Social economic aspects in the transition to robotics

Erik Pekkeriet | Program Manager Vision + Robotics | erik.pekkeriet@wur.nl | +31622660788

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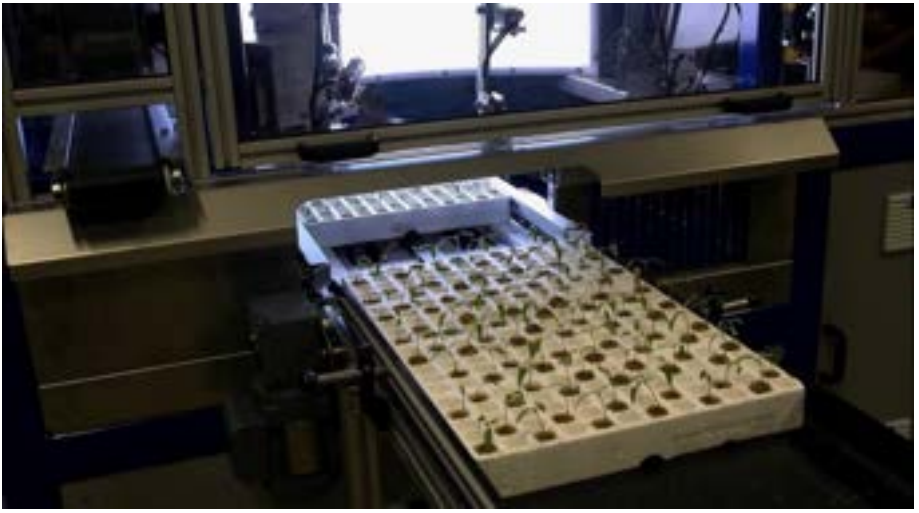
vision+robotics

Wall of failure Wageningen CEA Robotics

Some fames

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Contact: Rick van de Zedde


NEED
FARMING
TECHNOLOGIES


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Where are the robots...

Still high input of labour due to **immaturity** of technology

Still new, we lack seasons of training

High R&D cost – expensive – High Unit Costs

- Many functions not mature
- Robot experimentation facilities expensive or not used (experimental sites & virtual sites not used)

No standardized low cost building blocks, no sharing, no scale – High Unit Costs

Ownership issue machine manufacturer - farmer

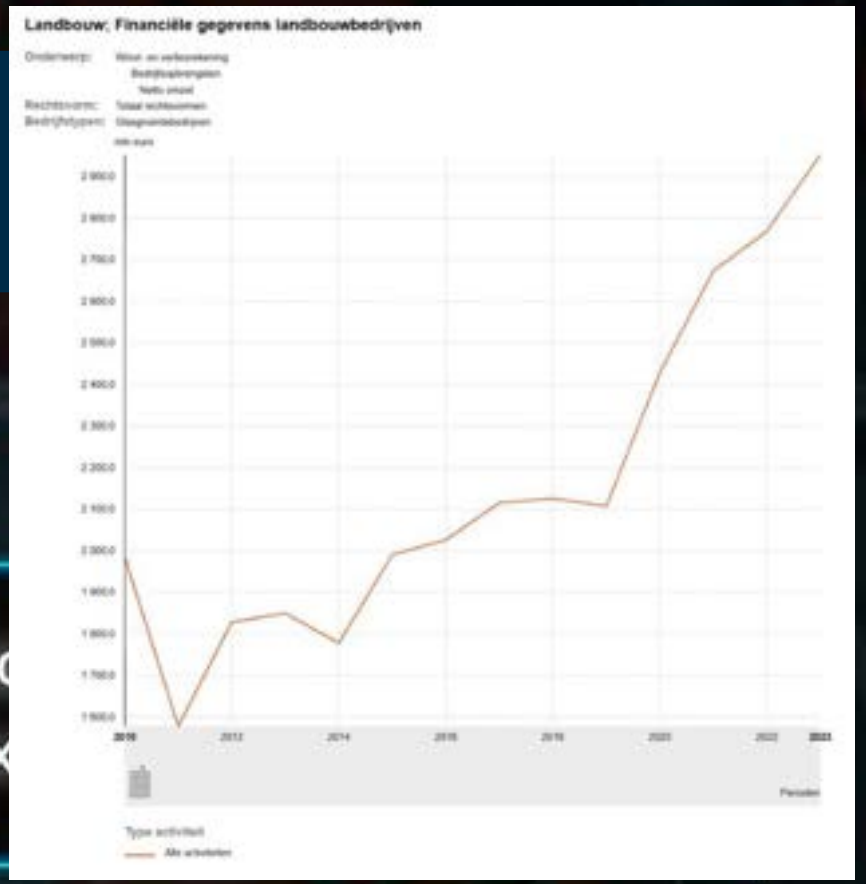
- AI Robot = Dataset + $(Robot)^{AI}$ = Performance. Do not try to build en sell robots

