

Big opportunities for big data in food and agriculture

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Based on work with LEI team and others

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DATA CAPTURING TOOLS FOR BETTER CONTROL



Disruptive ICT Trends:

- **Mobile/Cloud Computing** – smart phones, wearables, incl. sensors
 - **Internet of Things** – everything gets connected in the internet (virtualisation, M2M, autonomous devices)
 - **Location-based monitoring** - satellite and remote sensing technology, geo information, drones, etc.
 - **Social media** - Facebook, Twitter, Wiki, etc.
- **Big Data** - Web of Data, Linked Open Data, Big data algorithms

everywhere

anything

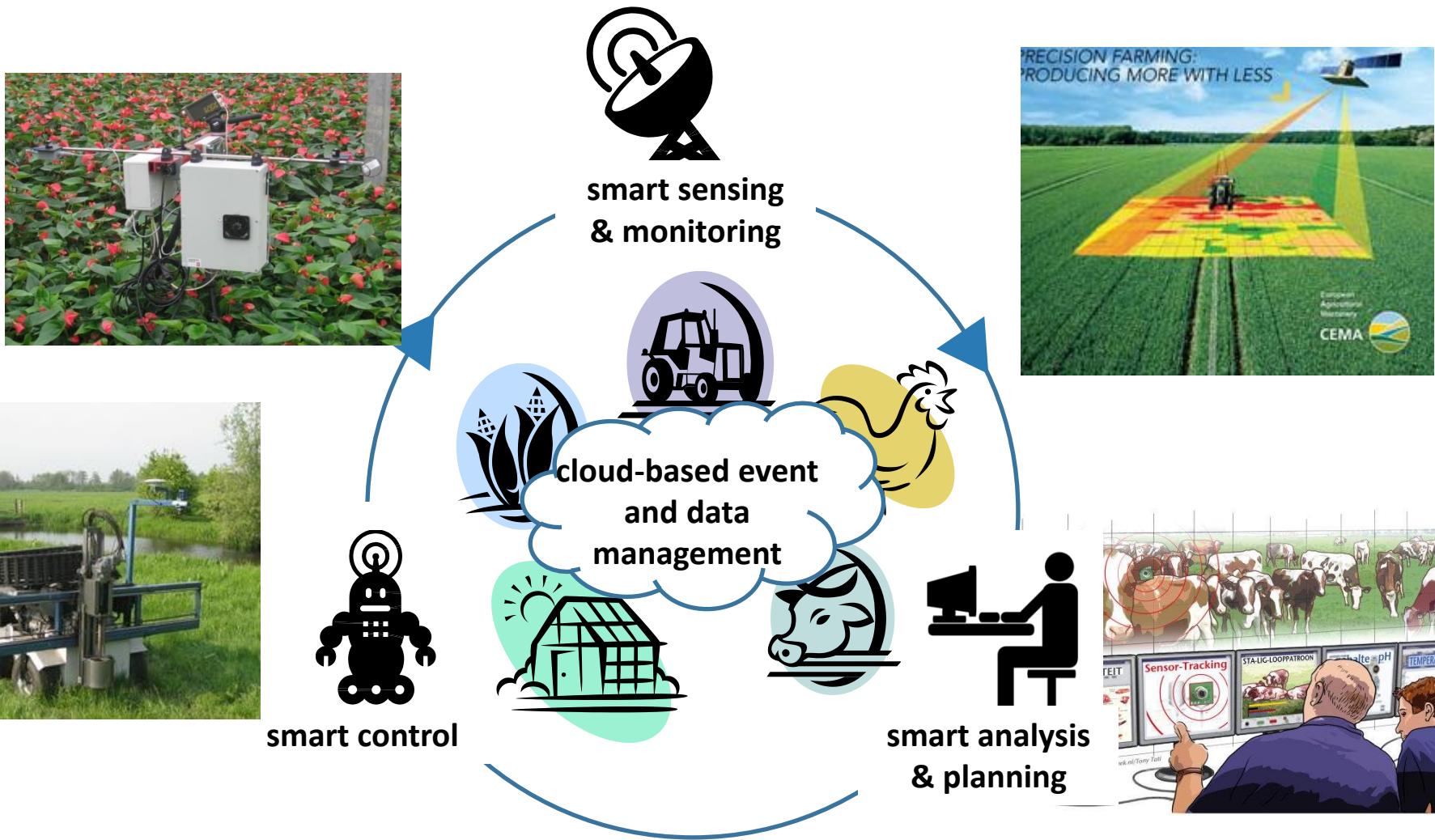
anywhere

everybody

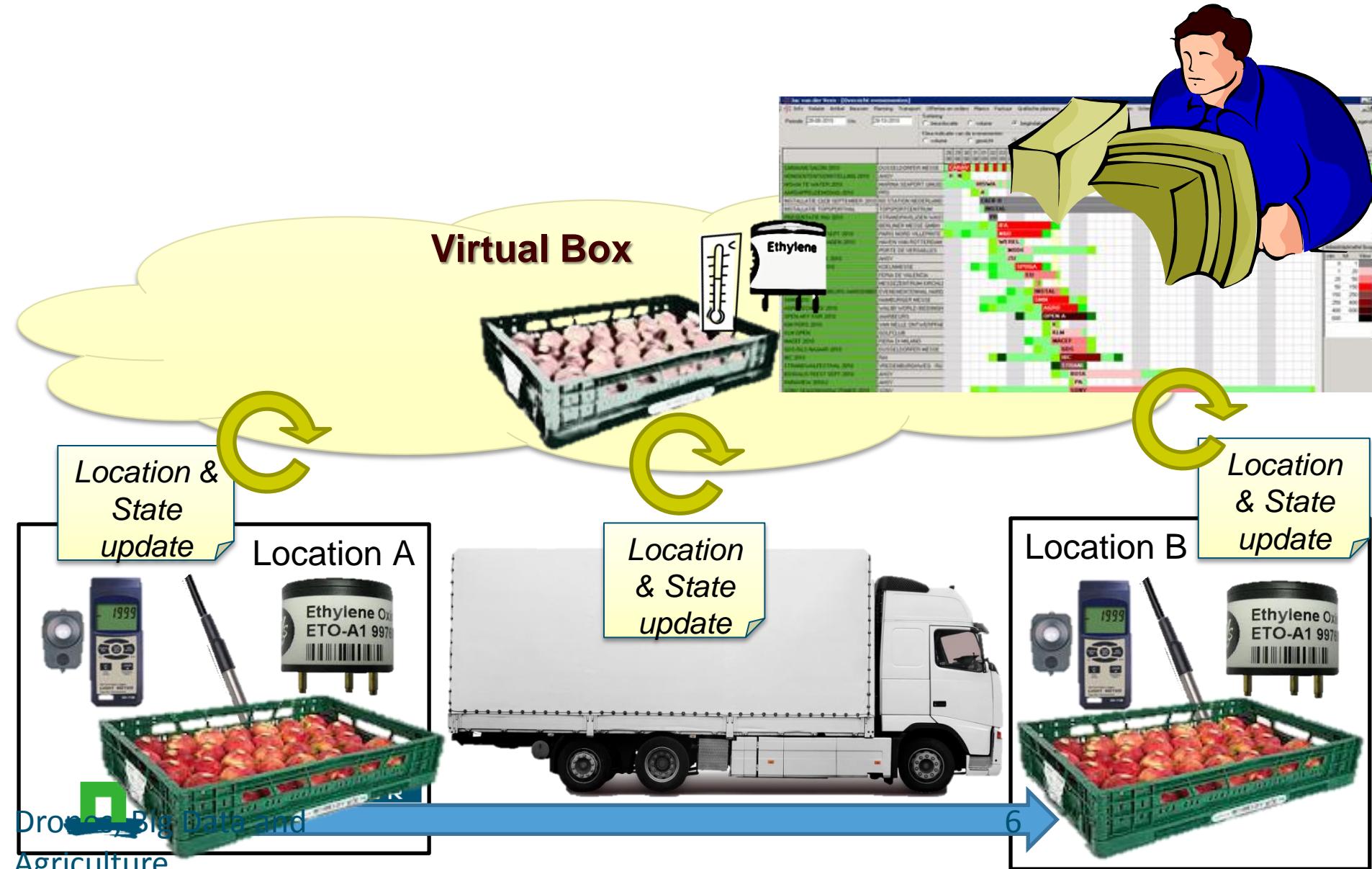
Content: line of reasoning

- ICT developments – why now?
- Effects on management and business models
- Effects on chain organisation
- Effects on markets
- Governance: centralisation or not?
- Implications for government policy

