



# Risk assessment and food safety

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**Joint FAO/IAEA Division on  
Nuclear Techniques in Food and Agriculture**

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**9<sup>th</sup> Scientific Conference  
of the Bulgarian Focal Point of EFSA**



Joint FAO/IAEA Programme  
Nuclear Techniques in Food and Agriculture

# Overview



1. Joint FAO/IAEA programme
2. Risk assessment and food safety
3. Analytical testing
4. Nuclear and related techniques



# The FAO / IAEA partnership

## Food and Agriculture Organization (FAO)

Since 1945 FAO helps developing countries and countries in transition to modernize and improve agriculture, forestry and fisheries practices and ensure good nutrition for all.

## International Atomic Energy Agency (IAEA)

Since 1957 - IAEA has served as the world's foremost inter-governmental forum for scientific and technical cooperation in the peaceful use of nuclear technology

**1964 - Joint FAO/IAEA Division of Nuclear Applications in Food and Agriculture was established**





# The FAO / IAEA partnership

Supports and promotes the safe and appropriate use of nuclear and related technologies by the FAO and IAEA Member States in food and agriculture, with the aim to contribute to peace, health and prosperity through the world, especially to global food security and sustainable agricultural production.

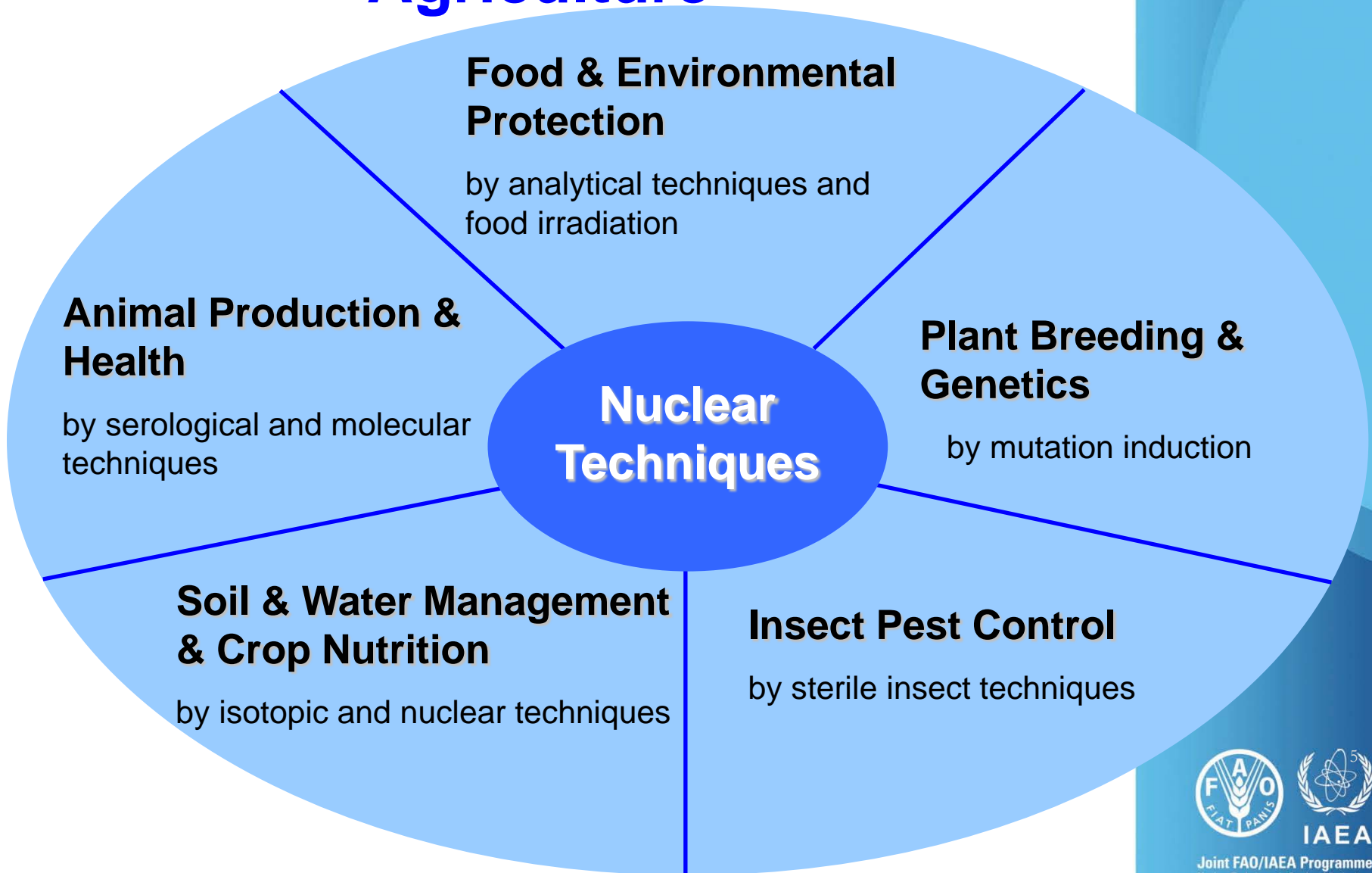
**Sustainable food security and safety  
through the use of nuclear techniques  
and biotechnology**