Limited hightech involved, limited r&d driven smart machines builders

Limited financial resources and access to VC

Sector

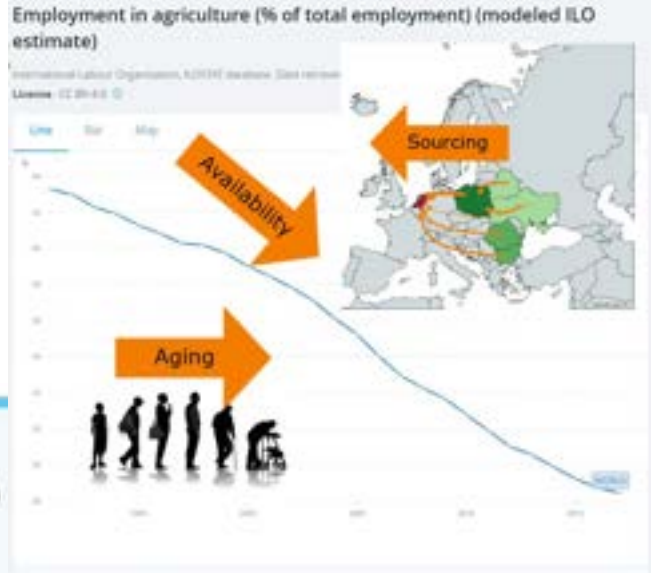
- Greenhouse vegetables - Fast growing sector
  - Input of external capital
  - World wide expension/scaling
  - Dutch grower-sites (area) are stable but only a few big cooperatives take it all
    - Harvest House 1mlrd with indivdual growers that grow to 1000ha (Agro Care)
    - Growers United 525 mln
    - Oxin Growers 900 mln
    - ZON 300 mln
    - Greenery 827 mln

