Challenges in implementing national biosafety frameworks on food and feed safety in selected countries from Eastern Europe and Central Asia: experiences and outcomes from FAO projects

„10 years of food science in service of consumers" conference ,
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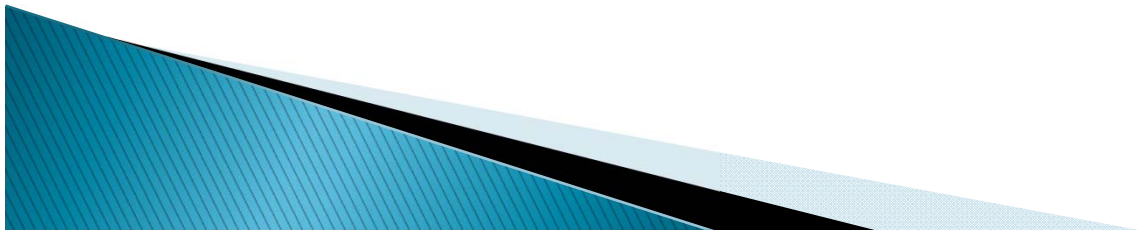
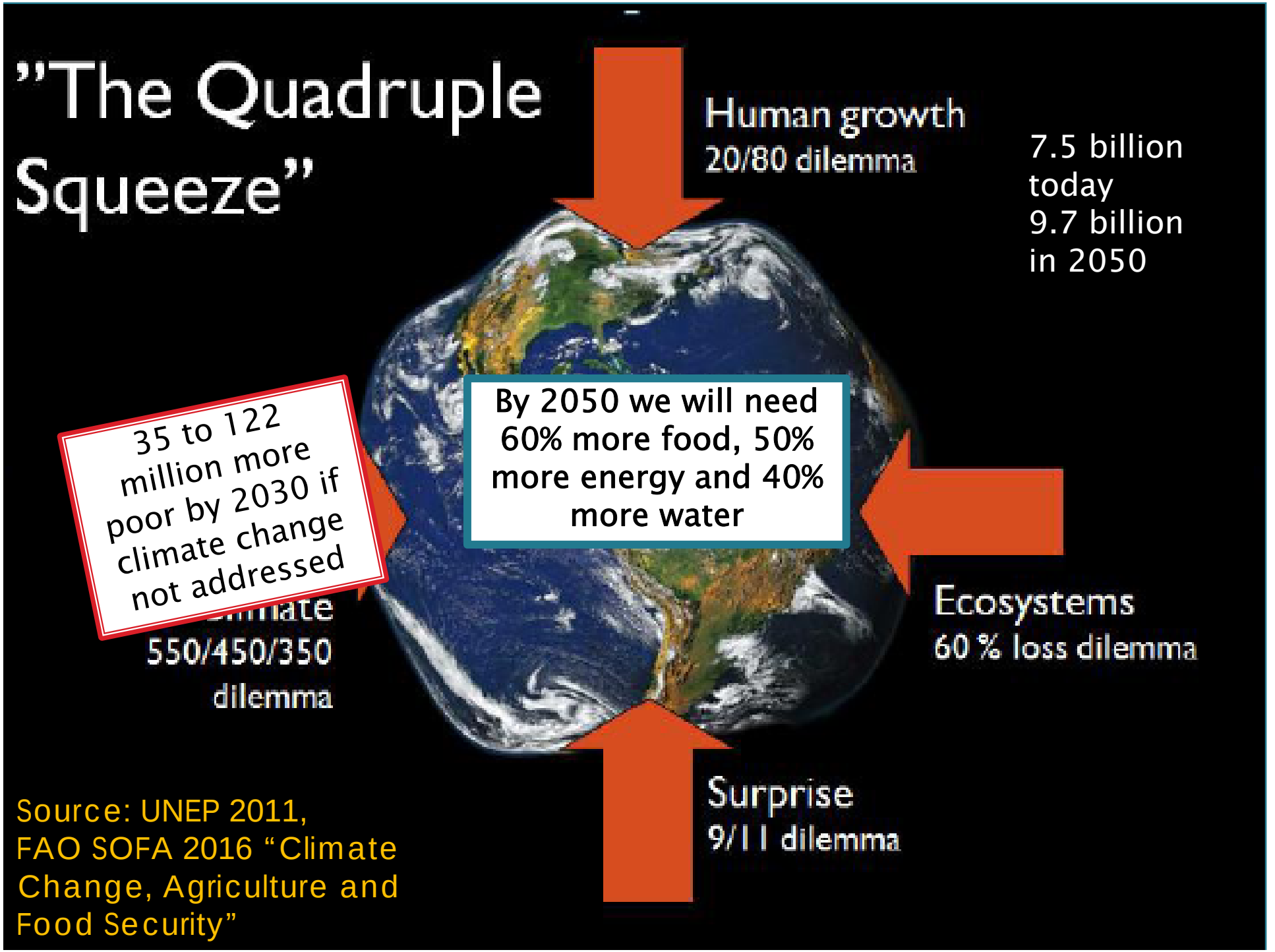
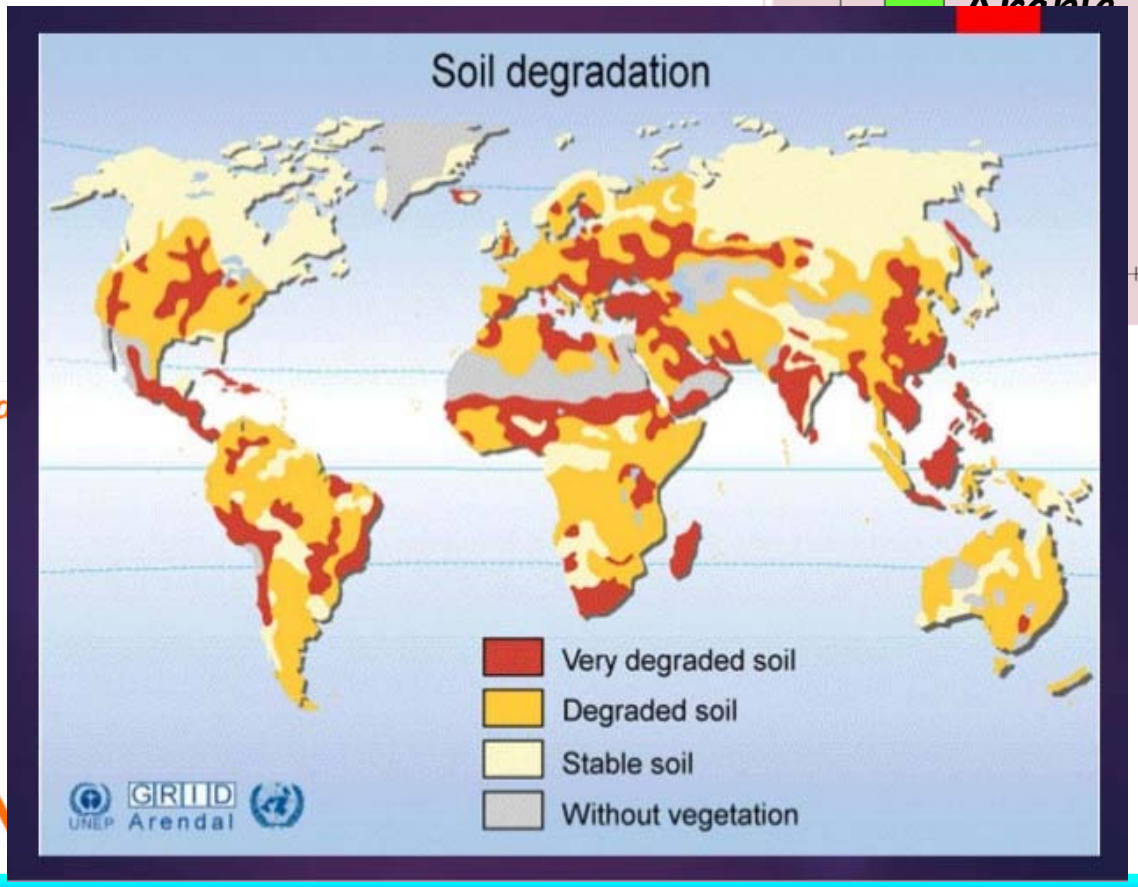
Content