IoT in Smart Farming



IoT in Agri-Food Supply Chains



IoT and the consumer

Smart Farming
tracking/& tracing

Smart Logistics

Domotics



Health

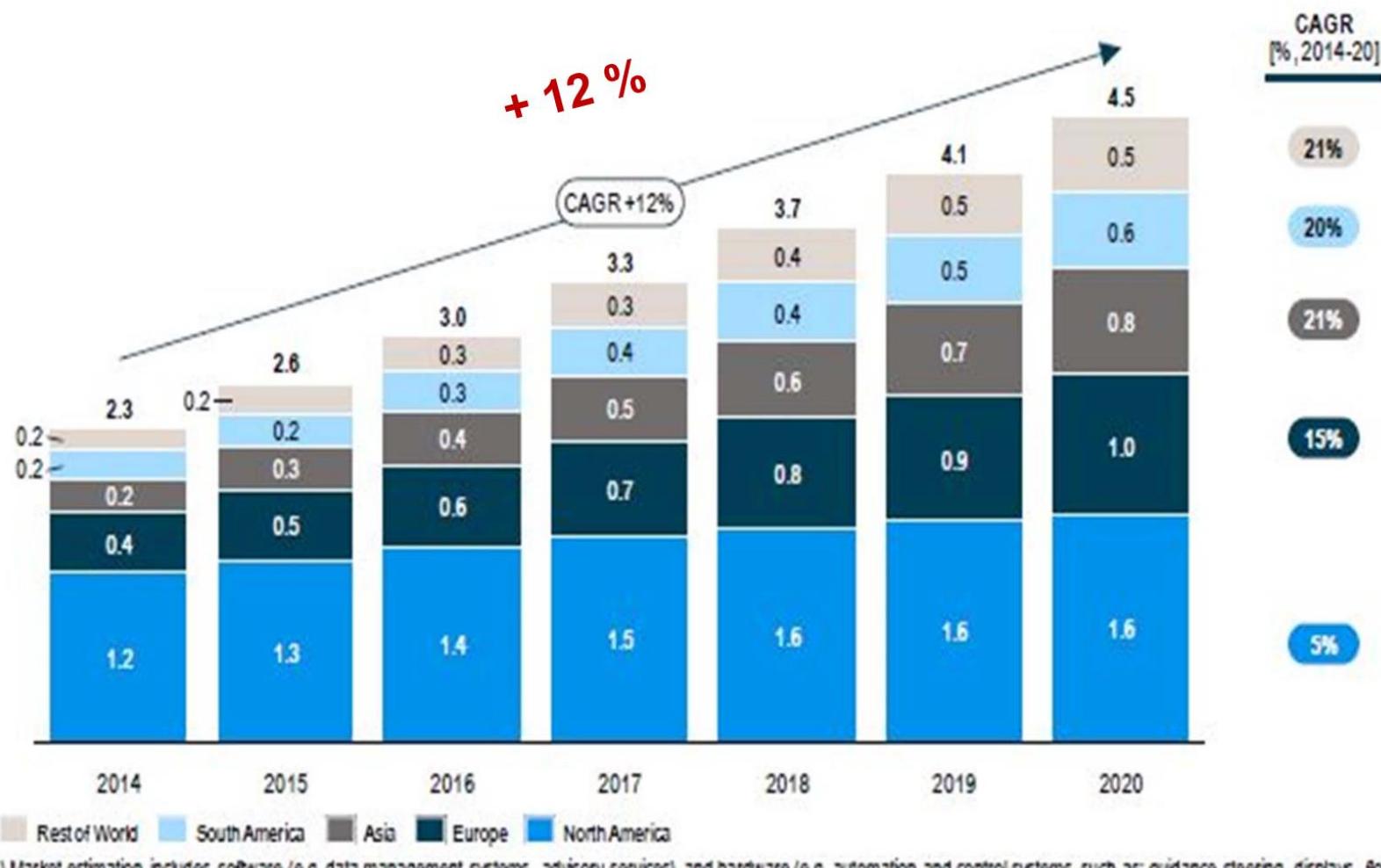


Drones, Big Data and Agriculture



zipongo
Health
Yourself
Fitness/Well-being

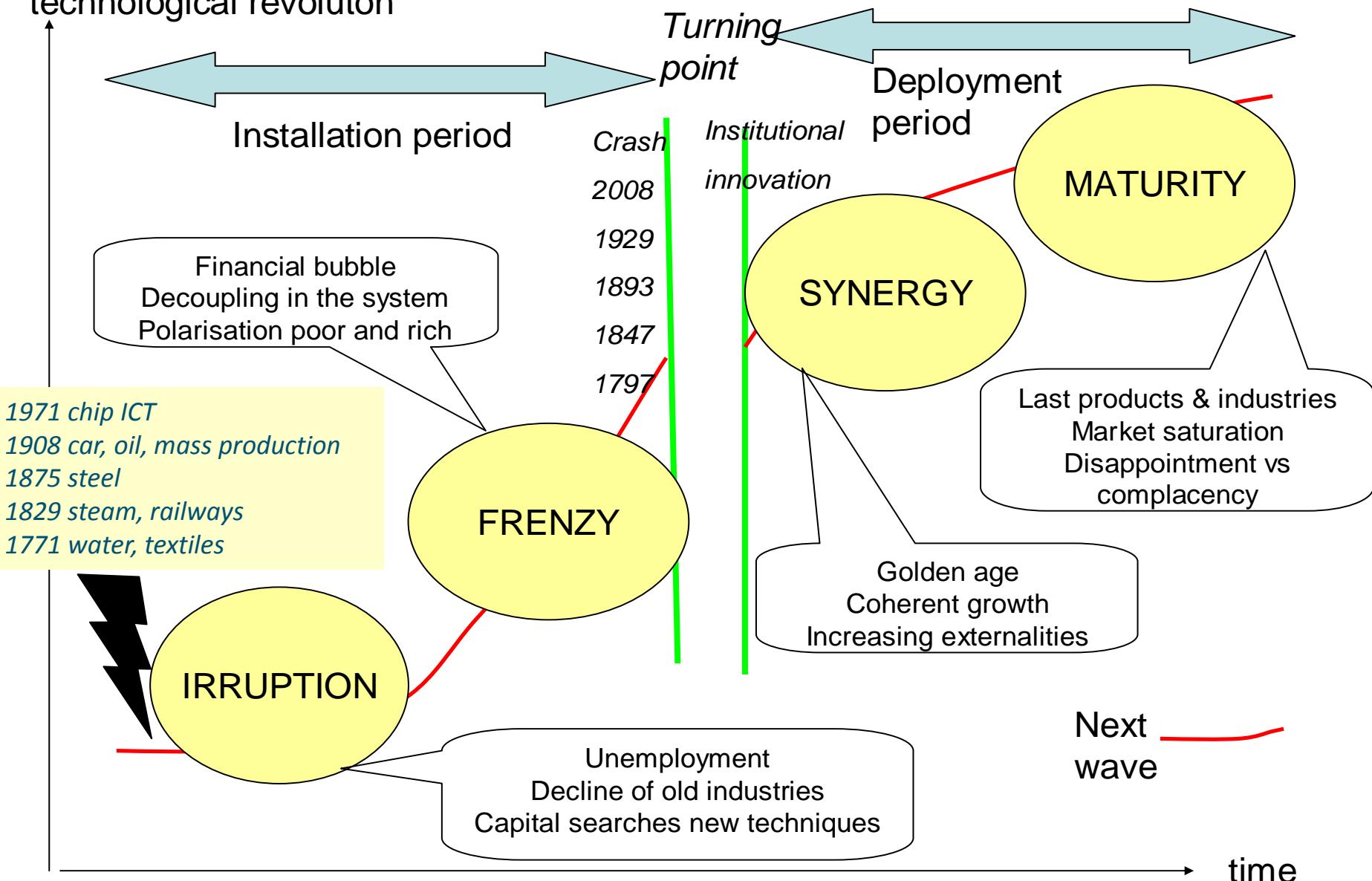
Figure 2: Market estimation of Precision Farming 2014-2020 [EUR bn]



