Future Internet for agri-food business?

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Because I was lately informed about this workshop I was not able to make an extensive position paper, touching upon the 5 questions. However, the following slides and notes provide quite some anchor points for this. Most of the ideas presented are elaborated thoroughly in several papers of which some are mentioned on the last slide. Before the meeting will take place I will be able to formulate a concise answer to the FI-PPP questions and isssues.

Apologize for this inconvenience.

Challenges in agri-food business

- Sector-specific characteristics include:
  - Fresh products
  - Seasonable production
  - Many SMEs particularly at farm
- Main challenges
  - 'license to produce'
    - consumers & society
    - food safety and transparency
  - Global competition (EU, WTO)
  - Demand-driven
  - Innovation: knowledge-based production
- Operate in multi-dimensional, dynamic networks

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Agricultural production is about plants and animals. Main lines of business include dairy, beef, pork, vegetables, fruit, flowers and last but not least arable farming. Arable farming is cultivation of crops in the open air, such as production of potatoes, sugar, grain, etc.

Some specific characteristics of agri-food busines are:

•Fresh products, so decay is a very important issue.

•For some sectors production is seasonable.

•There are many SMEs, especially for primary production, but also processing, wholesale.

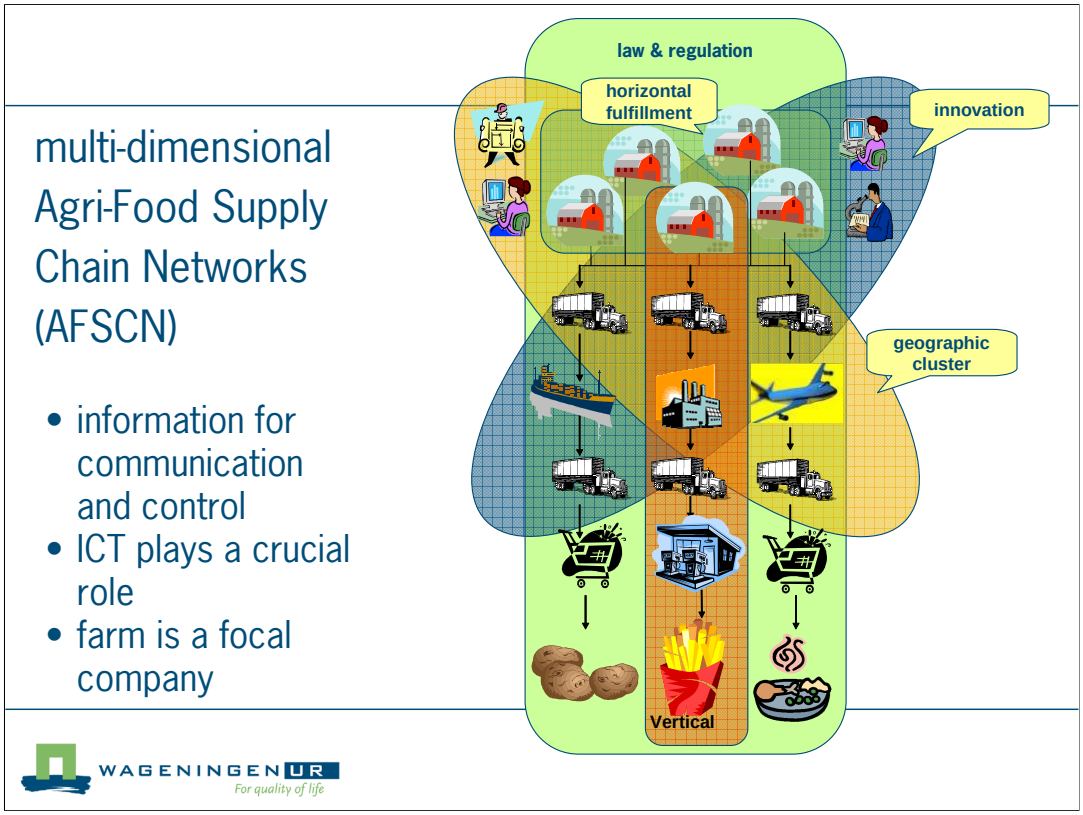
Challenges:

•Within these characteristic, agri-food companies must fight for there 'license to produce', the impact of consumers and society is high, so many environmental legislations, and food safety is a very important issue.

•Further, global competition is increasing among. In order to keep its good international position, it very important to become more demand-driven, so to be responsive to consumer needs, and be flexible in developing new products, participating in new markets, etc.

