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# How to frame digital agriculture: policy and legal appraisal

## CONTENT 3 Climate-Smart Agriculture: legal aspects of a new model of agriculture in the EU

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# Program

**Part 1:** General introduction to the notions of food systems/sustainable food system;

**Part 2:** The nexus between sustainability and digital agriculture;

**Part 3:** How do the relevant international actors deal with the nexus?

# Aim of the Session

to provide an overview of

- 👉 the relationship between sustainability (sustainable food systems) and Digital Agriculture (DAg)
- 👉 the way in which international actors are navigating the current scenario of emerging digital technologies in the agri-food sector

# What is a food system?

'food systems are complex and multidimensional webs of activities, resources and actors involving the production, processing, handling, preparation, storage, distribution, marketing, access, purchase, consumption, and loss and waste of food, and the outputs of these activities, including social, economic and environmental outcomes.

Food systems are constantly being shaped by different forces, drivers and structural changes and decisions by many different stakeholders that could affect their sustainability.'

(CFS Voluntary Guidelines on Food Security and Nutrition, Feb. 2021, para 21)

# What is a sustainable food system?

‘Sustainable food systems are food systems that enable **food safety, security and nutrition** for current and future generations in accordance with the three dimensions (economic, social and environmental) of sustainable development. Sustainable food systems must be inclusive, equitable and resilient.’

(CFS Voluntary Guidelines on Food Security and Nutrition, Feb. 2021, para 21)

# RELATIONSHIPS BETWEEN DIGITAL AGRICULTURE AND (sustainable) FOOD SYSTEMS

# WE NEED A FOOD SYSTEM APPROACH FOR ADDRESSING DIGITALISATION of AGRICULTURE

WHY?

Digital Agriculture implies links with upstream and downstream actors to integrate them into one system

FAO, 2019: …digital agriculture not only will change how farmers farm their farms, but also will transform fundamentally every part of the agrifood value chain. Digital agriculture will affect the behaviour of farmers, and also affect the way that input providers, processing and retail companies market, price and sell their products. **It can be applied to all aspects of agrifood systems** and reflects a change in generalized management of resources

highlights the key role that DAg can play within the food systems

# Food systems and digitalization

Prause et al., 2020

**Table 1** Digital technologies along the food commodity chain

| Step in food commodity chain | Key digital product or service | Key actors and example companies |
|---|---|---|
| Agricultural inputs | Fintech for credit evaluation and payment services | Start-ups (e.g. Advans Group); non-profit start-ups (e.g. One Acre Fund) |
| | Data-based insurances | Agriculture insurance companies (e.g. AIG Crop Risk Services) |
| | Genome-edited seeds | Start-ups (e.g. Calyxt); agro-chemical corporations (e.g. DowDuPont) |
| Farm operations | Precision agriculture equipment | Start-ups (e.g. Blue River Technology); agro-machine and equipment companies (e.g. John Deere); agro-chemical companies (e.g. Yara International) |
| | Farm robotics | Start-ups (e.g. Naio Technologies) |
| | Digital machine-sharing platforms | Start-ups (e.g. Tro Tro Tractor); agro-machine and equipment companies (e.g. Tractors and Farm Equipment Limited) |
| | Data-based agronomy advice and information | Start-ups (e.g. Indigo Ag); social start-ups (e.g. Green Dreams Tech); agro-chemical companies (e.g. Bayer Crop Science); public institutions (e.g. FAO) |
| | Farm management platforms | Agro-chemical companies (e.g. Syngenta); agro-machine and equipment companies (e.g. John Deere); start-ups (e.g. CropX) |
| Primary commodity trade | Digital marketplaces | Start-ups (e.g. Indigo Ag); multinational tech companies (e.g. Alibaba); multinational food trading corporations (e.g. Cargill) |
| Food processing | Collaborative robotics | Food processing companies (e.g. Nestlé) |
| | 3D food printing | Food processing companies (e.g. Choc Edge) |
| Packaging | Smart packaging | Tech companies (e.g. Adobe Inc) |
| | 3D printing for polymer-based materials | Tech companies (e.g. MakerBot Industries, LLC) |
| Transport | Quality sensors and analytics | Logistics companies (e.g. Purfresh); tech companies (e.g. Tellspec) |
| | Digital freight management | Multinational food trading companies (e.g. Cargill) |
| | Digital transport logistics for small-scale producers | Farmer organizations (e.g. Zambia National Farmers' Union); start-ups (e.g. Distrego) |
| Storage | Automated warehouses | Supermarkets (e.g. Ocado); food processing companies (e.g. Nestlé) |
| Retail and consumption | Smart shopping | Supermarkets (e.g. Carrefour); tech companies (e.g. Amazon) |
| | E-commerce platforms | Tech companies (e.g. Alibaba); supermarkets (e.g. Wholefoods Market) |
| Entire commodity chain | Digital tools for commodity chain traceability and transparency | Supermarkets (e.g. Carrefour); tech companies (e.g. Amazon); farmer organizations (e.g. Ugandan National Union of Coffee Agribusiness and Farm Enterprises); food processors (e.g. Nestlé); food commodity traders (e.g. Louis Dreyfus) |

