Smart-Farming-World

Interplay of Smart Services and Systems to support Potato Harvest

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DLR Projektträger

What do you see here?

A) Mobiles in the dirt

B) Smart devices that support the potato harvest

Agenda

1. Current Situation and Project Target
2. Smart-Farming-World as an Infrastructure for Smart Services and Systems
3. Use Case: Usage of a Digital Potato during Harvest
4. Conclusion and Next Steps

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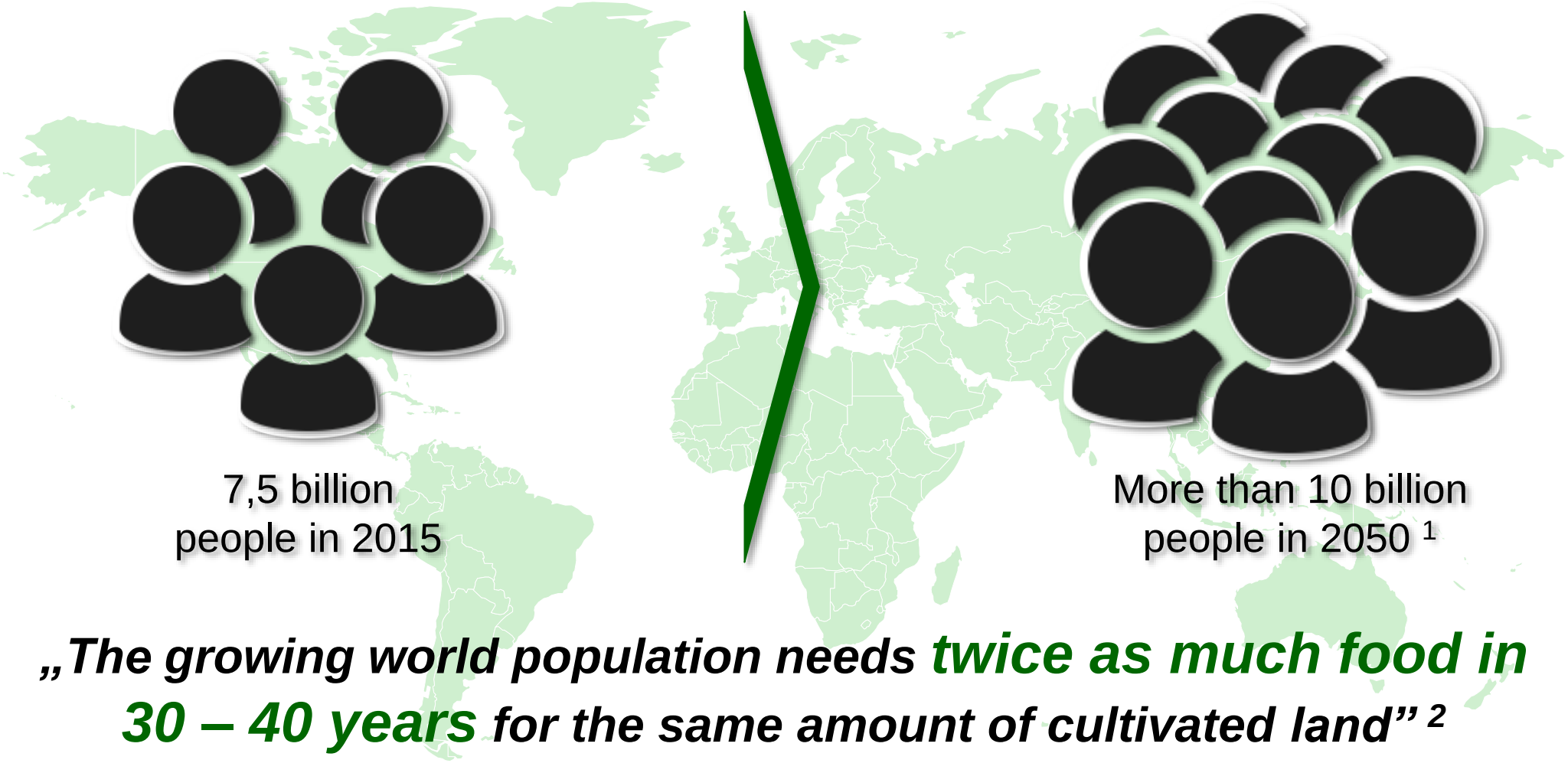
In the coming decades, the world population will grow by a further 2.5 billion people who need to be supplied with food



