Innovating Agriculture Economy

By

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Outline

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- Challenges for Sustainable Agricultural sector
- An overview for ICT in Agriculture
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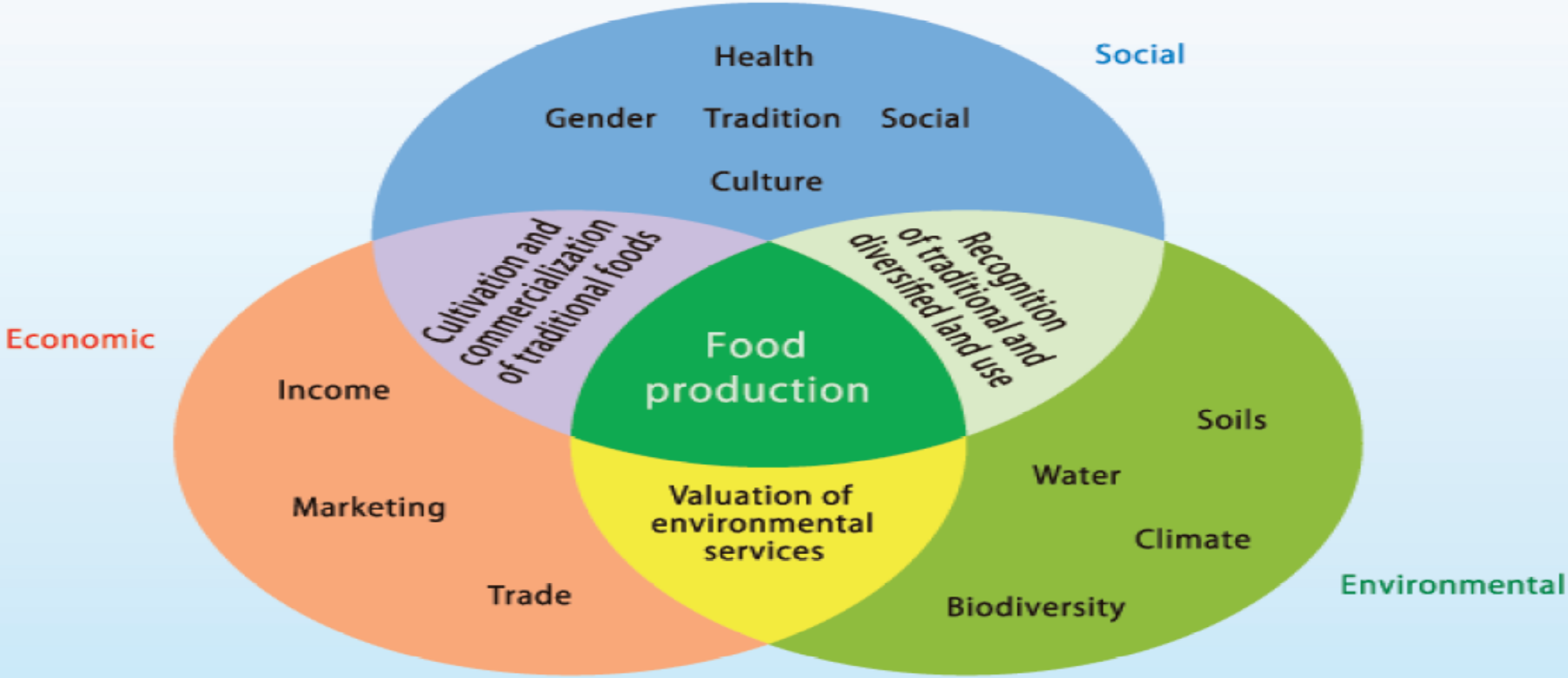
Introduction

- The word agriculture has been derived from the Latin word “agricultura” which is the combination of ager, "a field" and “cultura”, "cultivation” .Agriculture is an important sector and considered the backbone of economy



