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Digital revolution on the farm

A discussion about interfaces

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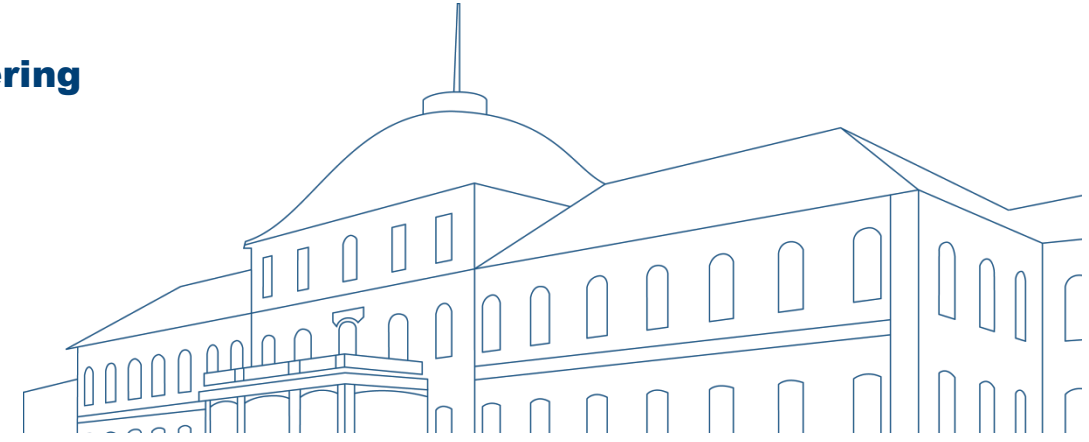
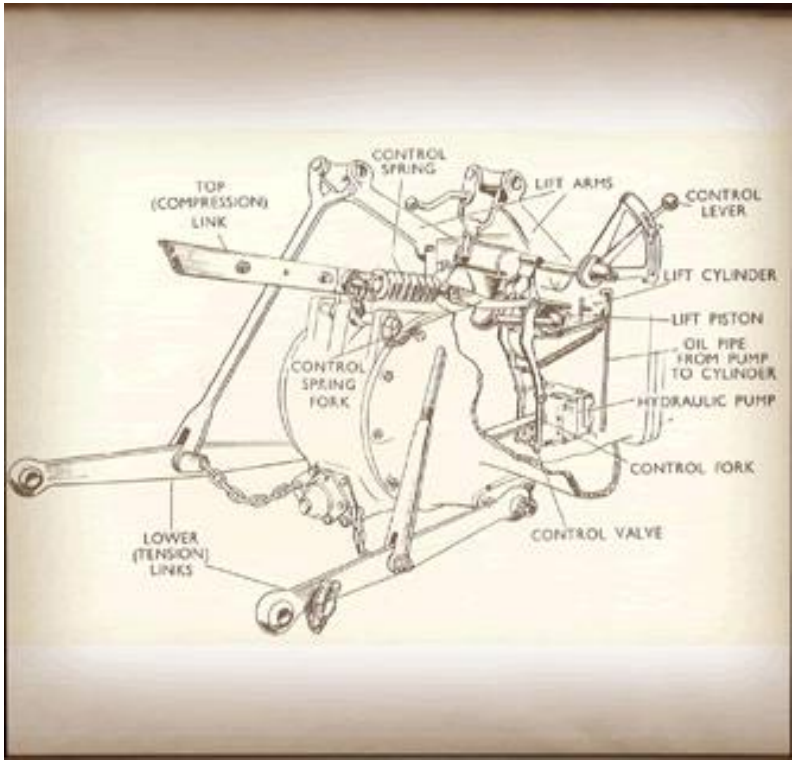


Major milestones in agricultural engineering

3 point linkage (Harry Ferguson, 1928)



Source: www.theharryfergusonlegacy.com

Pneumatic tire (T2 Continental, 1928)