7,5 billion
people in 2015

More than 10 billion
people in 2050 [1]

„The growing world population needs twice as much food in 30 – 40 years for the same amount of cultivated land" [2]

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Sources:
1) s. United Nations (Hrsg.) 2017
2) s. Bartmer 2016

The complexity of the agricultural production process results from the large number of actors involved

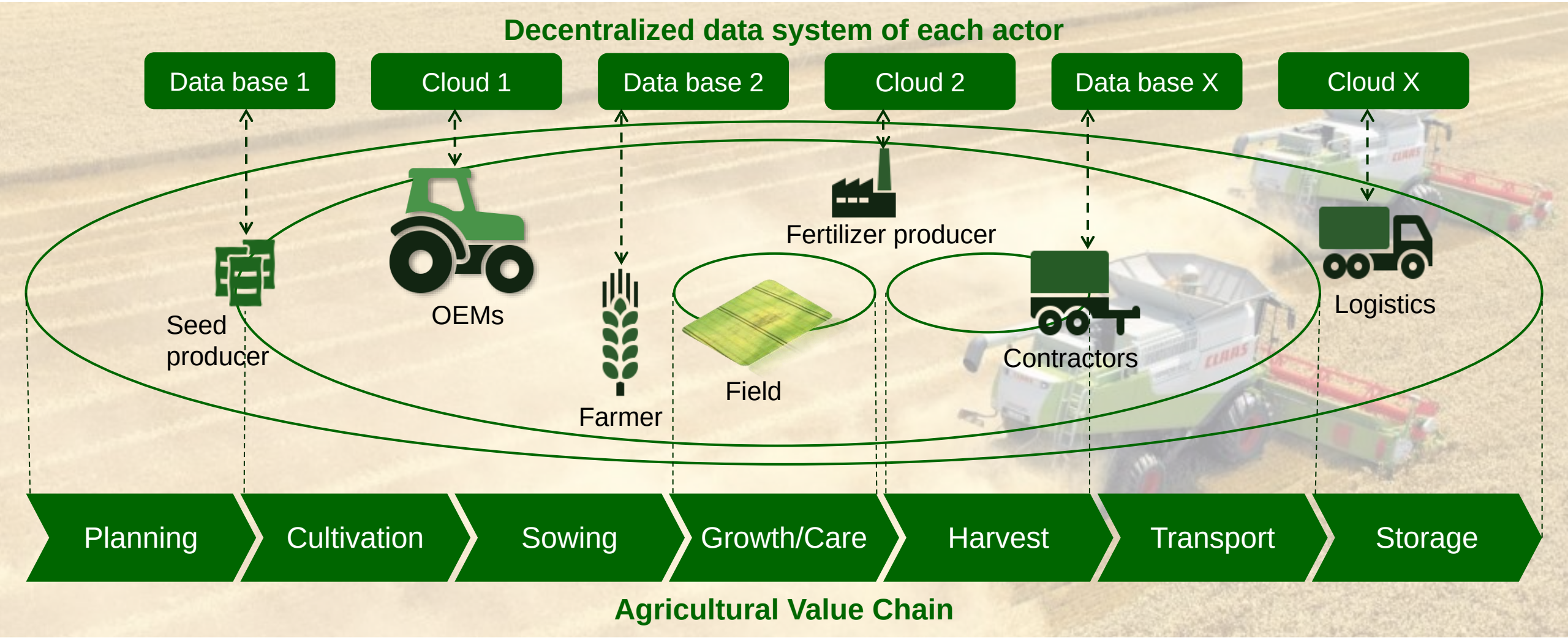
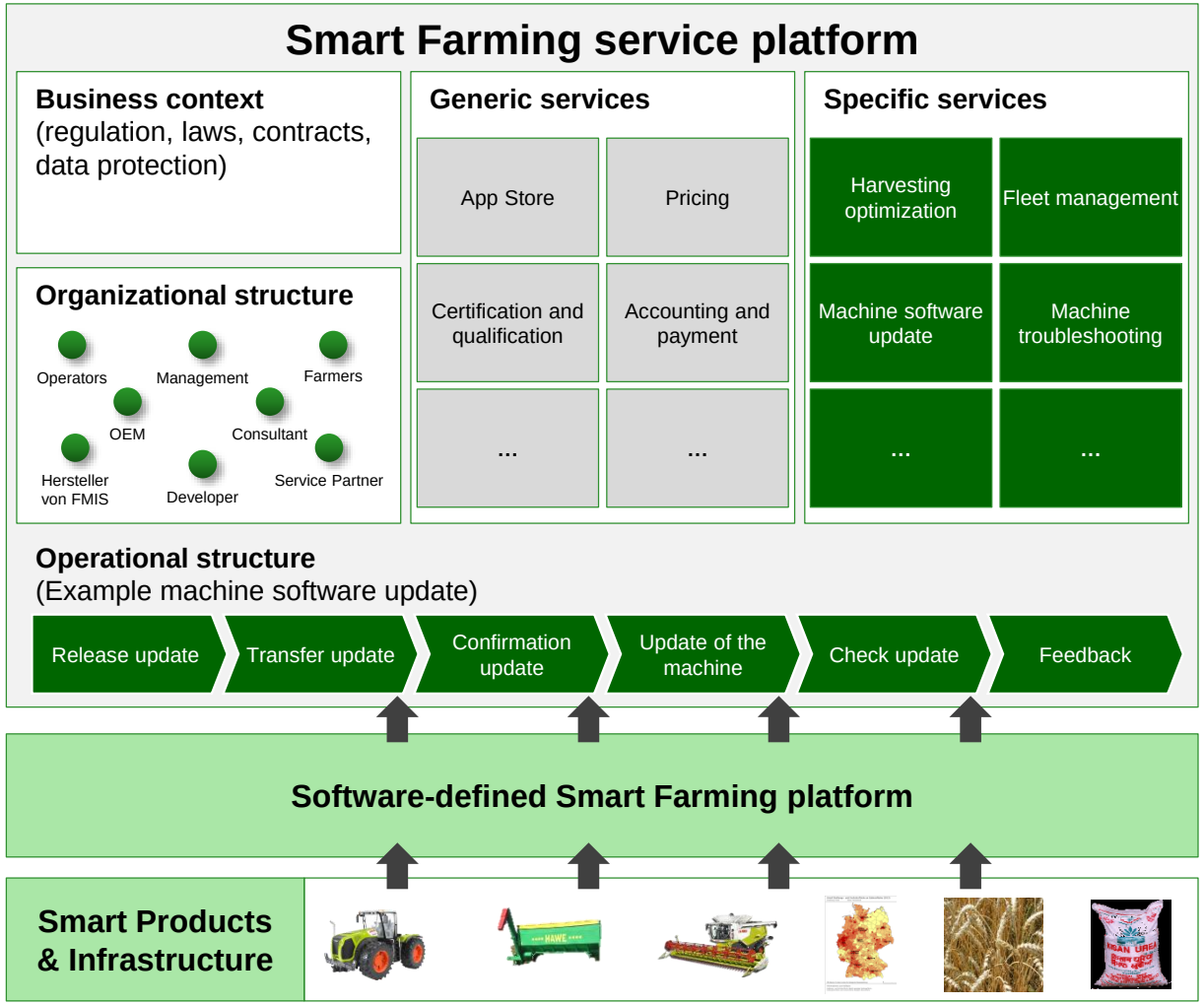


