Digitalisation of Agriculture and its role in Food and Nutrition.
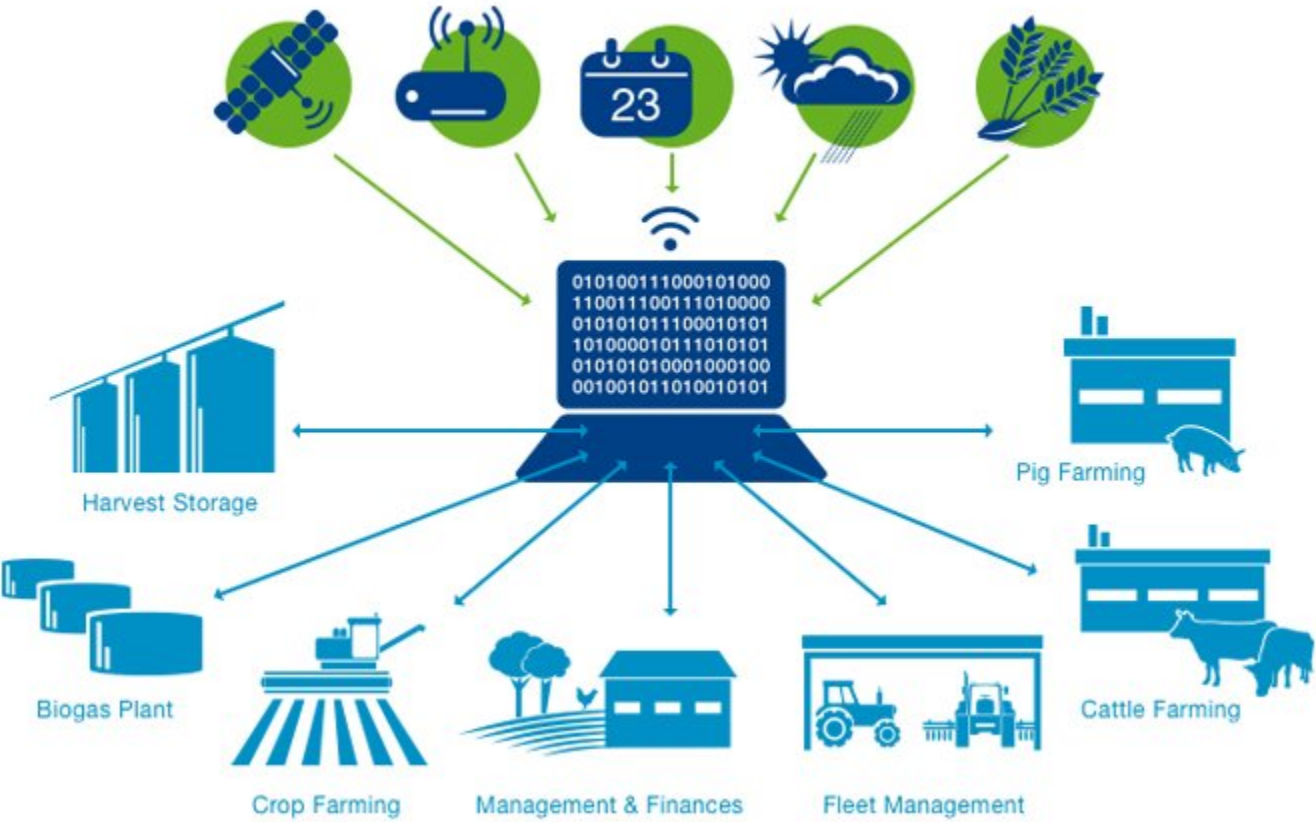
Nagarjun Devabhakthini
MSc. Crop Sciences (Plant Nutrition and Protection)
University of Hohenheim
Stuttgart

What is Digital Farming ?

1. Cropscience.bayer.com

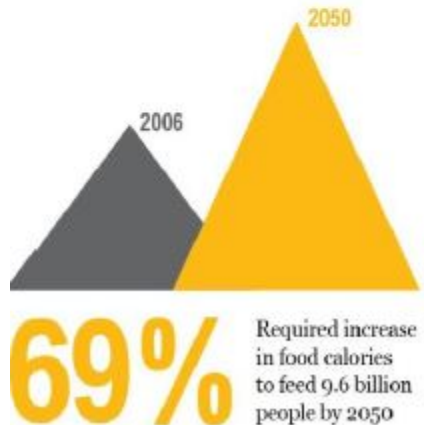# Does Smart Farming connects SDG'S 2030 ?

Is it need of the hour to concentrate on Digital Farming ?

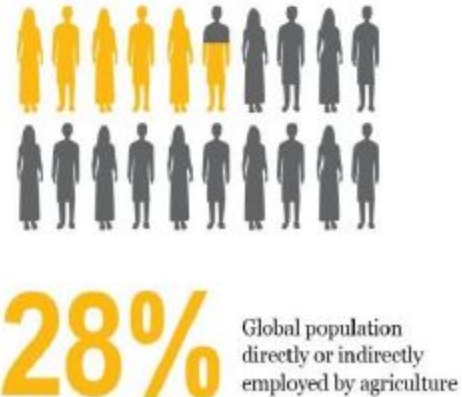# Yes, there is a huge challenge!

THE GREAT BALANCING ACT

The world must achieve a "great balancing act" in order to sustainably feed 9.6 billion people by 2050.
Three needs must be met at the same time.

