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

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

- Growing inequalities: over 3 billion people cannot afford a healthy diet
- 10% live in extreme poverty
- 690 million people are hungry

- 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

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

...which will improve livelihoods and hopefully reduce inequalities...

Omics

Genomics
Transcriptomics
Proteomics
Metabolomics

Nanotechnologies

Polymeric nano-encapsulations
Liposomes, inorganic NPs
Dendrimers, nanogels, nanofibers, nanoclays

Digital Technologies

Answers from the sky

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 GATICA-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)

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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

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

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
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 agro-based 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

- 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.
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 science, policy and practice interface needs to be strengthened and streamlined to boost its impact