Toolkit on Digital Transformation for People-Oriented Cities and Communities

Module 12:
Digital Agriculture

12

2 ZERO HUNGER

11 SUSTAINABLE CITIES AND COMMUNITIES

Jointly developed by: ITU and FAO

Module 12 – Digital Agriculture

- This Module of the Toolkit for Digital Transformation of Cities and Communities focuses on digital agriculture aspects.

- Cities and communities that are starting on their digital transformation journey will find the resources highlighted within this Module useful toward encouraging the use of smart technologies, devices and systems to promote enhanced agricultural outcomes.

- This Module is also useful for cities and communities that have already made some headway into their digital transformation process but would like to validate the effectiveness of IoT and other smart applications for this purpose.

- This Module will underscore how digital technologies have the potential to revolutionise agriculture by facilitating data-driven insights to improve decision-making, enhance environmental performance, improving yield, while ensuring transparency along the food supply chain.

Module 12 – Digital Agriculture

This Module will cover the following topics:

1. Agricultural Challenges
2. Digital Agriculture Solutions
3. Key Digital Agriculture Tools
   1. Digital Agriculture Tool #1: Digital farming
   2. Digital Agriculture Tool #2: E-agriculture strategy
   3. Digital agriculture Tool #3: Programming Toolkit
   4. Digital Agriculture Tool #4: E-agriculture in action

Food and Agriculture
Organization of the
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1. Current Status

Current Status

Number of people affected by hunger globally rose to as many as **828 million** in 2021, an increase of about **46 million** since 2020

45 million children under the age of five were suffering from wasting, the deadliest form of malnutrition

The global volume of food wastage is estimated at **1.6 billion tonnes**

2. Agricultural Challenges

Terminology - FAO

Welcome to the new FAO TERM PORTAL!

19/09/2014

Due to the need to adapt our terminological database to the new FAO template, we have released a new version of the FAO Term Portal, with FAOTERM, our historical database, NOCS, the Names of countries database, as well as the thematic glossaries developed with interested partners all on one page.

The new FAO TERM PORTAL has been upgraded also to make it more user-friendly and, above-all, much faster. Take a minute to have a try! Your feedback is essential to improve our work.

Food and Agriculture Organization of the United Nations

Food Insecurity

Current trends
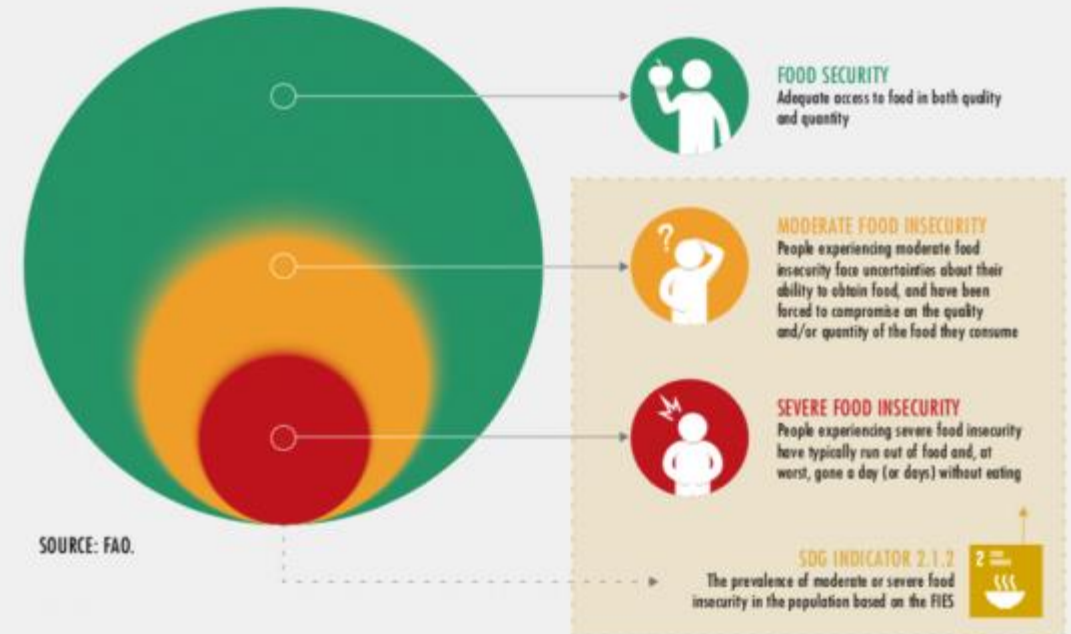
Rising hunger

Global nature of the problem

Progress off track to meet targets

Slow growth or declining economies most affected

EXPLANATION OF FOOD-INSECURITY SEVERITY LEVELS MEASURED BY THE FIES IN SDG INDICATOR 2.1.2

FOOD SECURITY
Adequate access to food in both quality and quantity

MODERATE FOOD INSECURITY
People experiencing moderate food insecurity face uncertainties about their ability to obtain food, and have been forced to compromise on the quality and/or quantity of the food they consume

SEVERE FOOD INSECURITY
People experiencing severe food insecurity have typically run out of food and, at worst, gone a day (or days) without eating

SDG INDICATOR 2.1.2
The prevalence of moderate or severe food insecurity in the population based on the FIES

SOURCE: FAO.

Food Insecurity Experience Scale (FIES) (source)