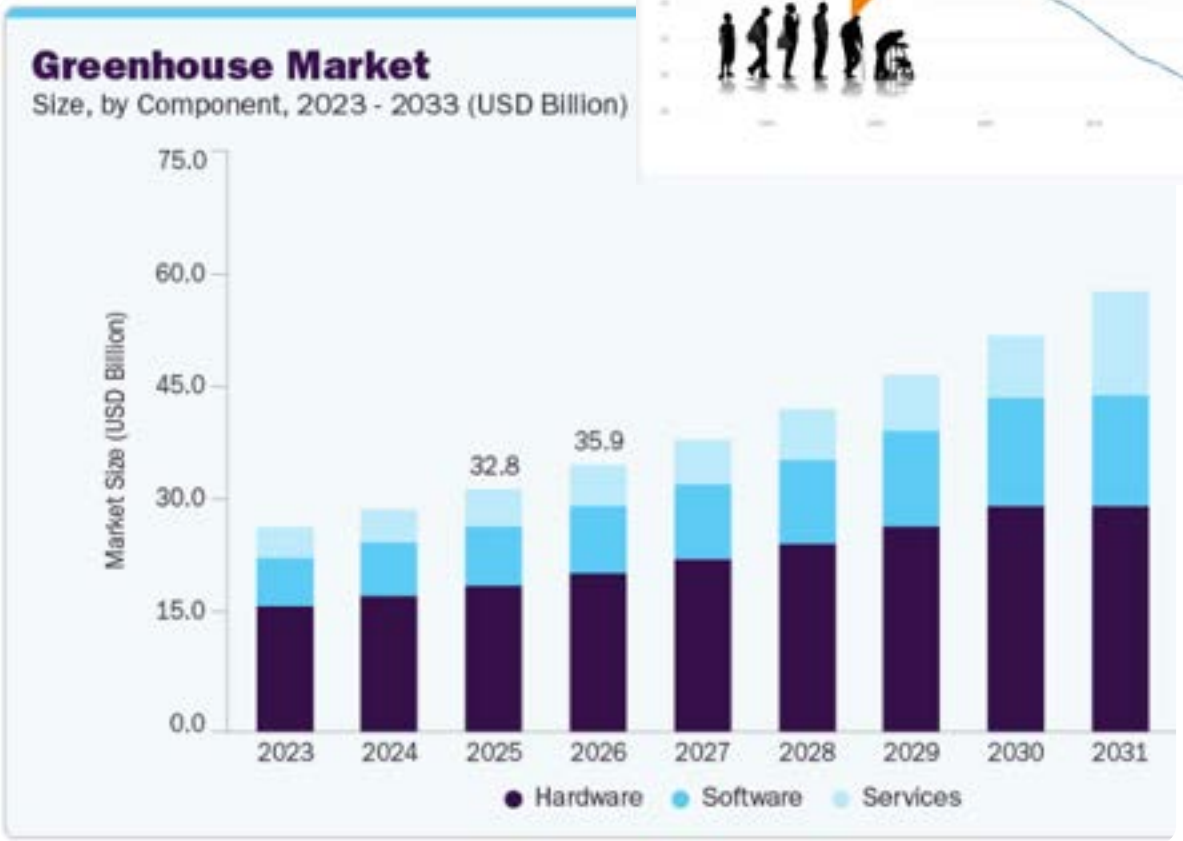


AVAG
GREENHOUSE TECHNOLOGY CENTER

Other assets

- **Good availability of labour (wages grow fast/performance goes down/aging population) ☐ Not sustainable**
- **Upcoming resources of labour is Ukrain, Romania and Bulagria**
- **€30/hr labor cost average is becoming the standard**
- **Fast growing agtech market**





4 Key things to do

1. Extreme high remote service levels
2. Focus on scalable mature buildingblocks
3. Simulation environments | twins
4. Focus on sale through early adopters and early majority, interoperable with farm management system. Use farming standards