Source: Roland Berger

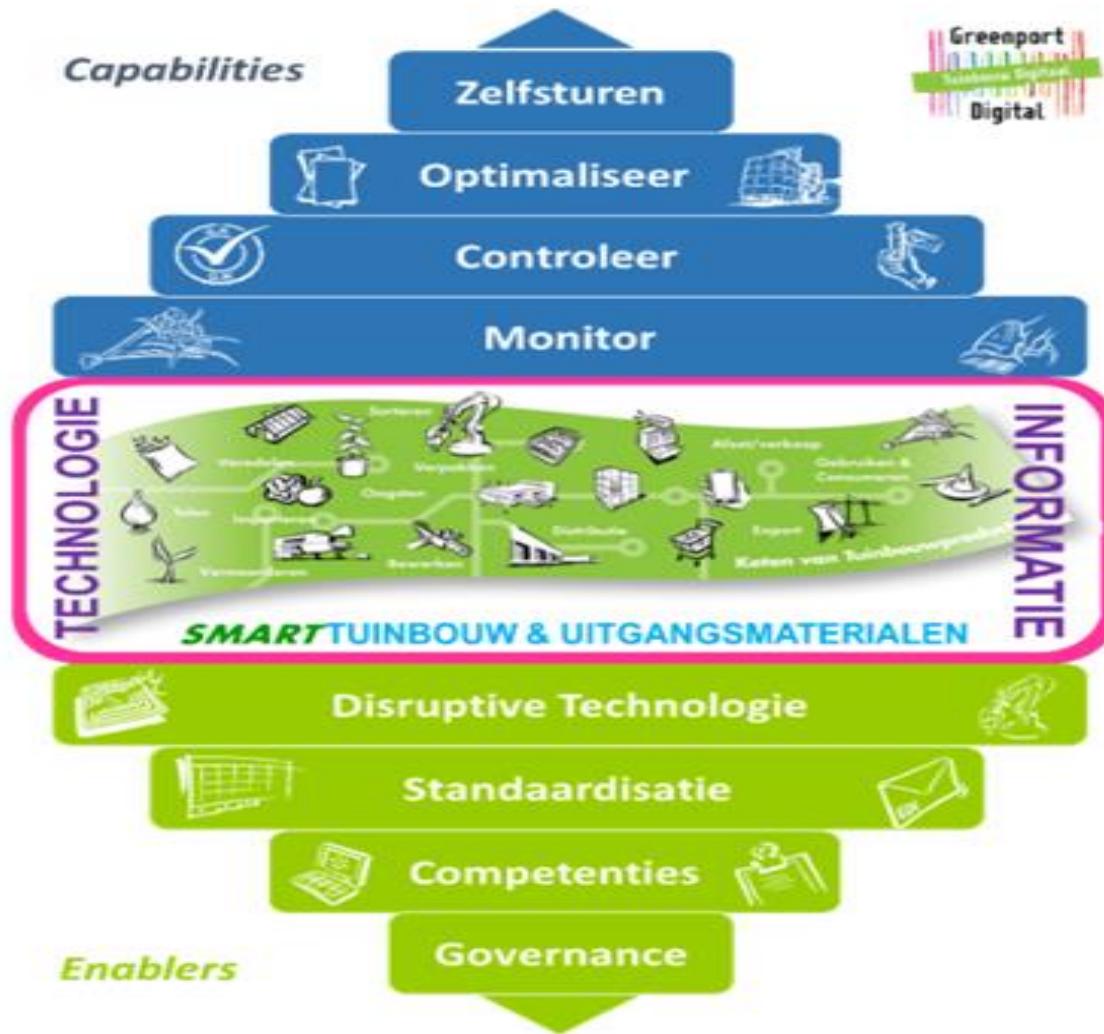
The opportunity for green growth

Degree of diffusion of the technological revolution



Based on Perez, 2002

Effect on management



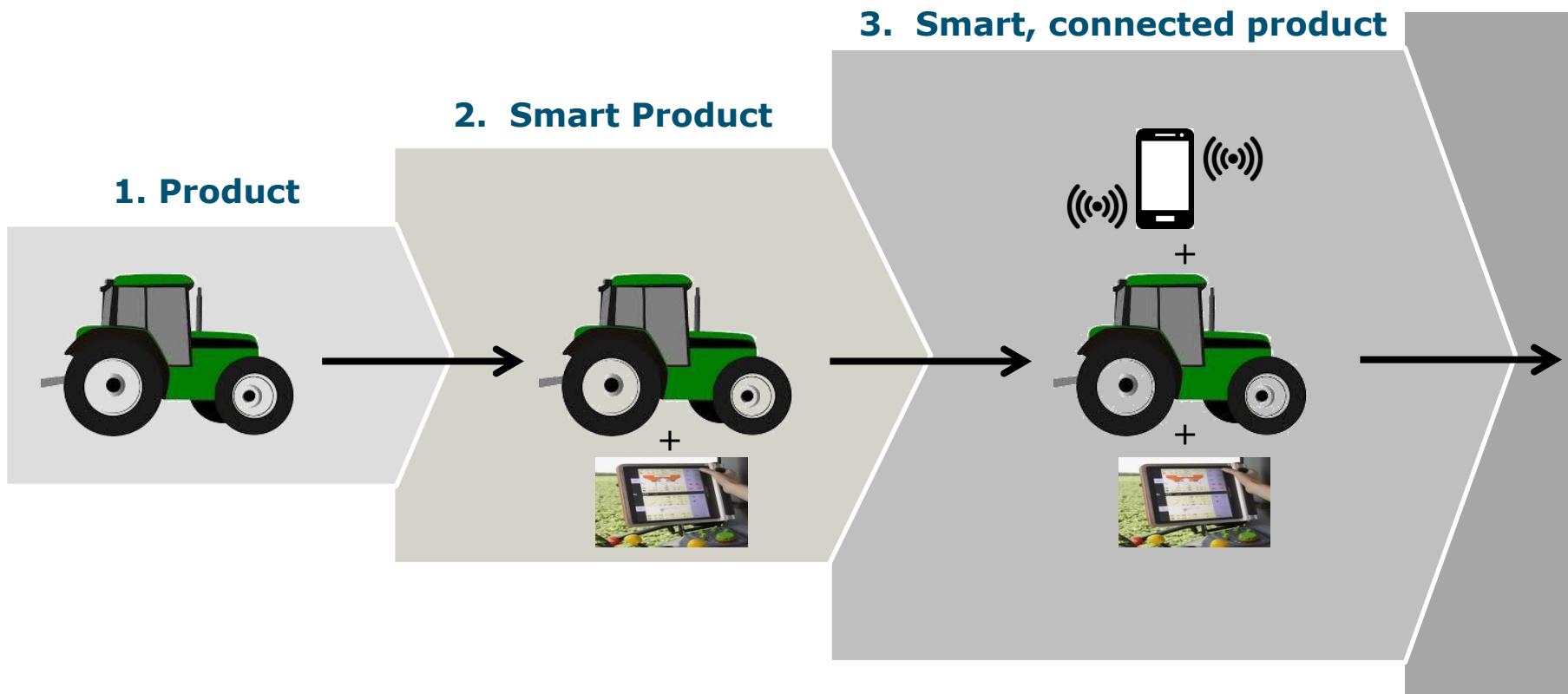
Effect on business models: how to earn money with data?

- basic data sales (commercial equivalent of open data; new example: Farm Mobile)
- product innovation (heavy investments by machinery industry, e.g. John Deere, Lely's milking robots)
- commodity swap: data for data (e.g. between farmers and (food) manufacturers to increase service-component)
- value chain integration (e.g. Monsanto's Fieldscript)
- value net creation (pool data from the same consumer: e.g. AgriPlace)

See: Arent van 't Spijker: "The New Oil - using innovative business models to turn data into profit", 2014