Image: CLAAS

The Smart Farming platform enables the exchange of data and connects the participants of the ecosystem



Functions of the Smart Farming platform

- The general framework of the smart farming platform is based on the **model of digital infrastructures** of acatech.[3]
- On the smart farming platform, the **data of all involved process partners** can be exchanged and linked.
- Generic services allow **faster development** of specific services by using basic functionalities which can be re-used several times in different application areas.
- Specific services are based on the data and/or linkage of **several process participants** and offer the different user groups specific value-added services that are tailor made to their needs.
- Specific services are divided in applications that are running in the cloud and applications that run **directly on the terminals of the farming machines** (edge devices).

Sources: 3) s. ACATECH 2016

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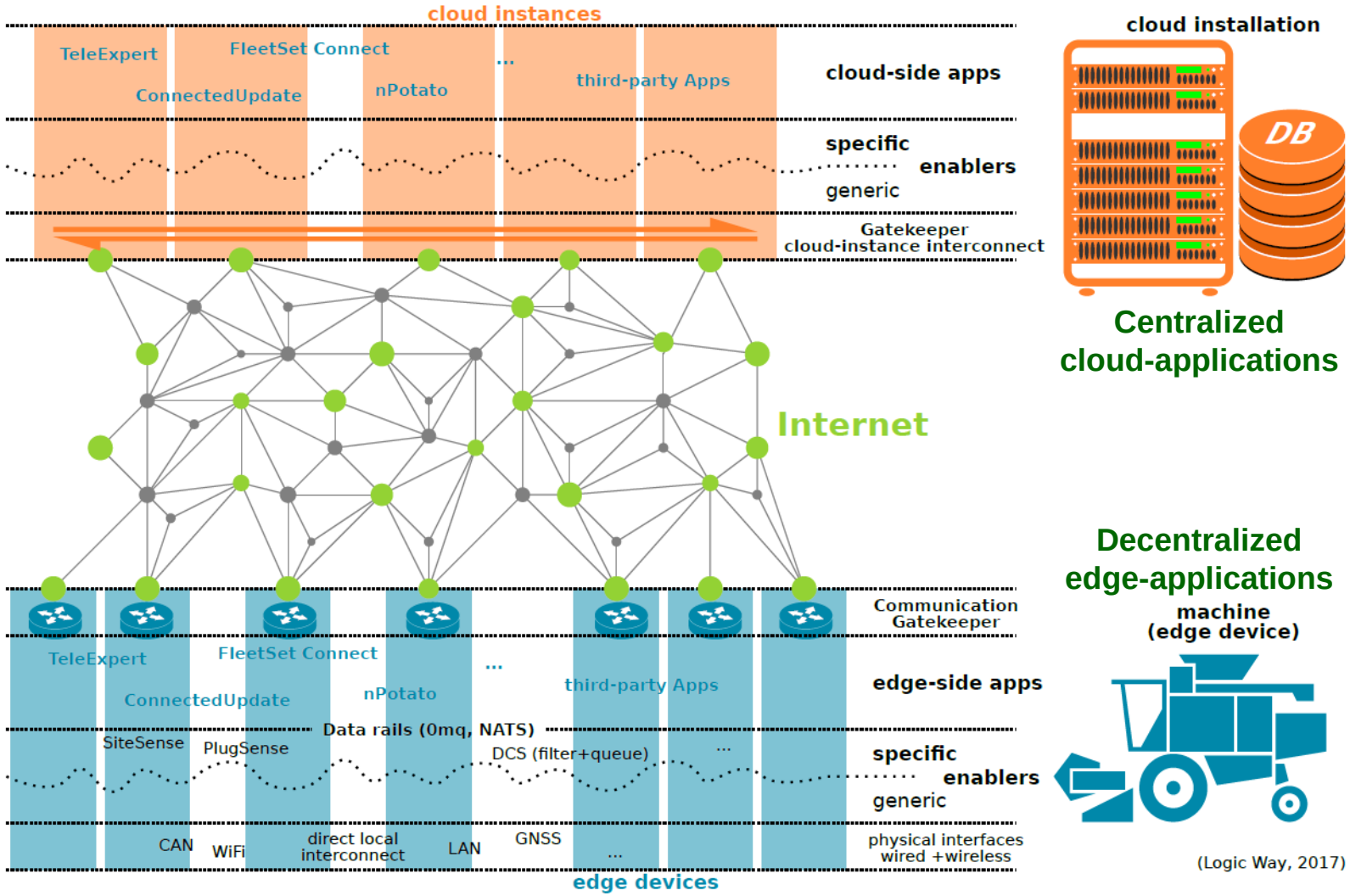
The technical development of the platform is separated in the two parts cloud-applications and edge-applications



Centralized cloud-applications

Decentralized edge-applications

(Logic Way, 2017)

Farming context requires technology combination

- Due to the poor network coverage in rural areas (e. g. in eastern Germany) the data processing is divided into **cloud and edge applications**.
- All applications have installations on the **terminals/communication modules** of the machines and the respective **cloud instance.**
- A **safe and secure communication** infrastructure is set up via an internet connection with communication gatekeepers, protocols and token systems.