CLOSING
THE FOOD GAP

2050

2006

69% Required increase
in food calories
to feed 9.6 billion
people by 2050

SUPPORTING
ECONOMIC DEVELOPMENT

28% Global population
directly or indirectly
employed by agriculture

REDUCING
ENVIRONMENTAL IMPACT

24%
Global greenhouse gas
emissions from agriculture
and land use change
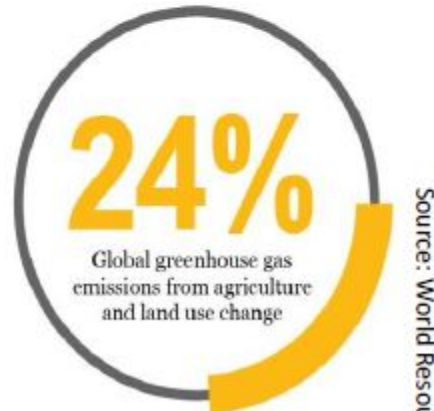
Source: World Resources

2. Global Food Challenge (World Resources Institute)

4

Agriculture : A story of two worlds

PRE GREEN REVOLUTION – BEFORE 1960

Produce — Harvest — Process — Treat & Pack — Distribute — Sell

INPUTS
SEEDS
ANIMAL WASTE
FARM WASTE
WATER
HUMAN LABOR

ACTIVITIES
MANUAL
CLEANING

RESOURCES
GUNNY BAGS
SILOS

REACH
PERISHABLES –
DOMESTIC/LOCAL
NON PERISHABLES –
LOCAL/DOMESTIC/EX
PORTS

3. Deepak Parek 2019

POST GREEN REVOLUTION

| Produce | Harvest | Process | Treat & Pack | Distribute | Sell |

INPUTS
SEEDS
FERTILIZERS
CROP PROTECTION
MECHANIZATION

ACTIVITIES
DRYING
CLEANING
SORTING
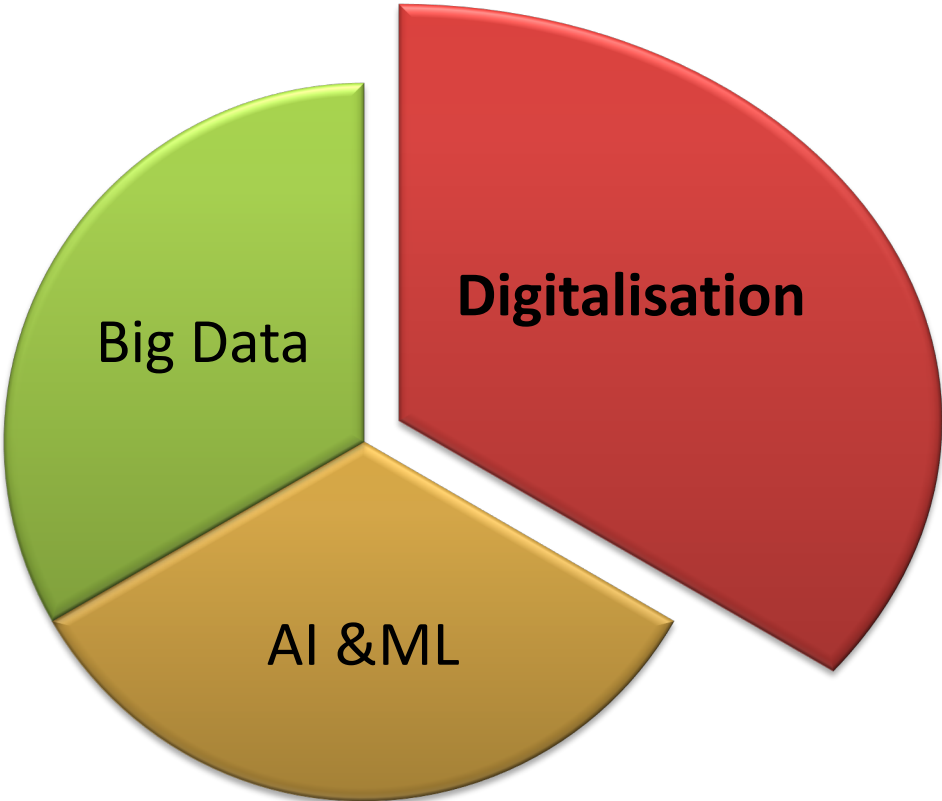AGGREGATION
CONVERSION

RESOURCES
TREATED GUNNY
/POLYTHENE BAGS
SILOS
CHEMICAL
TREATMENT
COLD STORAGE &
TRANSPORTATION

REACH
PERISHABLES –
GLOBAL
NON PERISHABLES –
GLOBAL

Deepak Parek 2019

6

Technology megatrends shaping future of Food and Agriculture Sector

How can we achieve ?

Drone/satellite field monitor

- Picture analysis from drone or satellite footages
- Information is fed into the farm mgmt. system

Integrated farm management

- All data is gathered and analyzed here
- Internal data from sensors, etc. as well as external data like weather reports, news (Big Data)
- Alarms directly on Grower's mobile device with all required information
- Automated action initiation possible

Automatic precision farm machinery

- Farm machines without drivers, networked for maximized efficiency
- Cultivating, seeding, fertilizing, using pesticides automatically with absolute precision and minimal waste

