



# Overview of JRC activities on enlargement, integration, and capacity building towards harmonisation of GMO analysis

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**Institute for Health and Consumer Protection (IHCP)**  
**European Commission - JRC**

# The Molecular Biology & Genomics Unit:



Molecular Biology & Genomics

## - **Biotechnology Research & Development:**

- Sampling
- Method development & validation
- Mol. characterisation & stability studies
- Bioinformatics & information systems in support to regulatory processes
- **Training and capacity building**



European Network of GMO Laboratories

- Management & Coordination of the **European Network of GMO Laboratories (ENGL)**



Community Reference Laboratory

GM Food and Feed

- Mandate of **Community Reference Laboratory for GM Food & Feed (CRL-GMFF)** and **Community Reference Laboratory for GMOs (CRL-GMO)**



# GMO or not GMO ?

*...towards harmonisation on*

- **Sampling**

- **Sample preparation**

- **Extraction methods**

- Matrix
    - Processing
    - Protocols

- **Analytical choice**

- **DNA-based methods**

- **Protein-based methods**

- Protocols
      - Specificity
      - Sensitivity

- **Interpretation and reporting**

- **Laboratory facilities**

- **Quality assurance**

- **Accreditation**

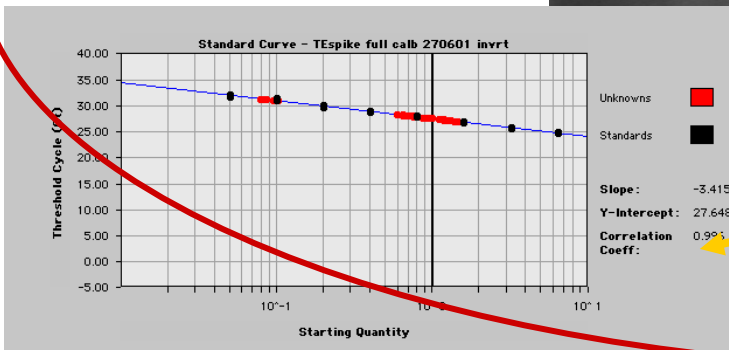
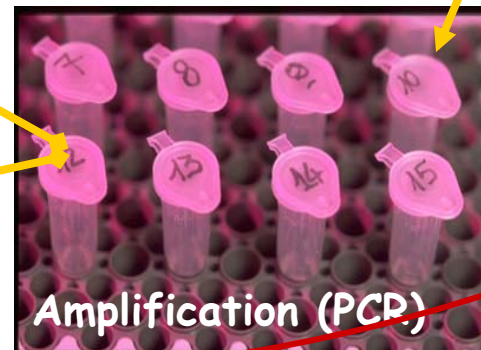
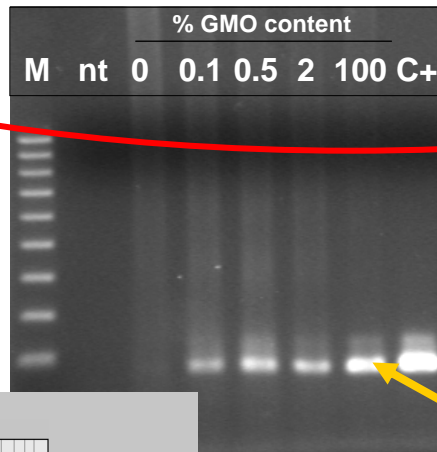
- **Method validation**



**Sampling phase**

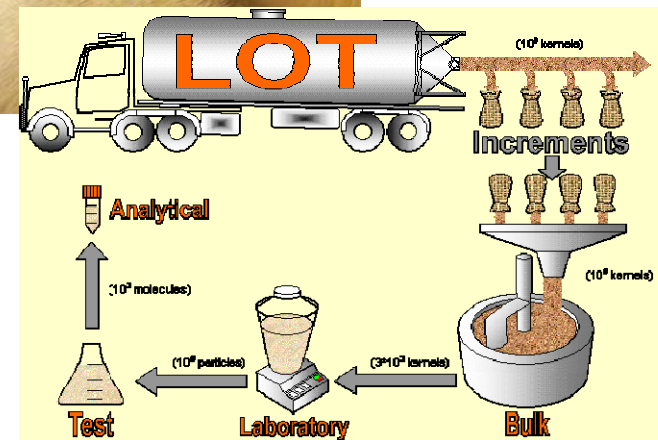


**Analytical phase**



# Research on sampling and method validation strategies

- Identification and development of appropriate sampling strategies in support to EU legislation for the detection and quantification of GMOs in different market products
- Definition of validation schemes and criteria for GMO testing methods