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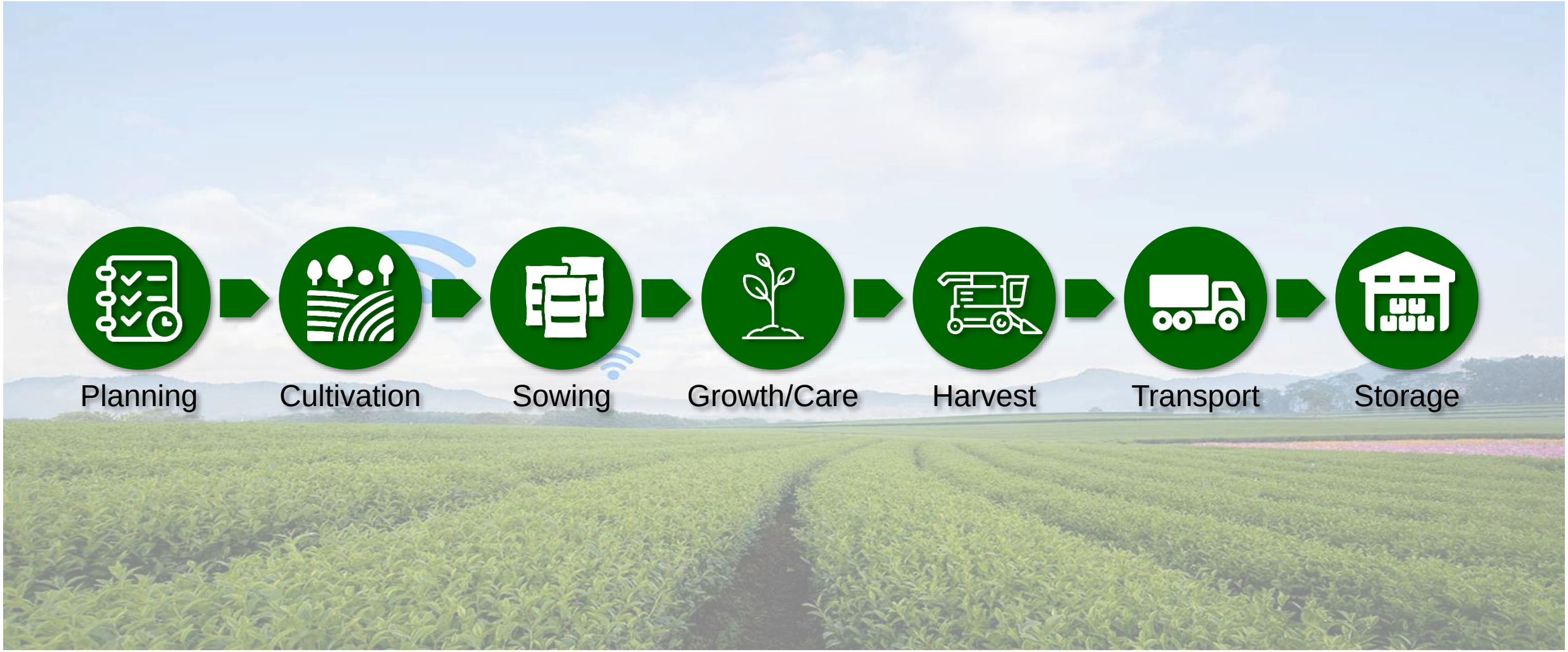
Image: Logic Way

Smart-Farming-World develops four use cases for different parts of the agricultural value chain with a focus on agricultural machinery



: Focus of the use case

: Possible integration processes of the use case

Image: CLAAS

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nPotato – A smart service based on a smart device to support farmers during potato harvest

