The role of science, technology, and innovation in sustainable food systems to improve food security and safety

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Before COVID-19, the world was already facing enormous challenges

Hunger, inequality and poverty are critical global problems

690 million people are **hungry**

Growing inequalities: over **3 billion people** cannot afford a **healthy diet**

10% live in extreme poverty

and a number of threats are increasing the risk of global crises

Plant and animal pests and diseases Pests: desert locust, fall armyworm

Extreme weather events: natural disasters, drought

Conflict: Threatens food security

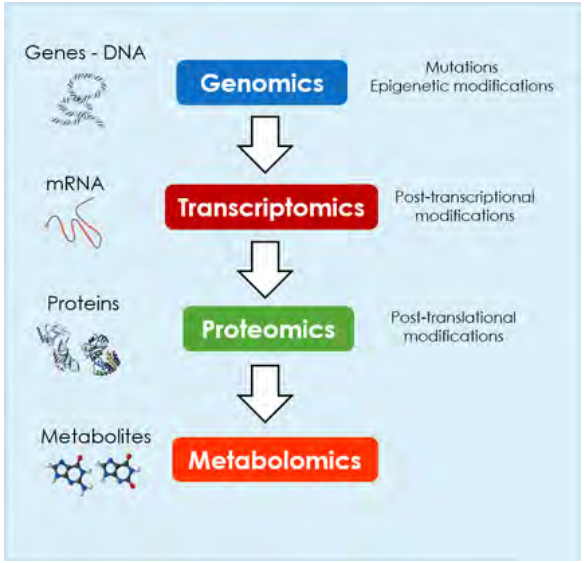
Biodiversity: threat to the components of biodiversity

Science, technology and innovations cuts across all aspects of agri-food systems

- Genetic improvement of crop, livestock, forestry and fishery
- Sustainable production, marketing and consumption of food
- Sustainable management and use of resources and inputs
- Strengthening institutions and innovation systems
- Social - engaging producers, consumers and policymakers
- Financial – prioritizing investments
- Enabling policies – governance and incentives

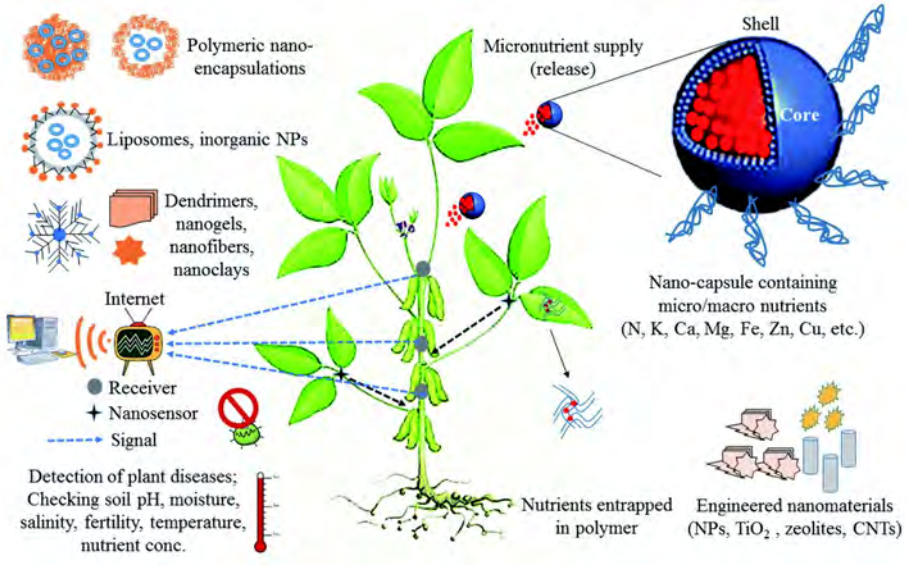
Disruptive science, technology and innovation

Omics



Omics – Chemometrics for Environmental Omics (ch4eo.info)

Nanotechnologies



Singh et al. (2021) Recent advances in the applications of nano-agrochemicals for sustainable agricultural development. Environmental Science: Processes & Impacts, issue 2, 2021.

Digital Technologies

….disruptive technologies are needed to increase productivity, increase nutrition, reduce environmental footprint ….