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# Nuclear Applications in Food and Agriculture





# Sustainable Development

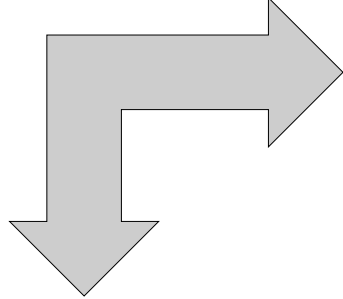
- Building the capability for countries to tackle problems and issues through their own research & programs & skills developed through participation in research projects and technical cooperation
- Regional/interregional cooperation and partnerships
- Accelerated capacity building
  - Trained personnel contribute to sustainable development in their own countries



# Delivering Results

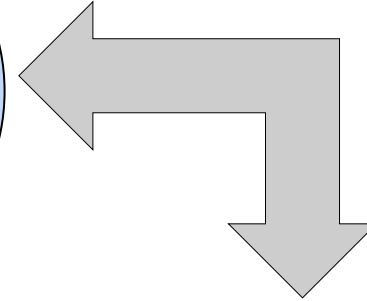
## Research

Coordination and support



## Capacity Building

Technical support



**Coordinated  
Research Projects**  
(Solving technical  
problems)

**Technical  
Cooperation**  
(transferring know how  
and technology to meet  
development needs)

International  
Research Centres

Regional  
organizations

National  
Institutions

Other  
international  
organizations

IAEA  
Collaboration  
Centres

# Nuclear Properties for Applications in Food and Agriculture

## Ionizing Radiation

(Energy beam)



Electric (X Ray or Electron Beam)



Radionuclides  
(Gamma Ray)



## Radioactivity

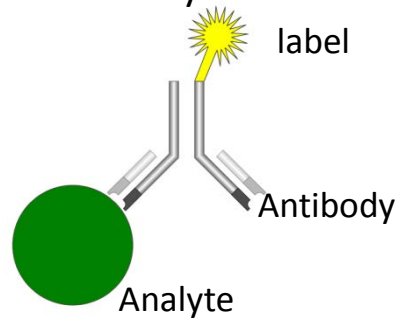
(Easy to measure)



Radionuclides



Immuno-assay



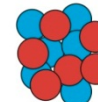
## Stable Isotopes

(Finger print)



Radionuclides

carbon-12

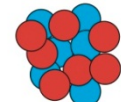


$^{12}\text{C}$

6 protons  
6 neutrons

light

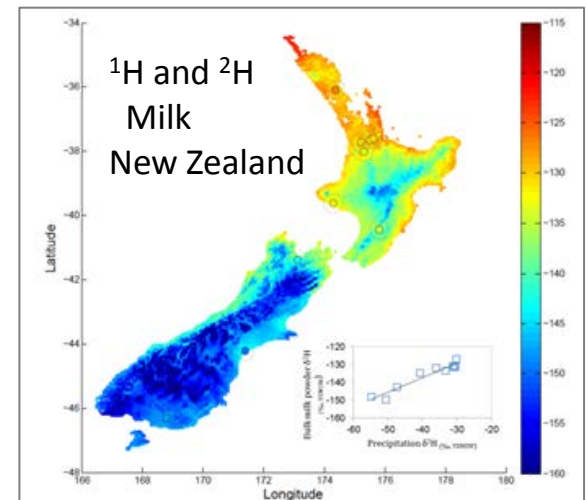
carbon-13



$^{13}\text{C}$

6 protons  
7 neutrons

heavy





# Comparative Advantages of Nuclear Techniques



## Irradiation

“cold treatment” kill bacteria, induced genetic variation, sterile insects, vaccines