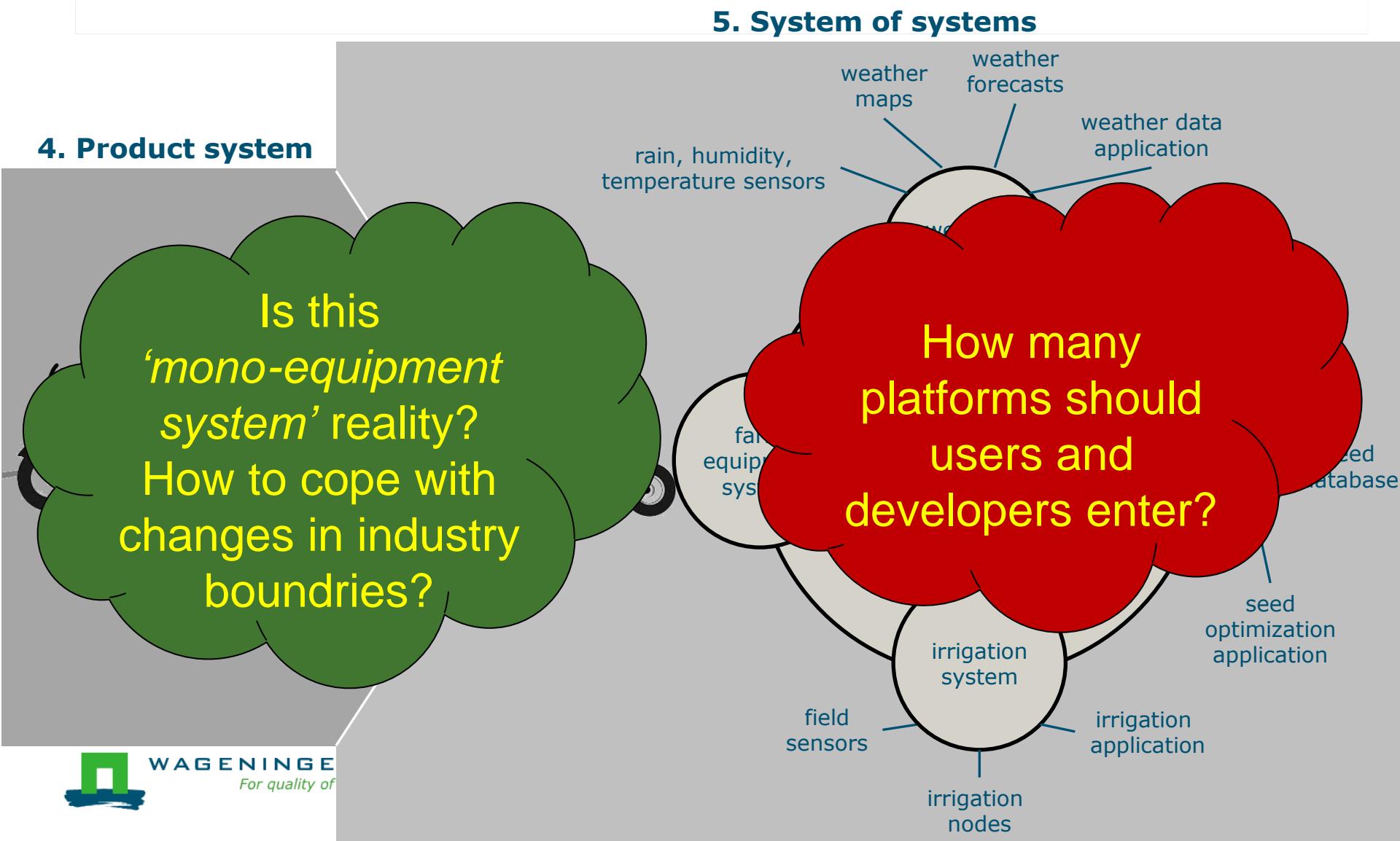
Redefining Industry Boundaries (1/2)

(according to Porter and Heppelmann, Harvard Business Review, 2014)

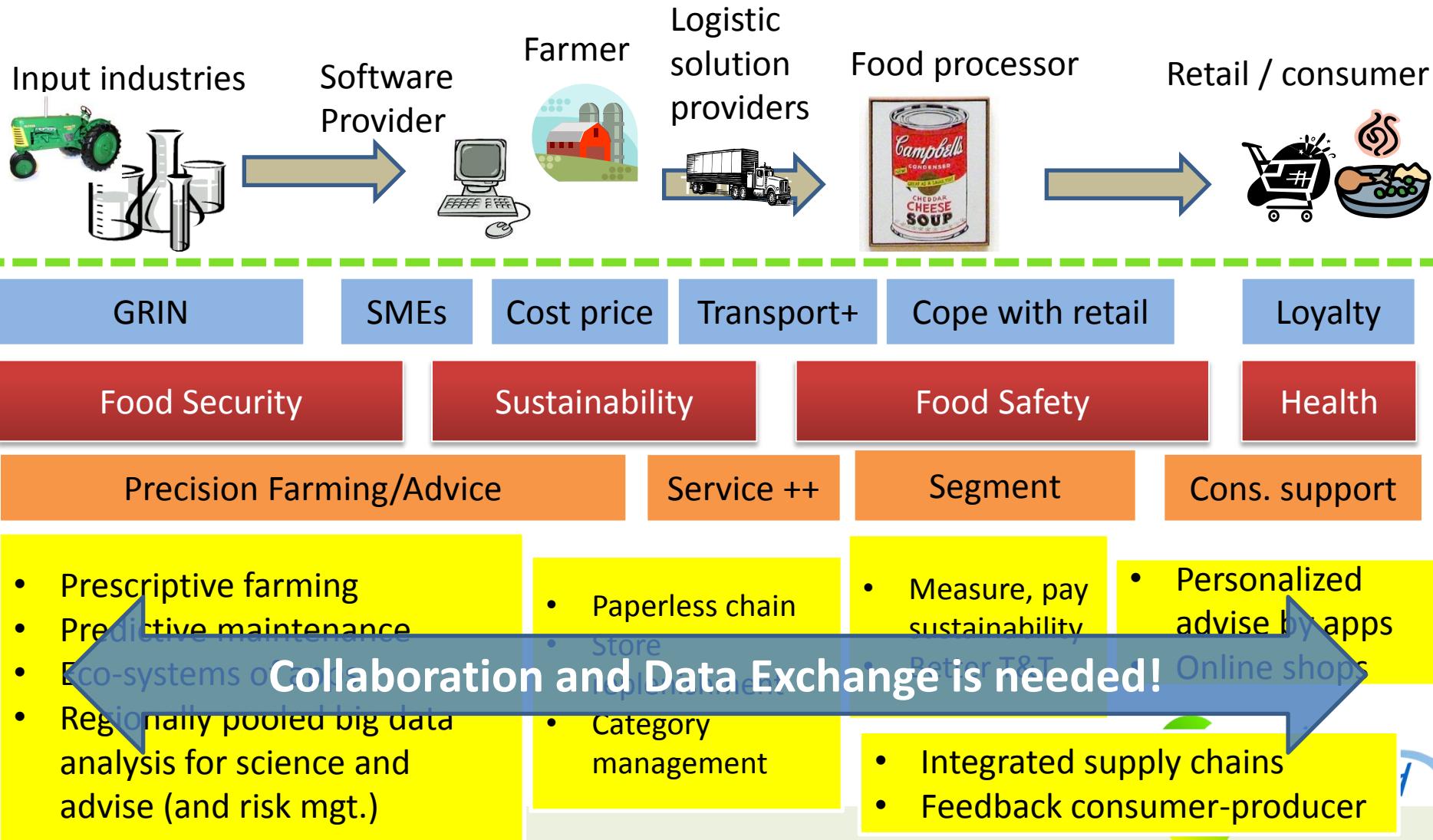


Redefining Industry Boundaries (2/2)

(according to Porter and Heppelmann, Harvard Business Review, 2014)



Which innovations and new business models are possible ?



Data exchange by ABCDEFs

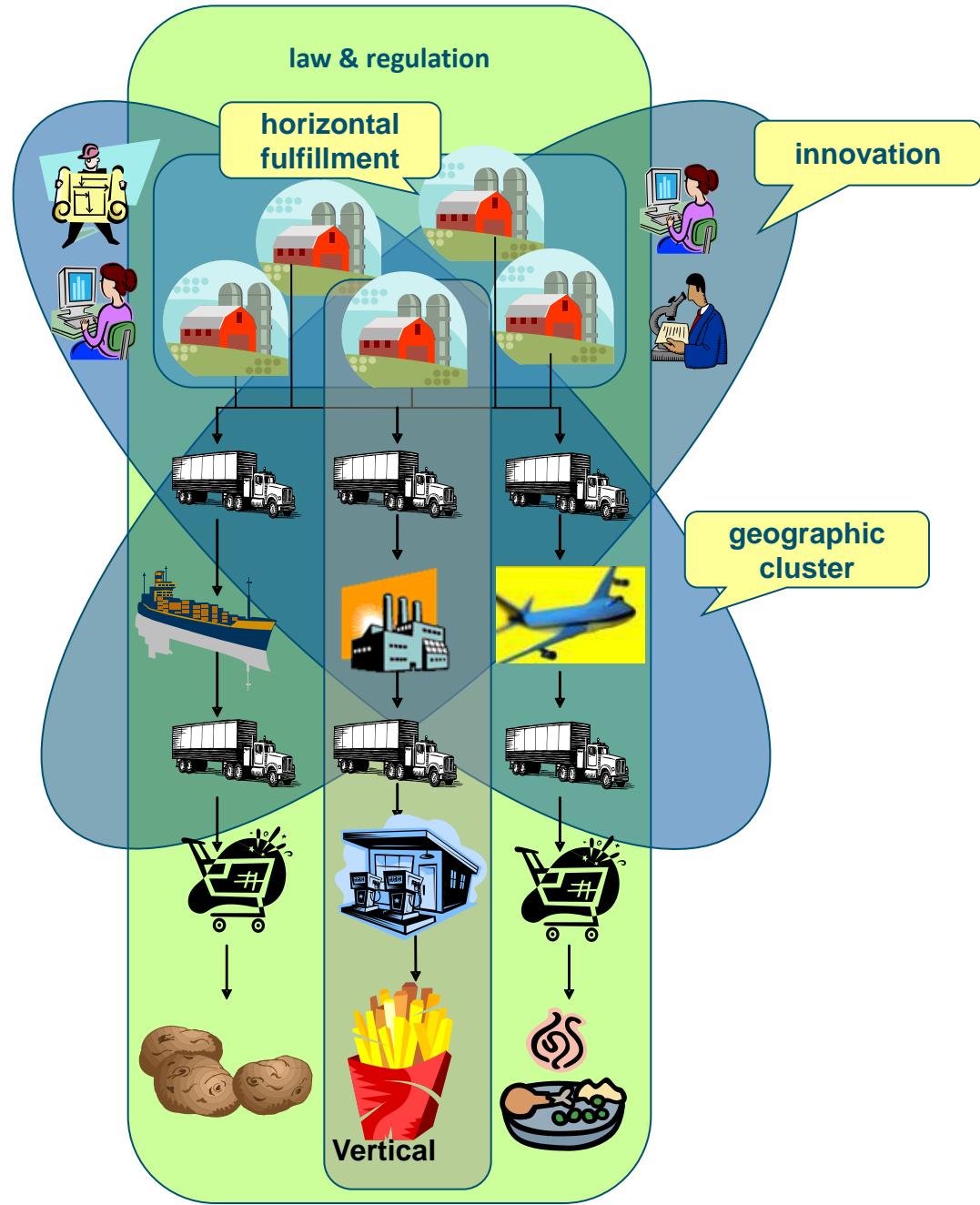
- Large organisations mostly have gone digital, with ERP and other systems
- But between organisations (especially with SMEs) data exchange and interoperability is still very poor
- While more data exchange for collaboration and business process control in the chain is needed
 - As data need to be combined to create value
 - The better we exchange data, the less disruptive it is for current business models and organisations