Paradigms of Agriculture

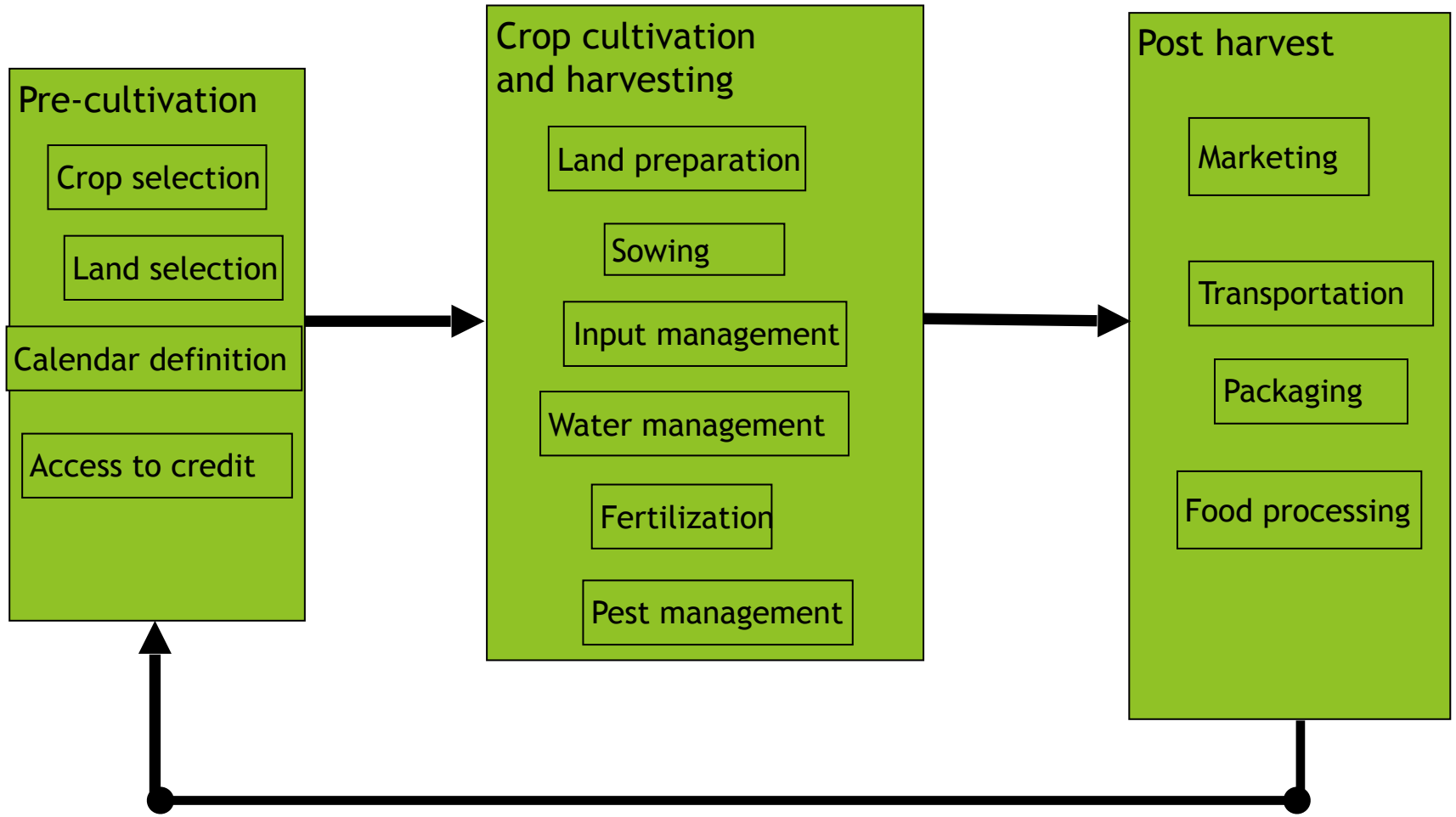
	Traditional Agriculture Prior to 1950	Modern Agriculture 1950-1985 (Green Revolution)	New Agriculture 1985 to date
Technology	Relatively Constant Technology	Mechanization-Agrochemical - Better Seeds and Breeds	Information Technology, Biotechnology IoTs, AI, ML, Block chain
Organization	Relatively Stable	- Labour Saving - Yield Enhancing - Intensification - Specialization - Concentration	Quality Orientation, Protecting the Environment - Direct and Ethical Marketing -New Products
Social Impact	Static Rural Society	Dynamic Structural Change	- Continuing Structural Change - Rural Development - Direct Payments
Driving Forces	Driven by Tradition	- Driven by Economies of Scale (produce more, faster, easier)	- Driven by Markets Consumer Preferences and Information
Innovators	individuals - "Local Geniuses" - Outsiders	- Technical Experts - Sector-Specific Innovation	- Social Experts - Social and for-profit hybrid enterprises - Strategic Innovation
Scope	Productivity	Input-output relationships	Farm-based, Beyond the farm gate
Role of policy	set priorities and allocate resources for research	set priorities and allocate resources for research in consultation with different stakeholders	Integral part of innovation capacity. Strengthening enabling environment and support system coordination

Source: Robert Chambers and Andy Hal (2005), OECD, (2002-2010) and FAO (2017)