Challenges in the Agricultural Sector

Biodiversity Loss

Food wastage
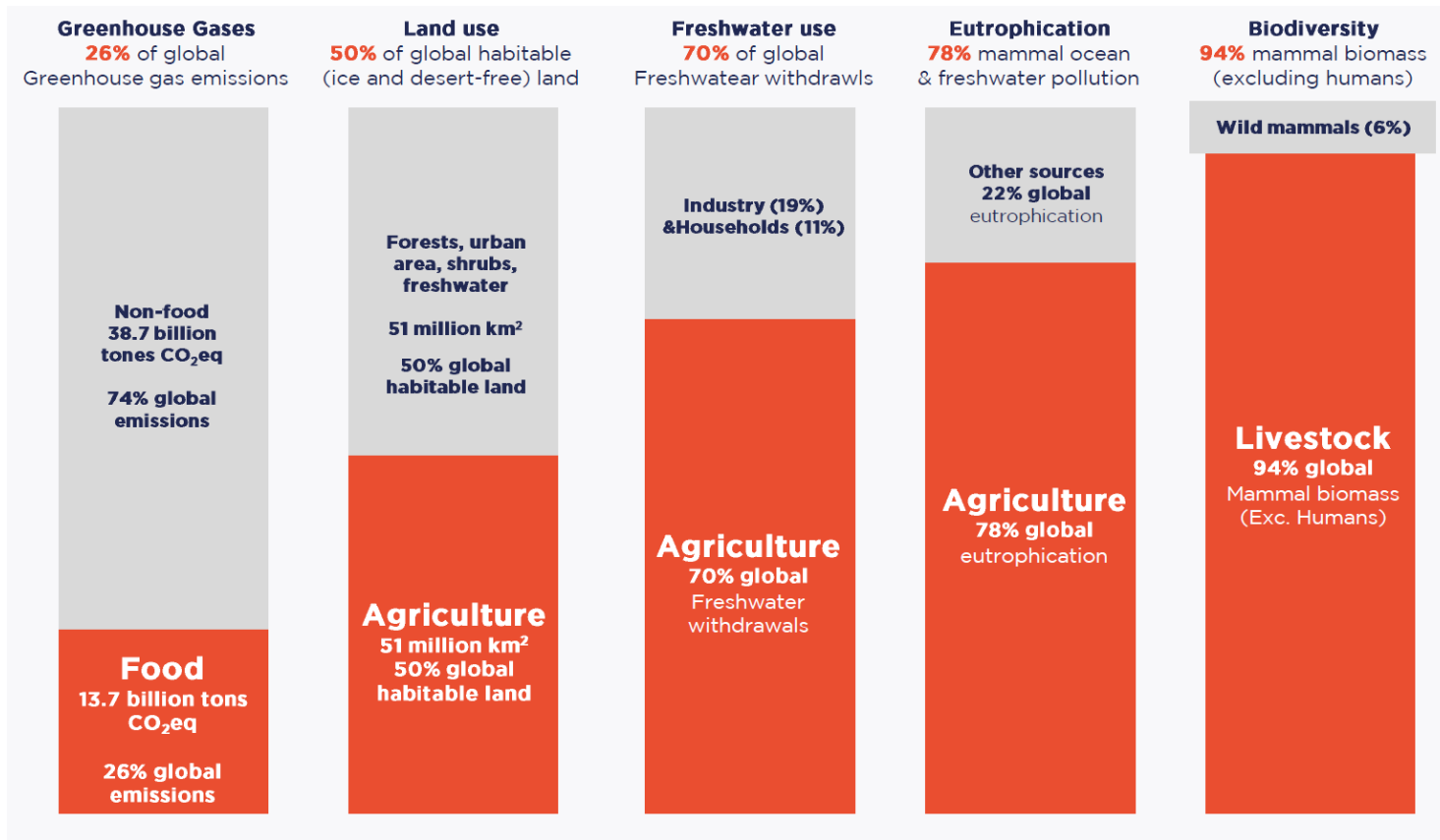
Water loss

Food Security

Climate change

Food distribution

The Impacts of Farming

Impacts of food and agriculture on limited resources ([source](#))

Standardization for the Agricultural Sector

3. Digital Agricultural Solution

What is Digital Agriculture?

Digital agriculture is the seamless integration of digital technologies into crop and livestock management and other processes in agriculture. For farmers, digital agriculture offers the opportunity to increase production, save costs in the long-term and eliminate risk.

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Digital Agricultural Revolution

Digitalization will change every part of the agrifood chain.

Management of resources throughout the system can become highly optimized, individualized, intelligent and anticipatory.

Value chains will become traceable and coordinated at the most detailed level whilst different fields, crops and animals can be accurately managed to their own optimal prescriptions.

Digital agriculture will create systems that are highly productive, anticipatory and adaptable to changes such as those caused by climate change.

Could lead to greater food security, profitability and sustainability.

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Digital Agricultural and the SDGs

Digital agriculture has the potential to deliver economic benefits through increased agricultural productivity, cost efficiency and market opportunities, social and cultural benefits through increased communication and inclusivity and environmental benefits through optimized resource use as well as adaptation to climate change.
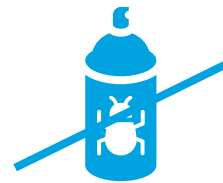
Food and Agriculture
Organization of the
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Role of ICTs in Agriculture

Regulatory frameworks
ICTs assist with implementing regulatory policies, frameworks and ways to monitor progress

Capacity development and empowerment
ICTs widen the reach of local communities (including women, youth and elders) and provide newer business opportunities, thereby enhancing livelihoods

Financial services and insurance
ICTs increase access to financial services for rural communities, helping to secure savings, find affordable insurances and tools to better manage risks

Food safety and traceability
ICTs help deliver more efficient and reliable data to comply with international traceability standards and food nutrition aspects

Role of ICTs in Agriculture

Agricultural innovations systems
ICTs bridge the gap between agricultural researchers, academia, extension agents, various market players and farmers

Sustainable farming
ICTs offer improved access and knowledge to sustainable farming practices, plant protection and animal health or climate-smart solutions

Disaster risk management and early warning system
ICTs provide actionable information to communities and government on disaster prevention, in real time, such as agro-meto information, while also providing advice on risk-mitigation

Enhanced market access
ICTs facilitate market access for inputs and products as well as trade

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The Objectives of Precision Farming

Food security

Less water usage

Less pesticide usage

Less GHG emissions

Greater worker safety

Food and Agriculture Organization of the United Nations

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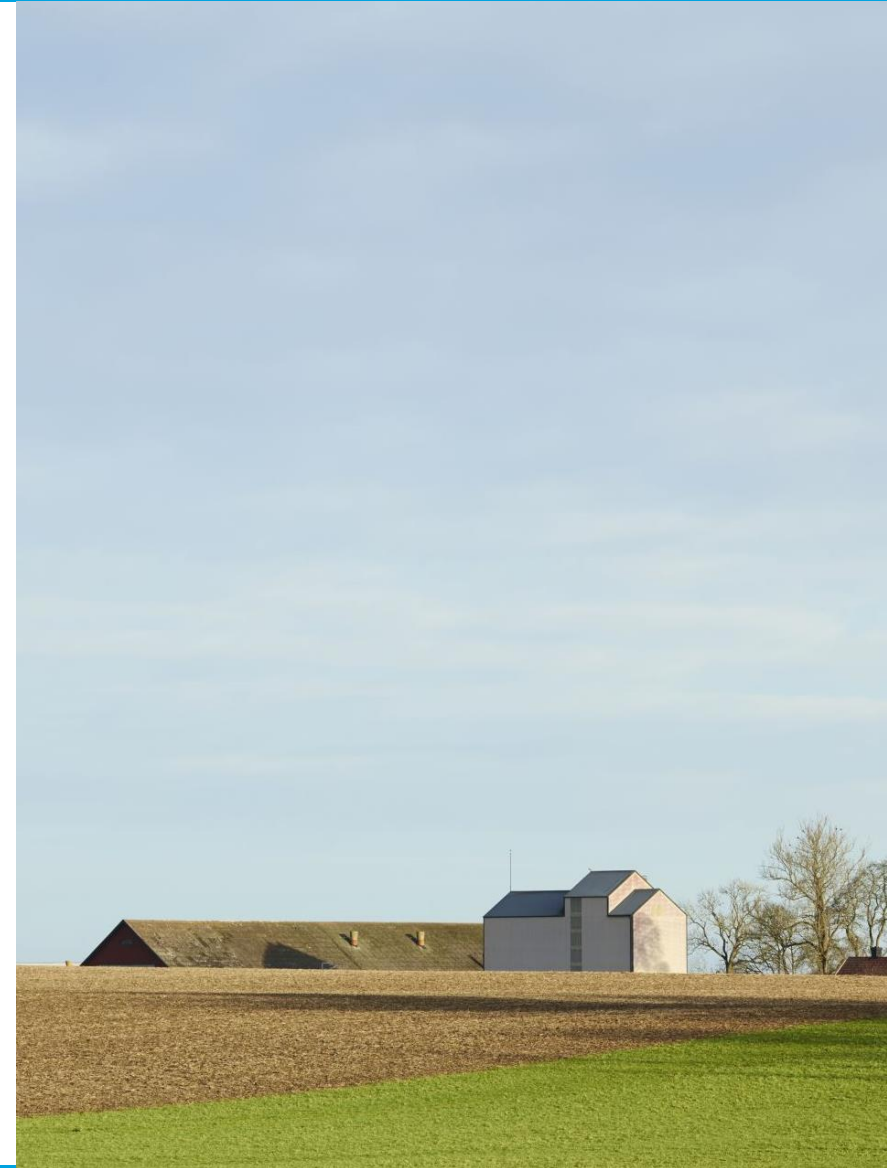
Emerging Technologies in Efficient Farming (Agtech)