➤ There is a need for ABCDEFs:

Agri-Business Collaboration & Data Exchange Facility

Proprietary/closed or open ABCDEFs?

Agri-Food Supply Chain Networks are multi- dimensional



Some examples of data exchange platforms in agriculture

- Fieldscripts (Monsanto)
- Farm Business Network (start-up with Google Ventures)
- Farm Mobile (start-up with venture capitalist): strong emphasis on data ownership
- Agriplace (start up by a Dutch NGO with a sustainability compliance objective)
- FIspace (recently completed EU project ready for commercialisation via a Linux-like Open Source model)
- Note the different governance structures!

The USA battleground: Monsanto (et al.)



PRESCRIPTIVE FARMING

based on
VARIABLE RATE
APPLICATION



USA: Farmers Business Network



FARMERS
BUSINESS NETWORK



Google

Farmers' owned,
investment by Google
Ventures

Summer 2015:

FBN has aggregated data from 7 million acres of farm land across 17 states, and they're growing 30% month over month. The platform is currently able to assess the performance of 500 seeds and 16 different crops.

Costs farmer \$ 500 / year.

USA: Farm Mobile



“Farmers believe their trust has been violated”:
their data go to multinationals, that announce
big future income from big data, while they have
pay for everything.

2016 = Farmer renewable revenue.

Farmers collect
'crop stories'
and decide where
they travel (and get a
few cents per item?)



December 2015

Farmobile Raises \$5.5M in Equity Financing From Anterra Capital

Farmobile was founded in the fall of 2013 as a self-funded company with two visions in mind, which were to digitize global agriculture and to protect farmer data rights in the process.

Based in Kansas City, Farmobile develops real-time proprietary data collection tools that standardize geo-located agronomic and machine data, regardless of the manufacturer. The company is a champion for farmer data rights, ownership and data portability. Farmobile is focused on strengthening existing farmer relationships and building tools to reduce the frictions of data portability.

Discussions among US farmers:

- Do I own my tractor? (IPR John Deere software > “an implied license for the life of the vehicle to operate the vehicle”)
- Do I own my own data? Who has access to my data?
- Does the government have access?
- Do companies gain market power on future markets ?
- Is there a lock inn ?
- Do I become a franchiser with the risks but not the returns?



American Farm Bureau Federation®

Code of Conduct



Farm Digital project

Sharing Data with AgriPlace:

Compliance Made Easy

<https://www.agriplace.com>



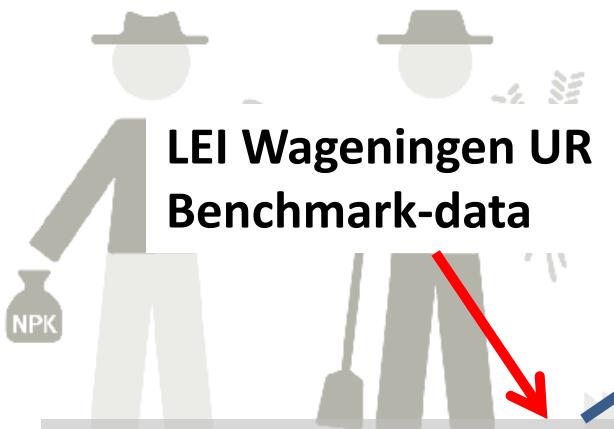
LESS ADMINISTRATIVE BURDEN AND CREATING VALUE

Consumers

- Relation with growers
- Better understanding of labels
- More transparency

Auditors

- More effective audit on farm
- More new clients
- Savings of >€100 per audit visit



Farmers and Growers

- Less time and irritation to collect data
- More digital management
- Savings of >€500 euro per grower

PROTOTYPE
AGRI-PLACE

FMS-manage-
ment software

GOV. open data

Retailers

- Quicker and more complete data
- Better risk management
- > €30 savings per farm request



- Cost savings on data collection
- Increase data quality
- Savings > €10,000 per importer

Fispace: an eco-system of apps as alternative

FARMER SCANS PESTICIDES PACKAGE IN THE FIELD

APP

Can we link apps / services in a clever way ?

Leading to a market for services (apps and data)?

BASED
ON

Can this market be European (not MS), so that development costs of services (apps and data) are shared ?