# Part 2: The nexus between sustainability and digital agriculture

Can digital technology play a major role in sustainability?

What is the relationship between sustainable development and technological innovation?

# Report of the World Commission on Environment and Development - Our Common Future (1987)

- I. 3.27 Humanity has the ability to make development sustainable ... The concept of sustainable development does imply limits - not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources ... But technology and social organization can be both managed and improved to make way for a new era of economic growth. …

- II.10 …The accumulation of knowledge and the development of technology can enhance the carrying capacity of the resource base. But ultimate limits there are, and sustainability requires that long before these are reached, the world must ensure equitable access to the constrained resource and reorient technological efforts to relieve the presume.

- II. 65. … reorientation of technology [to consider] the key link between humans and nature. First, the capacity for technological innovation needs to be greatly enhanced in developing countries so that they can respond more effectively to the challenges of sustainable development. Second, the orientation of technology development must be changed to pay greater attention to environmental factors ...

# SDGs as a framework for digital agrifood

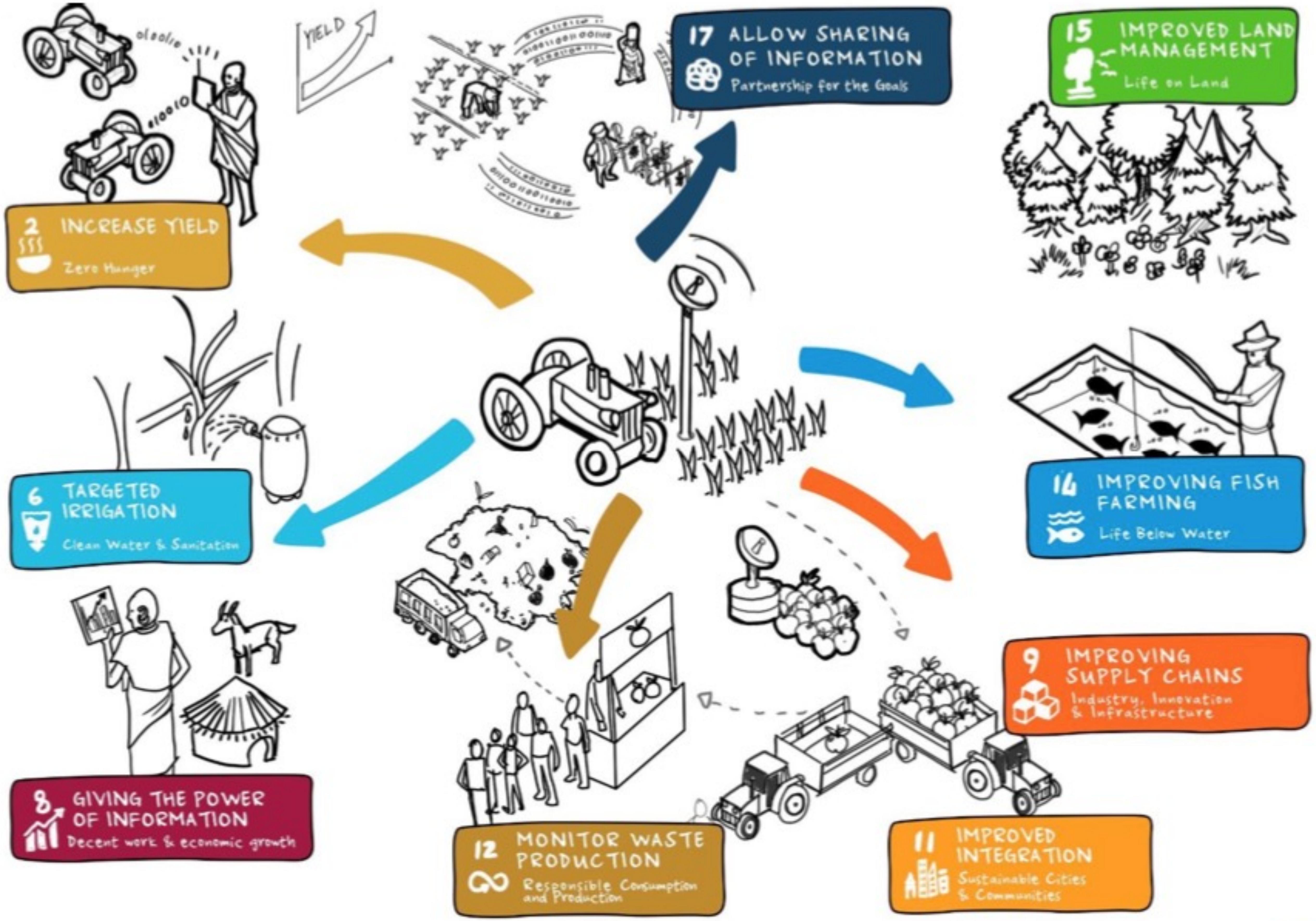
developing digital technology is prominent in the Agenda 2030


*Target **9.c** Significantly **increase access to information and communications technology** and strive to provide universal and affordable access to the Internet in least developed countries by 2020*

- While the possible contribution of digital technologies to the SDGs has initially been limited to the discussion of Goal 9, there is now a well-established understanding that **digital technology can help drive progress for all goals**


SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

# Advancing the Sustainable Development Goals (SDGs)



*...the use of dig. tech. is not without criticism...*

Vinuesa et al., 2020

digital tools could not contribute to reach the SDGs on climate and environment...

...the massive use of digital solutions could increase the world electricity demand up to 20% by 2030, and without changes in the energy sector (increasing renewables and energy efficiencies) the ecological footprint of human activities will grow considerably

*…the use of dig. tech. is not without criticism…*

Vinuesa et al., 2020

the carbon footprint of data centres challenge the achievement of limited or zero carbon footprint

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

automation of jobs could benefit inclusive growth, full and productive employment, and decent work for all

8 DECENT WORK AND ECONOMIC GROWTH

Uncapping the potential of digital agrifood requires that policymakers integrate technology developments into a coherent policy framework

## Part 3
## How do international actors deal with digital agriculture and with the relationship between digital agriculture and sustainability?