Genetically optimized crops

- More yield, shorter growth periods and higher resistance
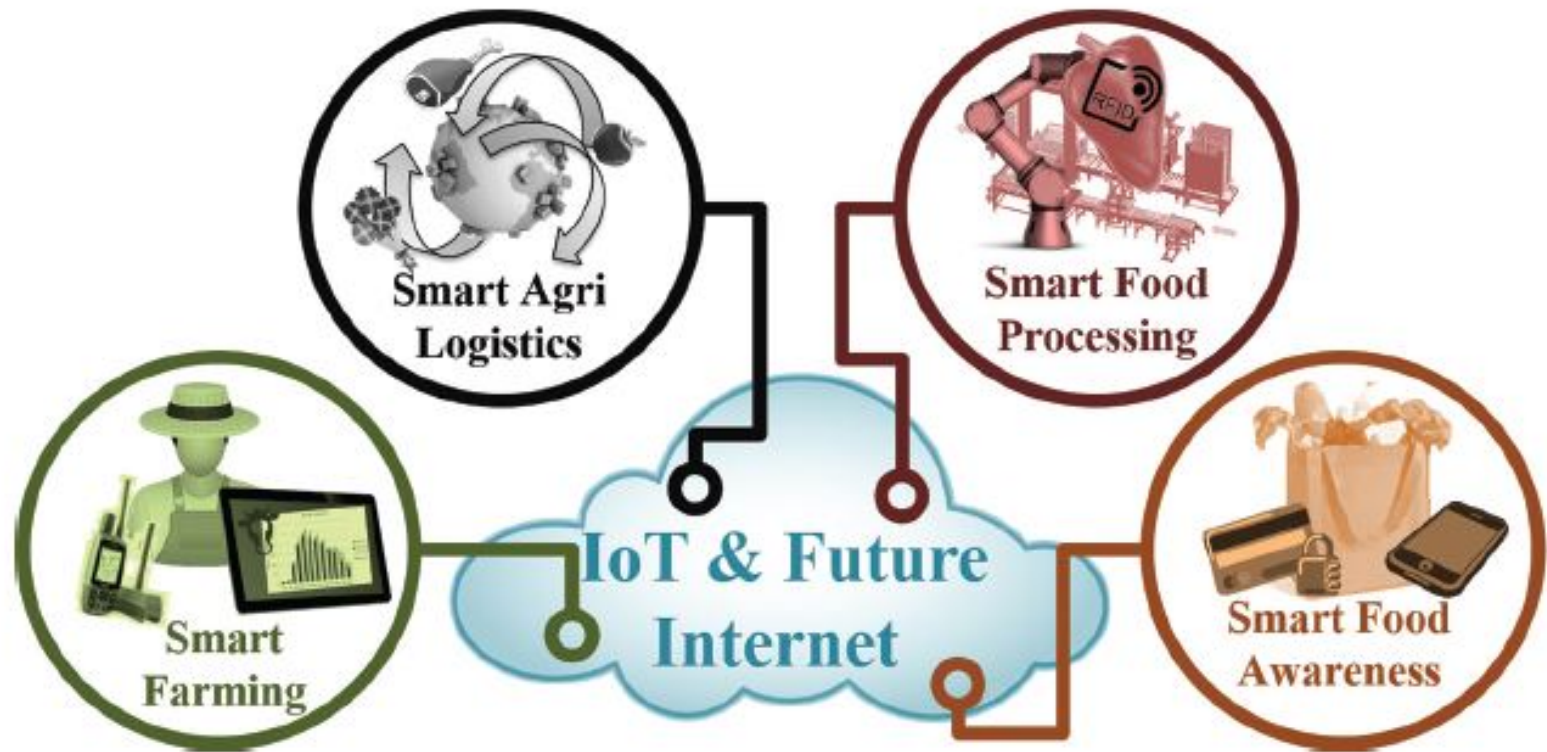- Specific features, like blossoming at a specific time
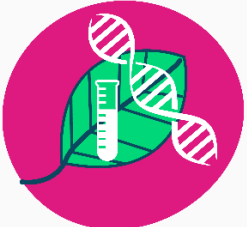
Field sensors

- Measuring soil irrigation, fertilization, humidity

4S Agri Food domains

4. Sundmaekar et al., 2016

Smart Digital Farming

- Ranked as the technological oppurtunity with the highest expected positive Impact on society on Global Oppurtunity Report (2019)

1	SMART FARMING
2	THE DIGITAL LABOUR MARKET
3	CLOSING THE SKILLS GAP
4	REDUCE FOOD WASTE
5	PRECISION TREATMENT
6	ANTIBIOTIC-FREE FOOD
7	REGENERATIVE OCEAN ECONOMY
8	NEW BUSINESS MODEL FOR ANTIBIOTICS
9	FLEXIBLE MOBILITY
10	NEW DIETS

Specific Objectives

- Increasing knowledge and expertise

- Stimulating open and data driven innovation

- Establish concrete validation process

- Implementing new business models

- Encouraging market and product differentiation

- Increasing the International visibility

- Digital Progress

- Adoption

- Penetration

- Digital Capacity

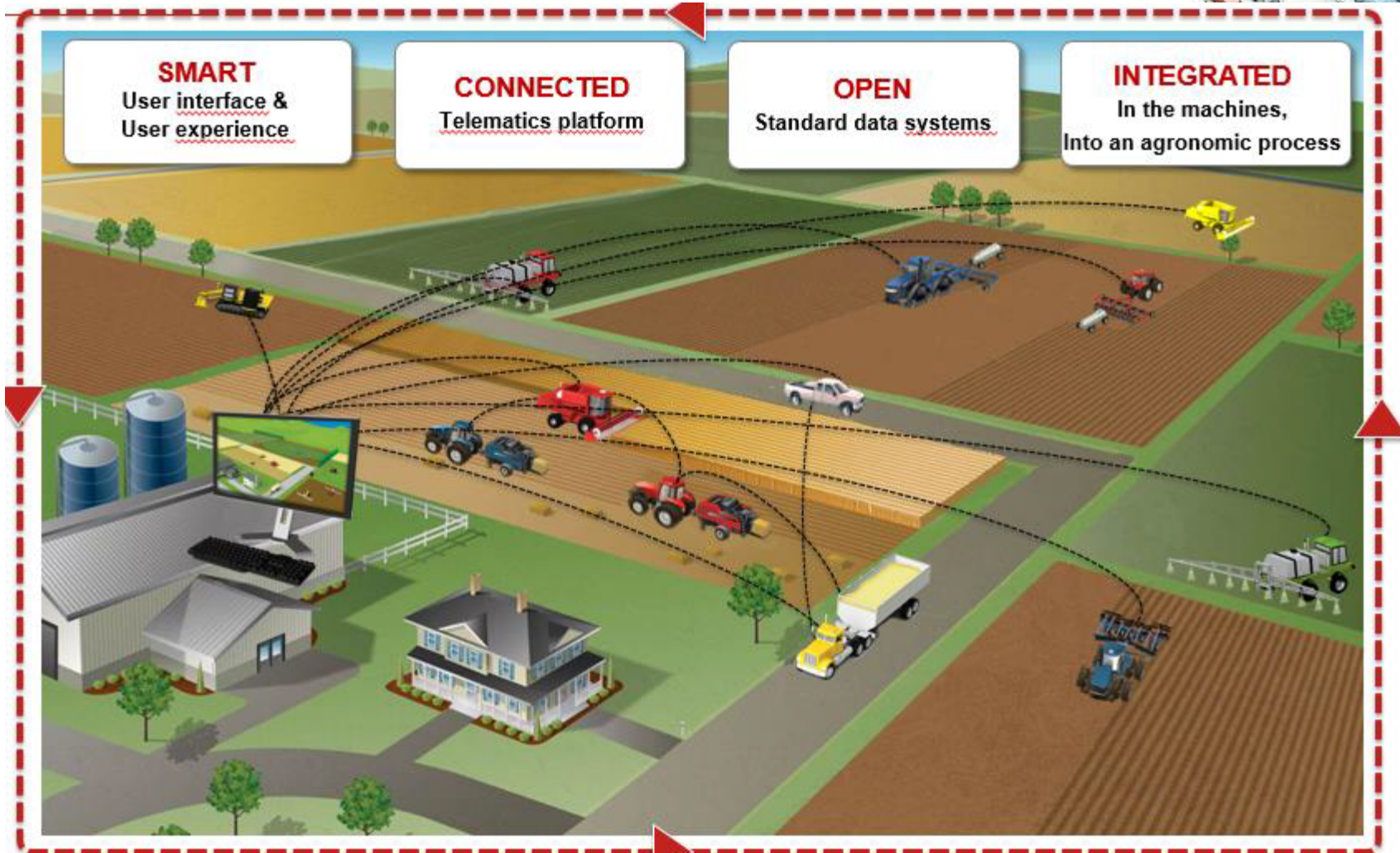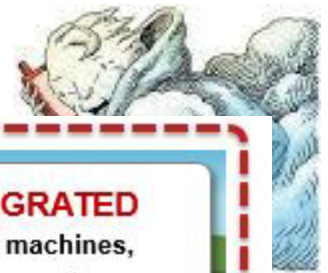- = > Lower than expected