1. Extreme high service levels

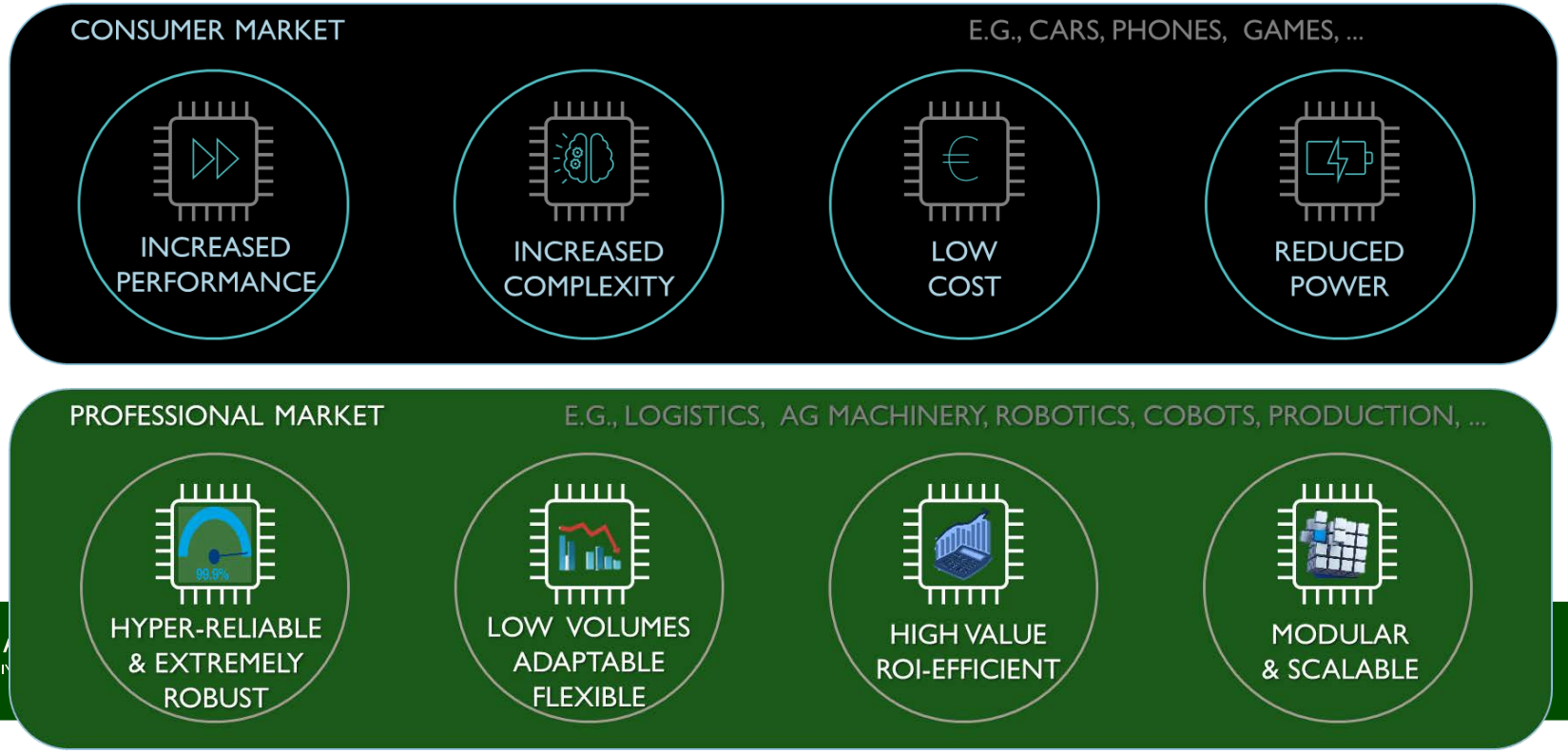
- From supervised to unsupervised through Tele-Operation
- Give controls to farmer and assist remotely (capture data on errors)
- 16/7 or 24/7 support | 1:1 , 1:2, 1:4, 1:8 (start sales….) 1:16
- Keep farmers on farming not dealing with hightech
- Solve the ownership issue
- Unburden the farmer

2. Scalability is the key to low cost

In the "silicon world," scale, miniaturization, and low cost are king. The agricultural market is far too small for this!

Developments in other areas (e.g., autonomous vehicles) are driving the development of new technology, where modular silicon design and AI on chips offer new possibilities.

We must immediately capitalize on these innovations, early in the Technology Readiness Levels, and make them applicable to agrifood.



1 bn units (Smartphones)

100 mln units (Auto's)

2 mln units (tractoren)

2000 units (ag Robots}

3. Simulation environments | twins

Year-round availability of crops to train

Changing environmental conditions (rain, sun-angles, dark, bumpy, slippery soil)