•Important for this is a reinforcement of a close cooperation between agri-food companies and research institutes. A knowledge based production in an open innovation approach has been an important element of the succes of agricuture and food so far, and should help to sustain in the future.

Together, these characteristics and challenges cause that many agri-food companies are typical examples of networked enterprises. They operate in different, ever-changing networks to meet the challenges. This will be illustrated by next slide.



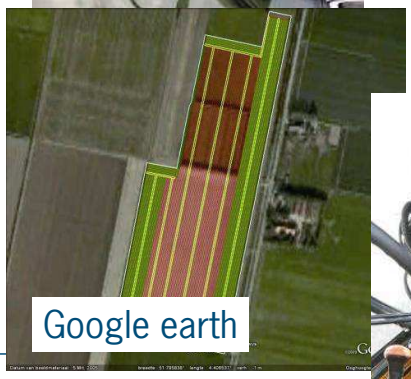
Multiple network dimensions

Major driver of information systems agility is the evolvement of multi-dimensional, dynamic and knowledge-based networks. They can be categorized into the following dimensions:

- Vertical supply chain dimension: combination of actors that together develop, produce and distribute products to fulfil customer needs. Challenge is to be responsive and consumer oriented to be competitive in the current market place. This requires that demand and supply information is timely available in the entire chain.
- Horizontal fulfilment dimension: combination of producers who complement each other providing a complete assortment in the required production volume and delivery reliability. Challenges: good mechanisms to make Available to Promise (ATP) decisions, to allocate orders to participating companies and to assure accurate fulfilment. Therefore, sharing timely and reliable information about assortment, availability, production and quality is of vital importance.
- Innovation dimension: combination of organisations, both companies, service providers and research institutes that cooperate in developing new products, processes or resources. Challenge: translate practical innovation needs to research questions, and make knowledge available in a form that is can be directly be used in company systems.
- Geographic cluster dimension: regional cooperation focusing on combining logistic flows or creating a closed system that utilizes mutual inputs and outputs (e.g. energy). This requires coordinated orchestration and control of the flows in the entire network. Information systems are an important means to realize this.
- Law & regulation dimension: all actors in the network have to deal with administratiion because of all kinds of regulations, e.g. concerning food safety, environment, health, etc.

Information is of crucial importance to enhance these networks by enabling timely and network-wide sharing of specific information and by enabling flexible response.

High-tech in arable farming



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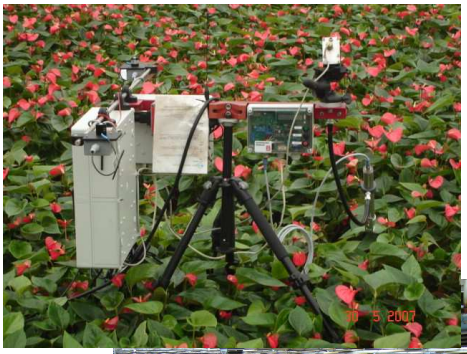
Current arable farming uses all kinds of high-tech for sensing & monitoring and precision control.

High-tech in horticulture



RFID tags

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The same holds for horticulture in which logistics plays a key role.