  Eg., 35% smart spreaders

Try to identify the main reasons behind the current lack of adoption and identifying the key barriers to the implementation of Smart Farming

PROTESTING AGAINST NEW TECHNOLOGY — THE EARLY DAYS

Need for Smart Digital Ecosystems

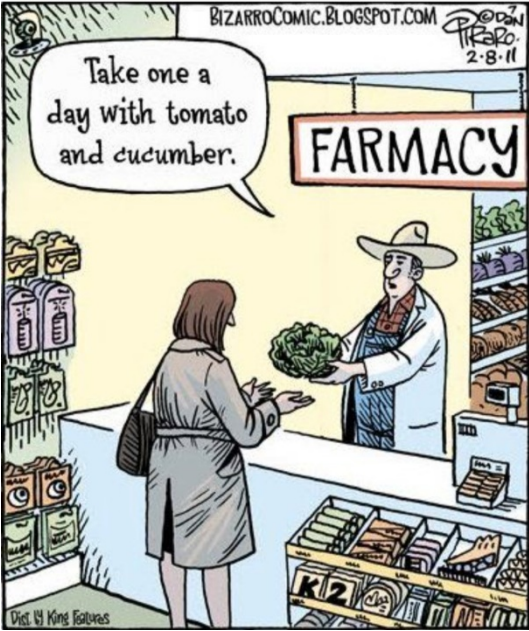- Large potential in Agriculture
- Ecosystem of Suppliers and stakeholders is very complex
  - Large machine constructors
  - Suppliers from M2M technology and decision support systems
  - Advisory services, experts, service providers.
  - ....

- Larger companies are digitalized with ERP (Enterprise Resource Planning) software but between smaller organisations there is a need for data exchange.

Via Cloud: " the connected farm" becomes reality
 - Real time process monitoring

SMART
User interface &
User experience

CONNECTED
Telematics platform

OPEN
Standard data systems

INTEGRATED
In the machines,
Into an agronomic process

5. Peter rakers 2015

Which word you instinctively associate to the Food?

"Our food should be our medicine and our medicine should be our food"
Nature (as sentient being) is so smart, it puts the medicine inside the food!

Meeting the SDG's of ending hunger, achieving food security and improved nutrition and promoting sustainable agriculture

WHAT IS FOOD SECURITY

and Why Should You Care About It?

Security
Ensuring all people across the world have access to sufficient food to meet their dietary needs.

Food Security

Sovereignty
Empowering people to make their own choices about the food they eat, where it comes from and how it is produced.

Safety
Ensuring people have healthy, nutritious food that is free from contamination or degradation.

6_https://www.bigpicnic.net/about/food-security/

Understanding the complexity of food systems and dynamics of how they must change