Changing Cultivation Systems and Environments

Changing Robot Configurations

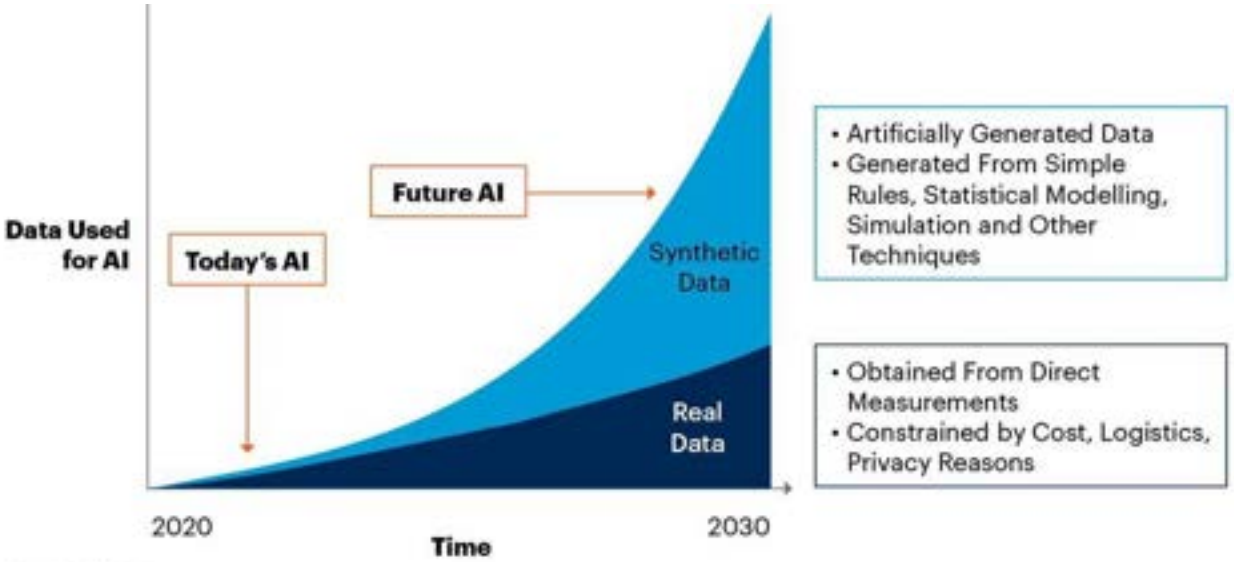
Time and resources consuming outdoor trials

Parallel 24/7 training options (rapid protytyping)

Ground truth awareness | knowing all plant features

Second attempt on same situation not possible

Large range of applications (robots, human plant interaction, variety testing, logistics, crop maintenance)



Source: Gartner
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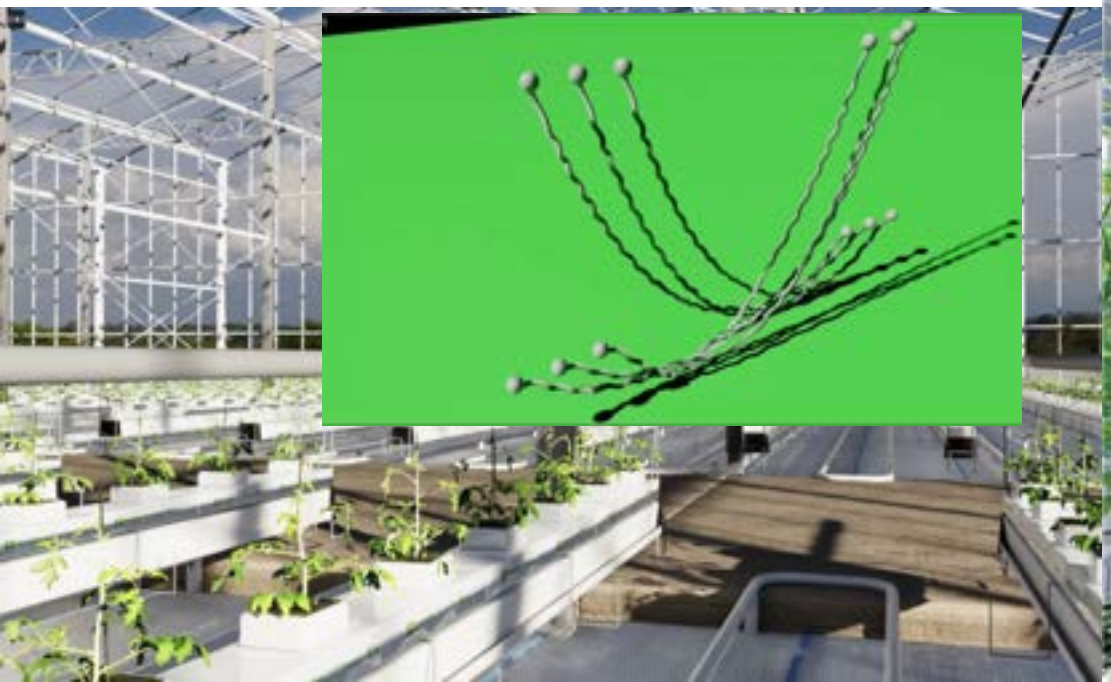
FSSTUDIO
NVIDIA
OMNIVERSE
Crop Growth Stage