FARMER CAN SHARE DATA WITH GOVERNMENT,
SGS-AUDITOR GLOBAL GAP AND PUBLIC

DOES IT
WORK WITH
BRC /
ISAcert

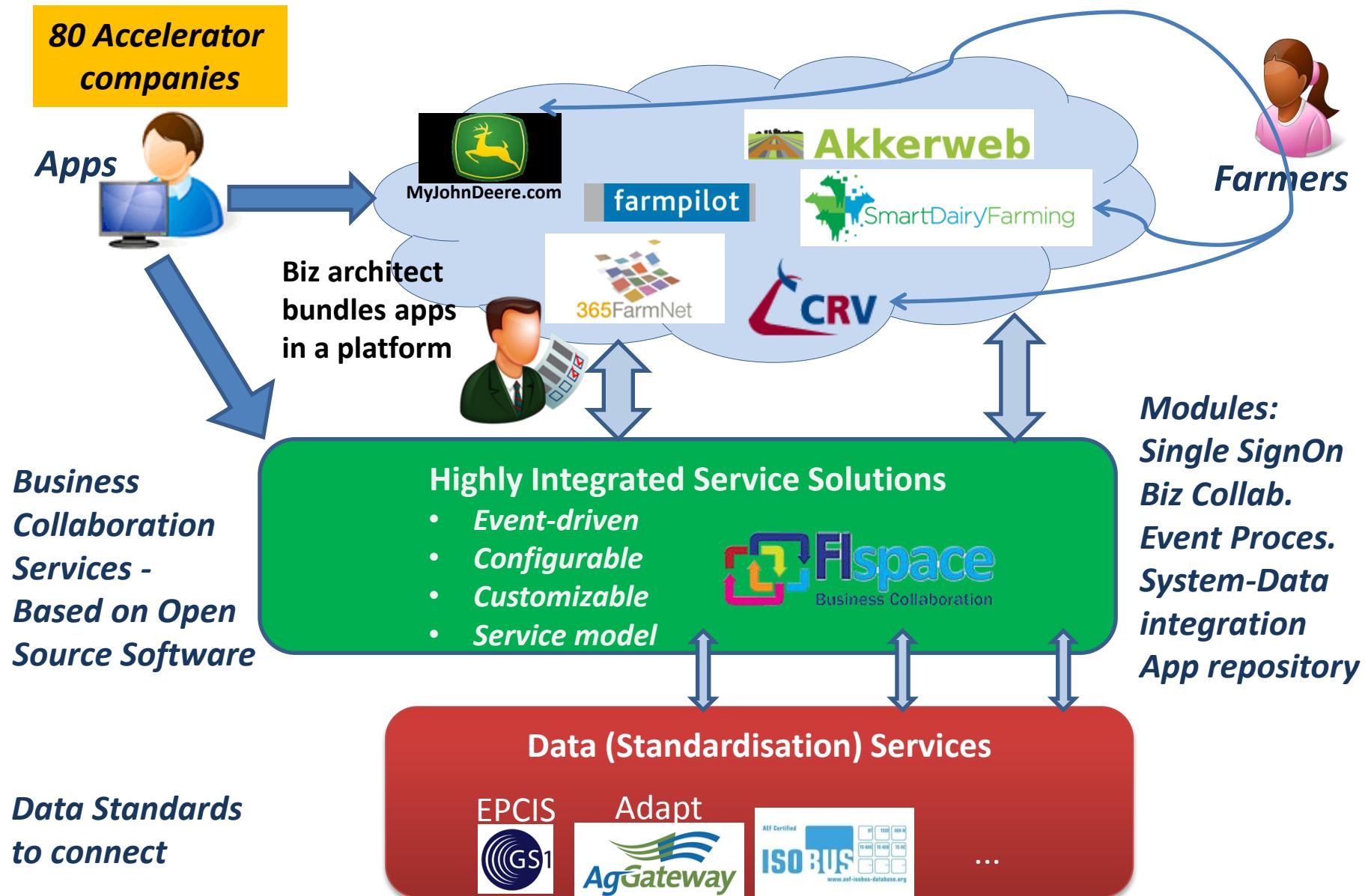
Towards highly integrated solutions



Platforms in the cloud of input suppliers and food processors:

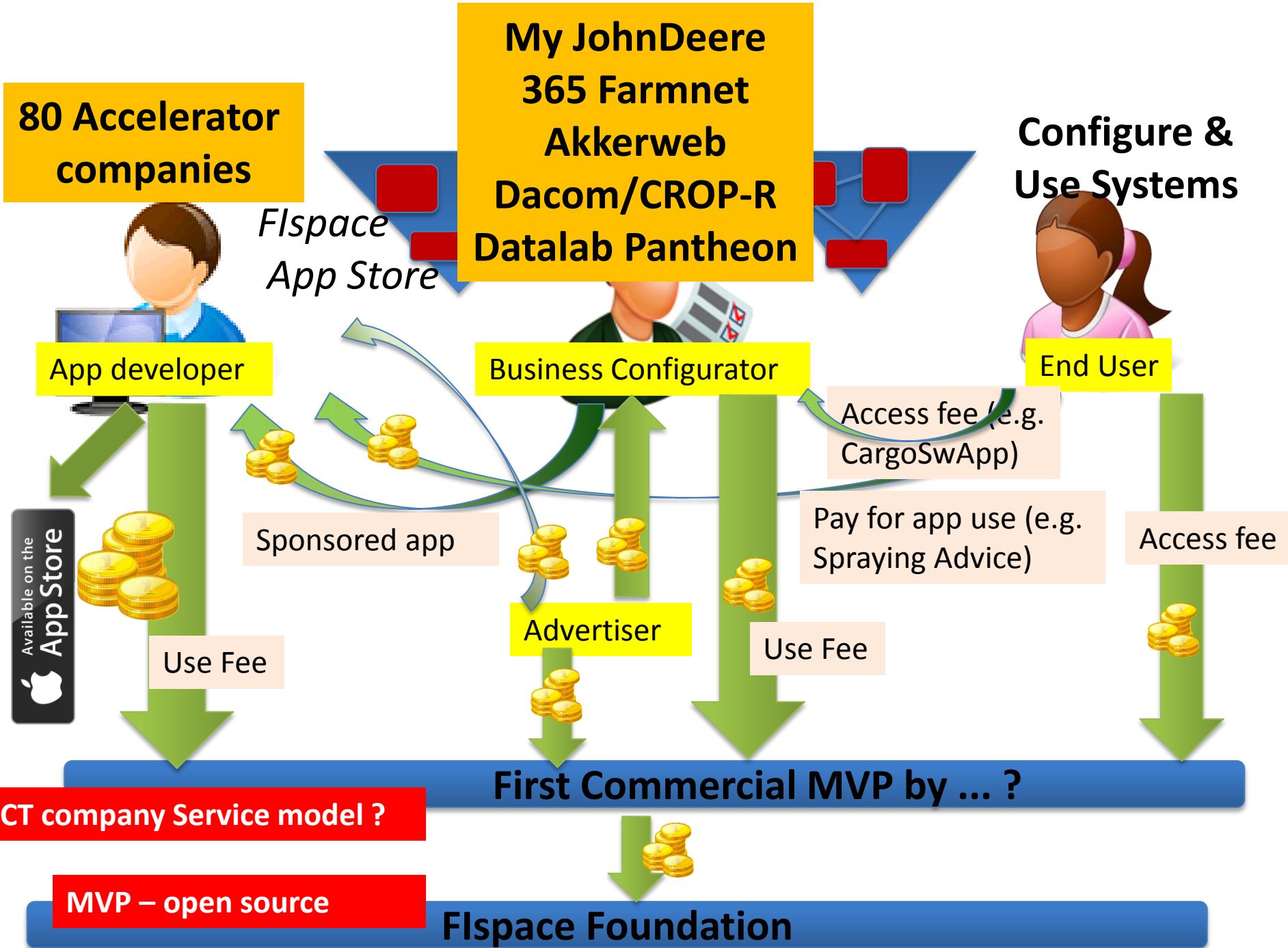
- What is the scope (connect only machinery or also with chemical companies and accountants ?)
- Reduce costs of linking individually with many other platforms and software packages (especially in chains that are not integrated)
- Is it possible to use apps with their own business model, so that the platform does not have to pay all their costs? >> can (non-strategic) apps be available on several platforms?
- How to prevent that farmers complain to have to pay for basic apps (e.g. weather service) more than once?