## Radionuclides and stable isotopes

- Traceability – tracers as “markers”
- Measurability – Radionuclides and stable isotopes
- Accuracy – analytical methods
- Specificity – specific and sensitive

**[Measuring for managing]**

# Food for the global consumer

- Increased global trade has made a wide variety of foods accessible to consumers worldwide
- Demand for increased production
- Climate change - changing production systems, regions, pests, contaminants  
Challenges such as food fraud, food contamination, emerging contaminants
- Exporting countries must demonstrate equivalence of food safety systems that can ensure protection of consumers and the environment



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# Strengthening national food control systems



## Assuring food safety and quality

Guidelines for strengthening national food control systems

FAO  
FOOD AND  
NUTRITION  
PAPER  
76



FAO, 2003

Strengthening national food control systems  
Guidelines to assess capacity building needs



FAO, 2006

Strengthening national food control systems  
A quick guide to assess capacity building needs



FAO, 2007



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# Food control systems



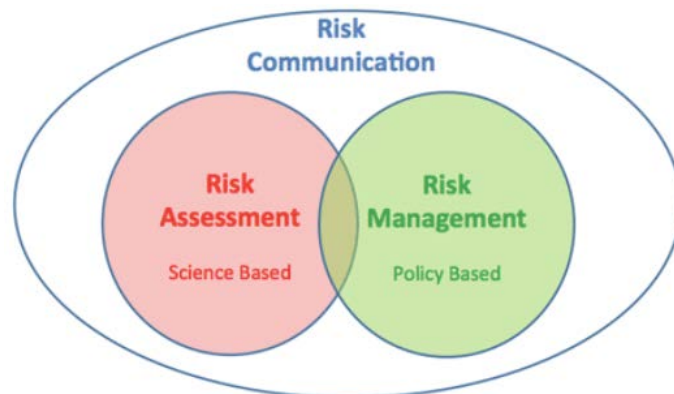
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# Risk analysis in the EU

- Risk Communication- Commission, EFSA and RASFF
- Risk Management- Commission and legislative tools
- Risk assessment – European Food Safety Authority (EFSA)





# Risk analysis and FAO

**Food safety and quality**

> Scientific advice > Microbiological risks and JEMRA > Risk assessments

## Risk assessments

### Pathogen-commodity combinations

The links below are to individual pathogen-commodity risk assessment pages, where you will find related documentation, reports and detailed information:

- Microbiological safety of foods for malnourished populations
- Microbiological hazards associated with fresh produce
- Viruses in foods
- Enterohaemorrhagic *Escherichia coli* (EHEC) in meat and meat products
- *Salmonella* in eggs and broiler chickens
- *Listeria monocytogenes* in ready-to-eat foods
- *Vibrio* spp. in seafoods

FAO Home

Food safety & quality

About us

Events & projects

Capacity development

Scientific advice

- Calls for data and experts
- Microbiological risks and JEMRA
  - Risk assessments
  - Risk management
  - Guidelines
  - Technology transfer
  - Resources
- Chemical risks and JECFA
- Other scientific advice