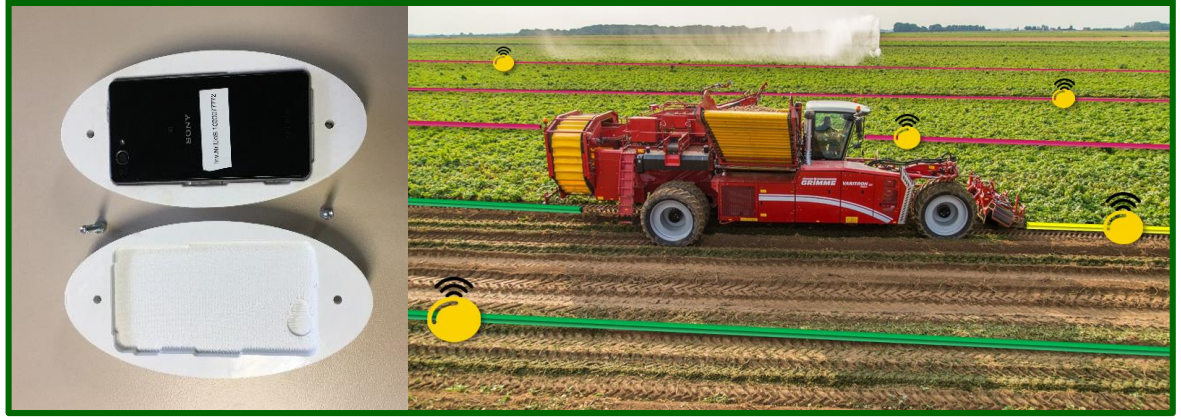
Major Challenge

The potato **harvesting** process with harvesting machines is a **complex process** that needs precise information about the fruit and the current harvesting conditions. **Wrong settings** can **harm the potato** and decrease the profit drastically.

Core Product Features

A **digital transmitter** in shape of a potato provides a detailed **digital twin of** the current impacts on **real potatoes**. **Recommendations** for action are given by real-time data processing and **lead to** optimally adjusted machines to **increase** the product **output**.

nPotato



Aims of the nPotato

- Increased product quality
- Reduced costs related to scrap

Involved partners

GRIMME, DFKI, LOGIC WAY, fir an der RWTH Aachen

Use case outlook

nPotato will be **launched** with pilot customers **in autumn 2018**. The current development will be an aftersales product of Grimme to improve their harvesting machines. In addition, the **idea of smart sensor** nodes **will be used** in future projects to extend its application area **to other parts of the food chain** and **other types of fruit**.

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Image: Grimme

nPotato – Our product story

Without our Product or Service

Field work decisions made on information from previous years

Potential **risk** of under/over estimation of field work resources **due to no fact/data** based decision support

Damages of the potato not detectable

Wrong settings of the harvesting machines have an impact on the potatoes and **lead to not visible damages** that decrease the profit margin later on

With our Product or Service

Access to data in real time

Dashboard for **monitoring farm activities** related to potato harvest in real time based on data from vehicles and nPotato

nPotato analyzes in real-time

Measuring of dynamic parameters to sent error messages **directly** to the driver to **optimize machine settings**

Value by nPotato

Improved field work efficiency and executional optimization and precision due to the **elimination of information latency**

Generation of estimated real-time income curves, **less damages** of the potatoes and **increased quality**

Target Users: Medium to large size farms or contractors (more than 100 ha)

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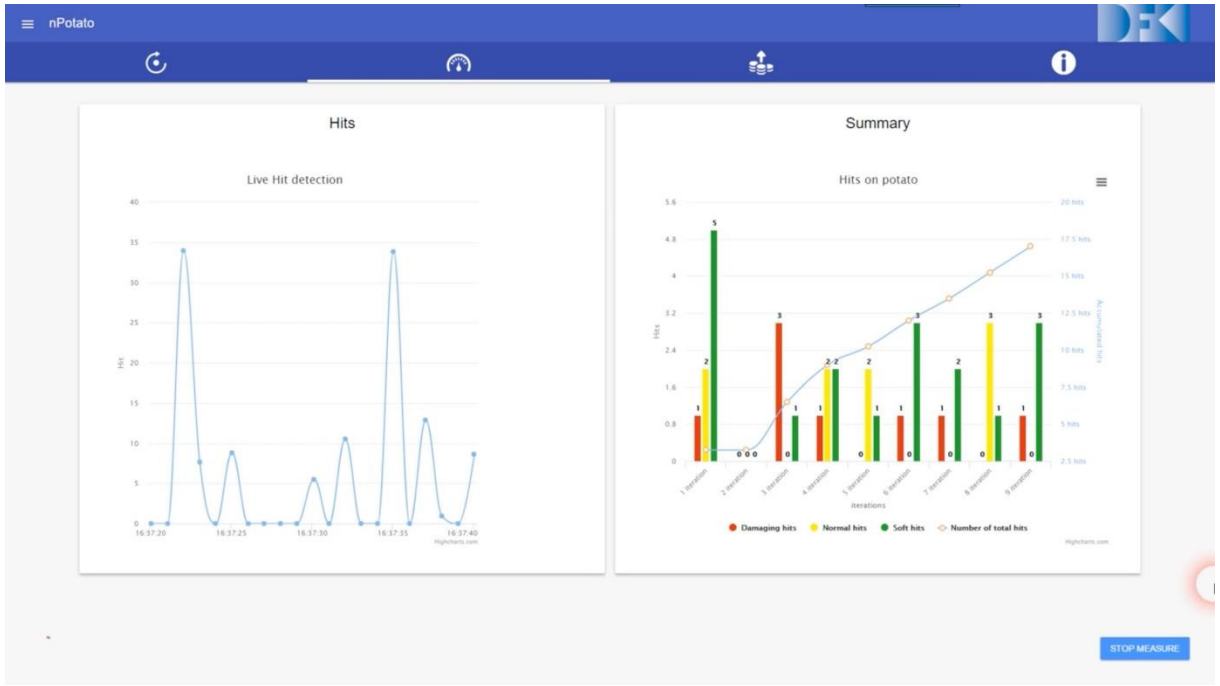
nPotato – The dashboards show the farmers different information such as a hit summary and estimated revenue curves for a field