## How is the Food System Summit dealing with Digital agrifood?

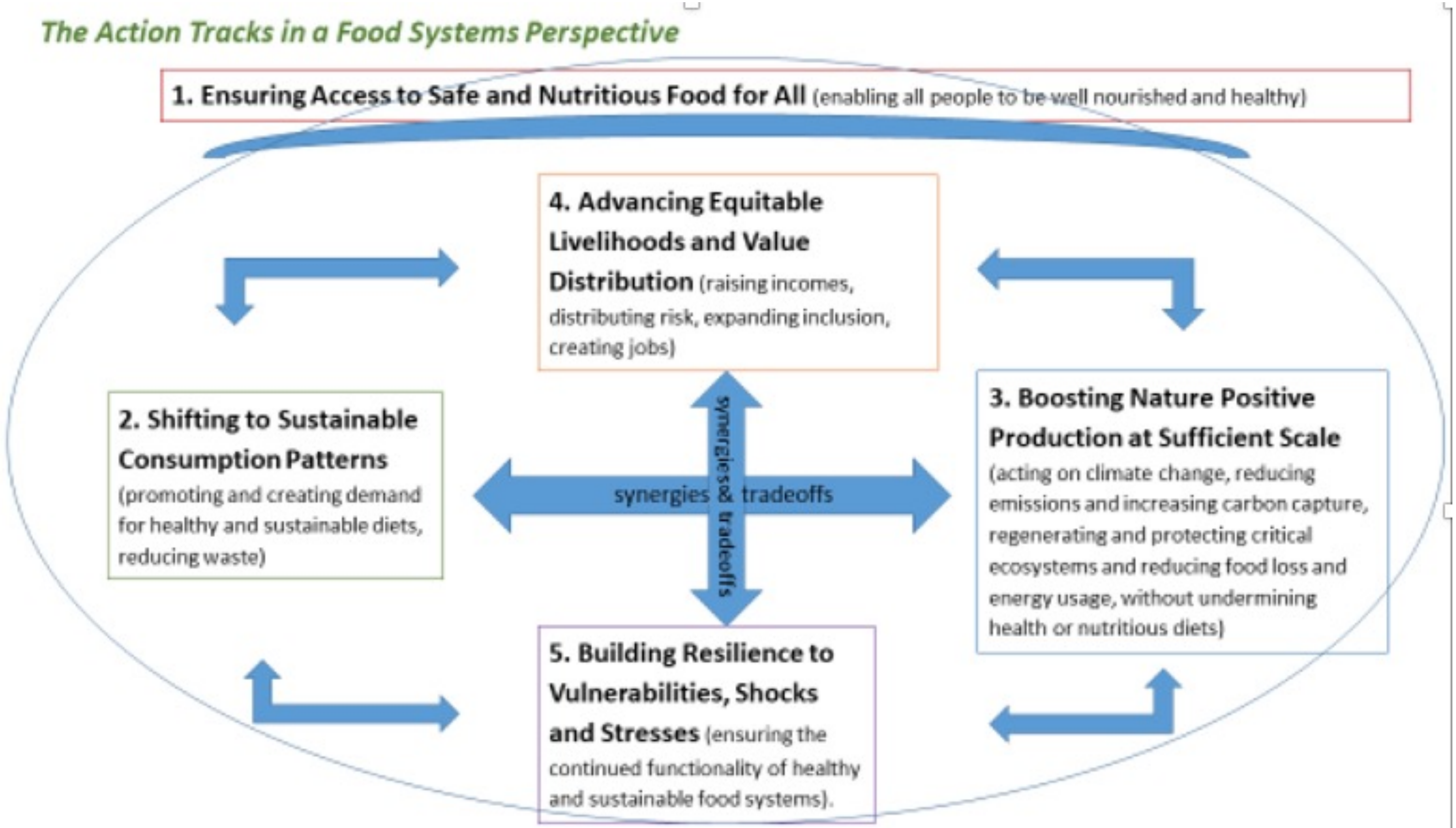
United Nations | Food Systems Summit 2021

**Objective of the Food System Summit**

to deliver progress on all 17 SDGs, each of which relies to some degree on healthier, more sustainable and equitable food systems

food systems touch every aspect of human existence

transforming our food systems is among the most powerful ways to make progress towards all 17 SDGs