Source: Continental

Electronic r

2

3

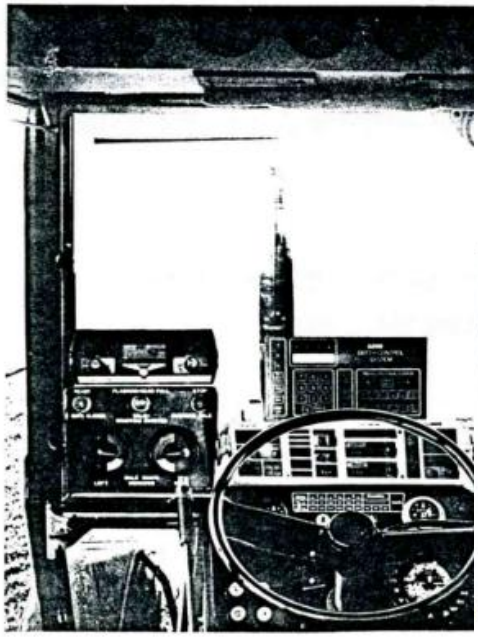
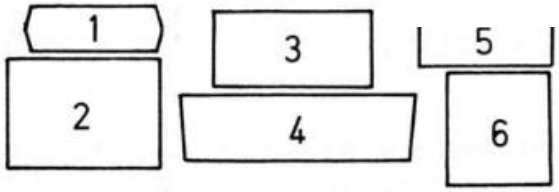


FIGURE 3. Electro-hydr

Source: www.agexpress.com/store/c23/harvesting/p1950/john-deere-43x53x-bale-trak-monitor/



4 Kirchbergen: Seed and Plant Controler
5 Bosch: Hitch-Tronic
6 SED: Automatic Sprayer Control

Fig. 1. Electronic Tractor Instrumentations of Today.

ISOBUS - 1990s (ISO 11783)

Source: mueller-elektronik.de/en/isobus/

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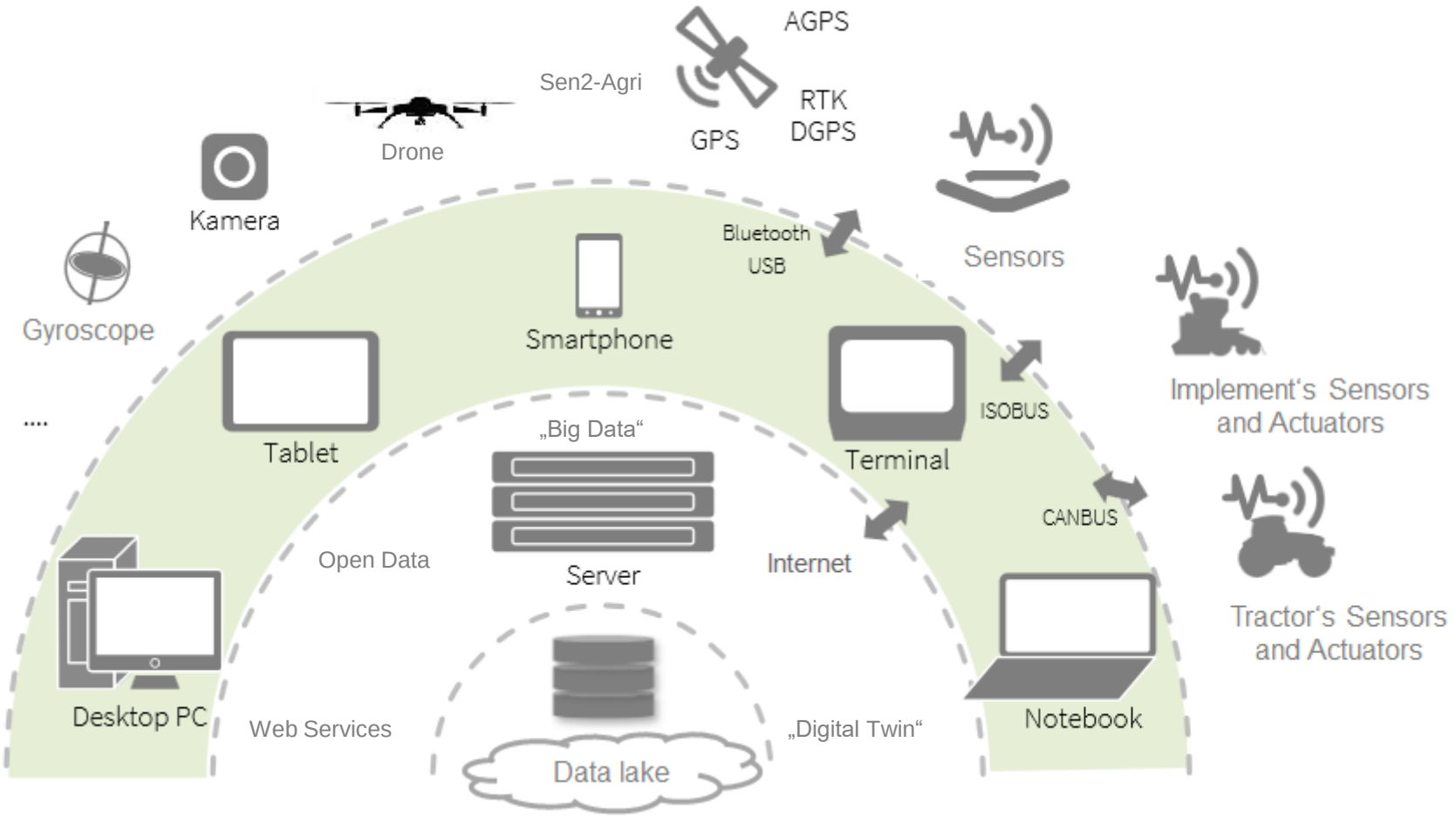
Former technology infrustructure