Emergency prevention system for food safety

Publications & tools

A-Z index

Partnerships

Food Safety Expert Roster

## Food safety risk analysis

### A guide for national food safety authorities

ISBN 9789241201475

FAO  
FOOD AND  
NUTRITION  
PAPER

# 87

Food and Agriculture Organization of the United Nations

FOOD SAFETY AND QUALITY SERIES  
ISBN 978-92-412-1279-2

## RISK BASED IMPORTED FOOD CONTROL MANUAL

## FAO/WHO guide for application of risk analysis principles and procedures during food safety emergencies

World Health Organization

## GUÍA PARA LA ELABORACIÓN DE DIRECTRICES PARA EVALUACIÓN DE RIESGO EN INOCUIDAD DE ALIMENTOS

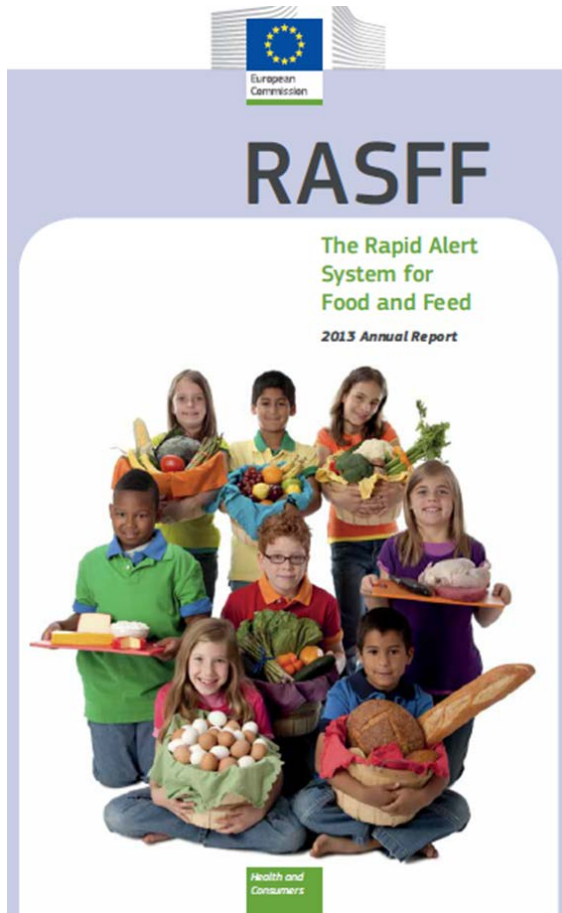
FAO IAEA MIDA

RALACA  
Red Analítica de Latinoamérica y el Caribe

GUÍA PRELIMINAR BASADA EN EL CURSO TALLER: REGIONAL TRAINING COURSE ON THE  
EVALUATION OF RISKS AND THE PRODUCTION OF GUIDELINES FOR IMPROVING  
MONITORING STRATEGIES TO ENSURE FOOD SAFETY

Panamá - 2013

# Rapid Alert System for Food and Feed (RASFF)



An informatics tool to ensure the cross-border exchange of information to swiftly react when risks to public health are detected in the food and feed chain

Increases consumer confidence in the functioning of food control systems in the EU



# Certification and accreditation

- Necessary to improve confidence

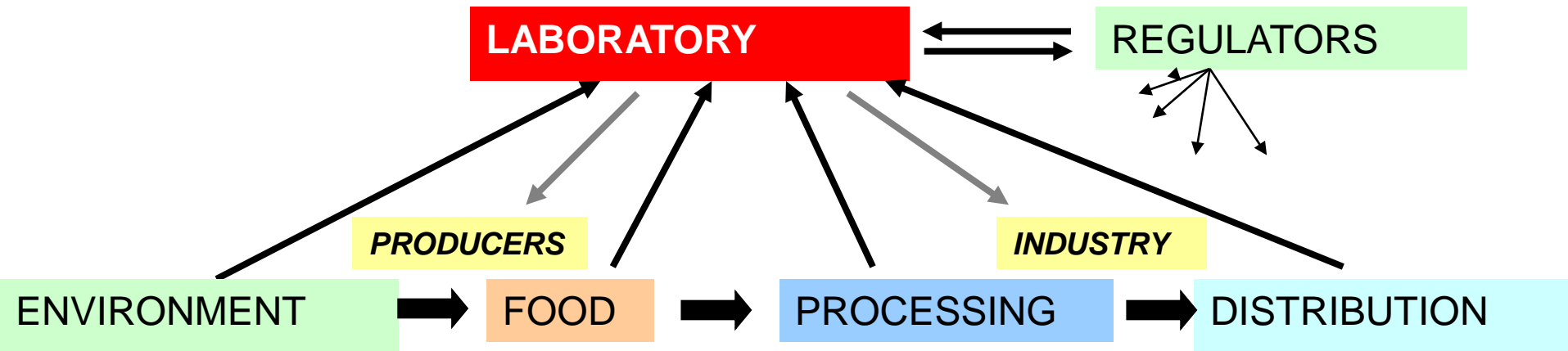
But – pitfalls:

- Independency and transparency of certification bodies (e.g. organic production claims)
- Traceability of documentation followed by product testing