Challenges for Sustainable Agricultural sector

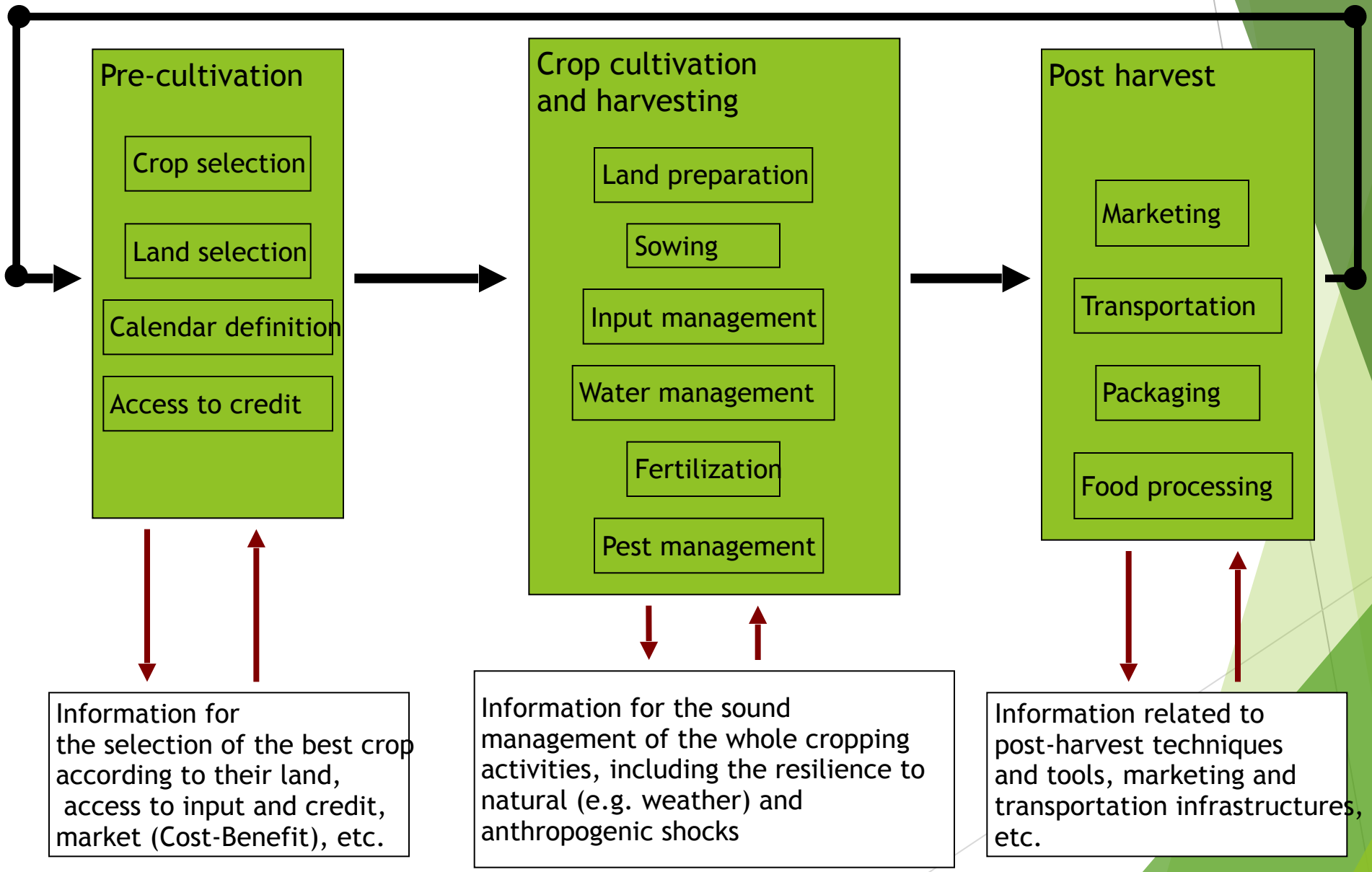
- Abundant food insecurity (*FAO:*Food and Agriculture Organization, 2006, 2017)
- Demand for food will increase and Urbanization (*Evans*, 2009, and WHO: World Health Organization)
- 70% of the world's poor live in rural areas (< USD 2/day). (source: FAO; Food and Agriculture Organization (United Nations)
- Unsustainable use of natural production factors such as soil, biological diversity and water (*Pimentel et al.*, 1995; FAO, 2003, 2017)
- 60 % of ecosystem services are degraded which causes to increase the frequency of droughts and floods (Millennium Ecosystem Assessment, 2005)
- Intensive agriculture is depends on high energy but could be energy self-reliant and could mitigate GHG emission considerably (*Smith et al.*, 2007)
- Agriculture is insufficiently prepared to cope with unpredictability and adaptation to climate change *(Lobell et al.*, 2008)
- Food waste: Between **33 percent to 50 percent of all foods produced globally is never eaten**, and the value of this **wasted food is more than $1 trillion**. To put that in perspective, US food waste represents 1.3 percent of total GDP. Food waste is a massive market inefficiency (**3rd largest emitter of greenhouse gases after China and the US, if food waste were a country) (FAO, 2016)**