Today‘s technology infrustructure



Source: R. Matthias; Horsch GmbH, modified

Physical world – Farm level

Source: Geoprospectors

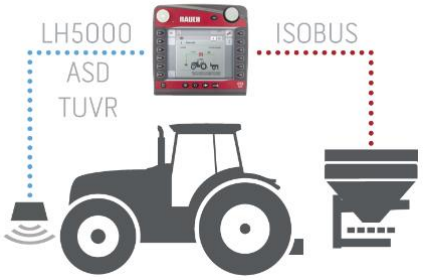
Source: CLAAS

Source: REICHHARDT

Source: SafeGuard

Source: Greentronics

Source: Greentronics

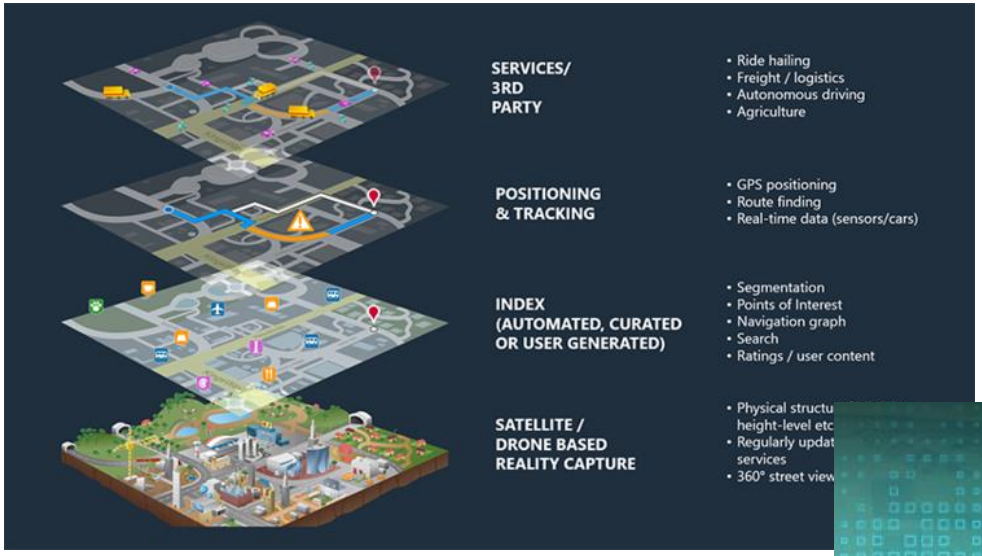


Source: CCI-ISOBUS

Source: Raven

Source: Topcon

Cyber (digital) world – Cloud level



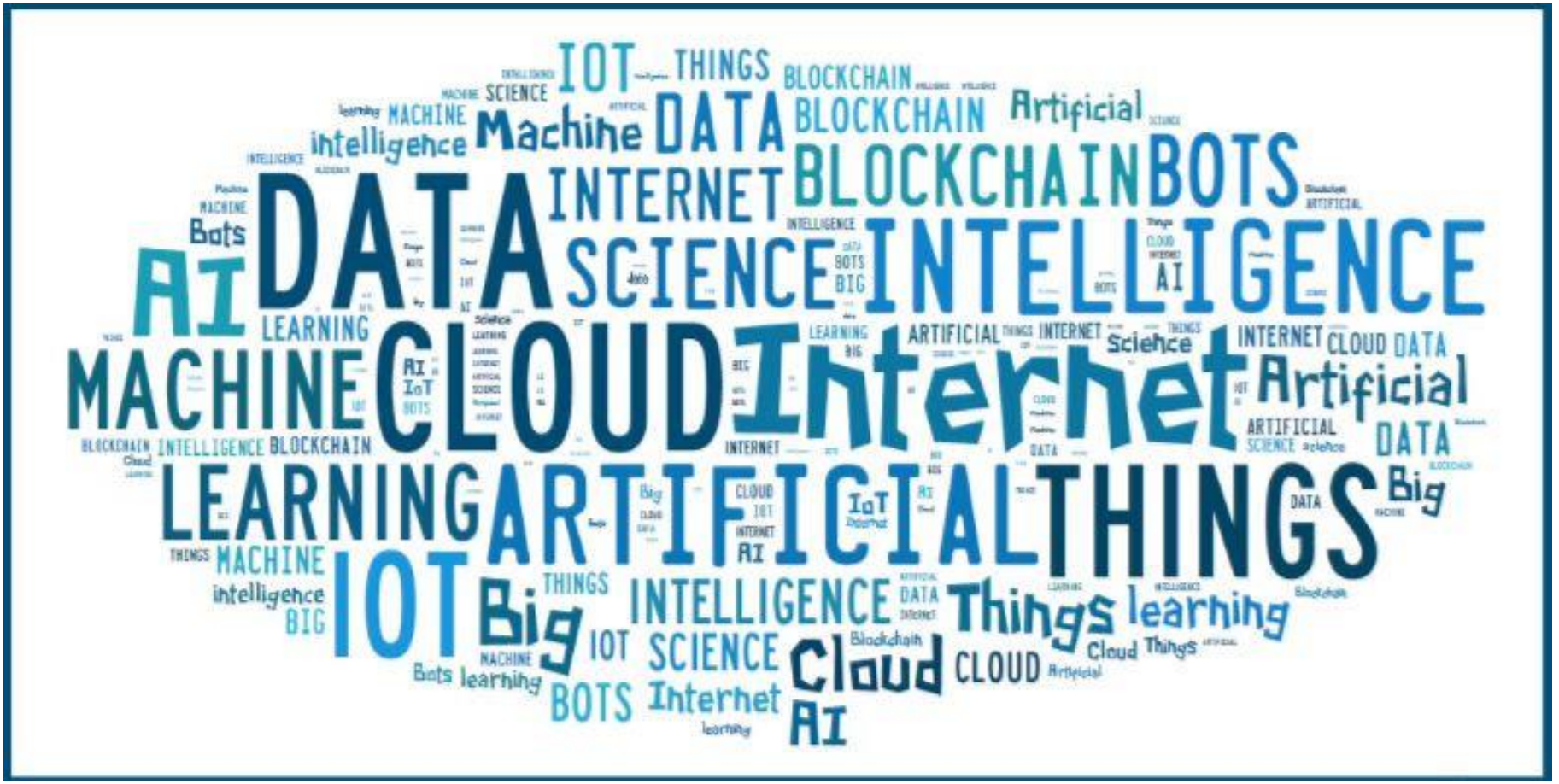