# The role of reference laboratories “farm to fork”



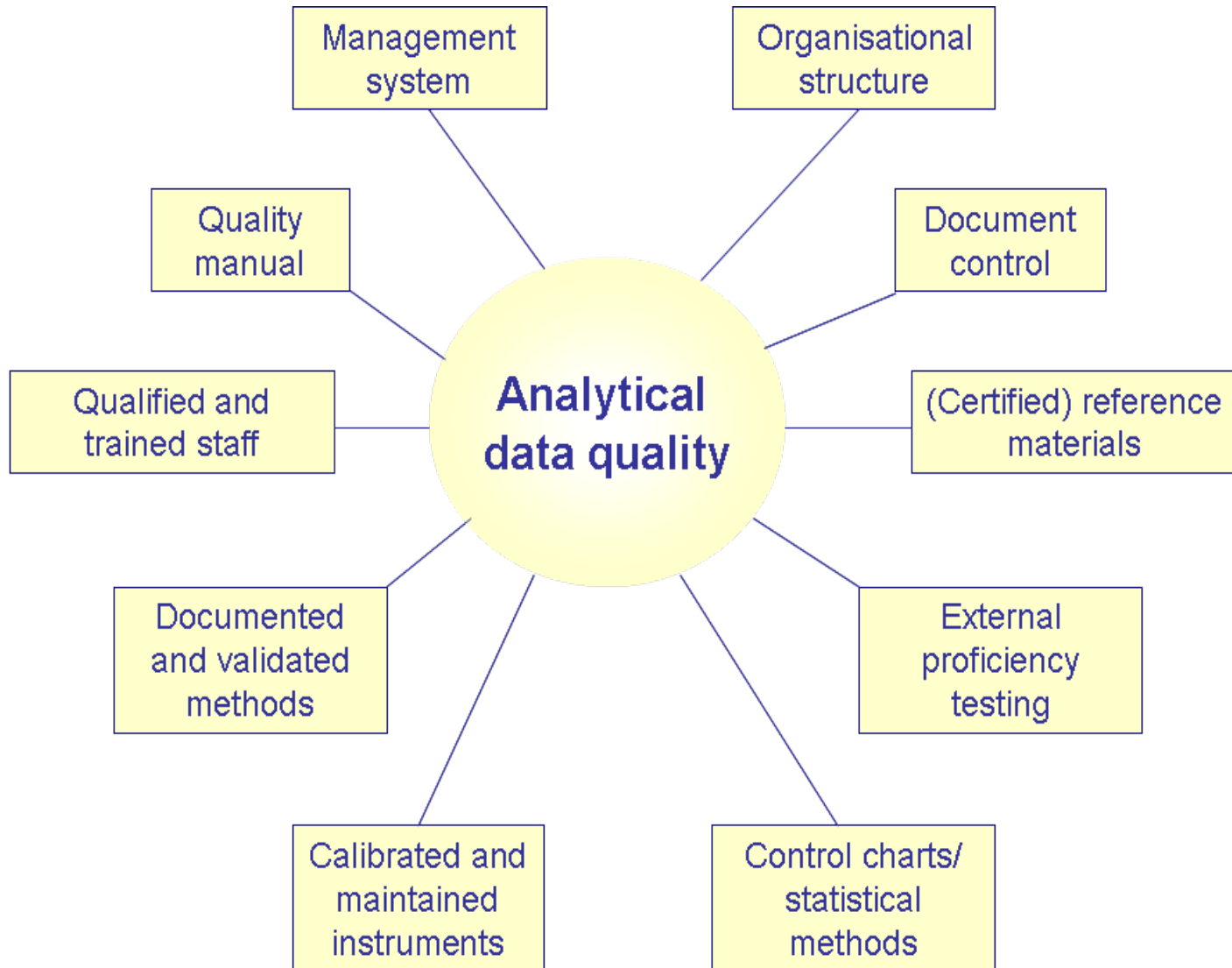
# Official food control laboratories



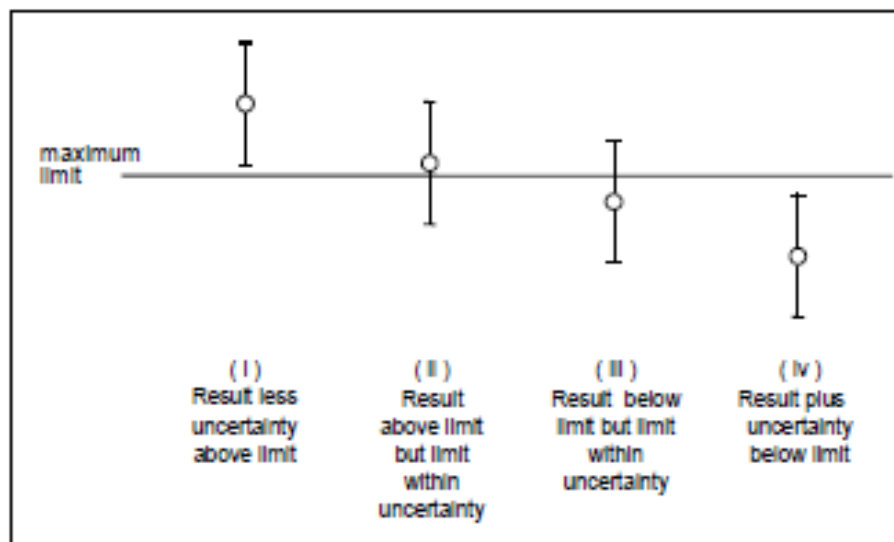
- Testing of samples for food safety/health assurance programmes
- Provide feedback to regulators on effectiveness of good agricultural and production practices
- Provide feedback to producers/extension services on production and management practices
- Identify 'new' problems
- Follow-up to ensure that corrective actions were effective
- Advanced analytical techniques must be in place to enable laboratories to perform these functions