Towards highly integrated solutions

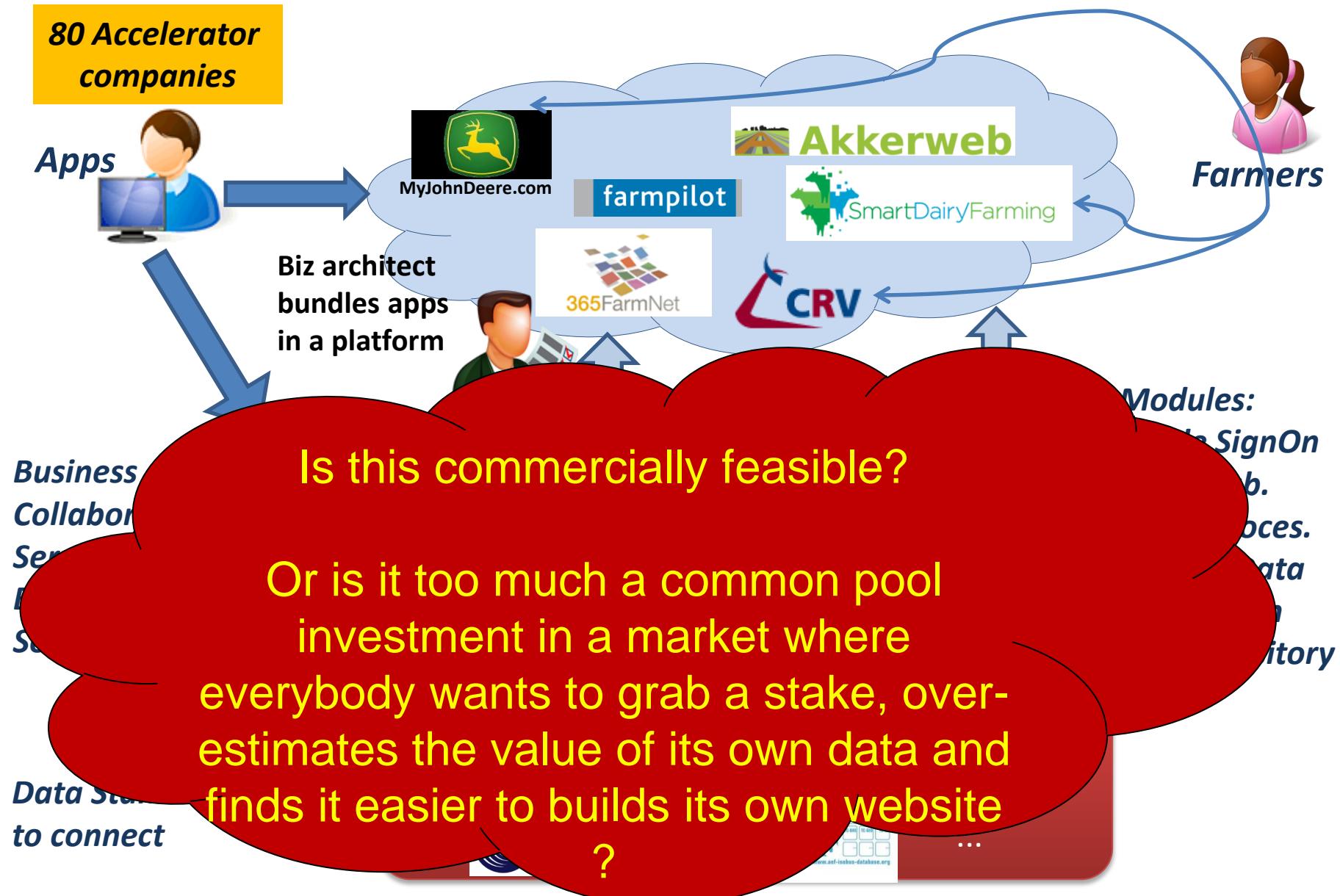


Value proposition

| | |
|---|---|
| Platforms | solve the issue of connecting individually with a lot of business partners to exchange data : connect easily to apps (and data services in apps) based on EDI-standards or let farmers / end-users make the connection |
| App-developers | Develop one app for different platforms Reach a European / Global market |
| Governments (and industry organisations) | See above for your government platform (paying agency, public advisory service etc.) Promote innovation by a competitive market for apps with new services Prevent lock-in situations for farmers and unbalanced power relations in the information exchange in food chains |
| Farmers | Not a direct Flspace client. Platforms using Flspace inside provide you more choice |
| Software writers in platforms and app-companies | Helps you to be part of an open source community that cares for sustainable food production with up to date ICT – be recognized by your peers |



Towards highly integrated solutions



Effects on Chain organisation

ICT lowers transaction costs

- In social media (Facebook etc.): the world is flat with spiky metropolises
- In 'sharing' platforms (peer-to-peer like AirBnb, Uber, crowd funding): creates new suppliers (reduce overcapacity) and users. Long tail effects.
- In chain organisation: centralisation to grab advantages of data aggregation or more markets?
- Platforms: centralisation via data management

Organisational arrangements in the food chain are changing

Programmability: Low → High

Asset specificity: Low → High

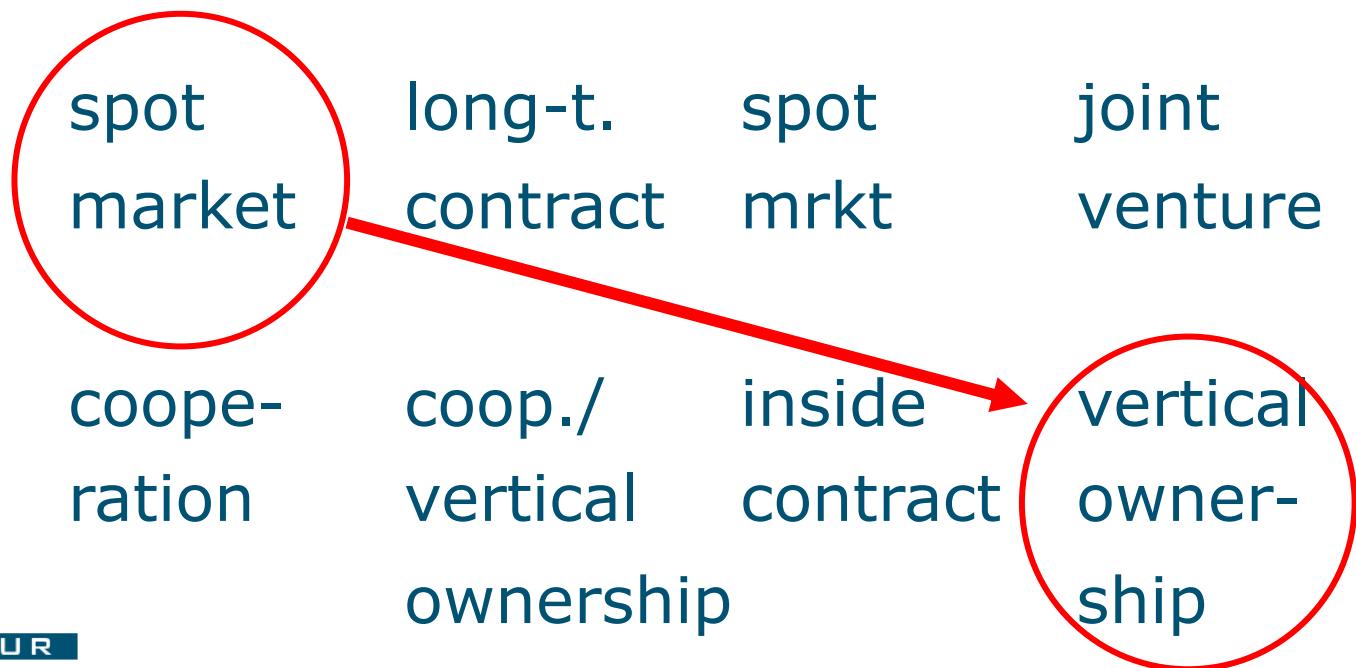
Contribution

partners

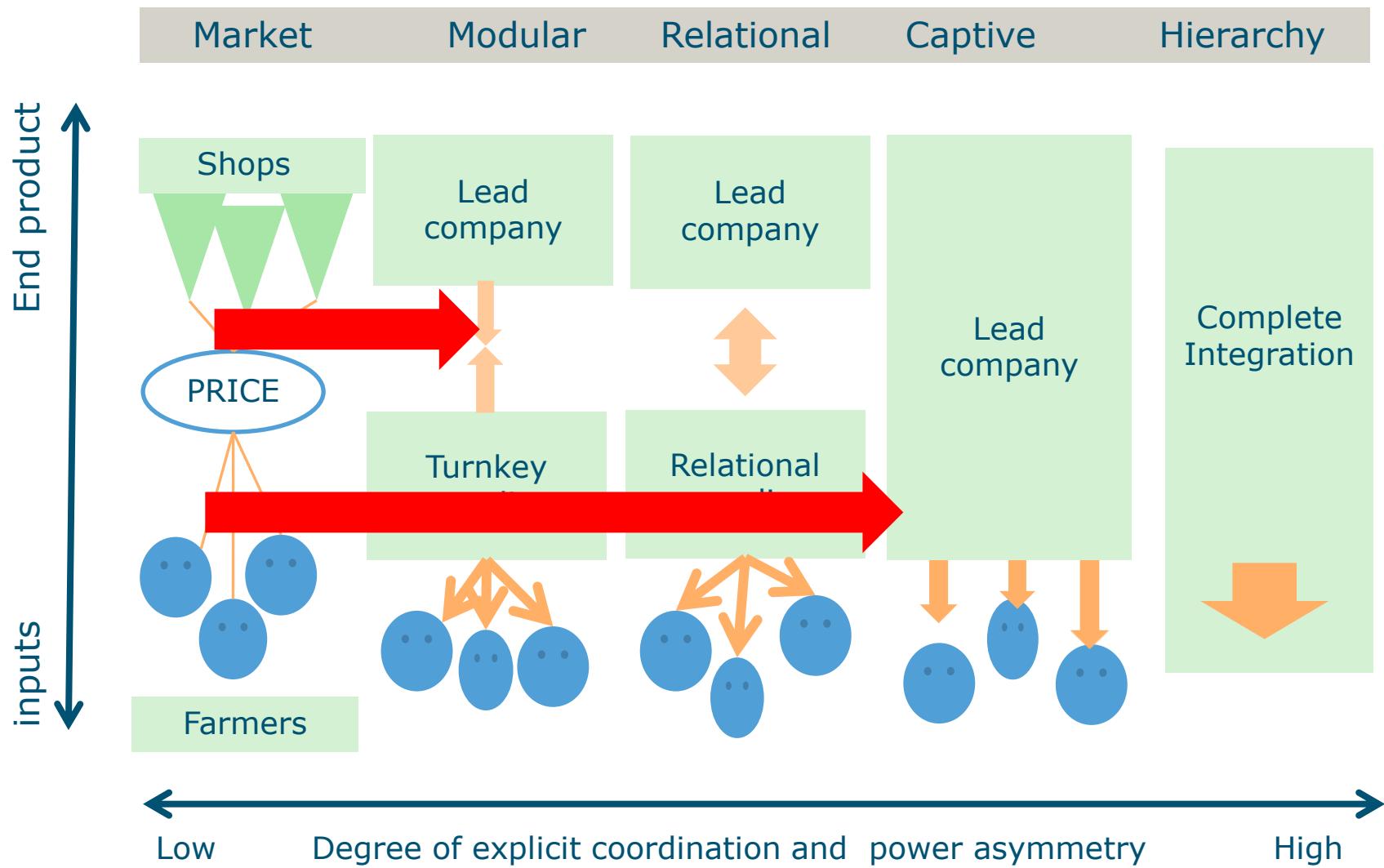
separable

High

Low



Chain organisation changes (©Gereffi et al., 2005)



2 Scenarios, with significant impacts ?

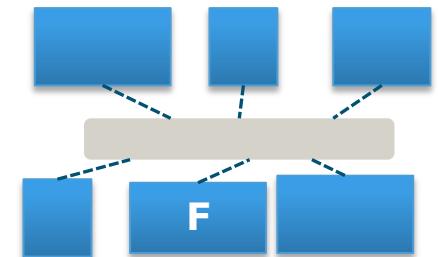
1. Scenario FIELDSCRIPT:

- Farmer becomes part of one integrated supply chain as a franchiser/contractor with limited freedom
- one platform for potato breeder, machinery company, chemical company, farmers and french fries processor.
- Weak integration with service providers, government ?