7. Karen Fabbri 2018
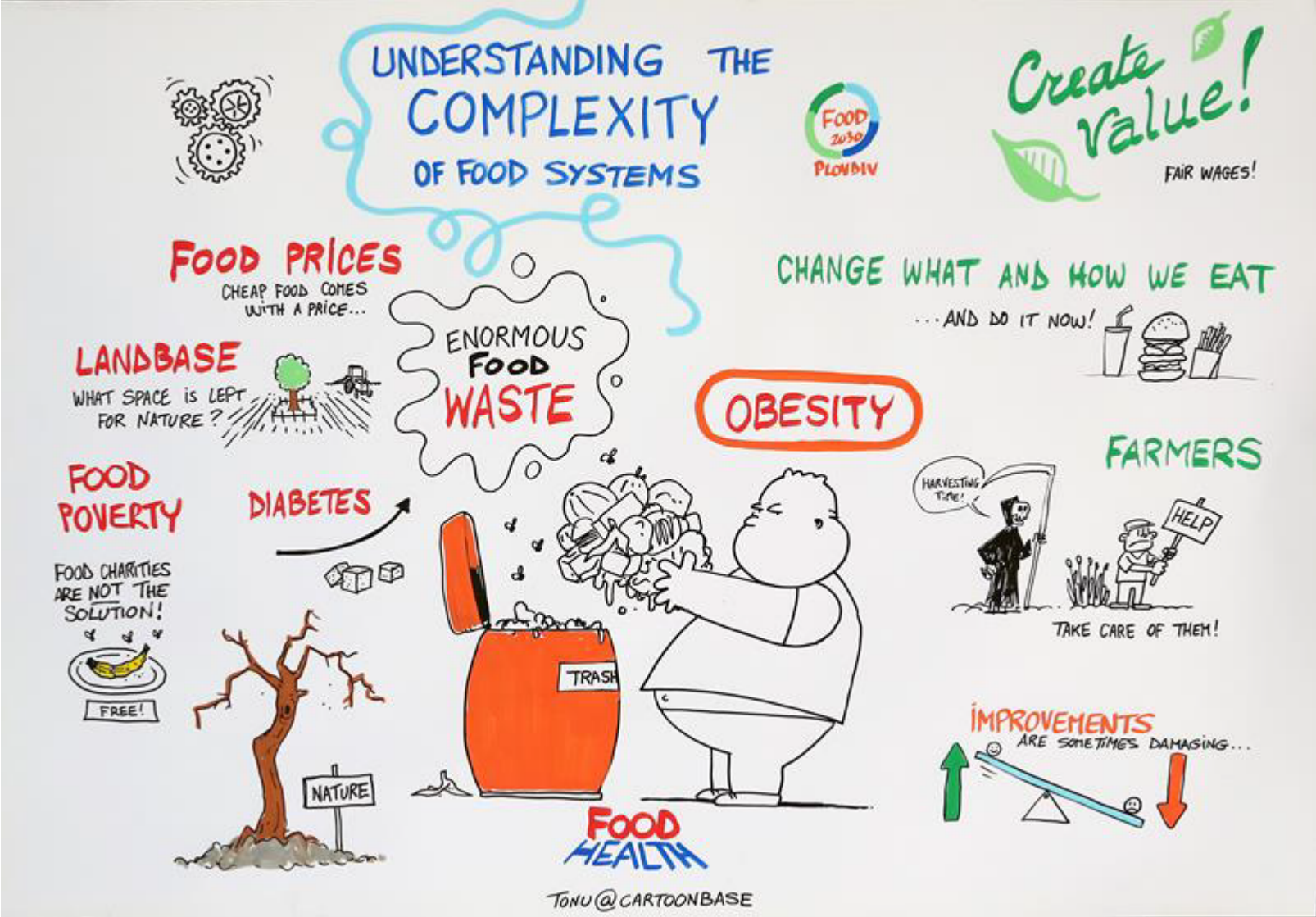
How to build resilient Food systems by 2030?

Karen Fabbri 2018
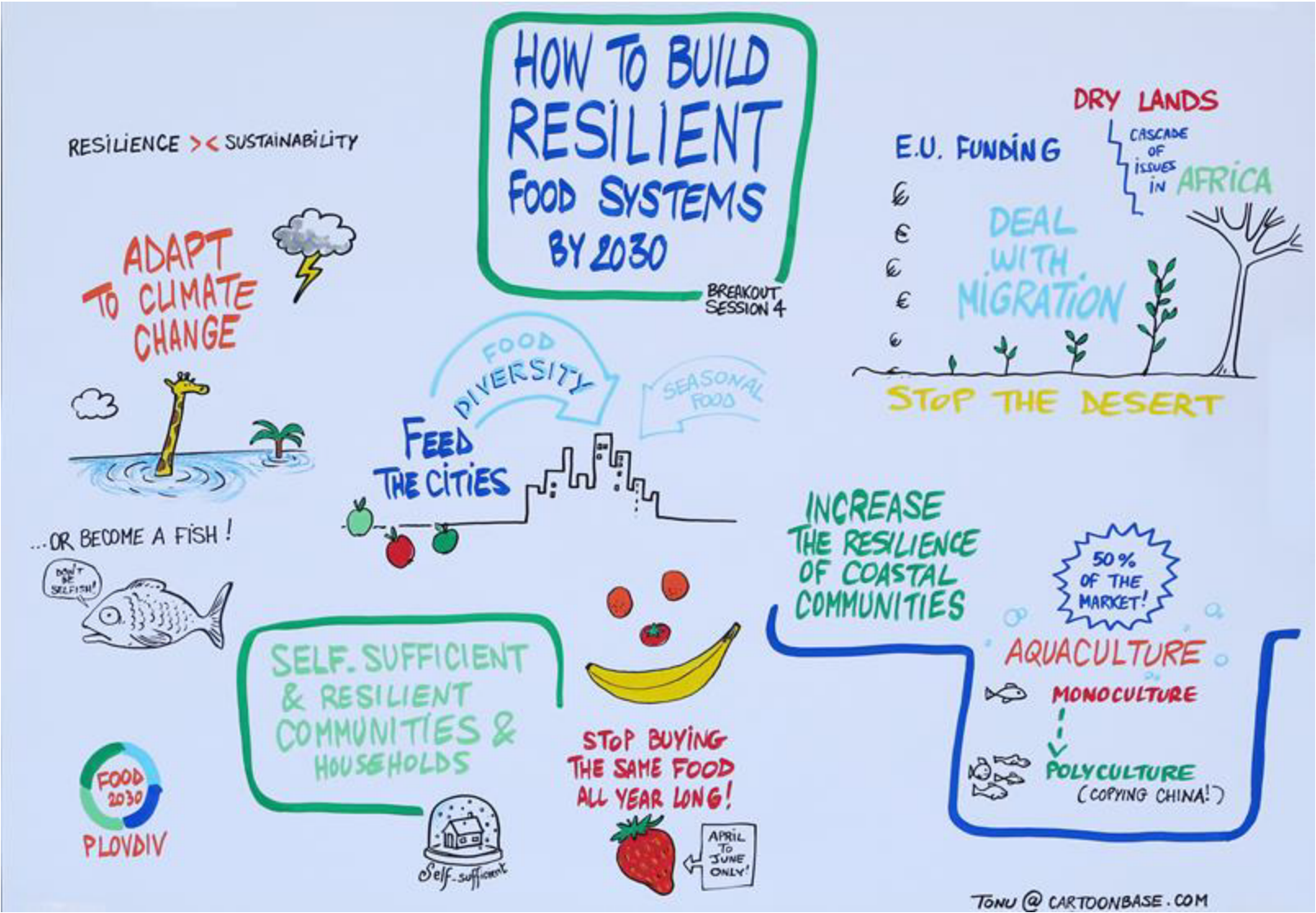
To strengthen diversity of Food Systems...

By smart integrative policies at the economic and social levels

Develop many different systems bottom up, at local, regional, national and European level facilitare mutual learning from different systems.

Developing and highlighting the business case for scaling diversity (vs. monoculture which scales well)

How should FOOD 2030 strengten diversity in food systems?