## Development of methods and standards for GMO analysis

- Development of new molecular methods for the qualitative and quantitative analysis of GMOs
  - PCR based approaches
  - Immunoassays
  - Microarray and novel high-throughput / multi-target approaches
  
- Development of DNA based control samples for GMO analysis
  - Plant- and GM-derived analytes cloned into of plasmids with single or multiple insertions



# Multi-target approaches for GMO analysis :

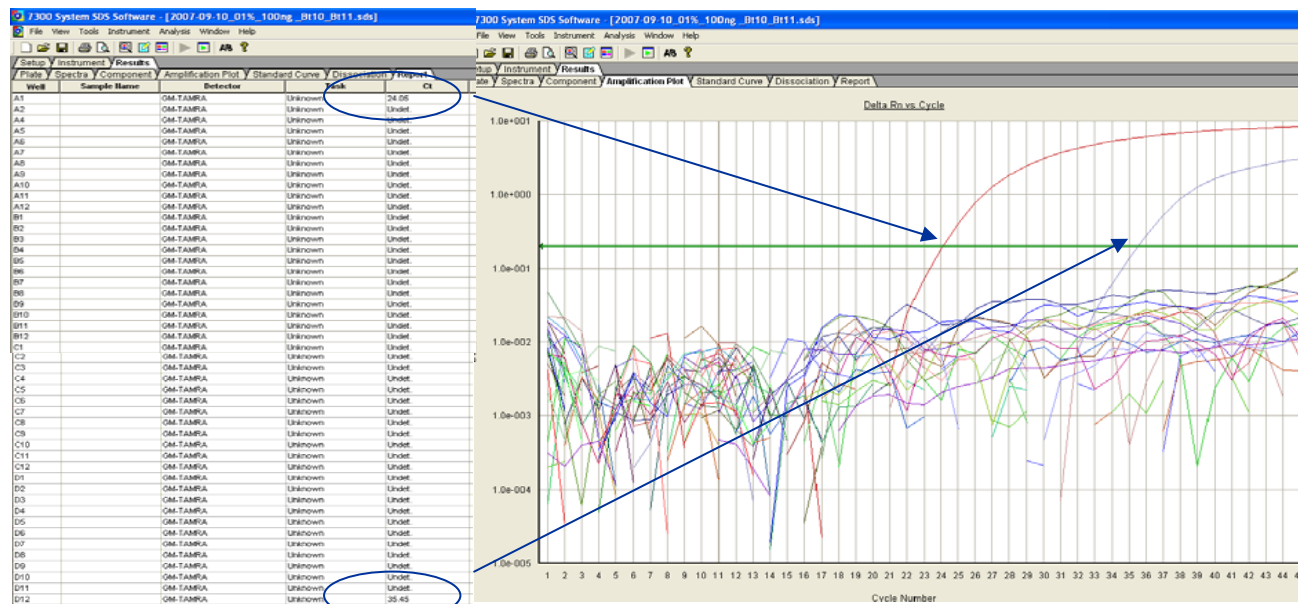
Real-Time PCR based ready-to-use multi-target analytical system for the detection of EU authorised and non-authorised GM events

Targets: 7 plant species  
39 GM events

	1	2	3	4	5	6	7	8	9	10	11	12
A	HMG Maize Ref	SAH7 Cotton Ref	PLD Rice Ref	CruA Oilseed Ref	Lectin Soybean Ref	GS Sugarbeet Ref	UGPase Potato Ref	Bt11 Maize	NK603 Maize	GA21Maize Monsanto	MON863 Maize	1507 Maize
B	T25 Maize	59122 Maize	H7-1 Sugar beet	MON810 Maize	281-24-236 Cotton	3006-210-23 Cotton	LLRICE62 Rice	T45 oilseed rape	EH92-527-1 Potato	Ms8 Oilseed rape	Rf3 Oilseed rape	GT73 (RT63) Rapeseed
C	LLCotton2 5 Cotton	MON 531 Cotton	A2704-12 Soybean	MIR604 Maize	Rf1 Rapeseed	Rf2 Rapeseed	Ms1 Rapeseed	Topas 19/2 Rapeseed	MON1445 Cotton	Bt176 Maize	MON15985 Cotton	40-3-2 Soybean
D	GA21 Maize Syngenta	MON88017 maize	LY038 Maize	3272 Maize	MON89788 soybean	MON89034 Maize	DP-356043 soybean	MON88913 cotton	Rice GM events P35S::bar	LLRice601 Rice	Bt63 Rice	Bt10 Maize
E	HMG Maize Ref	SAH7 Cotton Ref	PLD Rice Ref	CruA Oilseed Ref	Lectin Soybean Ref	GS Sugarbeet Ref	UGPase Potato Ref	Bt11 Maize	NK603 Maize	GA21Maize Monsanto	MON863 Maize	1507 Maize
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Sample 1

Sample 2



## European Network of GMO Laboratories (ENGL)



*...an enforcement network of GMO Laboratories established in June 2000 and officially inaugurated in Brussels on December 4<sup>th</sup> 2002, chaired and coordinated by the IHCP "Molecular Biology & Genomics Unit"*

<http://engl.jrc.it/>

The ENGL is comprised of more than 120 control laboratories, representing all EU, Norway and Switzerland, plus other Countries as observers.