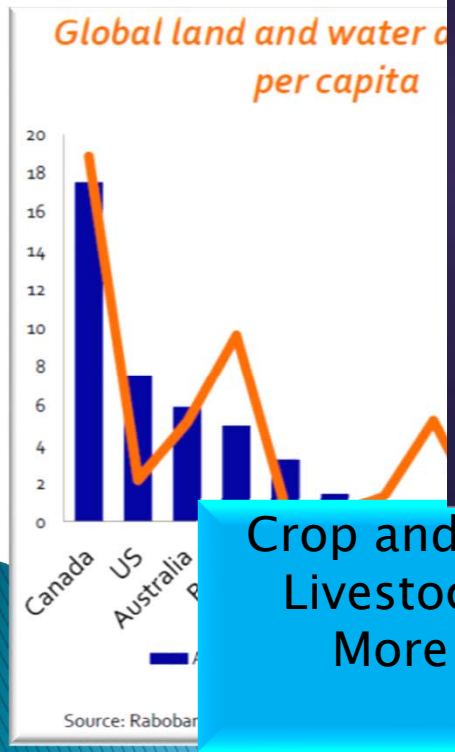
- Global challenges and trends in food and agriculture
- Biotechnologies@FAO
- National biosafety systems: maximizing the benefits and minimizing the risks from modern biotechnologies
- Challenges in implementation of the biosafety systems
- Take-home messages




"The Quadruple Squeeze"
Human growth
20/80 dilemma
7.5 billion today
9.7 billion in 2050
By 2050 we will need 60% more food, 50% more energy and 40% more water
35 to 122 million more poor by 2030 if climate change not addressed
550/450/350 dilemma
Ecosystems
60 % loss dilemma
Surprise
9/11 dilemma
Source: UNEP 2011, FAO SOFA 2016 "Climate Change, Agriculture and Food Security"

LAND AND WATER RESOURCES

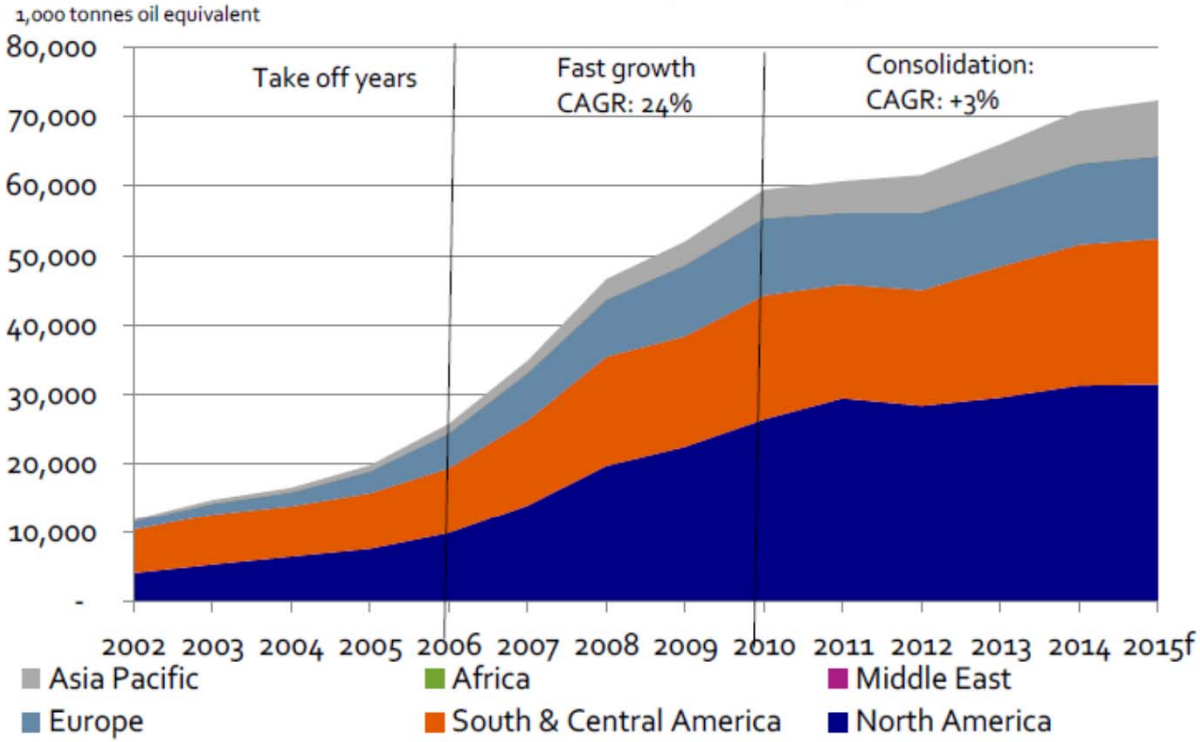




Crop and livestock sectors use 70 % of fresh water resources;
Livestock alone uses 80% of global crop and pasture areas
More land is needed for the fastest developing sector: aquaculture

BIOFUELS

Global demand for biofuels



Source: Rabobank analysis based on FAO and BP, 2016

Impact on agriculture

Ethanol:
- 12% of global corn supply
- 16% of sugar cane supply

Biodiesel:
- 17% of global soy oil supply
- 10% of global palm oil supply
- 25% of global rapeseed oil supply
- 1% of global sunflower oil supply