5 main pillars that need to be fulfilled in a FS perspective (in order to build healthier, more sustainable and equitable food systems). They all are interlinked to each other

# How is the Food System Summit dealing with Digital agrifood?

United Nations | Food Systems Summit 2021

4 levers of change
CROSS-CUTTING KEY THEMES

- Gender
- Human Rights
- Finance
- Innovation (including digital technologies)

digital technology a key area to transform food systems and make them more sustainable (that enable food safety, security and nutrition for current and future generations)

# Can emergent, high-tech solutions to our food system challenges be a panacea? (Klerx and Rose, 2020)

ex. *Food security*:

rapidly growing population as the central problem and technology as the solution

BUT

Dig. Ag. can further take power away from marginalised communities (lack of resources, digital divide, lack of digital literacy…)

SEVERAL ISSUES MUST BE ADDRESSED TOGETHER

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Global Food Security

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## Dealing with the game-changing technologies of Agriculture 4.0: How do we manage diversity and responsibility in food system transition pathways?

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ARTICLE INFO

*Keywords:*
Industry 4.0.
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Agricultural innovation systems
Sustainability transitions

ABSTRACT

Agriculture 4.0 is comprised of different already operational or developing technologies such as robotics, nanotechnology, synthetic protein, cellular agriculture, gene editing technology, artificial intelligence, blockchain, and machine learning, which may have pervasive effects on future agriculture and food systems and major transformative potential. These technologies underpin concepts such as vertical farming and food systems, digital agriculture, bioeconomy, circular agriculture, and aquaponics. In this perspective paper, we argue that more attention is needed for the inclusion and exclusion effects of Agriculture 4.0 technologies, and for reflection on how they relate to diverse transition pathways towards sustainable agricultural and food systems driven by mission-oriented innovation systems. This would require processes of responsible innovation, anticipating the potential impacts of Agriculture 4.0 through inclusive processes, and reflecting on and being responsive to emerging effects and where needed adjusting the direction and course of transition pathways.

# Herrero et al., 2020

- the transformation of the food system **will not be purely technological (complex and systemic process)**
- an arsenal of technological options can be tailormade to address different food system challenges **in a range of institutional and political contexts (not operate in a vacuum)**
- innovation should involve a fundamental reformatting of the values, regulations, policies, markets and governance surrounding food systems

PERSPECTIVE
https://doi.org/10.1038/s43016-020-0074-1
nature food
Check for updates

## Innovation can accelerate the transition towards a sustainable food system

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**Future technologies and systemic innovation are critical for the profound transformation the food system needs. These innovations range from food production, land use and emissions, all the way to improved diets and waste management. Here, we identify these technologies, assess their readiness and propose eight action points that could accelerate the transition towards a more sustainable food system. We argue that the speed of innovation could be significantly increased with the appropriate incentives, regulations and social licence. These, in turn, require constructive stakeholder dialogue and clear transition pathways.**

# Herrero et al., 2020: 8 action points to accelerate systemic innovation in food systems

More than technological development is needed. Implementation and impacts also depend on … regulatory frameworks

# Digital transformation of agriculture and ‘law and policy’

for policy-makers and international organizations figuring out how to navigate this new scenario may **require some radical rethinking** (FAO, 2019)

- …are international actors radically rethinking?

# What roles are being imagined for digital technologies by international actors (analysis by O'Malley et al., 2020) (1)

3 actors: World Bank – FAO – OECD (they influence policy and private sector decision-making about food systems) #timeframe: 2015-2018
#4 research questions:

1) What vision of the future is presented in the documents?

2) What digital technological forms and configurations appear in the documents?

3) What food system actors are represented in the documents?

4) Which food production strategies are represented in the documents?