An overview for ICT in Agriculture

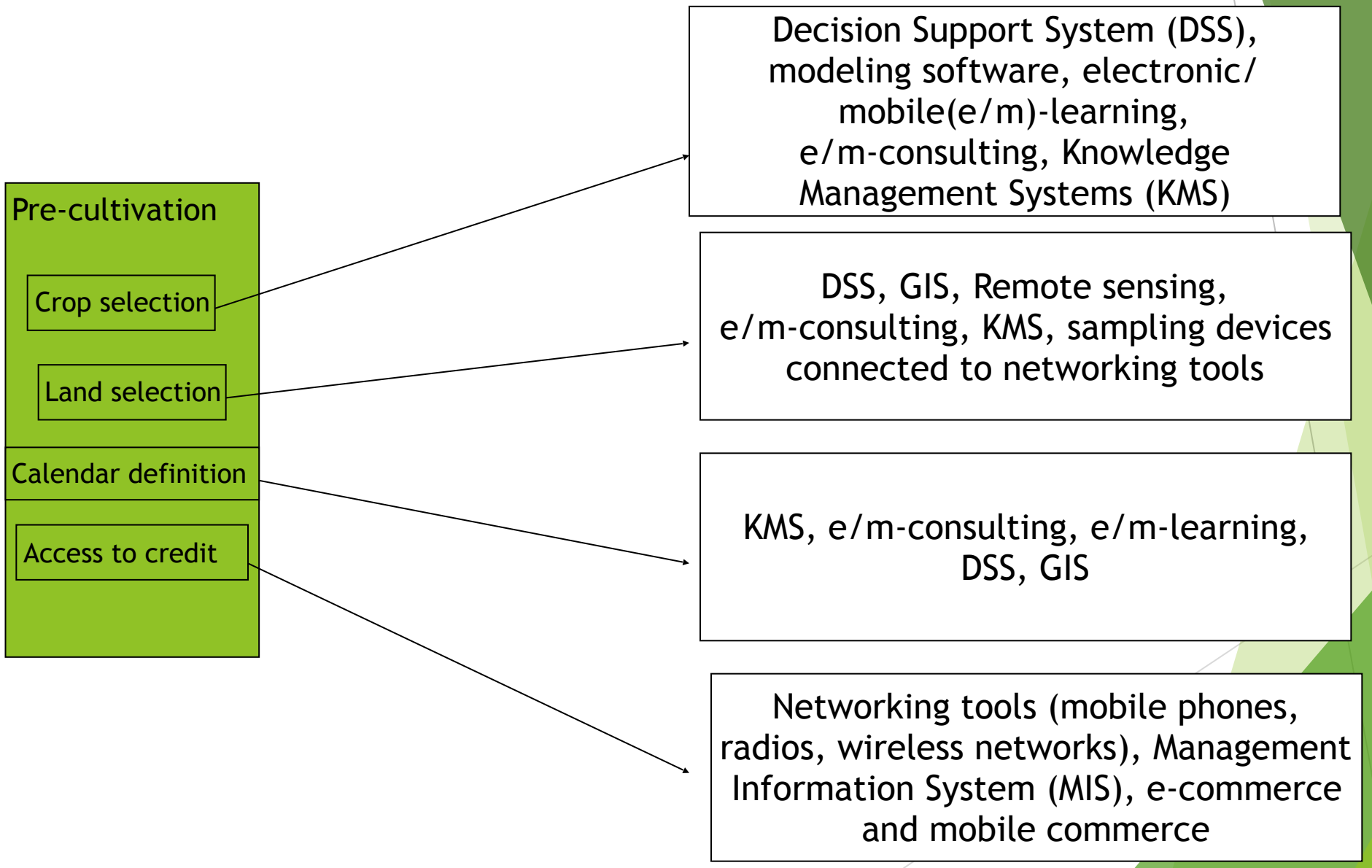


Main phases in the agriculture sector

Information produced/needed



ICT Application



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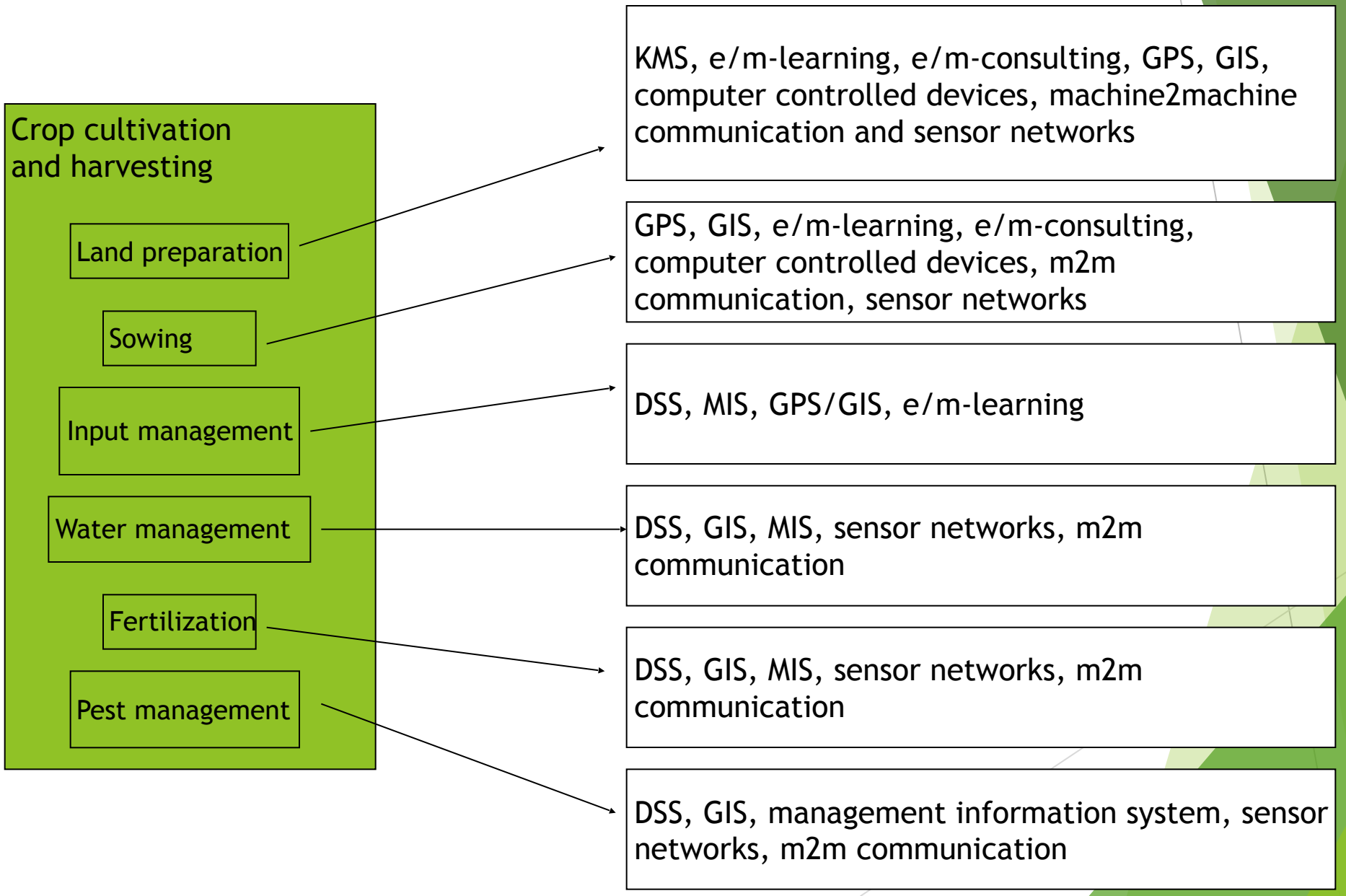