Food and Agriculture Organization of the United Nations

The future of food and agriculture

Trends and challenges

CROP YIELDS: TOO LOW FOR COMFORT

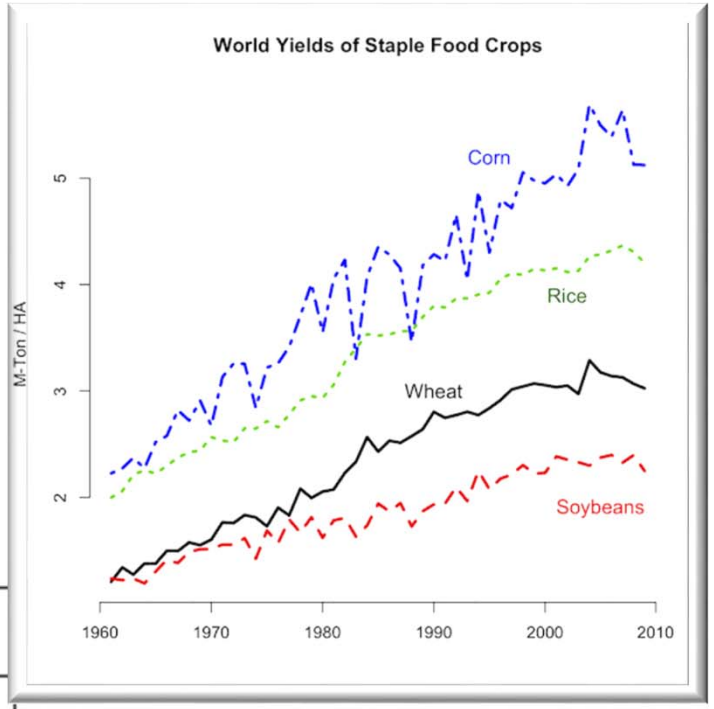
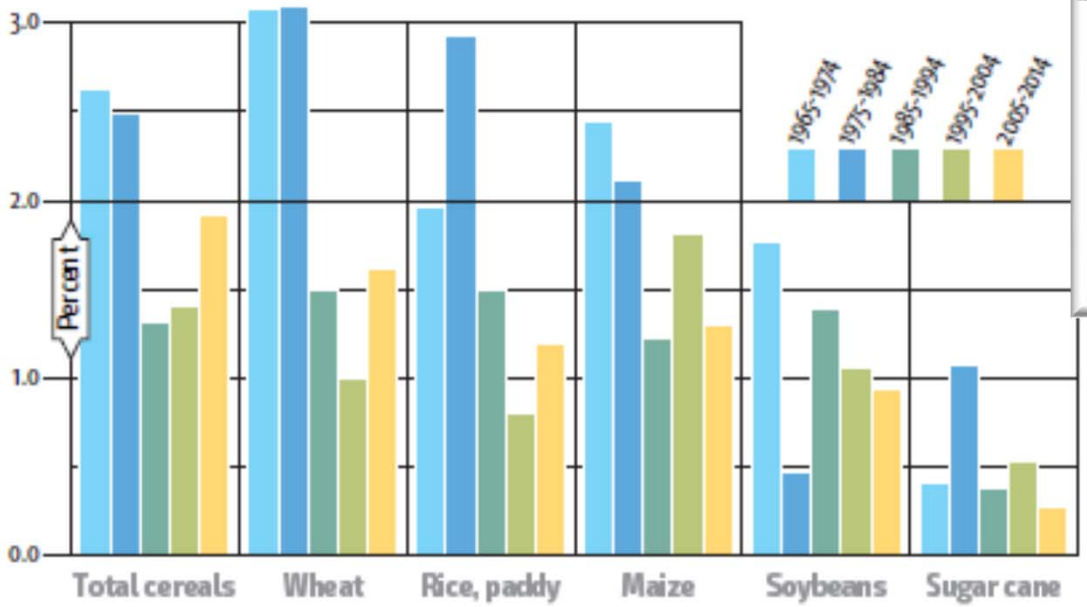


Figure 1 Average annual rate of increase in crop yields



Note: Calculations based on FAOSTAT production statistics (downloaded on 20 September 2016). Growth rates estimated using the ordinary least squares (OLS) regression of the natural logarithm of crop yields on time and a constant term The commodity group 'Cereals (total)' is from FAOSTAT and includes: wheat, rice (paddy), barley, maize, rye oats, millet, sorghum, buckwheat, quinoa, fonio, triticale, canary seed, as well as grains and mixed cereals not elsewhere specified.

Source: FAO. 2016. FAOSTAT [Website] (available at http://faostat.fao.org). Accessed November 2016.

INCREASE IN AGRICULTURAL PRODUCTION REQUIRED TO MATCH PROJECTED DEMAND, 2005/2007-2050 (PERCENT)

	2005/2007	2012-2050	2005/2007 2012	2013-2050
World				
As				
Wit (UN				
Sub				
As				
Wit (UN				
Rest				
As				
With updated population projections (UN, 2015)[2]	100	147.9	13.8	34.2

80 percent of the global food production increase towards the year 2050 should come from yield increases based on the advancement of agricultural research, its application and transmission to farmers through effective research-extension linkages and creation of an "innovation ecosystem".

[1] World Agriculture Towards 2030/2050: the 2012 revision. ESA Working Paper No. 12-03. Rome, FAO. Alexandratos and Bruinsma, 2012

[2] FAO Global Perspectives Studies, based on UN, 2015. Available at **https://esa.un.org/unpd/wpp.** Accessed November 2016

CHALLENGES IN EUROPE AND CENTRAL ASIA AND SDGS

Rural livelihoods and rural poverty

- 62% of poor live in rural areas
- Migration from rural areas

Farm structure

- 97% of farmers in Europe and 70% in Central Asia are small holders

Sustainability of food production and food systems and climate change

- Land degradation and increase of natural disasters in the region
- Transboundary diseases

Food Security and malnutrition

- Triple burden of malnutrition: undernutrition – obesity – micronutrient deficiencies

Agrifood Trade

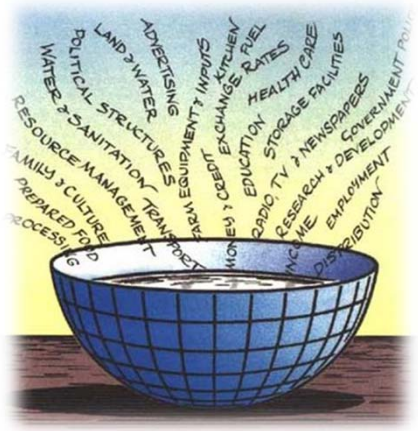
- Potential for export promotion, implementation of trade agreements
- Capacity Development in WTO
- Growing demand for updating the SPS

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

1. End hunger by 2030
2. End all forms of malnutrition by 2030
3. Double the agricultural production and income of small-scale producers by 2030
4. Make production systems sustainable by 2030
5. Maintain genetic resources by 2020