…which will improve livelihoods and hopefully reduce inequalities…

Biotechnologies

Broad range

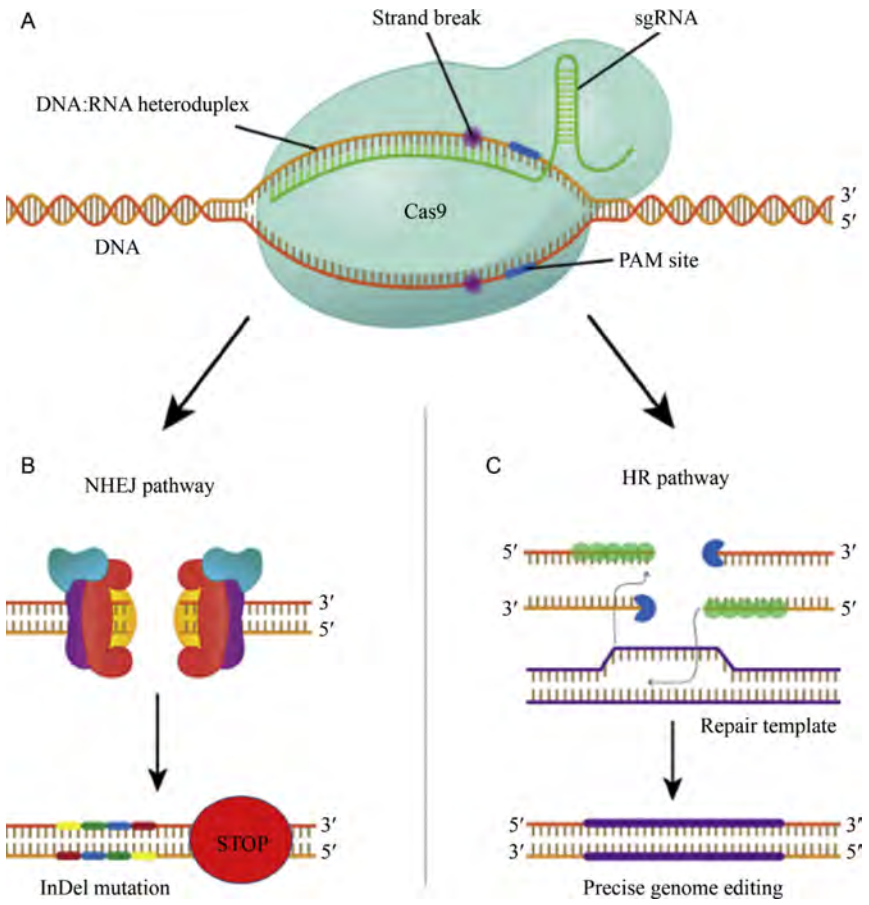
high-tech

GM, whole genome sequencing, gene editing and synthetic biology

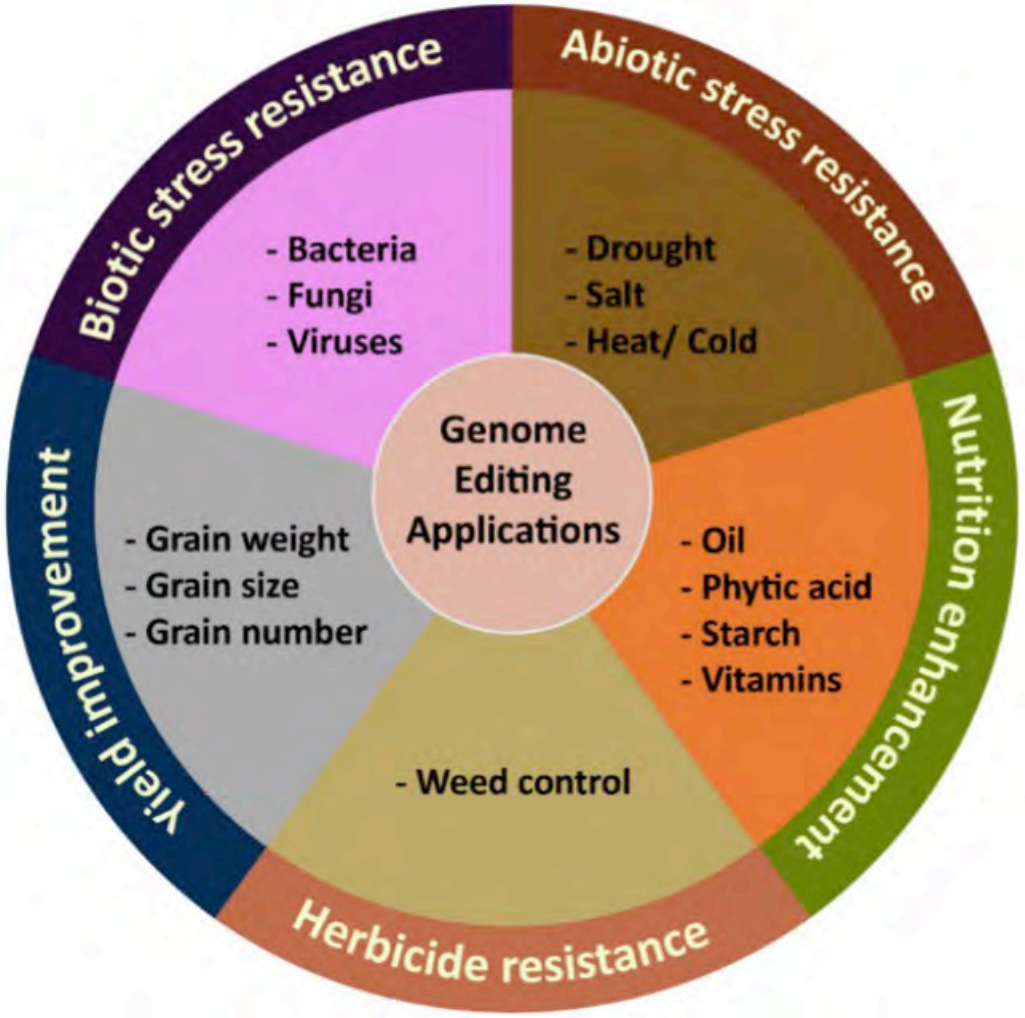