Source: www.bim-y.com

Multi-layer information

Digital twins

Source: www.plm.automation.siemens.com

Digital Technologies



Source: tagxedo.com

Digital Technologies in Farming

PHYSICAL

Sensors / Actuators
- IoT, WSN, Edge Computing
- ISOBUS (ISO11783)
- UAV, UGV

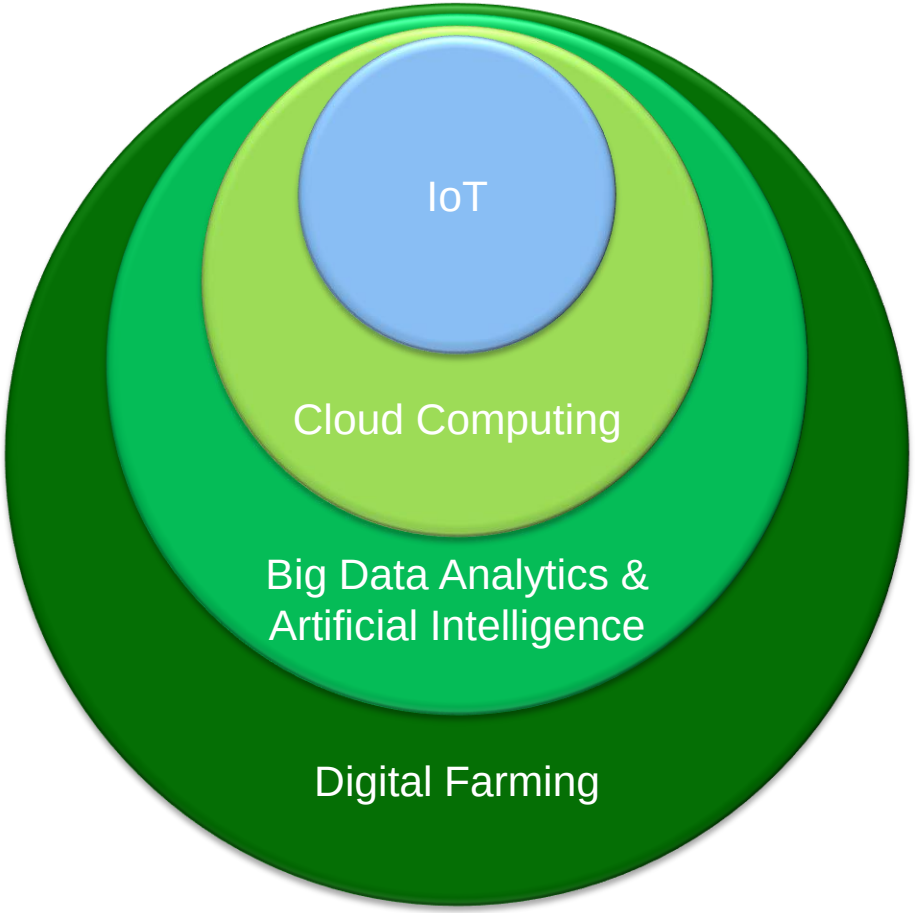
Interoperability!

CYBER

Cloud Computing
- On-demand computing services
- IaaS, PaaS, SaaS
- Farm Management Systems

Big Data and AI