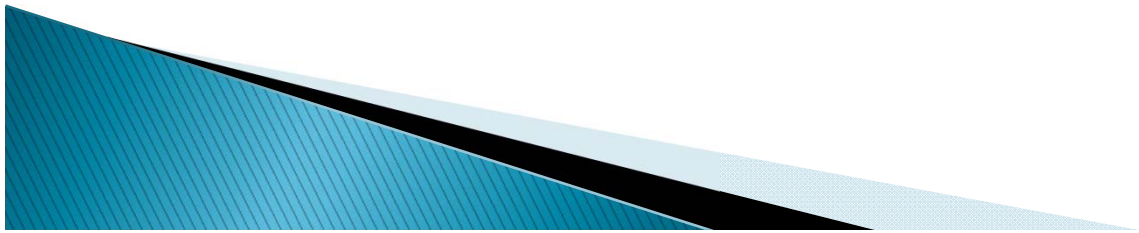
- increased investments in research and international cooperation
- prevent trade restrictions
- food commodity markets

HOW TO PRODUCE MORE WITH LESS?



- Expand the agricultural land ?
- Increase the yield
- Decrease field losses and food waste
- Change agricultural practices
- Change /refine agricultural policies

Any sustainable solution should be used in a safe, responsible and efficient manner to contribute to alleviation of poverty and improving livelihoods, while addressing environmental issues



WHAT IS BIOTECHNOLOGY?

”Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use"

(Source: CBD)

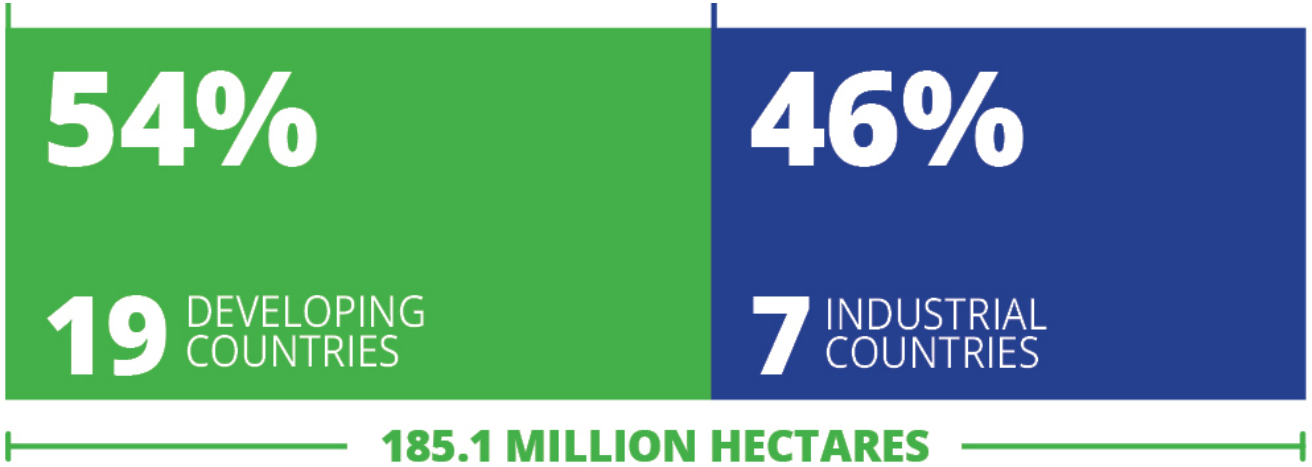
EXAMPLES OF BIOTECHNOLOGIES

- Techniques aimed at introducing desired traits from one plant into another, e.g.:
  - conventional cross breeding,
  - embryo-rescue (1906),
  - mutation breeding (1930),
  - Genetic modification of plants (including Cis-, intra and trans-genesis) (1983),
  - marker assisted selection (1990),
- Techniques aimed at 'editing' the existing genome, e.g
  - Zinc Finger Nuclease Technology (ZFN),
  - Oligonucleotide Directed Mutagenesis (ODM),
  - Mega-nucleases,
  - Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)s,
  - Transcription Activator-Like Effector Nucleases (TALEN)
- Techniques aimed at temporary or transient modifications, e.g.:
  - RNA-dependent DNA methylation,
  - Reverse breeding,
  - Agro-infiltration
- 'Designed system approach', e.g.: Synthetic Biology

- Cheap
- Faster
- More accurate
- No foreign genes in the product
- More versatile- for diverse use, including orphan crops
- No multination als' dominance

AGRICULTURAL BIOTECHNOLOGIES

- a **role to play** in improving farmers' livelihoods and in the fight against hunger and malnutrition
- Solution-oriented and demand-driven
- Technologies alone are not enough
- Upscaling of innovations
- **Strategies**, markets, legislation…