We need a stronger support from the authorities but also local networks as NGOs

Foster research to dispel concerns of policy and consumer, e. g. new protein sources (algae, insects)

Support start-ups and new business models

Karen Fabbri 2018

Development of smart and sustainable food systems in Europe
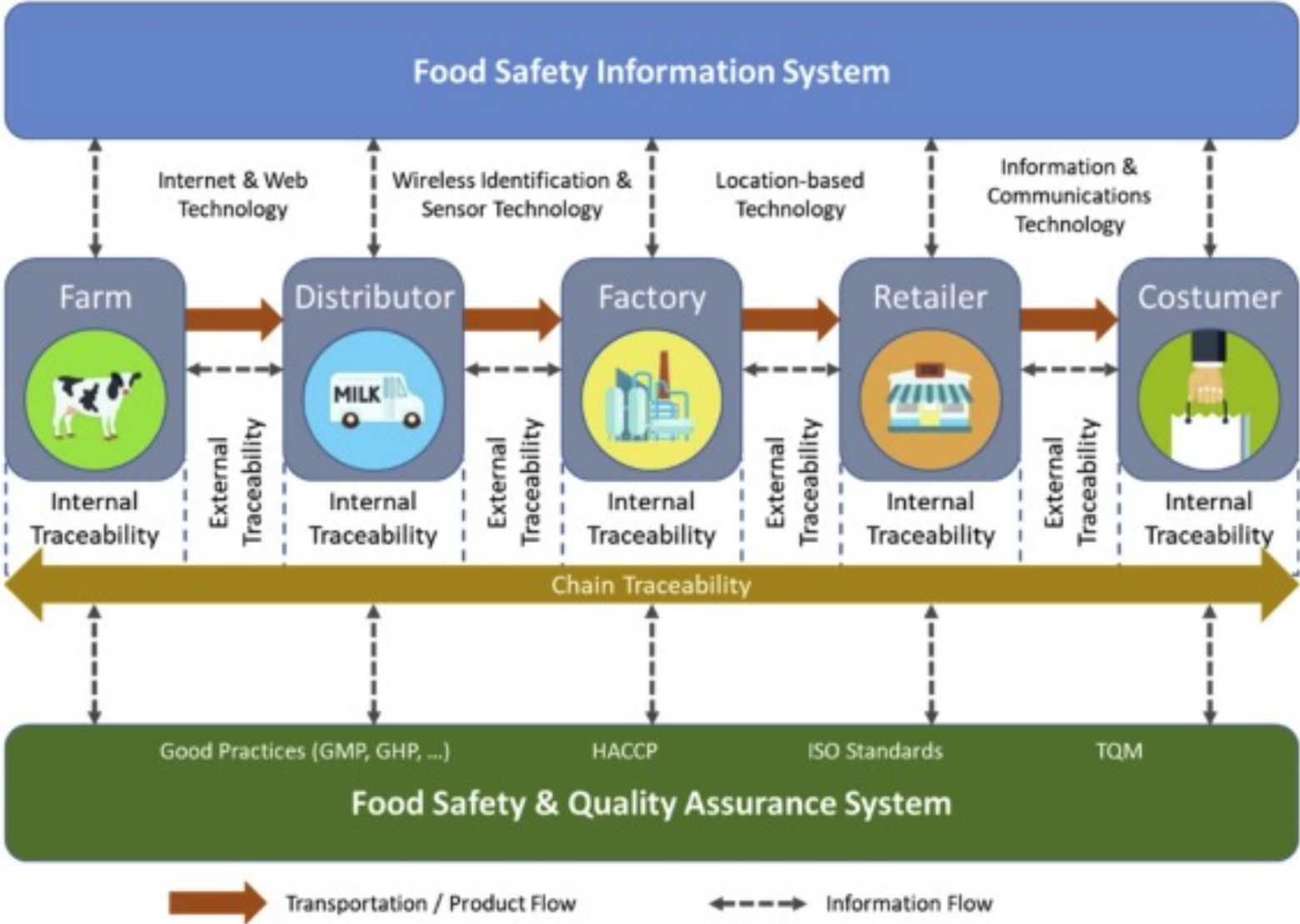
Karen Fabbri 2018