Drones

Data and IoF
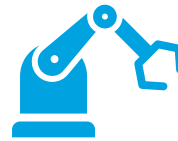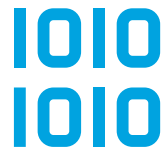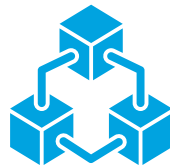
Robotic automation

AgRobots
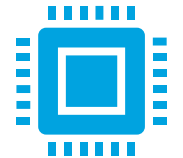
Livestock wearables

Machine learning and precision farming

Blockchain

Artificial intelligence

Innovative farming

Biotech

3. Key Tools for Digital Agriculture

Introduction to Key Tools for Digital Agriculture

| Tool #1: Digital farming | Tool #2: E-agriculture strategy | Tool#3: Programming Toolkit | Tool #4: E-agriculture in action |

Tool #1

Digital Farming

Digital Farming

Conceptual diagram of digital farming based on networks
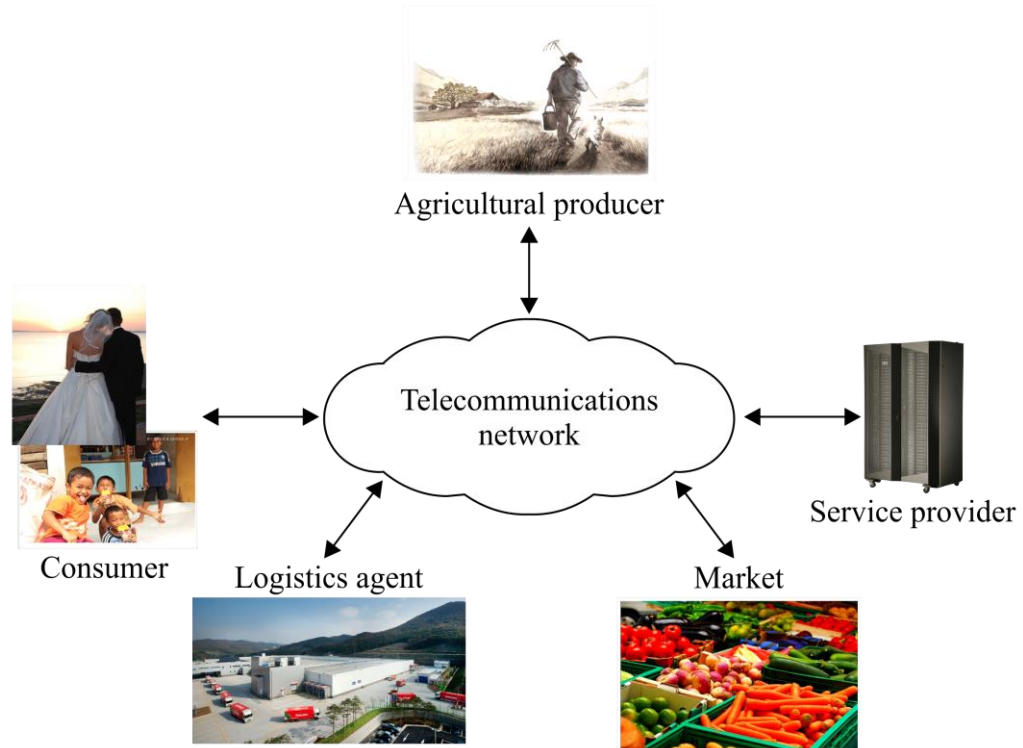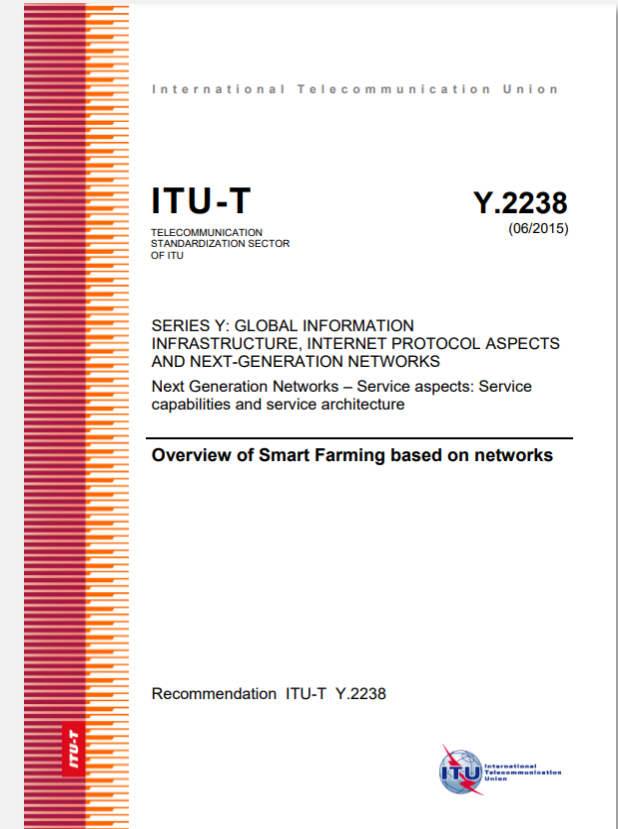
Agricultural producer

Consumer

Telecommunications network

Service provider

Logistics agent

Market

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International Telecommunication Union

ITU-T   **Y.2238**
(06/2015)

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS
Next Generation Networks – Service aspects: Service
capabilities and service architecture