Synthetic data: Horticulture

- Realistic crops (based on FSPM models)
- Robot-plant interaction

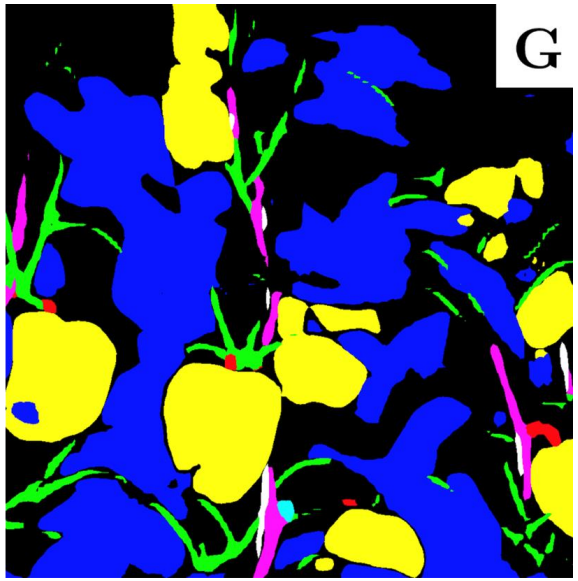


Synthetic A

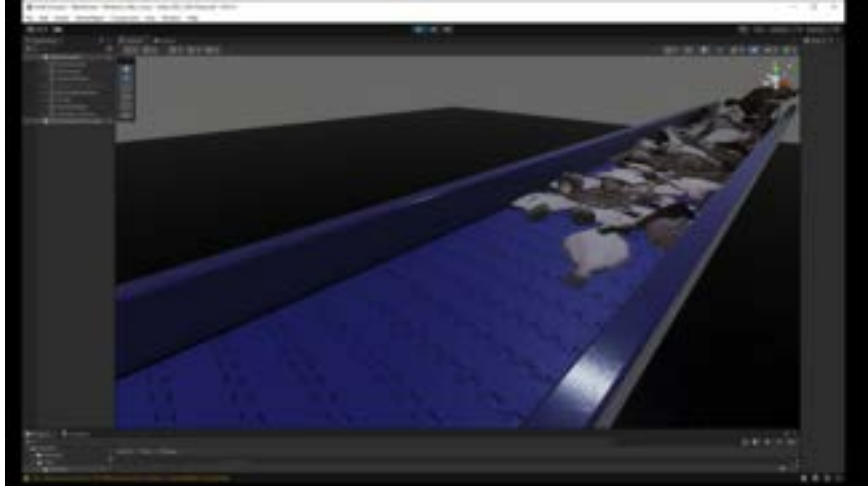
Empirical A

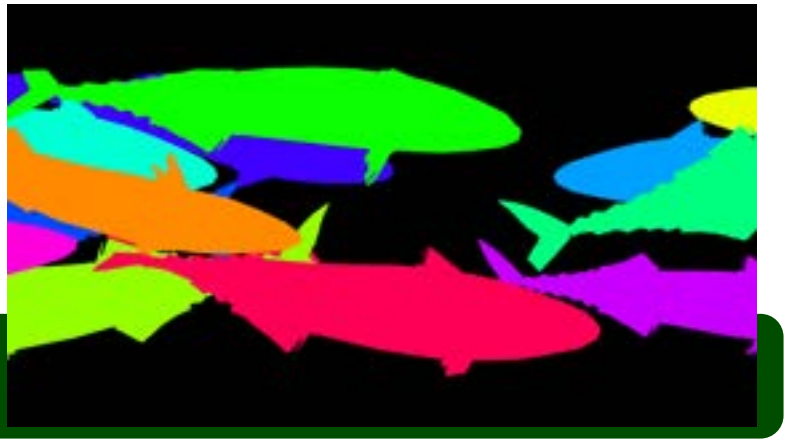
Synthetic B

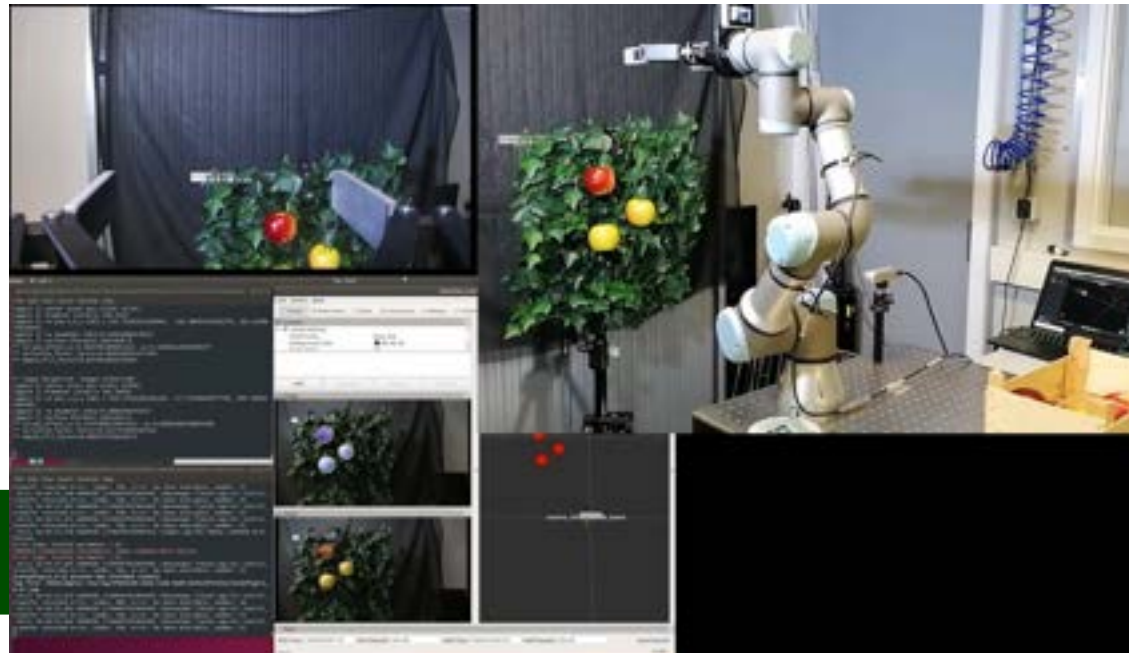