- Apache Flink and Spark
- Machine Learning
- Deep Learning

Digital Farming - Farming 4.0
- Highest level of cognition
- Data-driven agriculture
- Digital twins

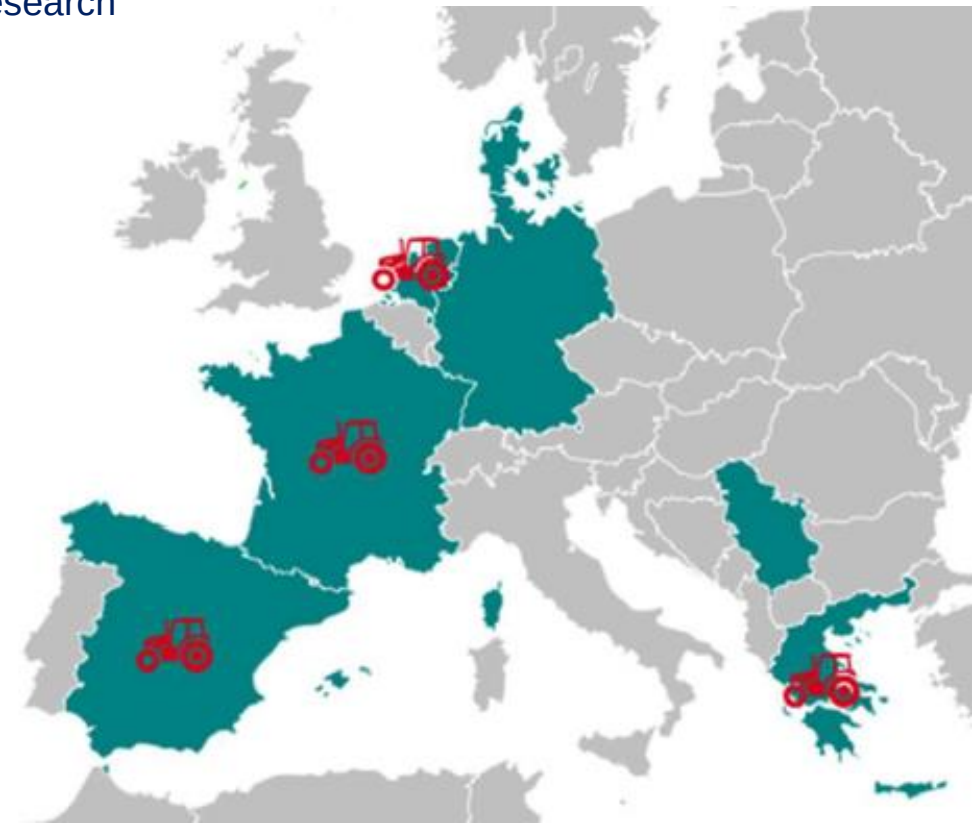


Cyber-physical interface – Hohenheim Spin-off

Source: EXA Computing GmbH

A look into the future …

Coordinator:	Stichting Wageningen Research
Funding:	6.83 Mio. EUR
UHOH:	0.56 Mio. EUR
No. of Partners:	16
Duration:	01.2021 - 12.2024