Overview of Smart Farming based on networks

Recommendation ITU-T Y.2238

Recommendation ITU-T Y.4450/Y.2238

Reference Model of Digital Farming Based on Networks
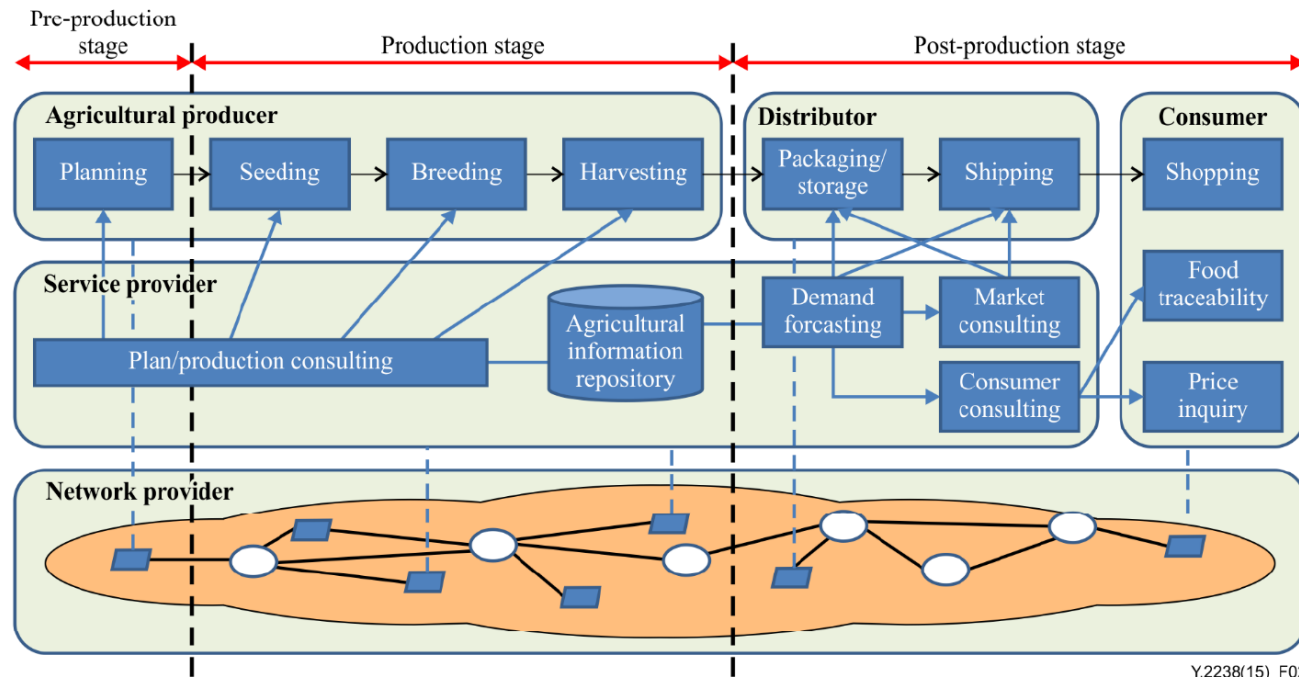
'Overview of digital farming based on networks'
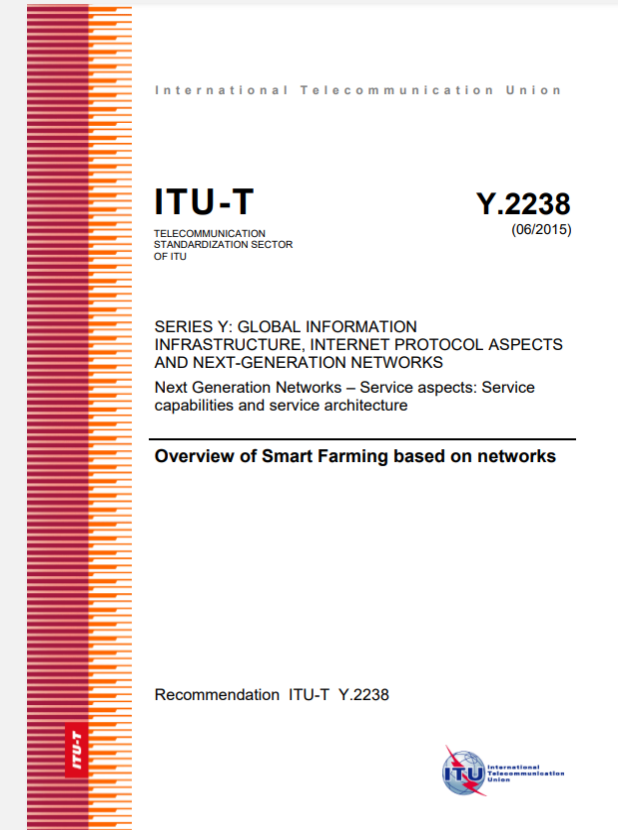
Recommendation ITU-T Y.4450/Y.2238
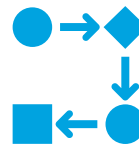
Smart Services to Address Farming Challenges
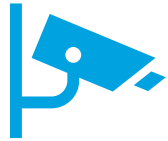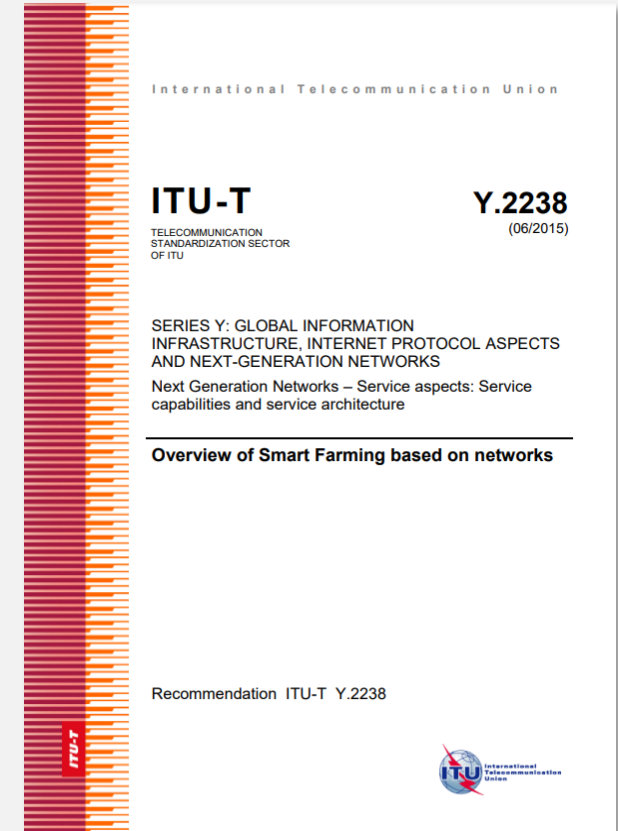