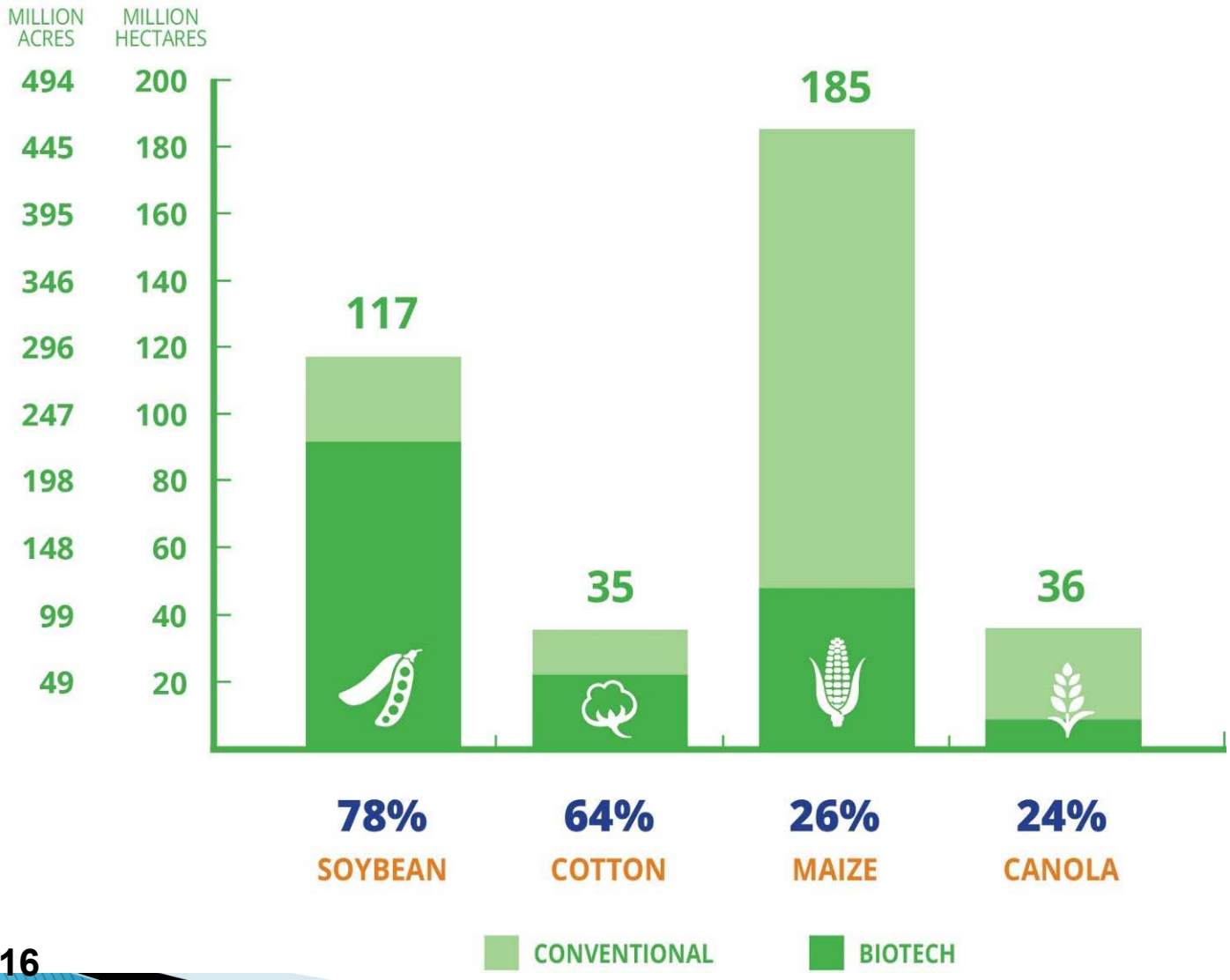


DISTRIBUTION OF BIOTECH CROPS IN DEVELOPING AND INDUSTRIAL COUNTRIES IN 2016

Source: ISAAA, 2016

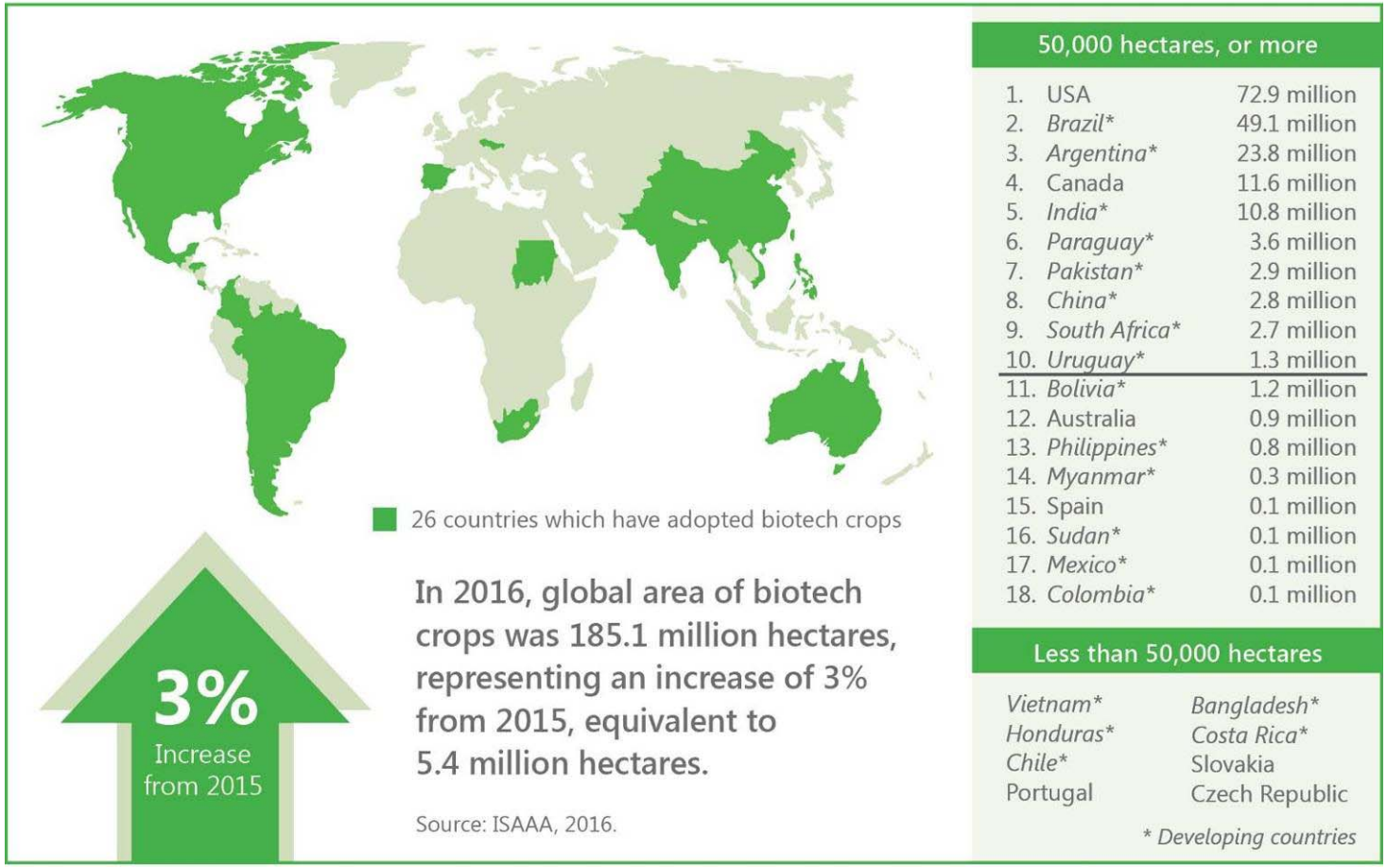
Developing countries: 99.6 million hectares
Industrial countries: 85.5 million hectares

Global Adoption Rates (%) for Principal Biotech Crops (Million Hectares, Million Acres), 2016



ISAAA, 2016

Global Area of Biotech Crops, 2016: By Country (Million Hectares)



- Top five countries: 3 Dev countries (Brazil, Argentina, and India) and 2 Industrial countries (USA and Canada) grew 91% of biotech crops

WHY GOVERNMENTS REGULATE MODERN BIOTECHNOLOGIES?

- Maximize benefits

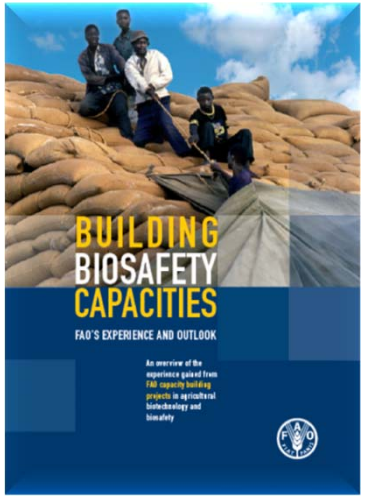
– Research and biotechnology policies, capacity development, support systems, communication, investments etc.