Food Ontology to increase global food traceability and quality control

8. Dooley et al., 2018

23
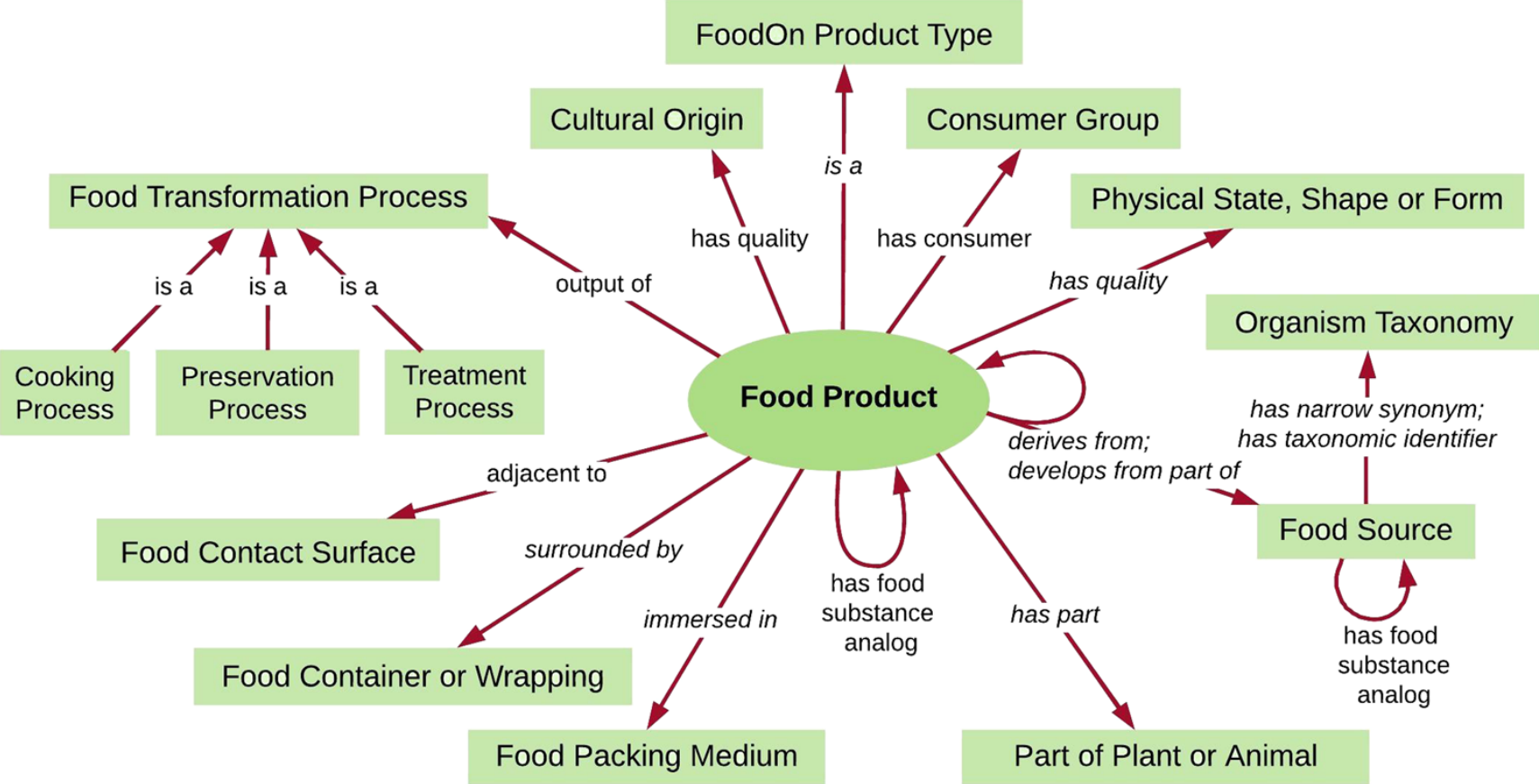
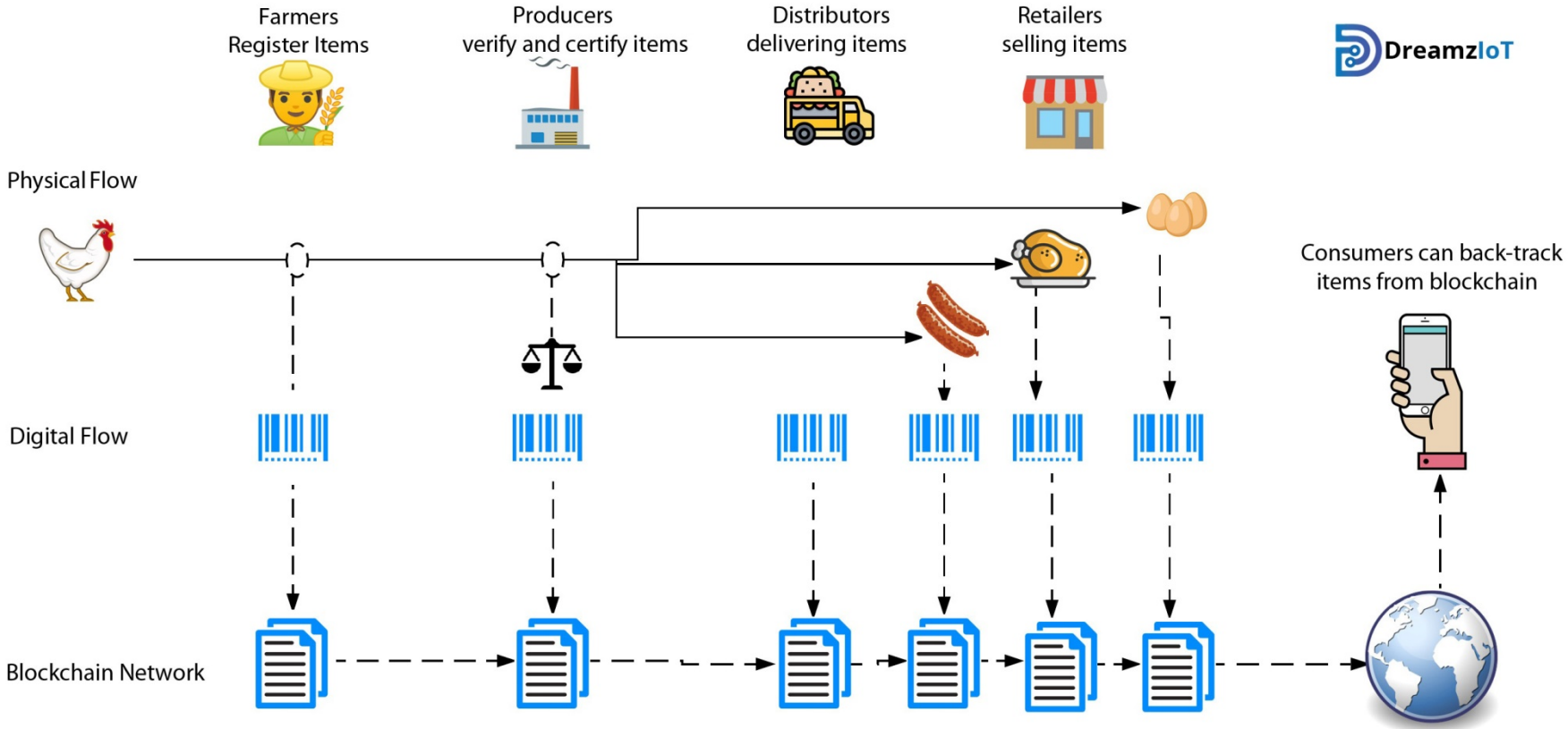# What drives digital transformation in the food security?