Farm products protection

Farm products traceability


Remote farm management

Farm production regulation

International Telecommunication Union

ITU-T   **Y.2238**
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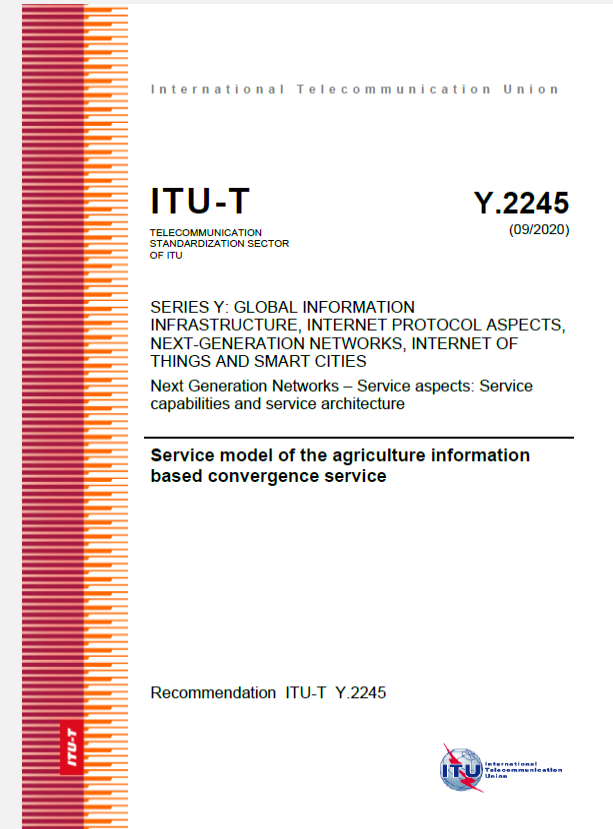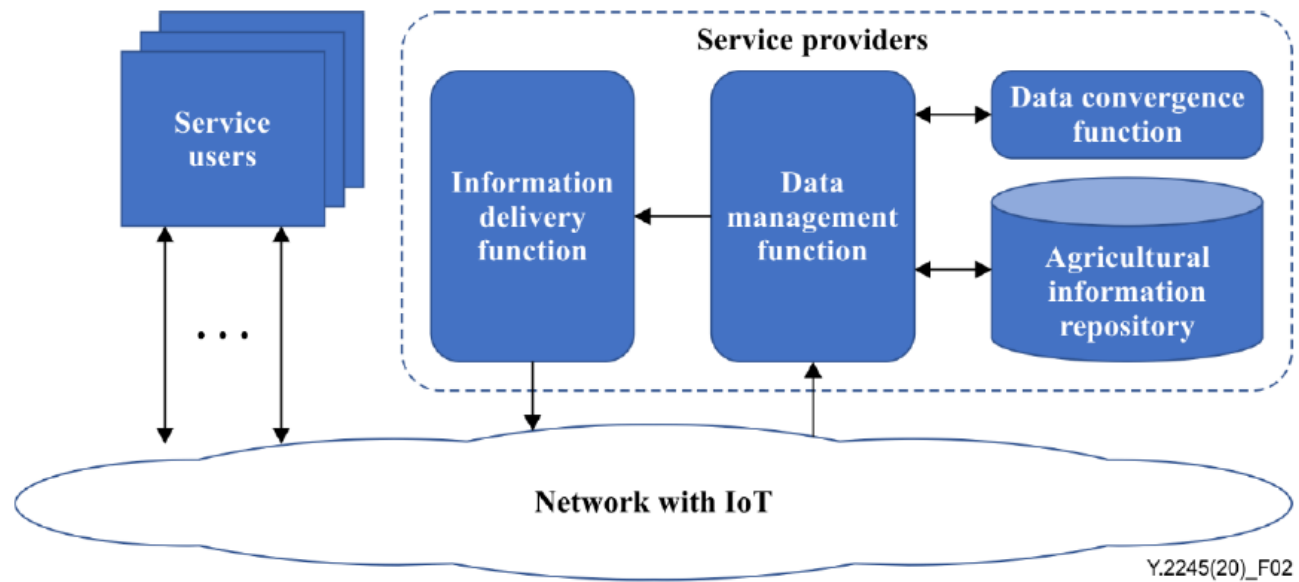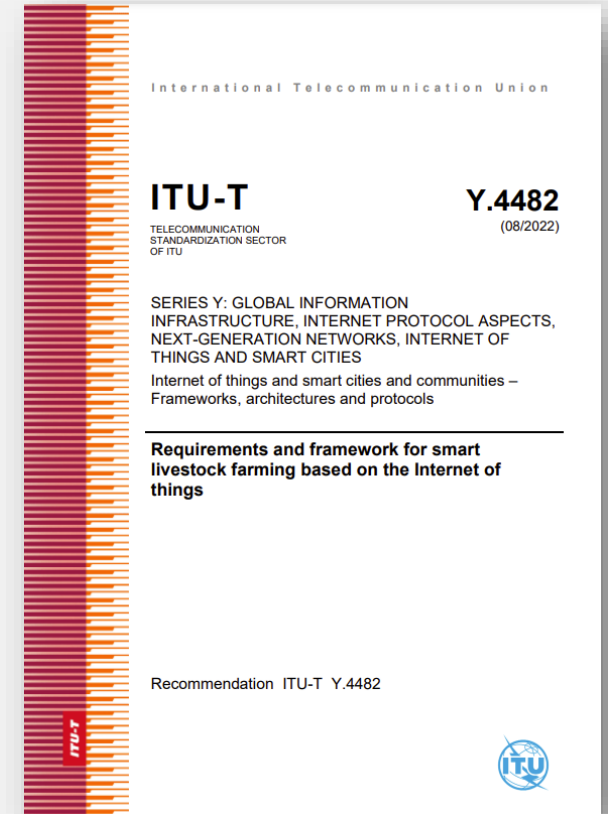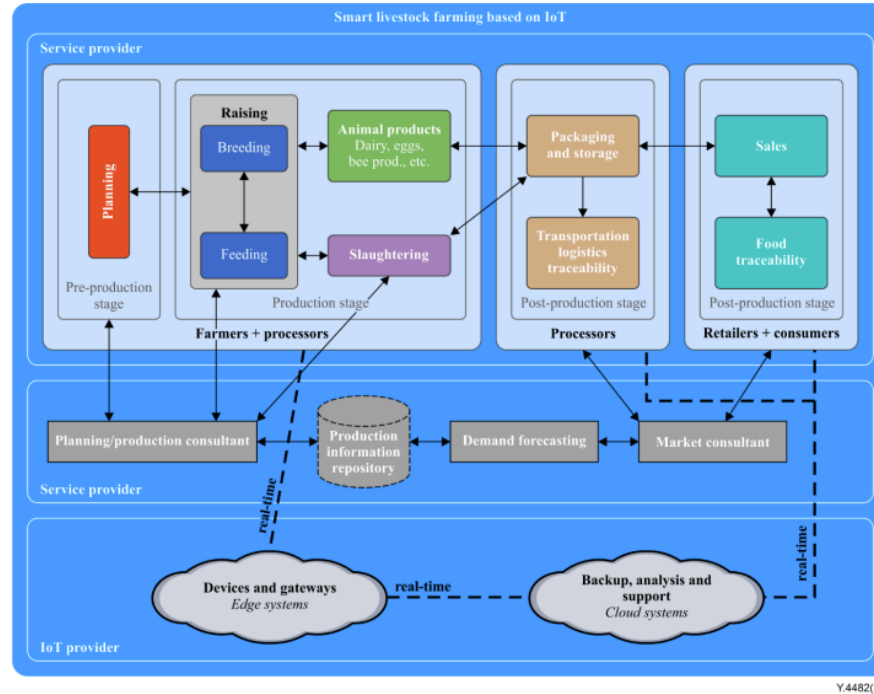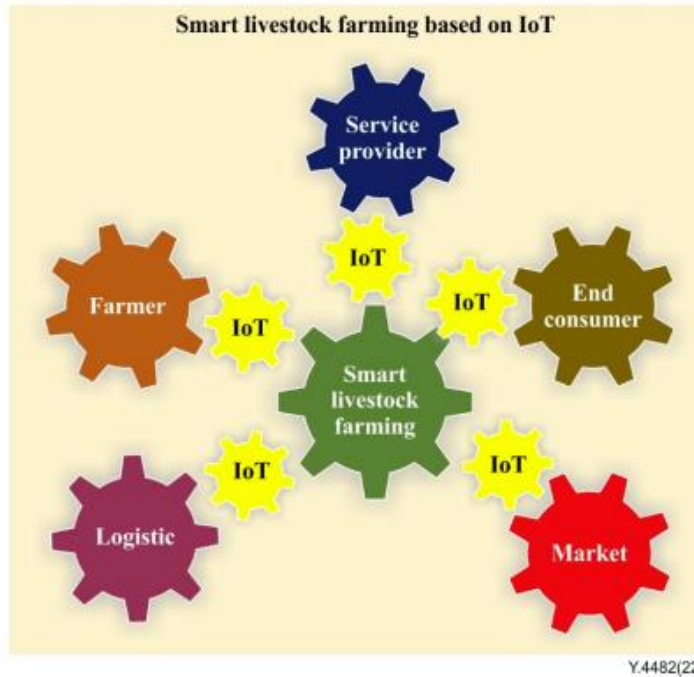# Concept of Agriculture Information-Based Convergence Service
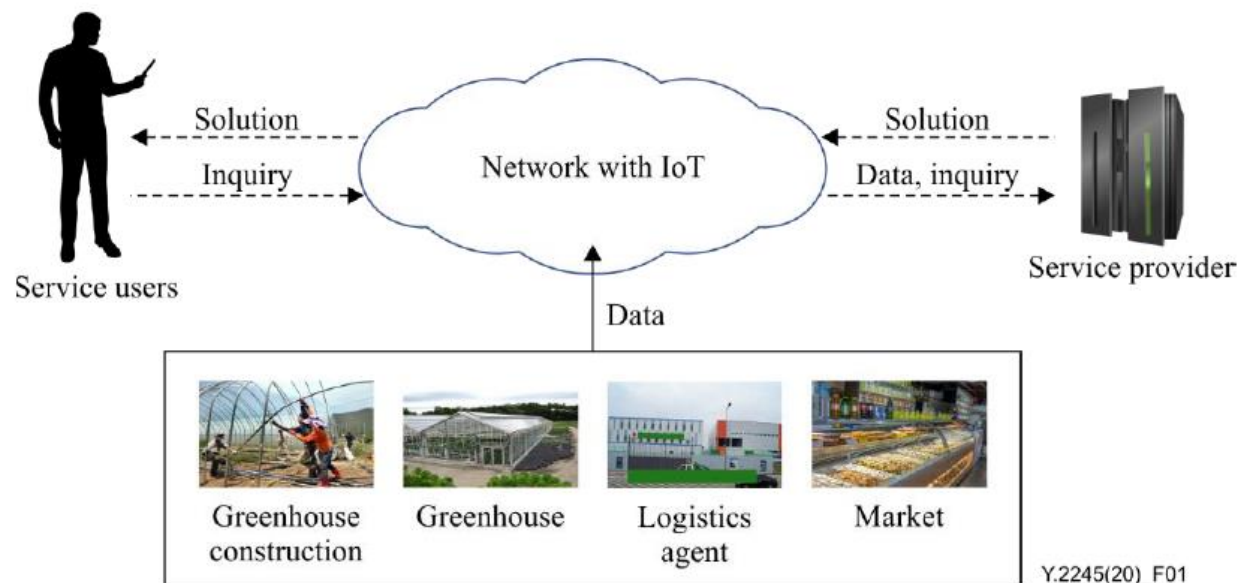
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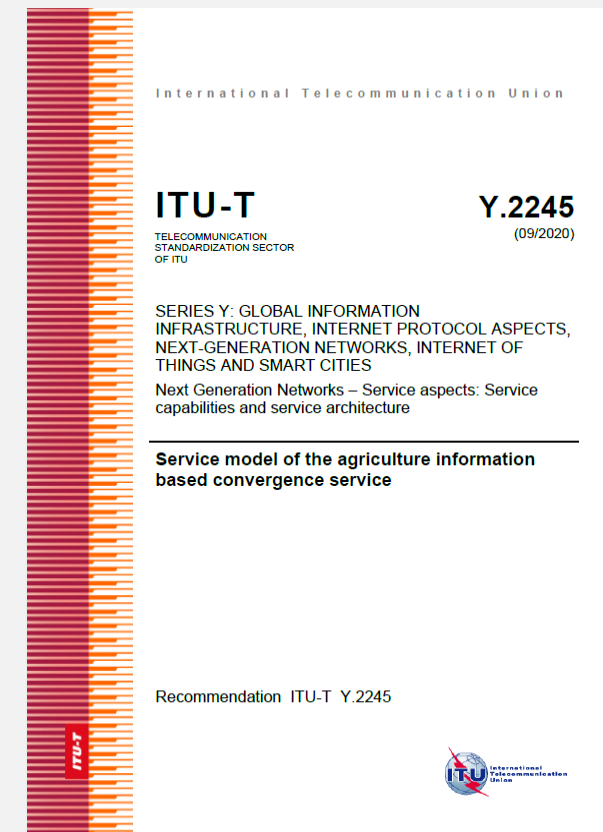
Architecture for Agriculture Information-Based Convergence Service