- Minimize risks– biosafety systems

- Regulations – consistent with CPB, and in some cases with EU
- **Case by case risk assessment** and decision making
- Monitoring and enforcement

WHAT IS BIOSAFETY?

- **Biosafety** refers to policy and legislative frameworks aiming at assessing and managing potential risks for human and animal health and environment, resulting from the sustainable use of genetically modified organisms.

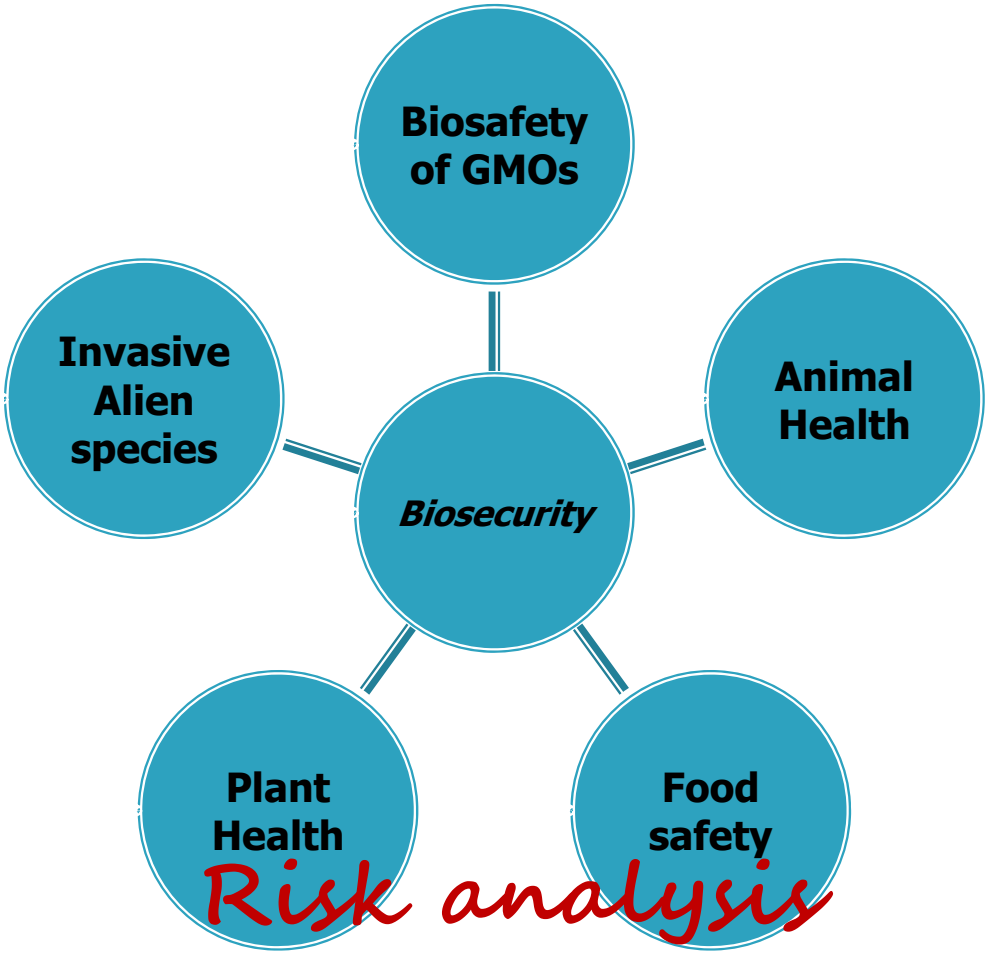


WHAT IS BIOSECURITY?

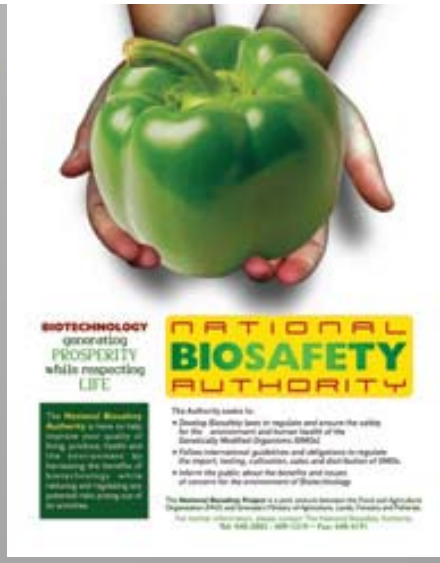
Biosecurity is an integrated approach, encompassing policies and regulatory frameworks that analyse and manage risks in the sectors of food safety, animal life and health, and plant life and health, including associated environmental risk.

BIOSECURITY CONCEPT

- Common basis: risk analysis
- Possible synergies, increased efficiency and reduced costs, especially in small countries