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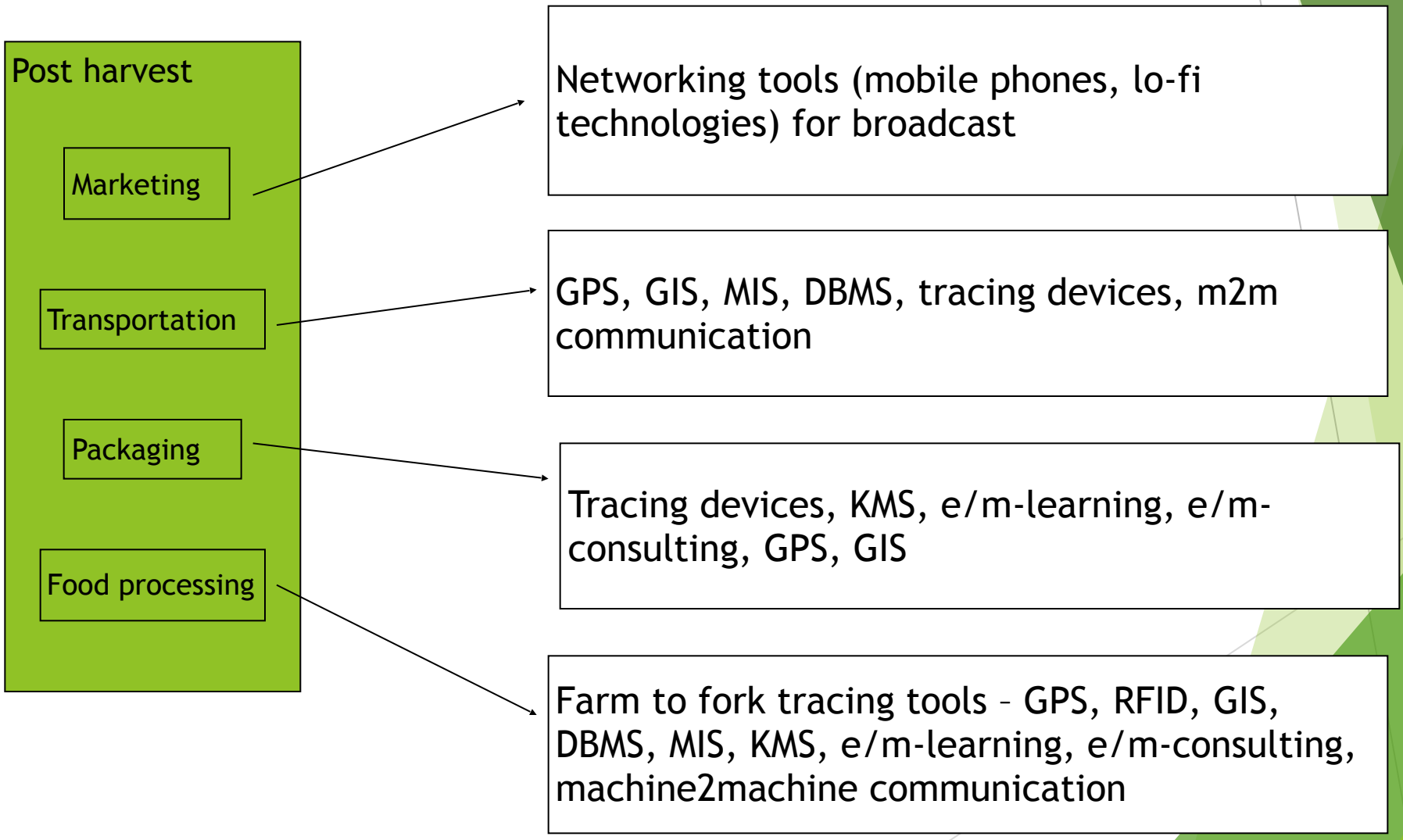
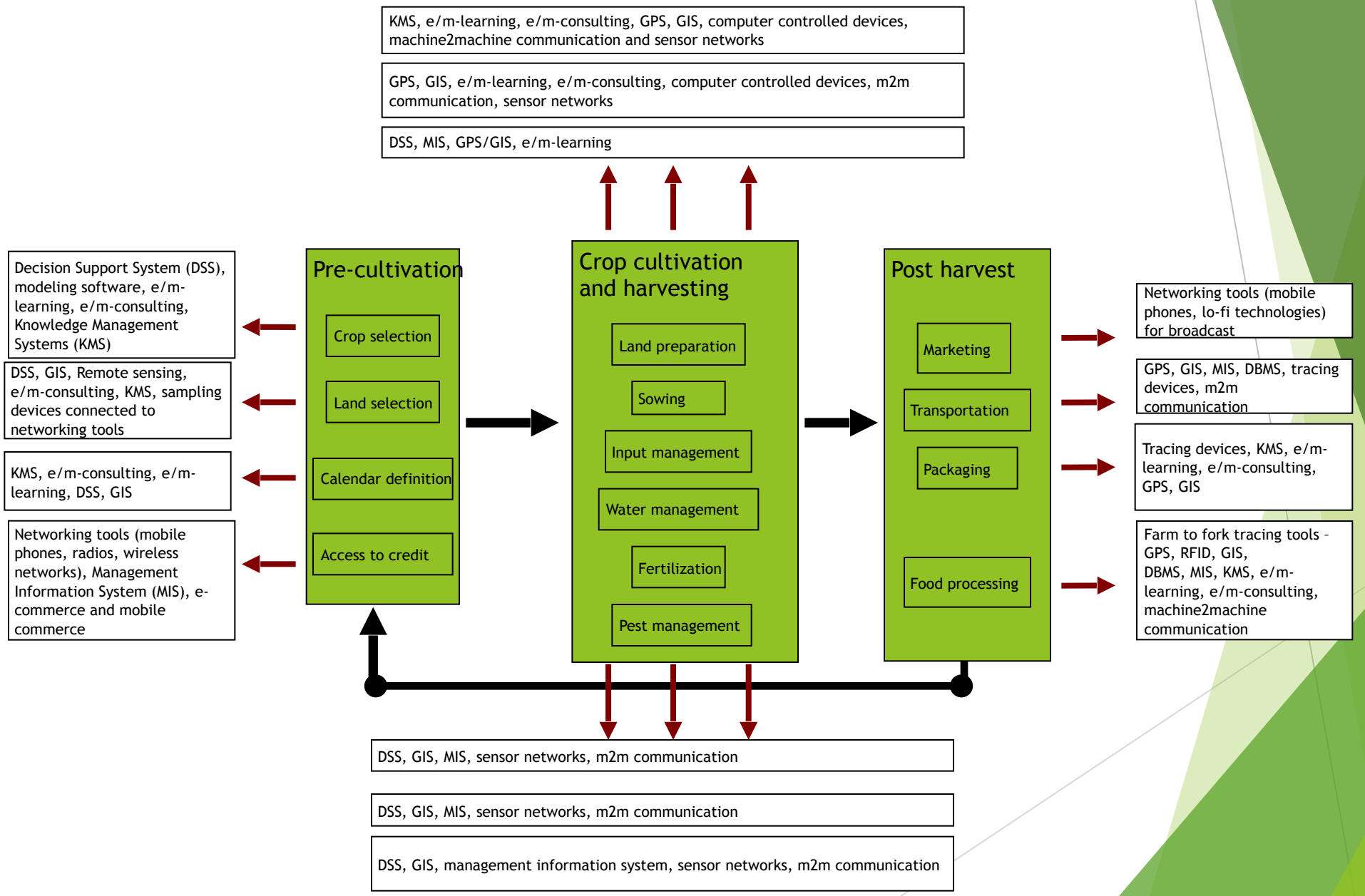