High-tech in animal farming

Milking Robot

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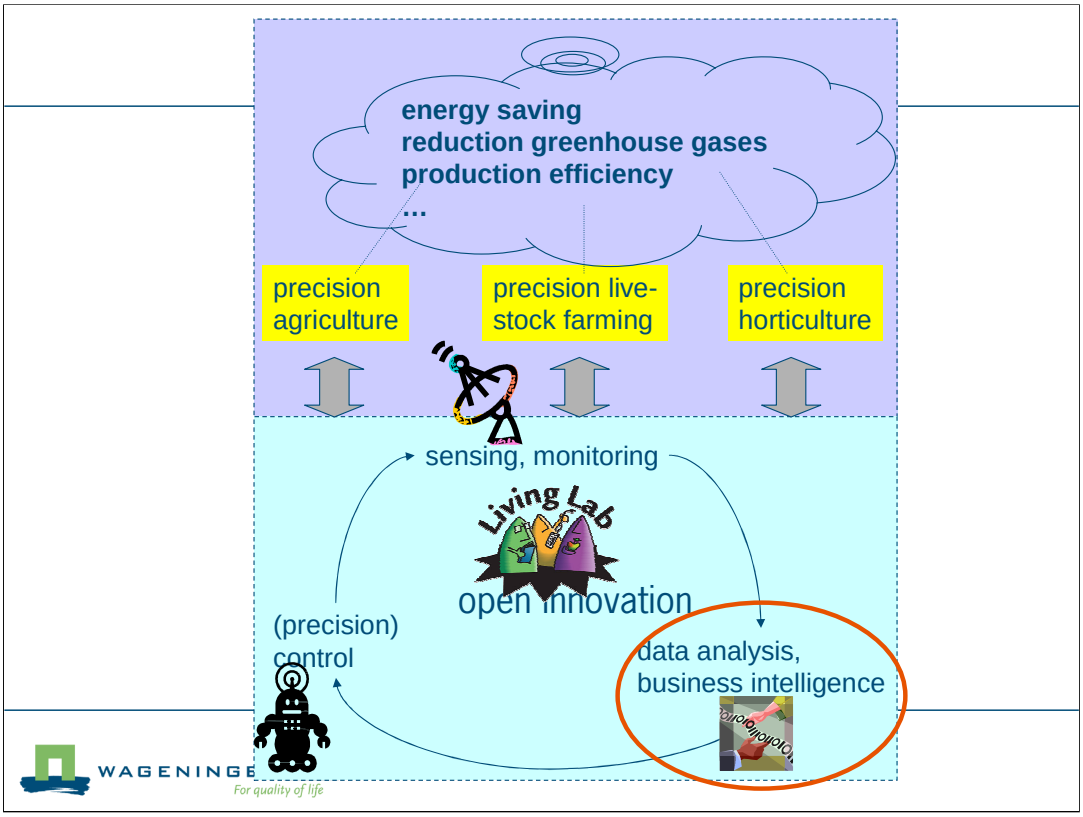
Within animal farming it is possible to manage at individual animal level.



However, the problem is that huge amounts of data are sensed and monitored, but because of isolated of poorly integrated ICT solutions it is still difficult to get the right information for process control at a precise level. We illustrate this by three exemplary cases from different levels in the agri-food supply chain network:

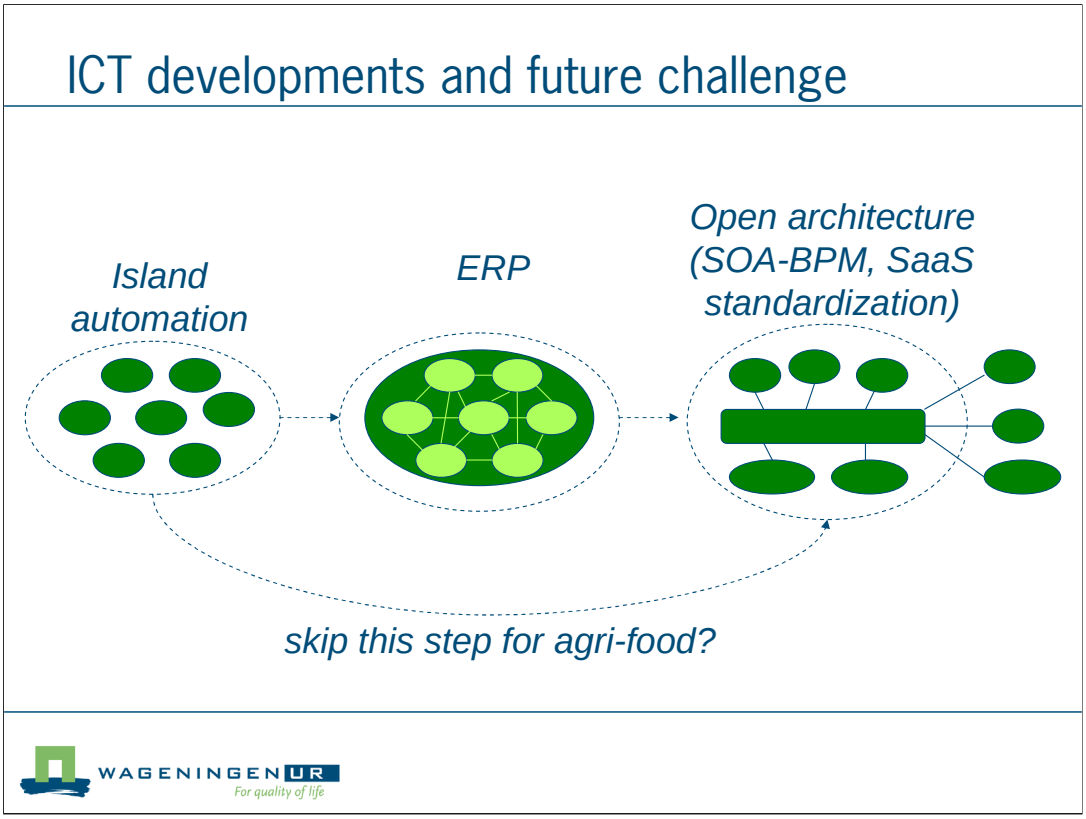
1. In the current trend of precision agriculture, using geographical information systems, it is possible to monitor and control crop development at a very precise level. However, although loads of data can potentially be generated, there is still a lack of scientific knowledge and models to use these data in order to make applications for improved decision-making;
2. At different points-of-sale in supermarkets and other shops (also increasingly in internet-based shops) loads of data are generated on consumer behavior, but still there is a lack of scientific knowledge and insight how these data could be used to better serve the customer or to improve downstream production;
3. Currently, it can often be observed that traceability is only arranged to comply with legal requirements. The possible merits of enhanced transparency and traceability to better serve and inform the customer, to better control product flows and to better guarantee the quality (attributes) of products have not yet been obtained;