low-tech

artificial insemination, fermentation techniques & biofertilizers

New breeding techniques – gene editing



CRISPR/Cas9 system components and pathways in CRISPR/Cas9: Development and Application in Rice Breeding (ROMERO and GAT I C A-ARIAS, 2019)



CRISPR CROPS: THE FUTURE OF AGRICULTURE BY EMILY PEARLMAN
Berkeley Scientific Journal | SPRING 2020

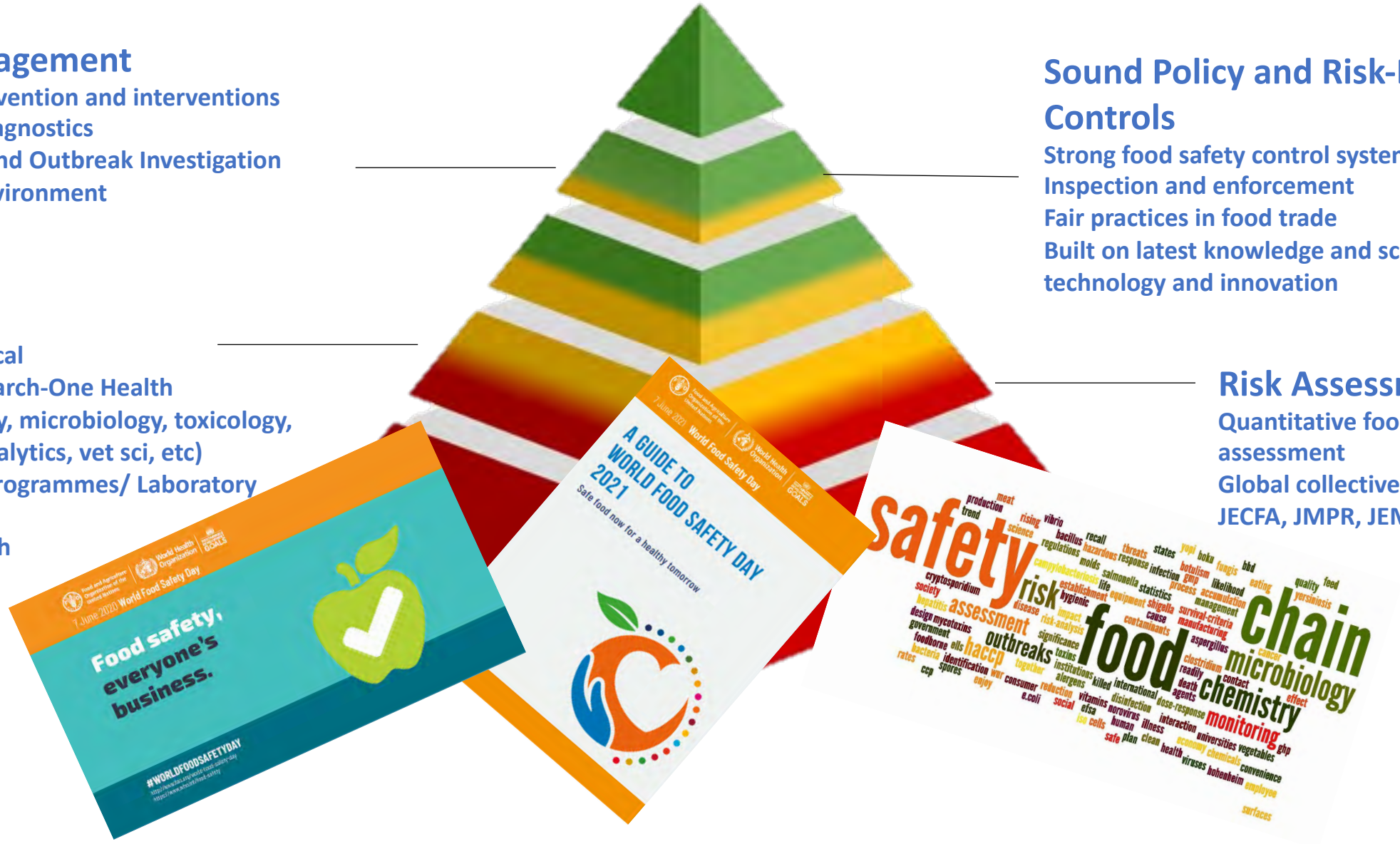
Science, technology and innovation for SAFE FOOD