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## The future(s) of digital agriculture and sustainable food systems: An analysis of high-level policy documents

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*Keywords:*
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Frame analysis

ABSTRACT

Ecosystem services delivery is influenced by food systems and vice versa. As the application of digital technologies in agriculture continues to expand, digital technologies might affect the delivery of ecosystem services in view of the sorts of food systems in which they are embedded. The direction food systems develop towards the future, and the role digital technologies play in this development, is influenced by imaginings, hopes and visions about what these technologies mean for future food systems. In this article, we investigate what roles are being imagined for these technologies by international actors with the ability to influence the future of food systems. We analyze outward-facing policy documents as well as conference proceedings on digital agriculture produced by the World Bank, the UN Food and Agriculture Organisation (FAO), and the Organisation for Economic Cooperation and Development (OECD). Using qualitative textual analysis, we show that these organisations envision future food systems that prioritize maximizing food output through technology. We illustrate how this vision reflects a long-standing narrative about the role of technology in food systems innovation, which makes the controversial assumption that increases in food production lead to improvements in food security. Based on this finding, we suggest that evaluations of how digital agricultural technologies might affect the delivery of ecosystem services must begin by considering what visions of future food systems are take into account in science, technology development and policy making. Supporting similar research on high-level narratives surrounding agroecology and climate smart agriculture, we find that the dominant narrative in our dataset supports the *status quo* global, industrial agriculture and food system. This system continues to be criticized by many scholars for its environmental impacts. Based on our findings, we suggest that ecosystems service researchers could contribute substantially to the evaluation of environmental impacts of digital agriculture by analyzing the impact digital agriculture may have on the trade-offs between provisioning, regulatory, and cultural ecosystem services for several different food system futures. Such analyses can feed into processes of responsible innovation.

# Analysis by O’Malley et al., 2020 (2)

Major problem of food systems

food shortages, exacerbated by ecosystem pressures

Solution

to find technological means of producing more food to meet the needs of a rapidly growing global population

…suggestion of a promise of enhanced maintenance of ecosystem services via the application of new technologies

# Analysis by O’Malley et al., 2020 (3)

Key Messages

- inevitable (and needed) agricultural shift

- societies are at risk of not delivering sustainability and food system security if they fail to adopt digital agriculture

- concerns about the extent to which the transformations brought about through digital agriculture will include or exclude small-scale farmers (and women)

- the need for social innovation: “technology alone is not a silver bullet”

- the need to “understand how to reconcile private and public good dimensions of data”

# Analysis by O'Malley et al., 2020 (4)

conclusion:

«*In the documents we analysed, there is no appearance of alternative narratives of the future where social and political innovation enable transitions* ***away from the industrial production model***»

The dominant narrative of these organizations seems to support the status quo of global industrial agri-food systems

- *‘continuation of a project first begun with the Green Revolution in the early 1940’s and continued through the 70’s and 80’s by the World Bank’s Poverty Reduction projects and the corporate interests involved’*

- *resulted in ‘food system that is now under the control of corporations and large industrial farmers’*

- *create[s] dependency on so-called new technologies*

- *“a ‘modified’ face of industrial agriculture […]. It is a form of re-colonisation.”*

LA VÍA CAMPESINA

UN-masking Climate Smart Agriculture

23 SEPTEMBER 2014 CLIMATE AND ENVIRONMENTAL JUSTICE

# Nyéléni Forum for Food Sovereignty, 2019:

Proponents of digitalization emphasize the supposed benefits  for marginalized people and small-scale food producers:

- digitalized land administration will increase tenure security;
- satellite-supported allocation of fishing rights will ensure transparency and security for small-scale fishers;
- blockchains will link producers to consumers directly, eliminating exploitation by intermediaries;
- digital agriculture will reduce input costs and increase the efficiency of irrigation and production...

**…"the technology and infrastructure for this rosy scenario will come from corporations, who are in it for profits, not public benefit"**

# Thank you for your attention

Any question? Doubts?

Feel free to reach me at:

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