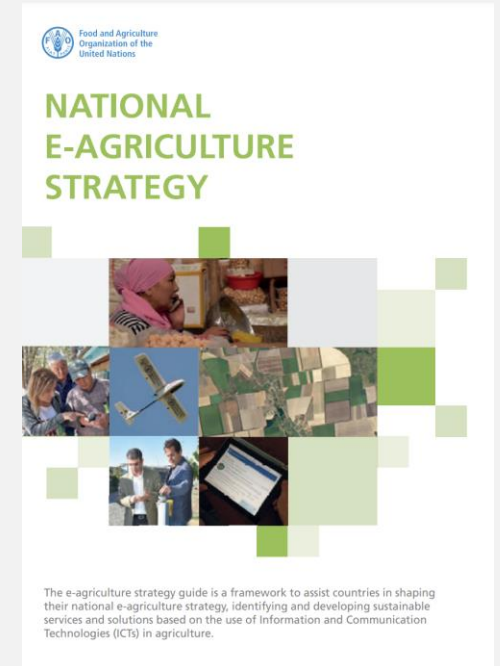# Requirements and framework for smart livestock farming based on IoT

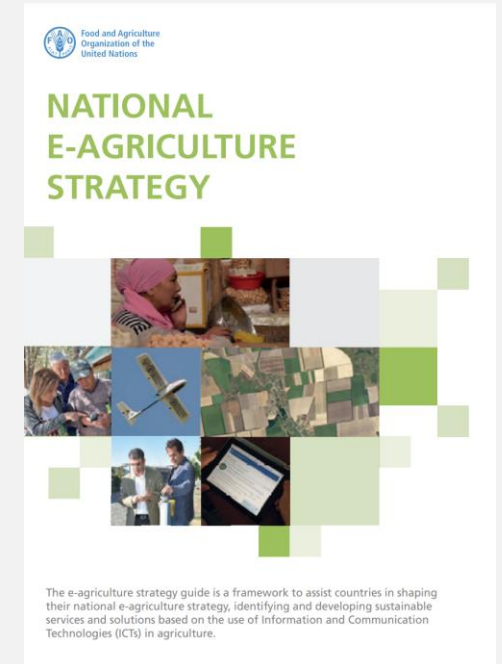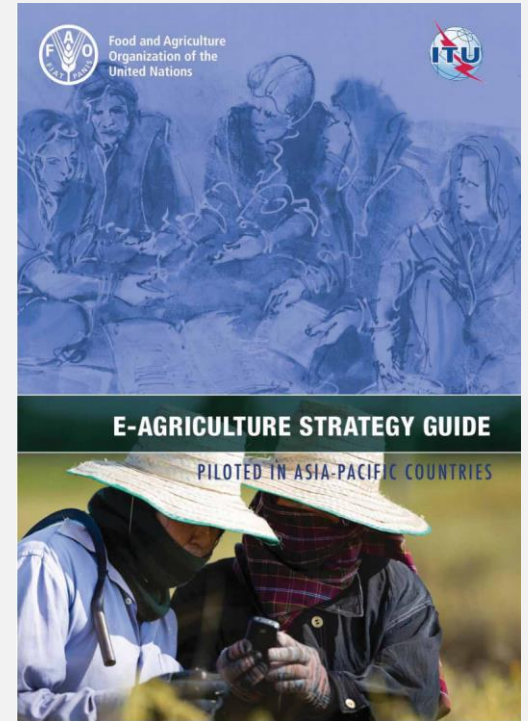**Tool #2**