Mind map for ICT in Agriculture



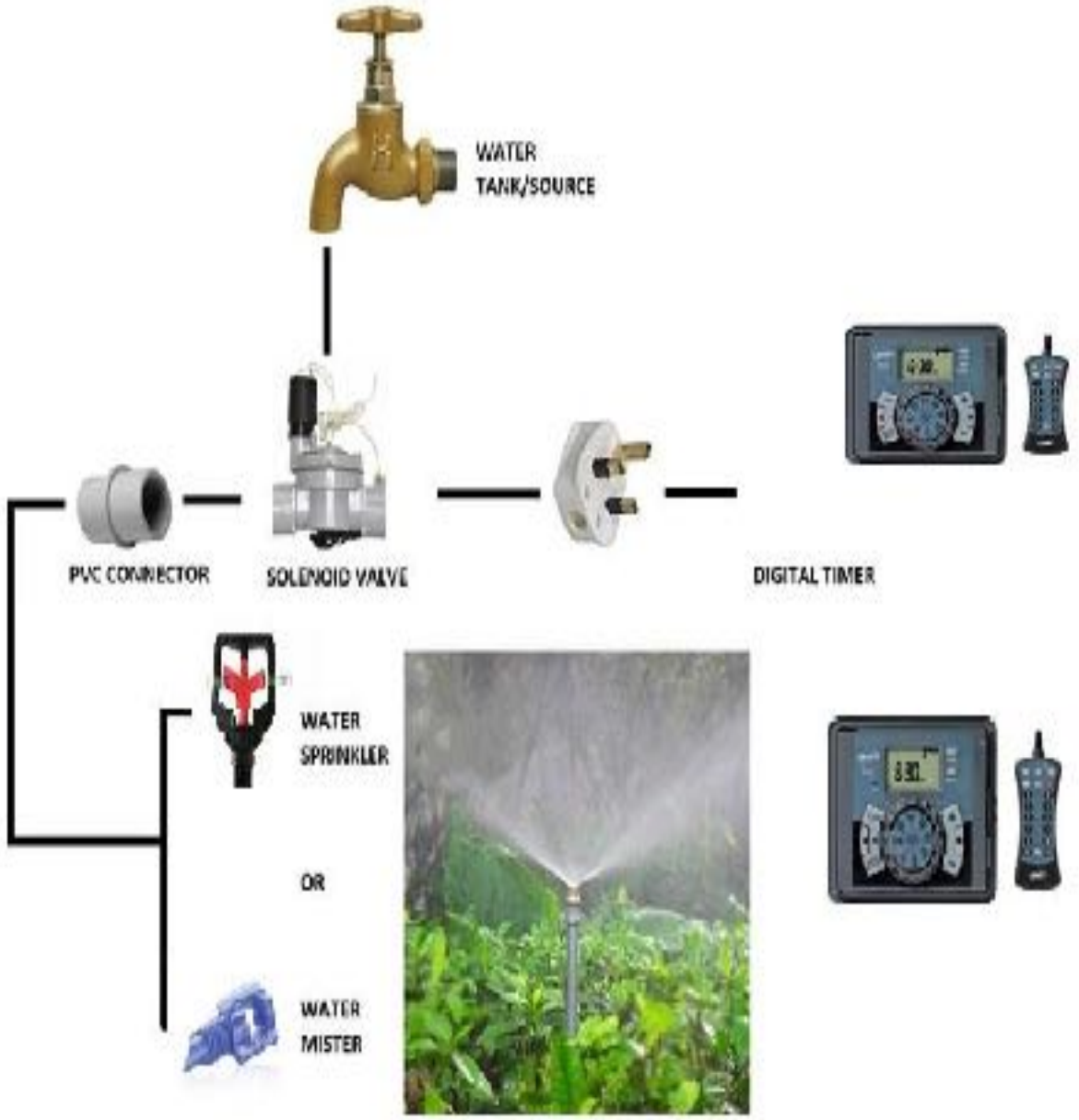
Solutions to Challenges of Agricultural sector

- Bill Gates and Richard Branson Back Startup That Grows “Clean Meat”
- IKEA, David Chang and the ruler of Dubai invest $40 million in AeroFarms vertical farming

AeroFarming

Solutions with Cross-industry technologies and applications

- **Internet of Things (IoT):** Digital transformation is disrupting the agricultural world. IoT technologies allow correlations of structured and unstructured data to provide insights into food production. IoT makes better water management when coupled with sensors, data and other machinery.