FAO AND BIOSAFETY



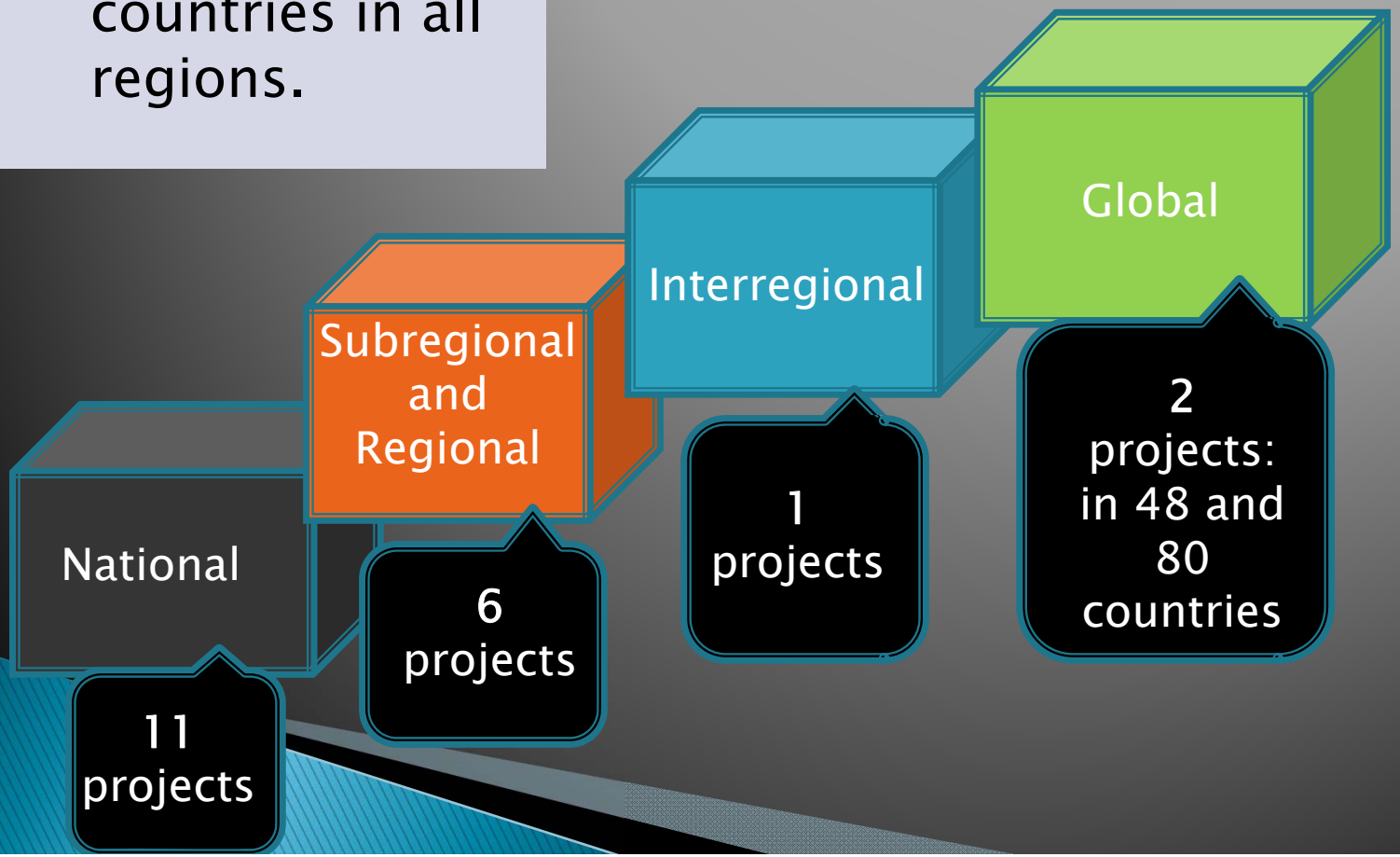
- Since the late 1990s
- Interdepartmental Working Group on Biosafety
- Numerous capacity development initiatives in biosafety as it relates to food and agriculture, as by the Cartagena Protocol on Biosafety (Art.22)

FOCUS OF FAO ACTIVITIES in biosafety

- Provide policy advice to governments
- Provide technical assistance
- Ensure access to neutral and balanced information
- Provide a neutral forum to develop international instruments of governance

FAO BIOSAFETY CAPACITY DEVELOPMENT PROJECTS

- Since 2002
- Approximately USD 8,5 million
- More than 80 countries in all regions.



BIOSAFETY INITIATIVES AND PROJECTS AT FAO REGIONAL OFFICE FOR EUROPE AND CENTRAL ASIA, 2006-2015

- FAO Technical Cooperation Programme for Croatia, 2008-2009, Capacity building of regulatory agencies for handling and monitoring genetically modified crops, products and processed food;
- FAO TCP on agricultural biotechnologies and biosafety in Armenia, Georgia and Moldova, 2009-2012.

PROJECT IN ARMENIA, GEORGIA AND MOLDOVA

CURRENT INITIATIVES

- Participatory approach for biotechnology and biosafety policy formulation
- Communication guide on biosafety issues
- Harmonizing national legislations on biosafety with international agreements (e.g. WTO)
- Capacity development project for Azerbaijan, Kazakhstan, Kyrgyzstan and Tajikistan (2015-2017)

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- Participatory approach for biotechnology and biosafety policy formulation
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CHALLENGES

- Lack of a critical mass of knowledgeable people and institutions able to make informed decisions
- Constraints in elaborating comprehensive laws, by-laws and technical guidelines, compatible with relevant international treaties (CBD-CPB, WTO, Aarhus convention)
- Insufficient negotiation skills for international treaties, such as CPB, according to national and regional priorities

CHALLENGES

- Lack of experience in enforcing a functional framework for GMO risk assessment, risk management and communication, monitoring systems, border and field control mechanisms and reliable detection schemes
- Lack of GMO detection capacities in accreditation, method validation and sampling, trained laboratory personnel and trained inspection bodies
- Lack of mechanisms to take gender and socio-economics into consideration
- Lack of mechanisms for public awareness and education

CHALLENGES

Labelling

Labelling of the presence in products of approved GMOs

Thresholds (e.g. 0.9 %)

CHALLENGES

Low-level presence (LLP):

The detection of low levels of GM crops that have been approved in at least one country on the basis of a food safety assessment according to the relevant Codex guidelines.

LLP is not specifically defined by Codex, however in the context of the Codex guidelines such a situation is referred to as LLP.

Threshold levels

Source : http://www.fao.org/food/food-safety-quality/a-z-index/biotechnology/llp/en/

CHALLENGES

Adventitious presence (AP):

Unintentional presence of GM crops that have not been approved in any country on the basis of a food safety assessment according to the relevant Codex guidelines.
Threshold levels

Source : http://www.fao.org/food/food-safety-quality/a-z-index/biotechnology/llp/en/

Project background: Governmental requests and project formulation

As International governmental organisation, FAO provides assistance upon request(s) from governments (MoAs)
requests from Azerbaijan, Kazakhstan, Kyrgyzstan and Tajikistan
on

TECHNICAL COOPERATION PROGRAMME (TCP)

Capacity development in biosafety


Public awareness and communication
GMO detection
Policy
FA O Training programme
Inspections
Regulations
Biosafety education
Risk analysis and monitoring

REGIONAL NETWORK FOR RISK ASSESSMENT INITIATIVE

- The Governments of Azerbaijan, Tajikistan, Kyrgyzstan and Kazakhstan are in process of establishing risk assessment for LMOs.
- received some early training from UN agencies and the EC and have some awareness of both the scientific and administrative requirements of such systems.
- realise that there are currently limited scientific resources in most of these countries and
- have at recent FAO organised workshops expressed interest in cooperating at the technical level of risk assessment in order to pool scientific resources and draw in external expertise.

