (e.g. tillage)

b. Material input/output operations without pretended tramlines

c. Tramline distances pretend working width
Telemetry Systems

- transfer of a system from demonstration to general use -> Stability
  - Different radio networks
  - Machines of different ages
  - Machines of different manufacturers
  - Different communication and data standards
  - Network coverage (crop harvesting chain does not work if parts of it are temporarily invisible)
  - IsoBus on the limit of its data transfer bandwidth -> Data for FMIS gets lost

- New standards for data exchange are necessary
- Data exchange interfaces for older machines should be developed
Value Chain
Value chain

Logistics play a decisive role in trading, data exchange along the stages of the value chain helps improve efficiency and generate benefits. In Germany chains have developed very differently.

Sugar Beet Logistics:
- Central digital database for planning
- Fields, grower, rowing order, storage location etc. documented
- Harvesting chain optimized through telemetry status updates
- Necessary data of sugar beets transmitted to factory & reported to farmer
- Central database for transport & billing
- all parties involved can query necessary data
- Only one central processor (9 factories) in southern Germany
- Only one central farming community (economically linked)
Value chain

Logistics play a decisive role in trading, data exchange along the stages of the value chain helps improve efficiency and generate benefits. In Germany chains have developed very differently.

Grain Logistics:
- Neither farmers, nor traders/processors have central organizations
- First approaches for digital data collection and exchange between farmers & traders (mainly supporting exchange of traceability certificates)
- Very inefficient data sharing: Farmers print from FMIS, send paper to trader, trader manually enters data to database
- No organizational structures to be found to share data digitally between farmers and traders as well es further stakeholders in the chain
Information sharing throughout the grain value chain

Multiple Benefits

Agricultural Trading Company

Platform Service

Charge XYZ?
- Parameter?
- Menge?
- Wo?

Angebot
Distribution
Große einheitl. Partien

M.Sc. Maximilian Treiber | Digitales Lagermanagement | 10.04.2018
Outlook

- Digitization of agricultural logistics desired and necessary
- Conditions of growing farms and requirements of agricultural trade promote this change
- First digital solutions are on the market
  - Lack of stability
  - Improvable adaptation to special agricultural requirements
  - Improvement of algorithms & data bases necessary
  - Standardization of Hardware, Software, Data-Exchange has to be improved
  - Clear regulations about the ownership of data have to be developed
  - Knowledge about benefits of improved Data-Exchange has to be generated and distributed to the different stakeholders