Empirical B



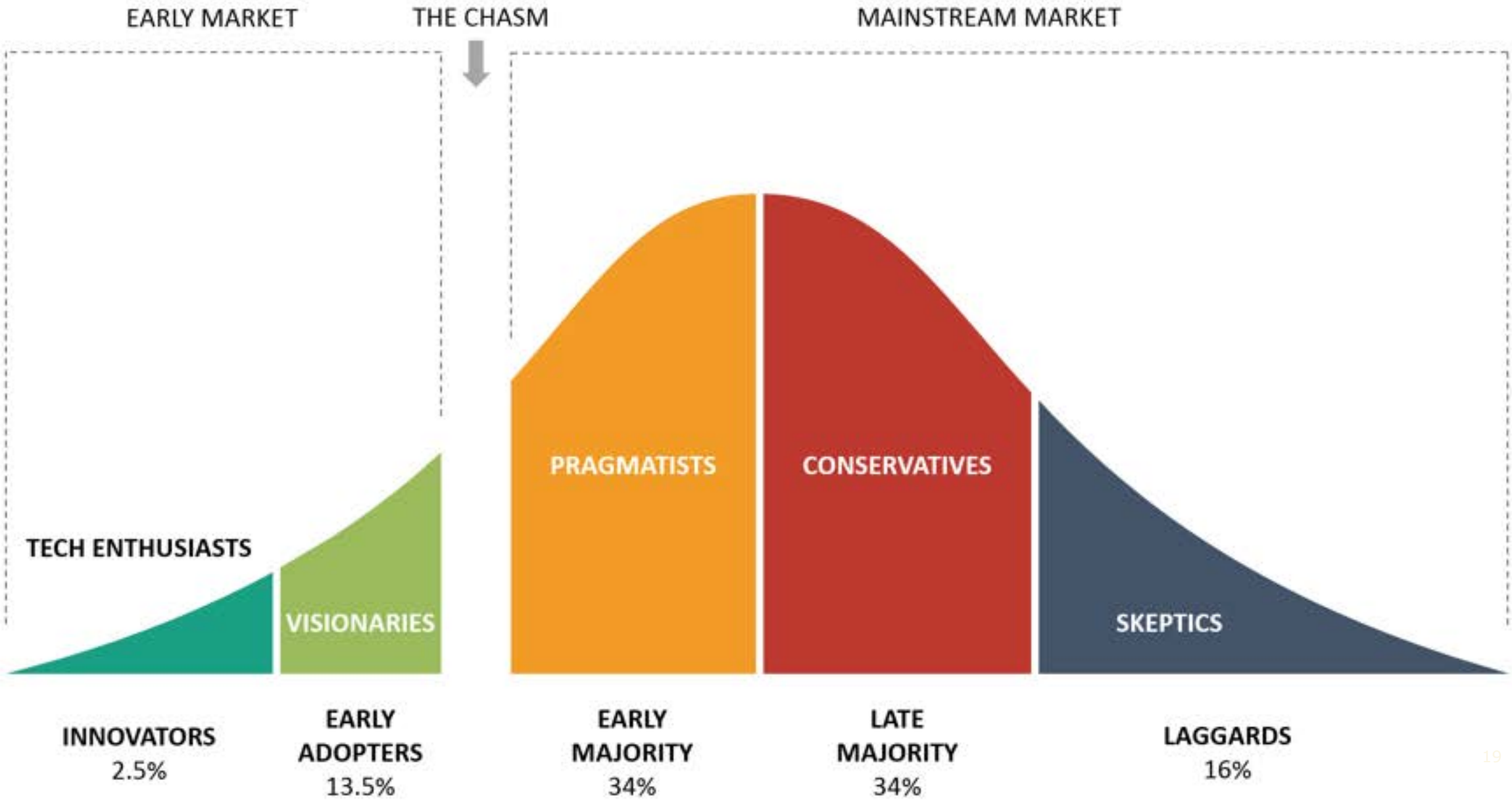
Related work from WUR: Synthetic data







4. Focus on early adopters and early majority



Integrate in farming practice

- Integrate with farm management information system (interoperability)
- Use farming ag-standards
- Secure local connectivity
- Needs the farmer calling you or are you calling the farmer when issues occur
- Facilitate app groups/platforms to share knowledge
- Select your launching customers carefully (pay them | provide value to them from the start)

End slide

Erik.pekkeriet@wur.nl

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