E-agriculture Strategy

What is e-Agriculture

Why is an e-Agriculture Strategy Important?
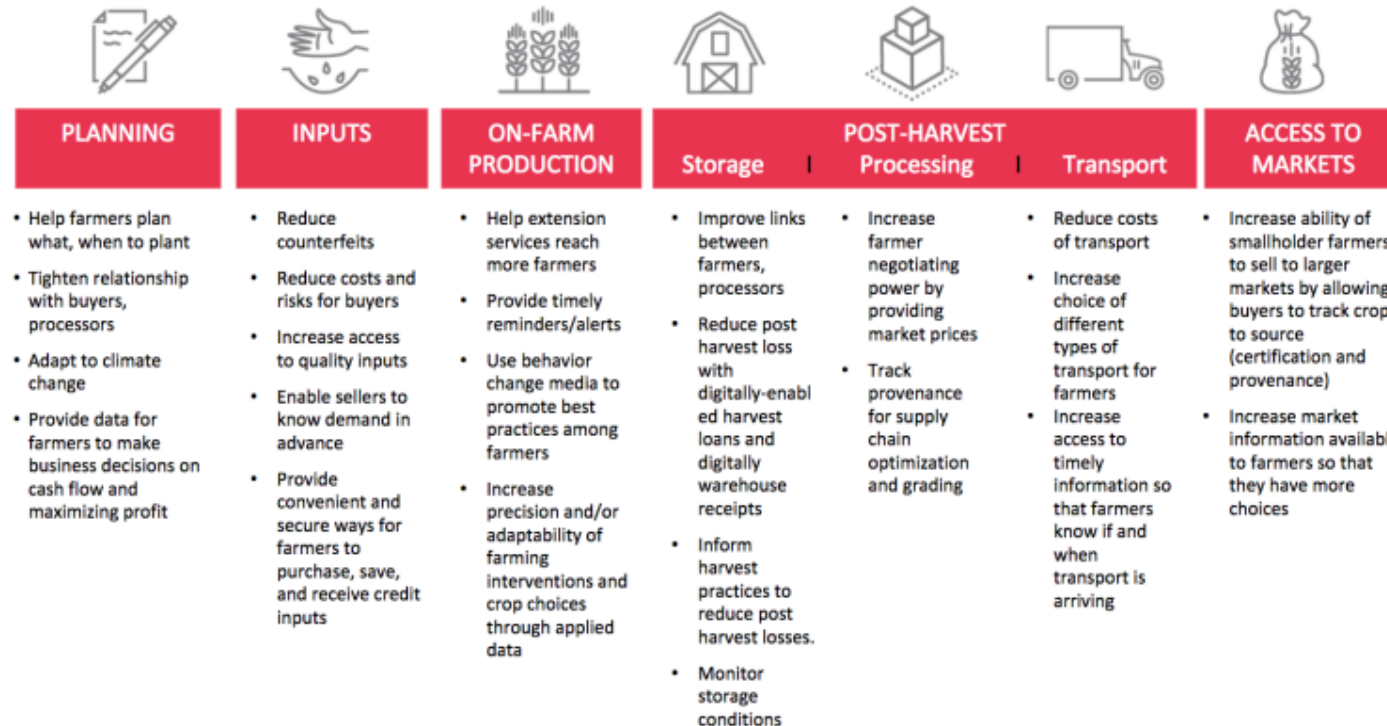
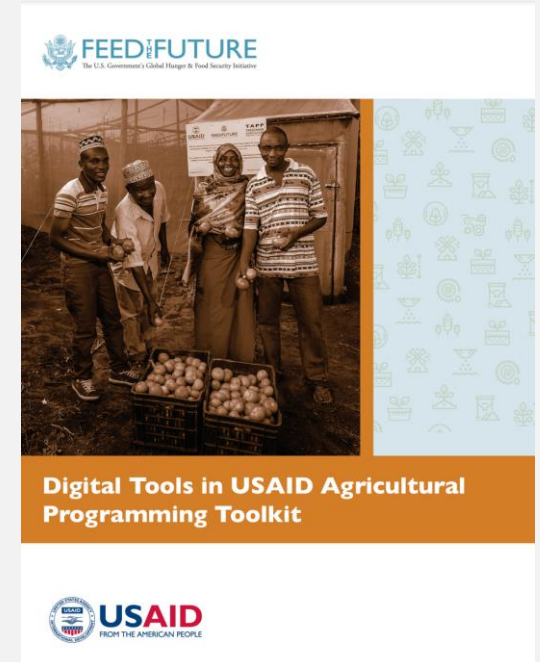# Developing a National E-agriculture Strategy

Tool #3

Programming Toolkits

Digital Tools in Agriculture

PLANNING	INPUTS	ON-FARM PRODUCTION	POST-HARVEST			ACCESS TO MARKETS
			Storage	Processing	Transport	
• Help farmers plan what, when to plant • Tighten relationship with buyers, processors • Adapt to climate change • Provide data for farmers to make business decisions on cash flow and maximizing profit	• Reduce counterfeits • Reduce costs and risks for buyers • Increase access to quality inputs • Enable sellers to know demand in advance • Provide convenient and secure ways for farmers to purchase, save, and receive credit inputs	• Help extension services reach more farmers • Provide timely reminders/alerts • Use behavior change media to promote best practices among farmers • Increase precision and/or adaptability of farming interventions and crop choices through applied data	• Improve links between farmers, processors • Reduce post harvest loss with digitally-enabled harvest loans and digitally warehouse receipts • Inform harvest practices to reduce post harvest losses. • Monitor storage conditions	• Increase farmer negotiating power by providing market prices • Track provenance for supply chain optimization and grading	• Reduce costs of transport • Increase choice of different types of transport for farmers • Increase access to timely information so that farmers know if and when transport is arriving	• Increase ability of smallholder farmers to sell to larger markets by allowing buyers to track crops to source (certification and provenance) • Increase market information available to farmers so that they have more choices

Digital Tools in Agriculture Programming Toolkit

driven by — Precision Agriculture, both on- and off-farm

that leads to — More effective data collection, analysis and dissemination

that allows for — Better information delivery through mobile-enabled extension services

Financial inclusion through Digital Financial Services

FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Digital Tools in USAID Agricultural Programming Toolkit

USAID
FROM THE AMERICAN PEOPLE

Food and Agriculture Organization of the United Nations

ITU

Digital Tools in Agriculture Programming Toolkit

(1) Data-Driven Agriculture

(2) Precision Agriculture

(3) ICT-Enabled Extension

(4) Digital Financial Services

Digital Tools in USAID Agricultural Programming Toolkit

Tool #4

E-agriculture in Action

Examples of E-agriculture

3D food printing

Digital knowledge support to farmers

Electronic traceability solution for agriculture
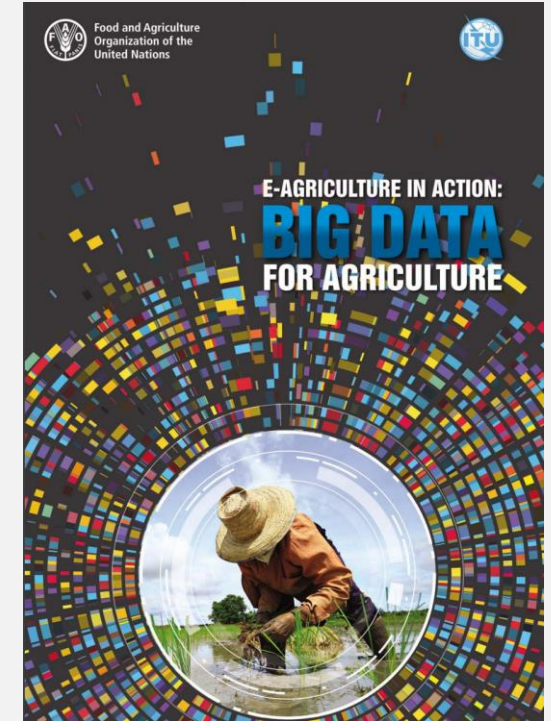
Examples of Data and E-agriculture