Hit summary



Revenue estimations

Image: DFKI

nPotato – Some insights from the first field tests last week

Yield increase [4)]

Preliminary test results and interviews show a **possible increase** in yield **of up to 5 %** per hectare

Business model [5)]

5 % of yield increase per hectare lead up to a **revenue increase of 560 € per hectare**

Teaching support [4)]

Farmers and drivers see a high potential to use nPotato to **teach unexperienced drivers**

Autonomous support [4)]

Farmers and drivers only want **recommendations for their actions** no autonomous settings

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Sources: 4) Based on interviews conducted with three farmers and drivers on 09.10.2018
5) Based on a rough estimation: 45 tons of potatoes per hectare and 250 € per ton (www.statista.com; www.raiffeisen.com)

Images: FIR

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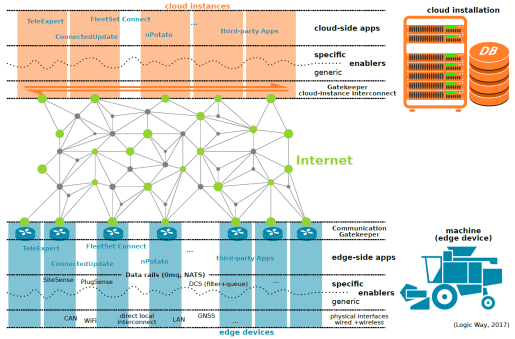
Conclusion and next steps: nPotato is only the first step to smart devices in agriculture to support harvests globally

Conclusion



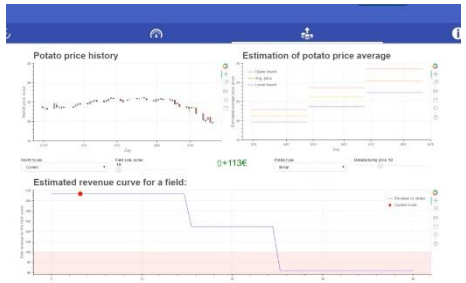
Interoperability between existing platforms in agriculture is necessary to increase the data value within the whole value chain and create new services

nPotato is a **smart service based on a simple smart device** that supports farmers during their potato harvest and **increases the yield**

Next steps

Usage of the nPotato during the **whole value chain** of potato growing – from sowing to supermarkets

Development of other **digital vegetables and fruits** to support other harvesting activities



Development of a **global benchmarking system** to compare potato harvests and possible impact factors

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Thank you for your attention!

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Literature

1) United Nations, Department of Economic and Social Affairs, Population Division (Hrsg.) (2017): World Population Prospects: The 2017 Revision, Key Findings and Advance Tables, 2017 revision, URL: https://esa.un.org/unpd/wpp/publications/files/wpp2017_keyfindings.pdf, last access 15.10.2018.

2) Bartmer, C.-A. (2016): Interview of the Wirtschaftswoche with the president of the German Agriculture Society. URL: http://www.wiwo.de/technologie/digitale-welt/smart-farming-wie-die-digitalisierung-die-landwirtschaft-revolutioniert/12828942.html, last access 15.10.2018.

3) H. Kagermann, F. Riemensperger, D. Hoke, G. Schuh, A.W. Scheer, et al. (2015): “Smart Service World: Recommendations for the strategic initiative ‚web-based services for business‘,” final report long version, published by acatech – Deutsche Akademie der Technikwissenschaften, Berlin, March 2015