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Moisture precision sensors: Moisture precision sensors in a cornfield are used to assure that the crops are receiving the right amount of water and nutrients.

Automation of skills and workforce: By the 2050, the UN projects that two-thirds of the world's population will live in urban areas, reducing the rural workforce. New technologies will be needed to ease the workload on farmers: Operations will be done remotely.

Autonomous Vehicles

Moisture precision sensors

Drone Technology

Drone technology is giving agriculture a high-tech makeover. Here are six ways drones will be used throughout the crop cycle:

1. **Soil and field analysis** :By producing precise 3-D maps for early soil analysis, drones can play a role in planning seed planting and gathering data for managing irrigation and nitrogen levels.
2. **Planting**: Start-ups have created drone-planting systems that decrease planting costs by 85 percent. These systems shoot pods with seeds and nutrients into the soil, providing all the nutrients necessary for growing crops.
3. **Crop spraying**: Drones can scan the ground, spraying in real time for even coverage. The result: aerial spraying is five times faster with drones than traditional machinery.
4. **Crop monitoring**: Inefficient crop monitoring is a huge obstacle. With drones, time-series animations can show the development of a crop and reveal production inefficiencies, enabling better management.
5. **Irrigation**: Sensor drones can identify which parts of a field are dry or need improvement.
6. **Health assessment**: By scanning a crop using both visible and near-infrared light, drone-carried devices can help track changes in plants and indicate their health—and alert farmers to disease.

Shared Economy

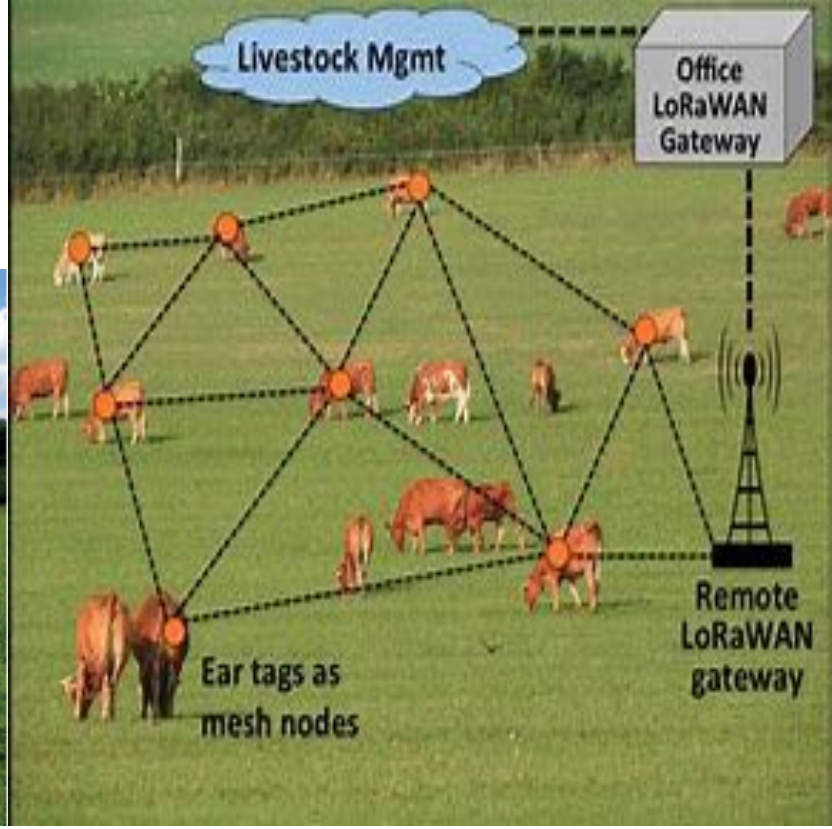
Food Sharing and Crowd farming:

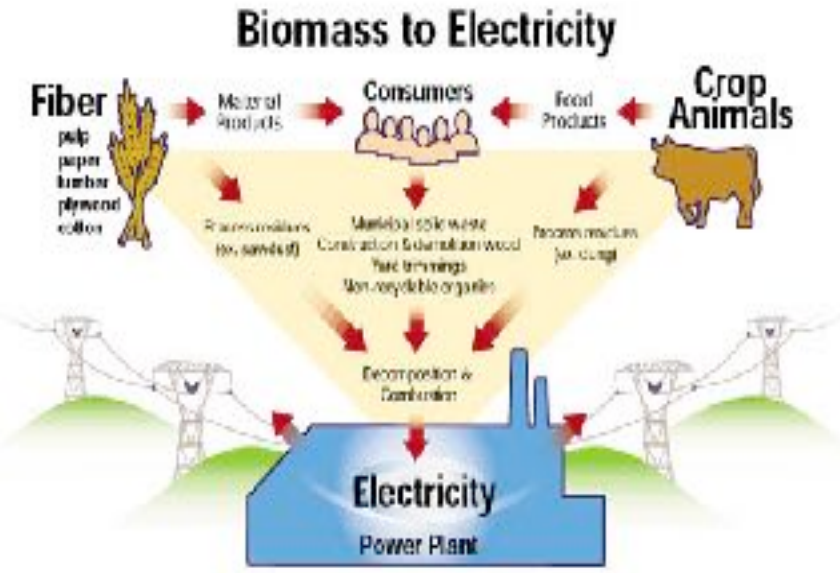
- Finally, the sharing economy and crowdsourcing also have a place in preventing food waste.
- **Technology** has enabled communities **to share their goods and services. This first became popular in ride sharing and house sharing, and now it is being applied to every industry, including food.**
- **Olio, founded by social entrepreneurs**, has built an app connecting people with their neighbours and local shops so that surplus food can be shared, rather than be discarded.
- Another social entrepreneurial project, **Naranjas del Carmen, has developed the concept of Crowdfarming**. Naranjas del Carmen has created a system in which the person has ownership over the trees and land that the farmer cultivates. In this way, the fruit of those trees goes to their owners, creating a direct link between production and consumption and avoiding overproduction and waste along the value chain.