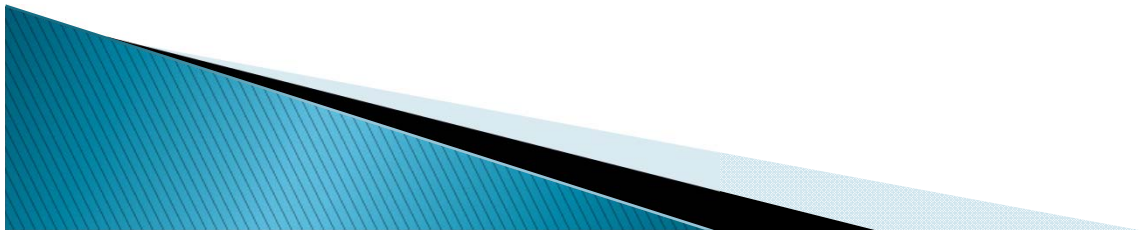
HISTORY AND GENERAL APPROACH OF RISK ASSESSMENTS

Long history of risk assessment by international bodies:

- the Joint FAO/WHO Expert Committee on Food Additives (JECFA, 1956)
- the Joint FAO/WHO Meeting on Pesticide Residues (JMPR, 1961),
- the Codex Alimentarius Commission (CAC, in 1963)

General approach of risk assessments:

1. Hazard identification / Hazard Characterisation
2. Exposure assessment
3. Risk Characterisation



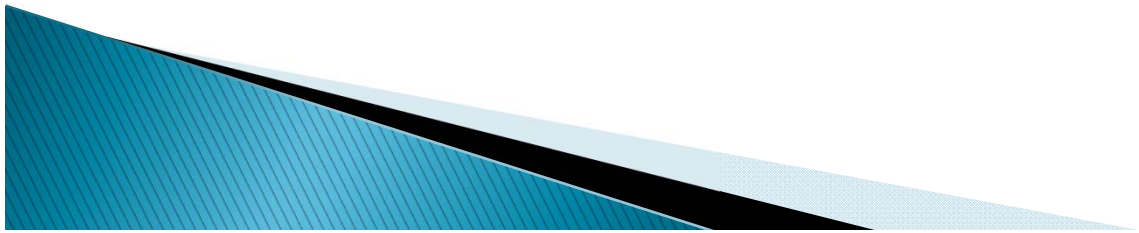
CPB – RISK ASSESSMENT

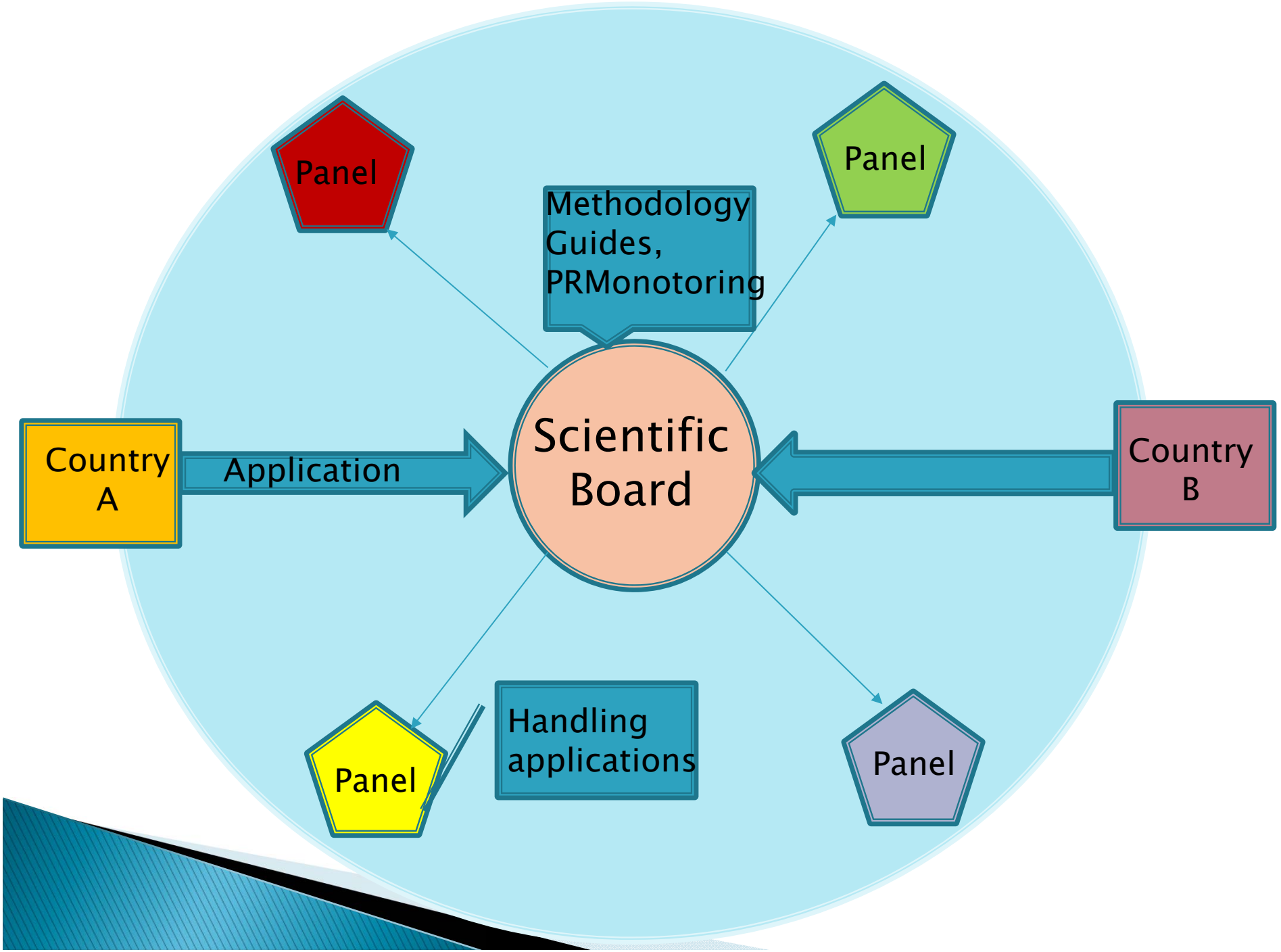
Article 10 – Decision procedure

"Decisions taken by the Party of import shall be in accordance with Article 15."

Article 15 – Risk Assessment

"Risk assessments undertaken pursuant to this Protocol shall be carried out in a scientifically sound manner, in accordance with Annex III and taking into account recognized risk assessment techniques."

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Panel
Methodology
Guides,
PRMonotoring
Country
A
Application
Scientific
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B
Handling
applications
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TAKE HOME MESSAGES

- We are facing several challenges at global and regional level that affect food security which already require adequate actions
- Promising biotechnologies (techniques) are already available; more innovations are needed
- Further enabling environment (REGULATIONS, CAPACITY DEVELOPMENT) is needed in order to adopt existing and generate proper technologies
- Available now BIOTECH products may not always address specifically the needs of all regions and farmers; NBTs look promising
- Maximize benefits:A clearly formulated biotechnology and biosafety strategy facilitates the development of effective and efficient biosafety regulations.

TAKE HOME MESSAGES

- Biosafety approach (science-based, case-by-case RA) is developed and agreed internationally
- Biosafety regulations are a tool for informed decision making – allowing countries to maximise the benefit of biotechnology and minimise the risks
- The role of the regulator is to set clear, transparent, predictable and enforceable system for biotechnologies, genome editing techniques in a proper communication setting
- Room for Regional approach

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