Risk Management

Validated Prevention and interventions
Innovative diagnostics
Traceability and Outbreak Investigation
Impact on Environment

Data

Scientific
Epidemiological
Applied Research-One Health (epidemiology, microbiology, toxicology, chemistry, analytics, vet sci, etc)
Monitoring programmes/ Laboratory studies
Basic Research



Sound Policy and Risk-Based Controls

Strong food safety control systems
Inspection and enforcement
Fair practices in food trade
Built on latest knowledge and science, technology and innovation

Risk Assessment

Quantitative food safety risk assessment
Global collective expertise (e.g., JECFA, JMPR, JEMRA)

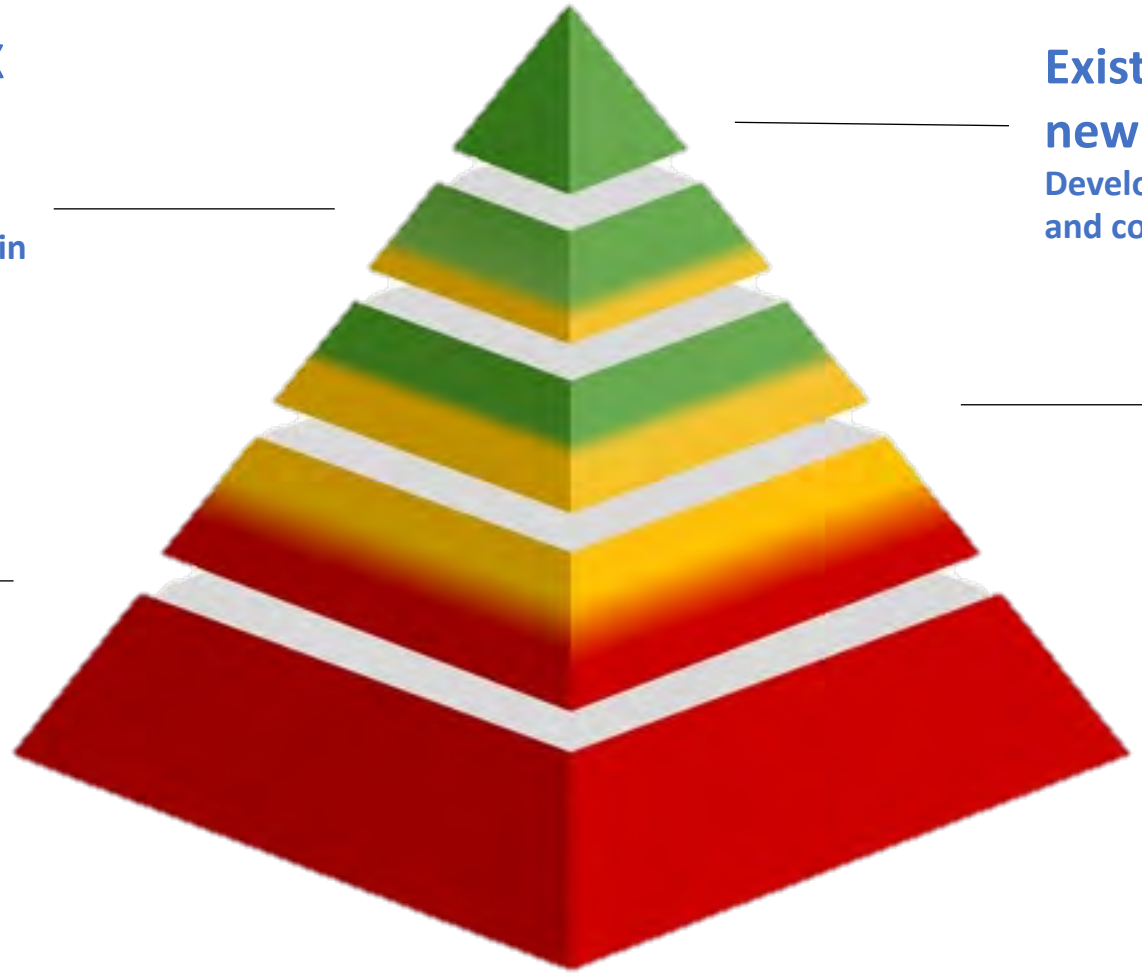
Codex standards for safe (innovative) food

New international Codex guidance

Benchmark in WTO/SPS
FAO capacity building

Raising awareness in CODEX

Codex work is member driven
FAO and WHO can place items on the Codex agenda
Discussions on need of normative work in new areas



Existing CODEX committees or new task forces

Development of new standards, guidelines and codes

FAO Horizon scanning and Risk Assessment

Science and innovation offices
Definitions
Evaluations of use and impact on Priority programs and SDGs
Existing Risk Assessment bodies
Ad-hoc consultations

New technologies/practices in food

Nanotechnology
Microalgae
Edible insects
Cell culture-based food products
Plant-based protein alternatives
3-D printed foods
Combinations of new technologies

Digital technologies for sustainable food systems

- Mobile applications for small/ scale farmers
- Agricultural robots ('agrobots') to improve efficiency of agricultural operations
- Application of the Internet of Things (IoT) in Precision Agriculture (PA)