2. Scenario OPEN COLLABORATION:

- Market for services, apps and data
- Common, open platform(s) are needed
- Higher upfront, common investment ??
- Business model of such a platform more difficult?
- More empowerment of farmers and cooperatives?



Effects on markets

- In terms of suppliers, buyers, market organisation and market regulation (government involvement)

Make an analytical difference between:

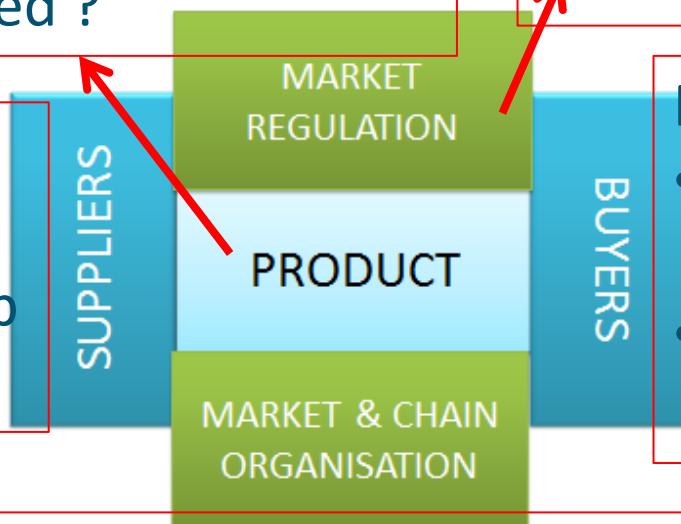
- current (old) product markets (e.g. social effects old producers, is gov. using up to date ICT for auditing)
- market for new products/services (milking robots, milk with credence attributes like 'nature-friendly')
- new ict/data markets (e.g. platforms)

- Products change: the tractor with ICT – from product to service
- New products: smart phones, apps, drones: should markets be created or regulated ?

- Due to ICT new options to fine tune regulation / monitor behaviour
- Regulation can be out of date

New entrants:

- Designers on Etsy
- Landlords on AirBnb
- Drivers on Uber



New entrants:

- Direct international sales by website
- Long tail: buyers for rare products

- New types of pricing and contracts: on-line auctions, dynamic pricing, risk profiling etc.
- Shorter supply chains (intermediaries as travel agencies and book shops disappear)
- Strong network effects in on-line platforms (rents and monopolies)

Governance issues

2 Scenario's to explore the future:

- **HighTech:** strong influence new technology owned by multinationals. Driverless tractors, contract farming and a rural exodus. US of Europe. Rich society with inequality. Sustainability issues solved. Bio-boom scenario.
- **Self-organisation:** Europe of regions where new ICT technologies with disruptive business models lead to self-organisation, bottom-up democracy, short-supply chains, multi-functional agriculture. European institutions are weak, regions and cities rule. Inequalities between regions, depending on endowments.

(Based on EU SCAR AKIS-3 report that also included a Collapse scenario:
Big climate change effects, mass-migration and political turbulence leads to a collapse of institutions and European integration).

Issues at several institutional levels

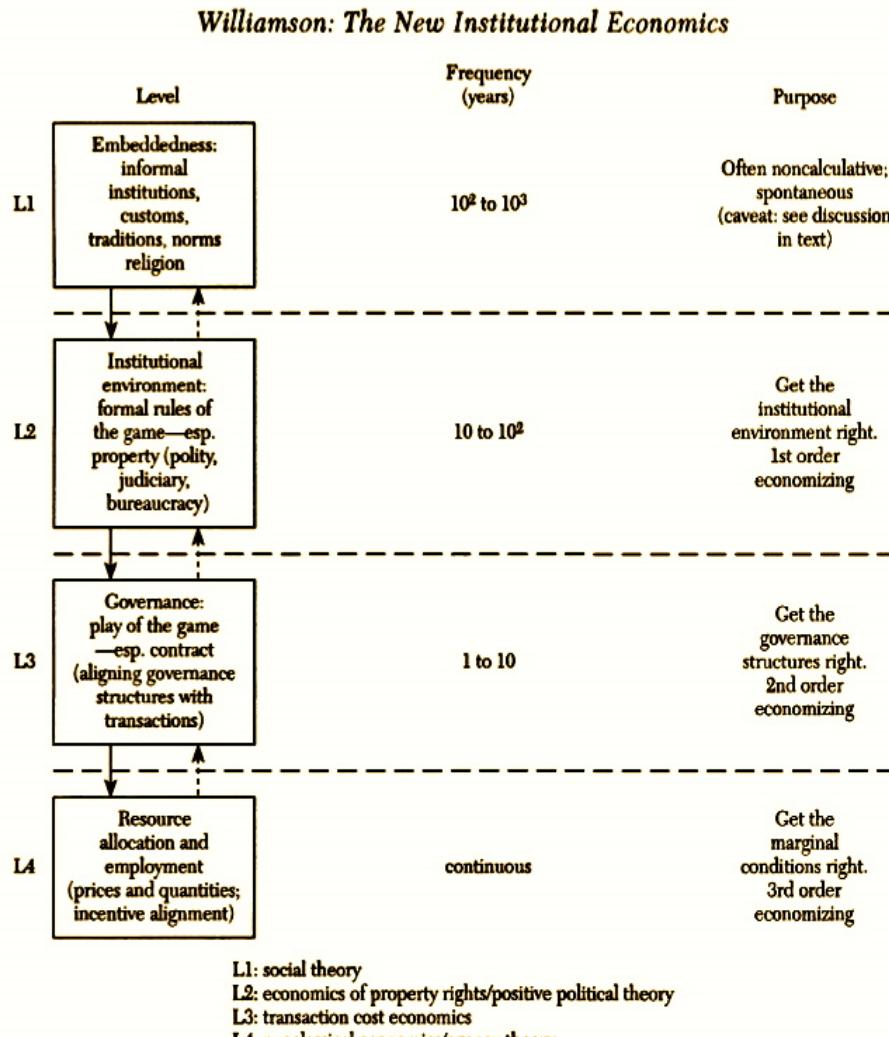


Figure 1. Economics of Institutions
For quality of life

- Data ethics, privacy thinking, on-line and wiki culture. Libertarian 'californisation'
- Data "ownership", right to be forgotten, Open data cyber security laws etc.
- Platforms (nested markets), contract design (liability !), open source bus. models
- Value of data and information

Effects on government policy

- Agricultural policy
 - Data sharing between government and business
 - Worries on the future of the family farm
- Environmental policy
 - Precision measurement: internalisation
- Regional policy
 - Risk of rural exodus, need for ICT infrastructure
 - Some regions can become a big-databhub
- Competition policy
 - Monopolies in platforms ?
- Science & Innovation policy: enablers (+ next sheet)



Much is invested by multinational companies – *Why should government intervene and plan research in ICT?*

- **Public objectives** like food security, employment, regional development are **not automatically guaranteed by the market**
- Many **SME** (also in food and machinery industry) that **underinvest in knowledge** as IPR cannot easily be protected: quickly copied in the market. Pooling of funds make sense.
- There could be **systemic bottlenecks in collaboration agriculture with ICT-sector** or logistics.
- There is a **need for common pool investments** (Standards, infrastructure like ABCDEFs = **Agri-Business Collaboration and Data Exchange Facility**).
- There are **(negative) external effects of ICT** that needs attention: privacy, **data ownership, power balance**, effects on small farms, remote regions...
- There are **(negative) external effects in agriculture that can be solved by ICT** more attractively than by regulation (environment, food safety, animal welfare, etc.)
- **Government is user of ICT: simplification issue CAP; E-science**

Thanks for your attention

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