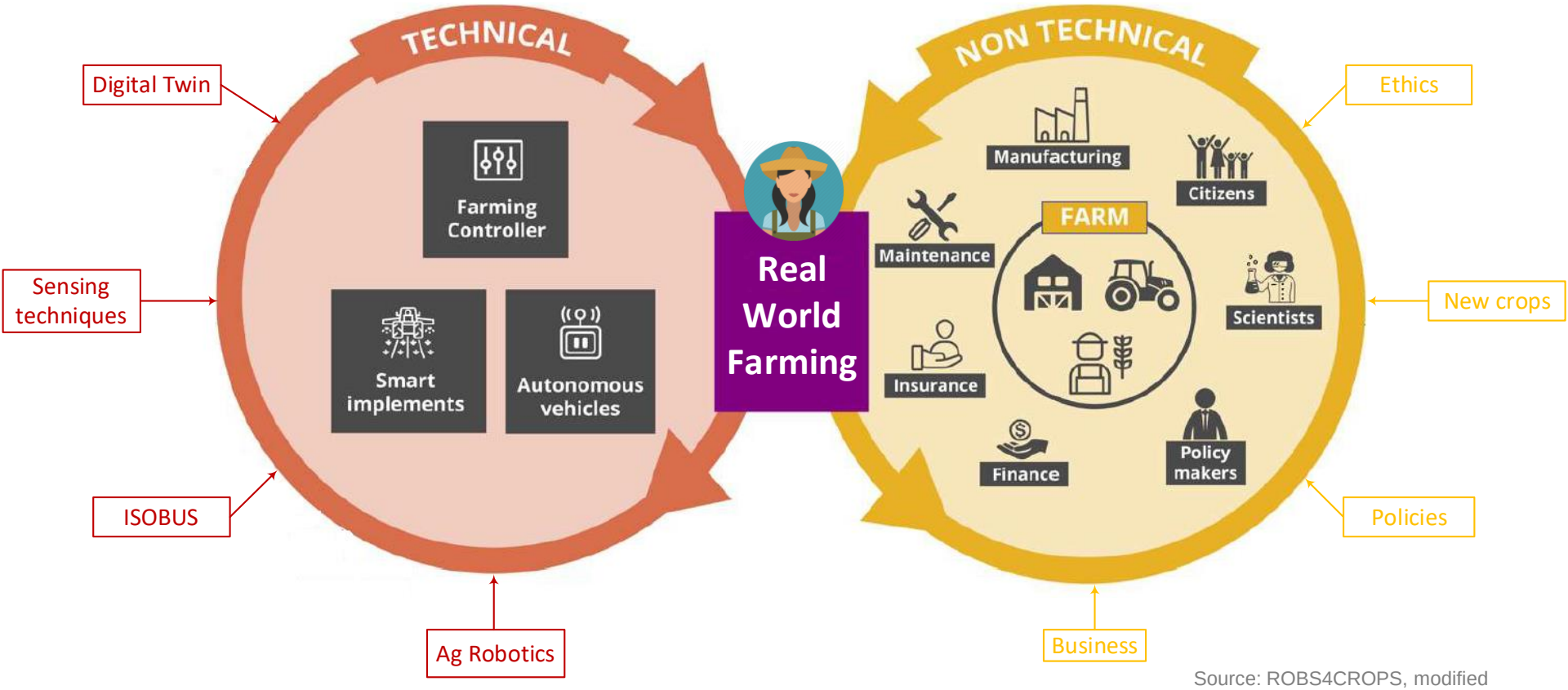
Source: ROBS4CROPS

ROBS4CROPS – Robotic platforms

Source: Agrointelli

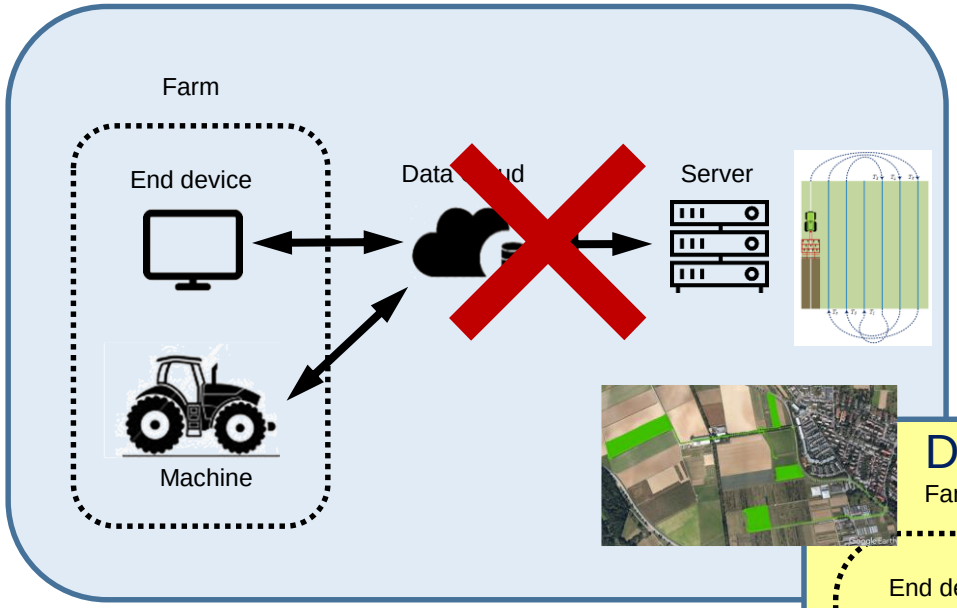
Source: AGreenCulture

ROBS4CROPS – Digital Farming Ecosystem



Source: ROBS4CROPS, modified

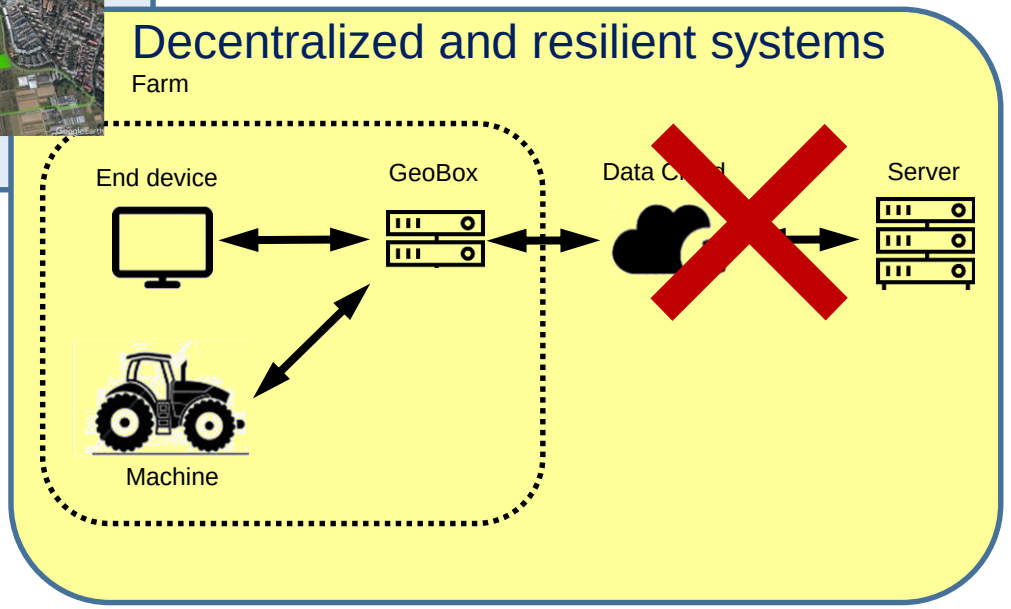
Digital revolution – No connection to the cloud?



Should primary production stop?

Source: Reuter et al. 2018, modified

Primary production should continue!



Conclusion

- Digital technologies are a reality in farming.
- The need today is an interoperable interface between the physical and the digital world (4th milestone?) .
- Digital-farming systems should consider a decentralized and resilient architecture.
- All technologies that are revolutionizing agriculture should be targeted at supporting the farmers and not replacing them.

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Thank you!

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