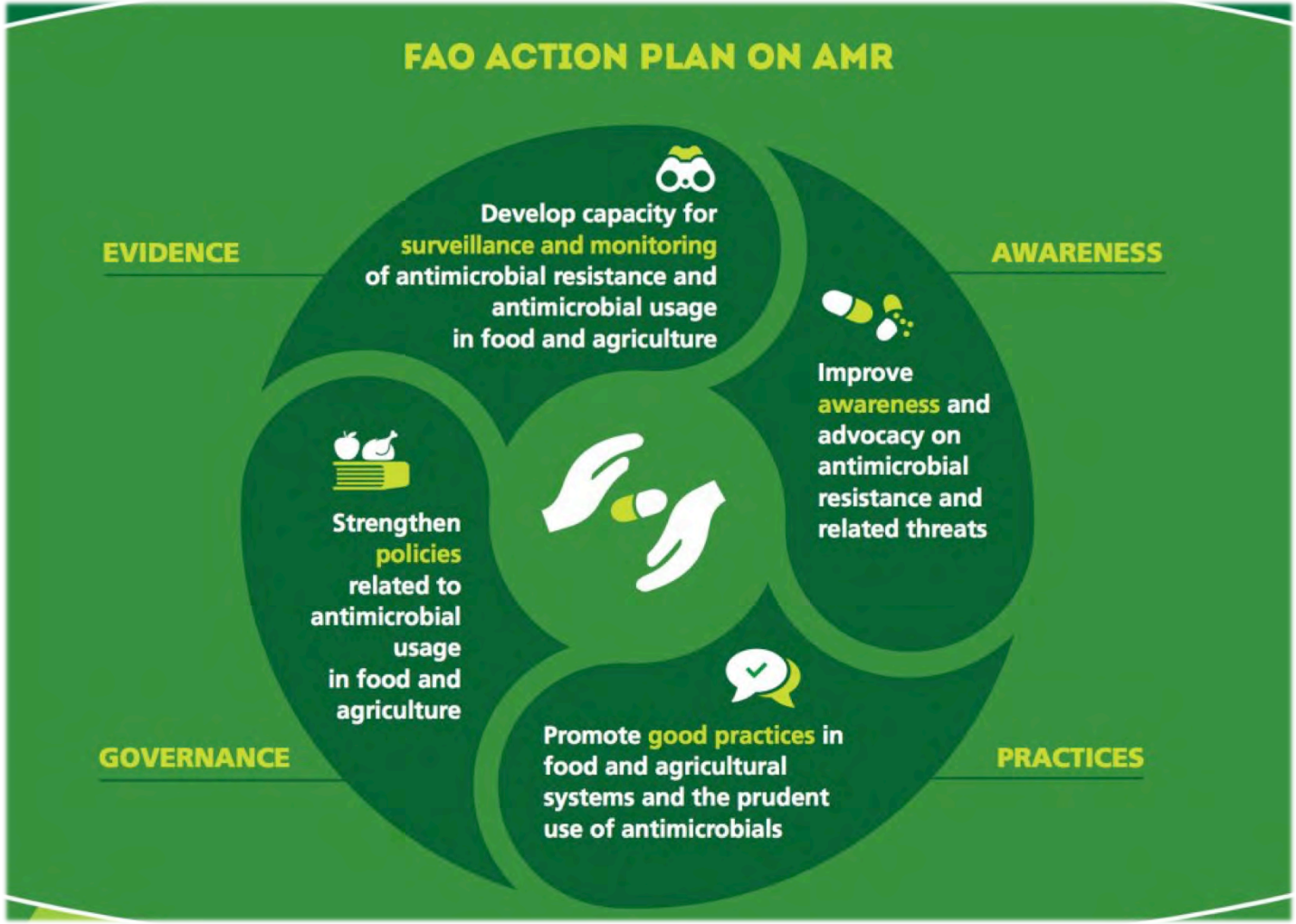
Digital technologies for sustainable food systems

- Artificial Intelligence technology (AI) to improve efficiency of agrobased businesses
- Blockchain technology to improve traceability
- Leveraging digital technologies guided by the risk assessment

Action against Antimicrobial Resistance (AMR)

Antimicrobial Resistance (AMR)

…..risks to human and animal health and welfare, agriculture and food security



Dealing with the effects of climate change

….STI to faster effective climate action through agriculture.

- **Adoption of species, breeds, varieties and strains that are well adapted to changing climatic conditions**
- **Use of satellite-based remote sensing and mapping techniques -** monitoring crops, pests and diseases, water stress detection
- **Climate extremes and agriculture commodity markets through multi-scenario analysis**
- **Koronivia Joint Work on Agriculture (KJWA) -** Addresses six interrelated topics on soil, livestock, nutrient and water management as well as the food security.
- **Monitoring GHG emissions and climate change mitigation in agriculture** – isotope and tracer techniques, blockchain technologies etc.,

United Nations Food Systems Summit 2021

Creating a **system of follow-up and review** to ensure that the Summit's outcomes continue to drive new actions and progress.

Key messages

- 2021 is an important opportunity to transform the agri-food systems and **link it to the climate change and biodiversity agendas** – UN Food Systems Summit 2021, COP26 and CBD COP15
- STI **can accelerate the transformation of agri-food systems to become more efficient, inclusive, resilient and sustainable**
- Leveraging STI for sustainable and resilient agri-food systems should be guided by the assessment of **risks, inequalities, synergies and trade-offs**
- The s**cience, policy and practice interface** needs to be strengthened and streamlined to boost its impact

BETTER PRODUCTION

BETTER NUTRITION

BETTER ENVIRONMENT

BETTER LIFE

SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY

2 ZERO HUNGER

10 REDUCED INEQUALITIES

Thank you

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