This indicates that the use of ICT in the agri-food sector can be improved considerably, because ICT could help to:

- organize and streamline large amounts of data in an effective way (data warehousing);
- make knowledge accessible (e-content) and put it in the right context for application (e.g. by context-sensitive search);
- combine knowledge and data in models that are meaningful in the right context (e.g. in decision support systems).

So, first this integration has to take place. Secondly good practices for data analysis and business intelligence are needed to translate the data into useful management information. Finally if this stage is reached, it is believed that these developments can contribute to issues at a higher level such us energy saving, animal welfare, human health, etc.

First steps in an open innovation approach were already taken by setting up Living Labs.



Most software in the agri-food sector is still in the phase of 'Island automation'. There was not much development into the direction of ERP systems like in other industries. In other industries the developments to more open architectures with a common backbone takes place (like is advocated also in FI-PPP). The suggestion is that agri-food business could skip this step and directly connect to this development. It is also a logical step, because the basic need of agri-food production is one of a 'chain information system' and not just information systems for one single company.

Vision for the future

- Business in the lead and responsible!
  - Human and organizational change
  - Commitment and vision at both 'CEO-level' and 'workers level'
  - Co-operation and co-ordination in all dimensions of AFSCNs (as much as possible)
- Business processes must be leading
  - Rapid re-configuration approach using dynamic modelling and component repositories
  - Based on Business Process Management (BPM) and Service Oriented Architecture (SOA)
  - Alignment of and interdependency between all integration types and levels
- Sector-specific, open models and standards
  - Based on cross-industry models/standards (e.g. OpenGIS, ebXML, XBRL)
  - Standards organizations
    - execution by (ICT) consultants
    - innovation by researchers

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Interest in Future Internet PPP

- Agri-Food is an interesting area for use cases, also related to general topics (e.g. climate change, health, logistics, …)
- current national Dutch programs
  - Program Precision Agriculture (12 M€)
  - Horticulture Integral Digital (starting)
  - ➢ agri-food business is leading and very much involved!
- EU-FP7: agriXchange, ICT-agri, C@R, FutureFarm, …
  - ☹ dominated by research
- Challenge: involve private (ICT-)business in EU-projects
  ➔FI-PPP?

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More information

- Wolfert, J., Verdouw, C.N., Verloop, C.M., Beulens, A.J.M., 2010. *Organizing information integration in agri-food - a method based on a service-oriented architecture and living lab approach*. Computers and electronics in agriculture 70, 389-405. http://www.agrifoodlivinglab.nl/Portals/1/Wolfert_COMPAG_2010.pdf
- Verloop, C.M., Wolfert, J., Beulens, A.J.M., 2009. Living Lab "Information Management in Agri-Food Supply Chain Networks". In: Cunningham, P., Cunningham, M. (Eds.), eChallenges e-2009 Conference Proceedings. IIMC International Information Management Corporation Ltd 2009, Istanbul, Turkey. http://www.echallenges.org/e2009/outbox/eChallenges_e2009_ref_229_doc_5873.pdf
- Living Lab for Information Management in Agri-Food, a white paper. http://www.agrifoodlivinglab.nl/LinkClick.aspx?fileticket=An8Zfa5edJY%3d&tabid=120

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