9. Kay Behnke et al., 2019

Smart Logistics for Agriculture

Monitoring

- Conditions

- Reusable containers

- Food shipment

Block chain network from FARM to FOOD

10. DreamzIoT

Smart Food Awareness

Retail Legacy system

IoT, open infrastructure

Open platforms, anonymization, security, privacy

Authorization

Product Information

Profile

Product Information

Smart Food Awareness

Logistics Services

Product Information

Interoperability, semantics, big data

Open platforms

Certification Information

Certification providers

11 . Krijn J.Poppe WUR

27
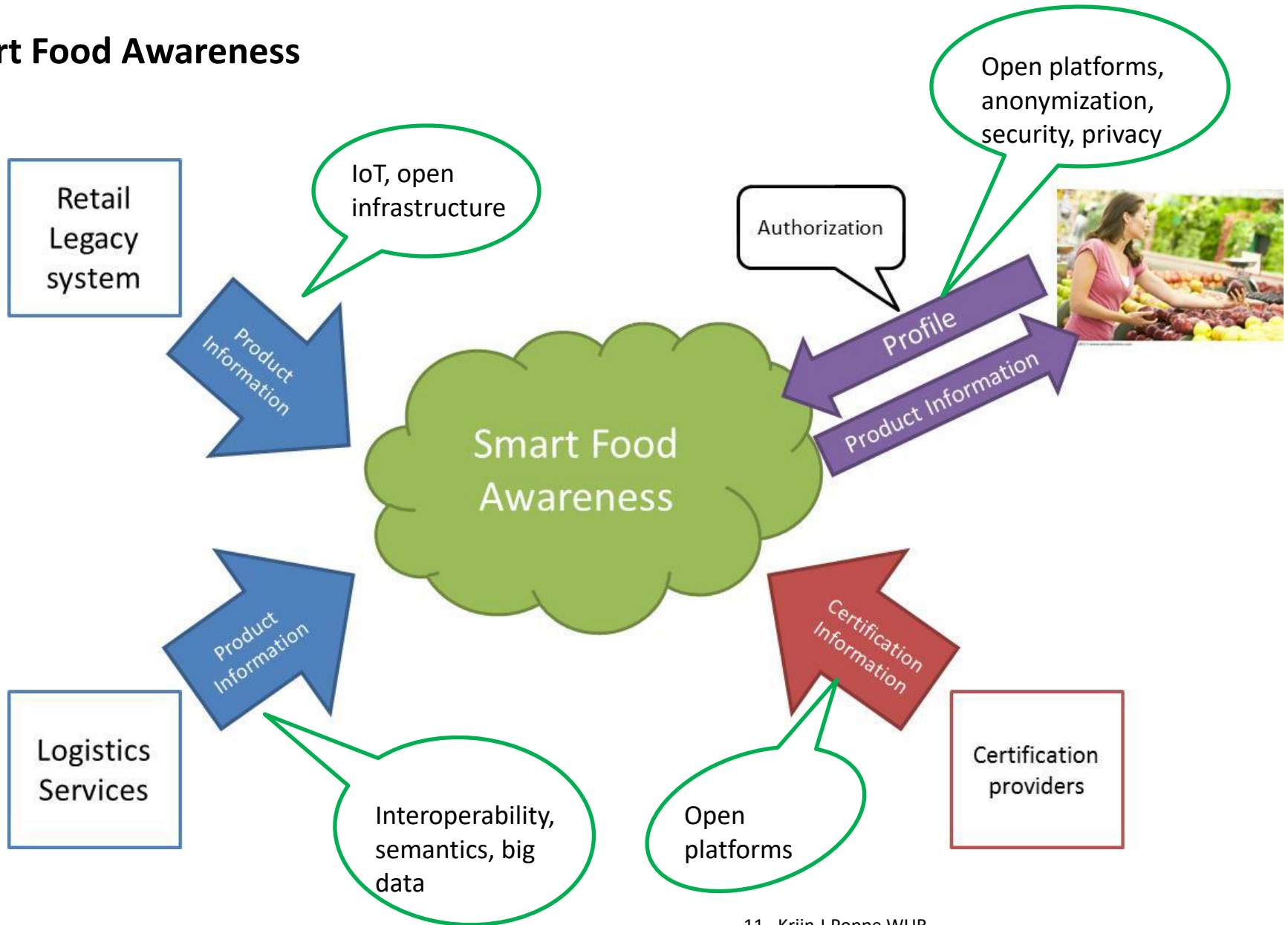
Take home message from the talk

- Enhanced precision agriculture solutions, including data gathering by satellites and drones, weather information and soil sensors as well as other data driven farming practices.

- Digitalisation is having a huge impact on all sorts of farming.

- Technologies can help stimulate innovation for sustainable agri-food systems.

- Production of better and safe foods while preserving the biodiversity.

- Increasing profitability and productivity by leveraging digital solutions and strengthening business innovations.

- Necessary to move towards precision agriculture for smallholder farming.

References

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3 https://www.slideshare.net/deepakpareek/digitalization-of-agriculture
4 Sundmaeker, H., Verdouw, C.N., Wolfert, S., & Freire, L.P. (2016). 4 Internet of Food and Farm 2020.
5 https://www.slideshare.net/ClusteriX20/smart-digital-farming
6 FAO (2015) Urban agriculture. Available from:http://www.fao.org/urban-agriculture/en/
   Campbell, M. and Campbell, I., 2010. Allotment waiting lists in England 2010. Transition Town West Kirby in conjunction with the National Society of Allotment and Leisure Gardeners Ltd.
7 Karen Fabbri https://ec.europa.eu/food/sites/food/files/safety/docs/fw_eu-platform_20181206_flw_pres-065.pdf (2018)
8 Dooley, D.M., Griffiths, E.J., Gosal, G.S. *et al.* FoodOn: a harmonized food ontology to increase global food traceability, quality control and data integration. *npj Sci Food* **2,** 23 (2018). https://doi.org/10.1038/s41538-018-0032-6
9 Kay Behnke, M.F.W.H.A. Janssen,
   Boundary conditions for traceability in food supply chains using blockchain technology, International Journal of Information Management, https://doi.org/10.1016/j.ijinfomgt.2019.05.025
10 https://dreamziot.com/transforming-food-supply-chain-with-blockchain-and-iot/
11 https://www.slideshare.net/bullzito/smart-agrifood-barcelonafeb2013

Acknowledgements

Ms. Hannah Hadaller
STUBE-BW Coordinator

Thank you!

Q&A

Views & Opinions

Discussion