Future prospective of agriculture economy

1. Innovation and Technology Players in Agricultural Economy

- Agricultural Drones
- Artificial Intelligence, Big Data and Robotics
- Monitoring and Controlling Crop Irrigation Systems via Smartphone
- Ultrasounds for Livestock
- Application of Agricultural Products as a source of Renewable Energy





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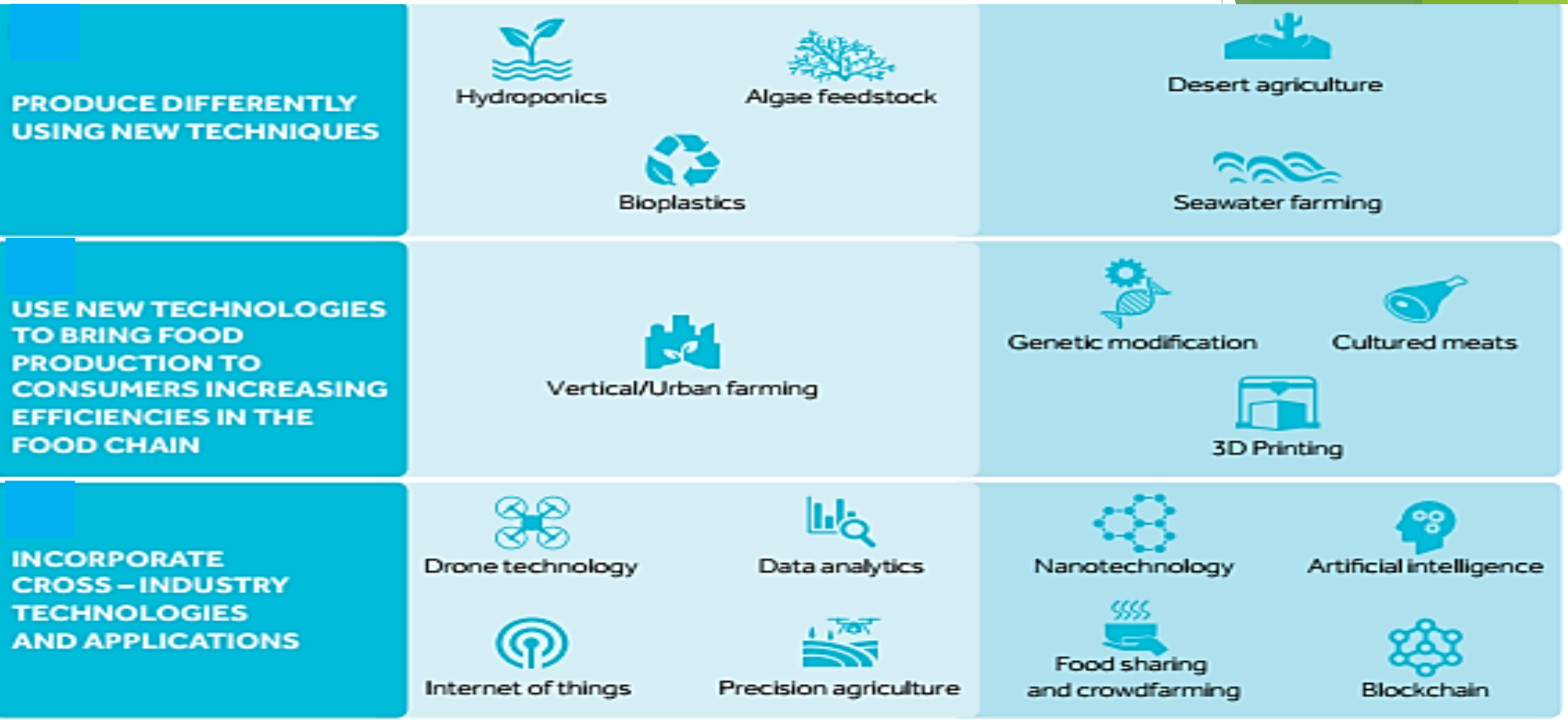
2. Blockchain

1. technology behind Bitcoin and other cryptocurrencies, allows for highly secure digital transactions and recordkeeping. While **blockchain has mainly been used in virtual currencies**, it can also be applied to other types of transactions, including agricultural ones.
2. **Blockchain can reduce inefficiencies and fraud and improve food safety, farmer pay, and transaction**. By improving traceability in supply chains, it can enable regulators to quickly identify the source of contaminated foods and determine the scope of affected products during contamination incidents.
3. The transparency of blockchain can also help fight food fraud. As consumer demand for organic, GMO-and antibiotic-free food soars, the news is rife with cases of fraudulent labelling. The smallest transactions— whether at the farm, warehouse, or factory—can be monitored efficiently and communicated across the entire supply chain when paired with IoT technologies, such as sensors and RFID tags.
4. Maersk, a shipping and logistics company, has intra-continent supply chains that involve dozens of personnel and hundreds of interactions. They estimate that blockchain could save them billions by improving efficiencies that reduce fraud and human error.
5. The benefits of openness extend to all honest market participants. Blockchain technologies can prevent price extortion and delayed payments while simultaneously eliminating middlemen and lowering transaction fees, leading to fairer pricing and helping smallholder farmers capture a larger part of their crop value.

Future technologies and maturity of Agricultural Economy



Source: OECD,FAO,(2017)


It's just the beginning