Big data ecosystem for disaster resilience

Interactive web portal + WhatsApp alerts
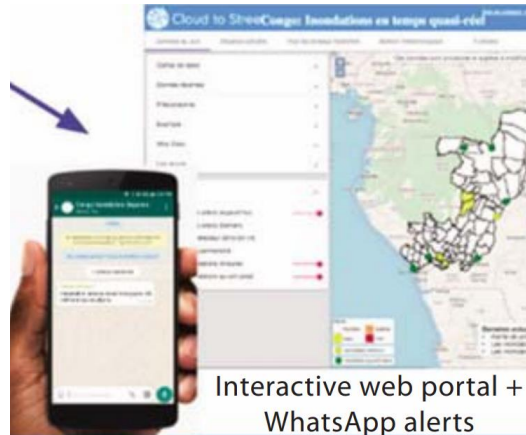
Mobile solutions and assistance

Satellite data and AI for financial inclusion of small farmers
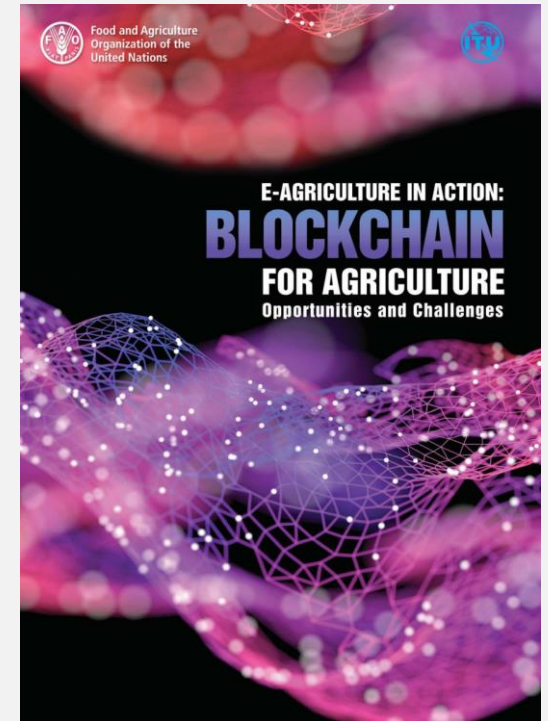
Examples of Blockchain and E-agriculture

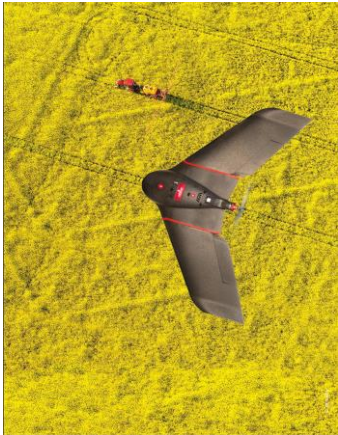Financial and agricultural risk management for smallholders
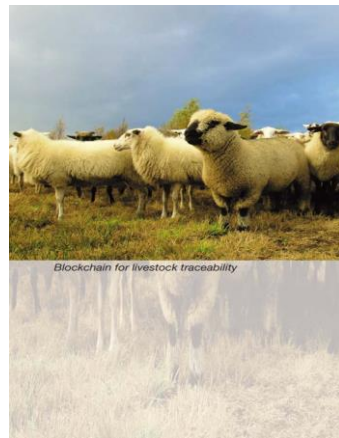
Blockchain for agri-supply chains
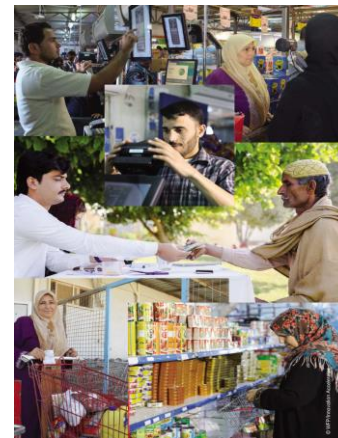
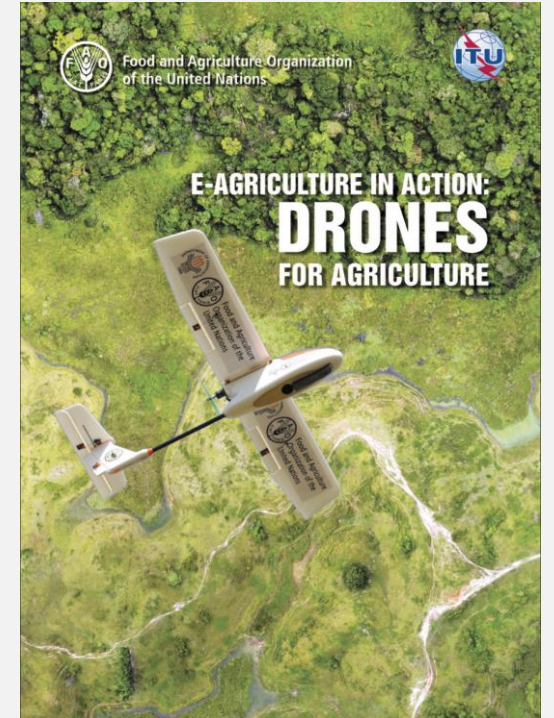Blockchain for cash-based transfers

Examples of Drones and E-agriculture

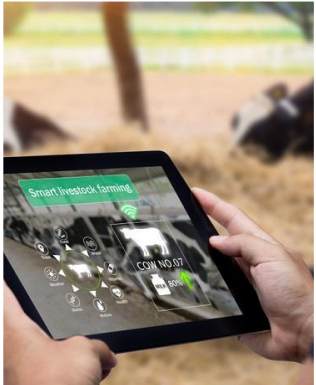UAVs in agriculture: regulations and good practices

Mapping and monitoring rice areas

Unmanned helicopters for agriculture

E-AGRICULTURE IN ACTION: DRONES FOR AGRICULTURE

Examples of Artificial Intelligence in E-agriculture

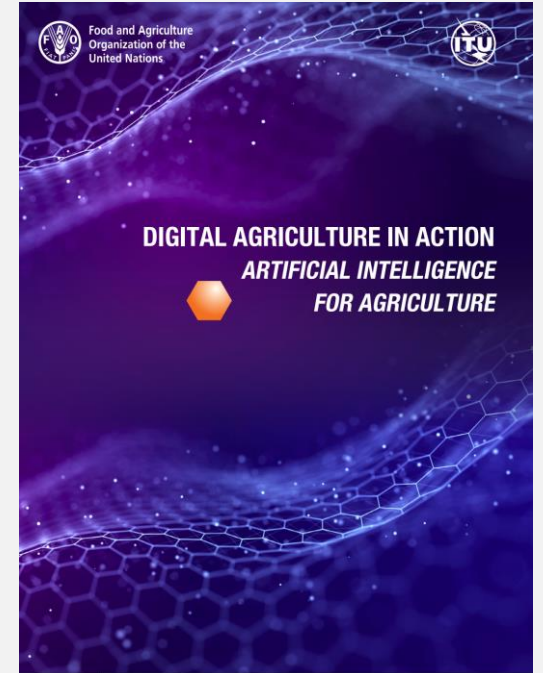Crop, soil, and livestock monitoring

Detection of pests and diseases

Weather and temperature forecasting

Predictive analytics

Autonomous agricultural robots and farm equipment

DIGITAL AGRICULTURE IN ACTION
ARTIFICIAL INTELLIGENCE FOR AGRICULTURE

Module 12–
Digital Agriculture

Thank you for completing this Module of the ITU Toolkit for Digital Transformation of Cities and Communities.

We hope that you found the information in this Module useful toward planning and initiating your city or community's digital transformation process.

Please review the resources highlighted within for further details, including valuable real-world use cases, on how to get started on – and optimize from the onset – your city or community's digital transformation journey.

[Toolkit on Digital Transformation for People-Oriented Cities and Communities](#)

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