# Integrated system for analytical data quality (ISO 17025 accred.)



# Decisions based on analytical results



Action: reject accept accept accept

Analytical uncertainty and sampling uncertainty!!

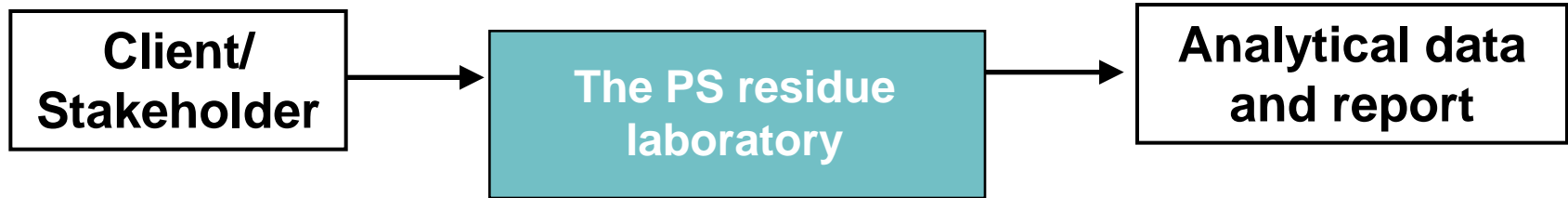


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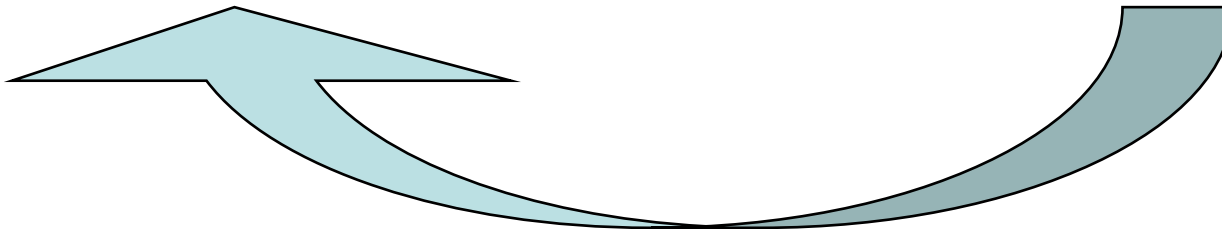
# A pesticide residue laboratory

- Samples
- Physical infrastructure
- Human resources / sustainability
- Equipment & consumables



- Method-validation
- QA/QC system
- Uncertainty measurements
- Proficiency testing
- Calibration

- Maximum residue limits
- Statistical interpretation



- Feedback and advisory role
- Stakeholders communication

# The expanded role of the laboratory



- Stakeholders approach & communication
- Multidisciplinary
- Feeding back results and promote farm to fork food safety (holistic)
- Risk assessment & the need for quality data
- Address decision makers and encourage risk management and communication

Accessible Institutional  
infrastructure



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# Vulnerabilities in the food chain



- Globalization
- Environmental contamination of agricultural land
- Raw materials and commodities contamination
- Production chains tampering and sabotage
- Contamination during storage, logistic, and delivery of goods
- On-the-shelf-single-product tampering and adulteration
- Emerging contaminants
- Food crime
- Legislation gaps and new challenges
- Ineffective systems for food control

# Towards holistic approaches to ensure food safety

- Risk assessments
- Risk based monitoring (sampling) for food safety
- Risk based management guidelines applied
- Feedback and communication mechanisms (i.e. RASSF) in place







*Thank You*

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