# The Community Reference Laboratory for GM Food and Feed

Community Reference Laboratory



GM Food and Feed



DAC-PL-0459-06-00



# JRC Capacity Building and Training Programme

## Objective:

- To help control laboratories to implement proper facilities and expertise in GMO testing
  - To contribute to the enforcement of an harmonised approach in GMO analysis
- 
- ✓ Scientists from more than 120 laboratories trained worldwide
  - ✓ Specific training for trainees
  - ✓ External facilities as 'Training Sites'
  - ✓ Production and release of *ad-hoc* didactic material



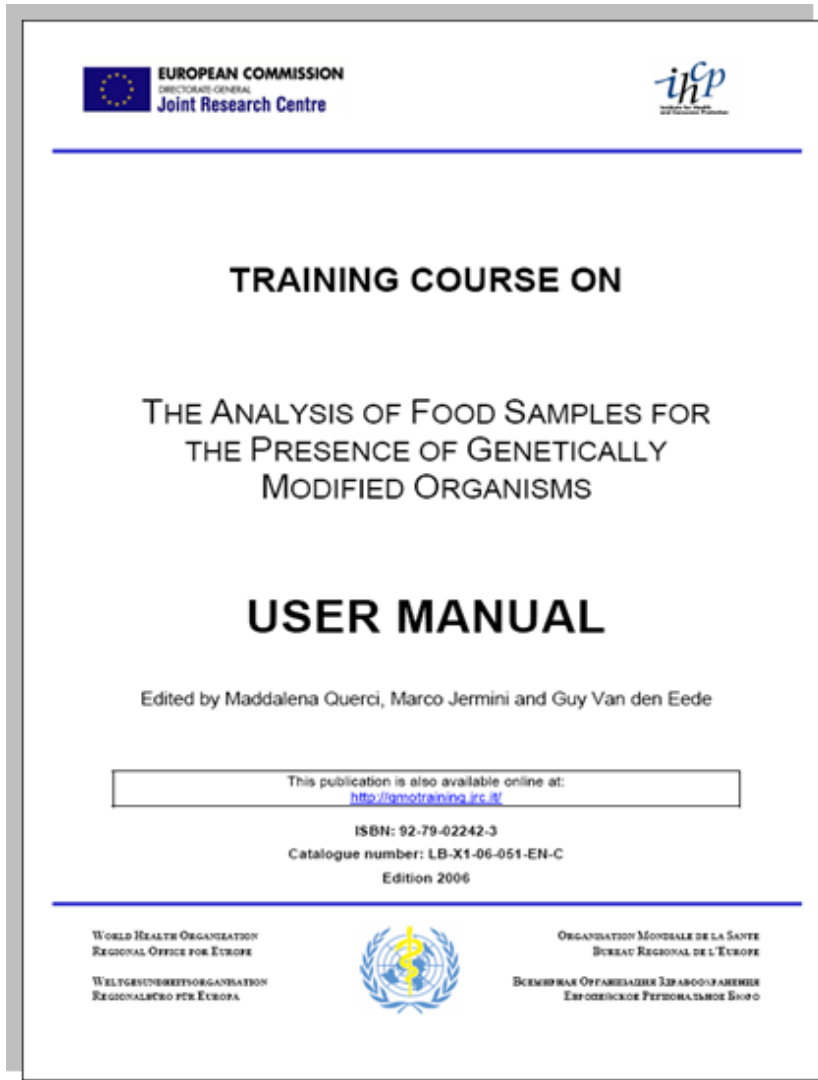
# Training Courses

## Theoretical lectures:

- EU legislation on GMOs and specific requirements
- Experimental planning and sample preparation
- DNA extraction
- PCR principles
- Qualitative and quantitative PCR
- Protein based GMO detection
- Sampling
- Lab. implementation
- Method validation criteria and laboratory accreditation

## Experimental work:

- Experimental planning and sample preparation
- DNA extraction from raw and processed materials
- Simple and nested PCR for qualitative GMO analysis
- GMO quantitative analysis by real-time PCR
- Protein based GMO detection approaches

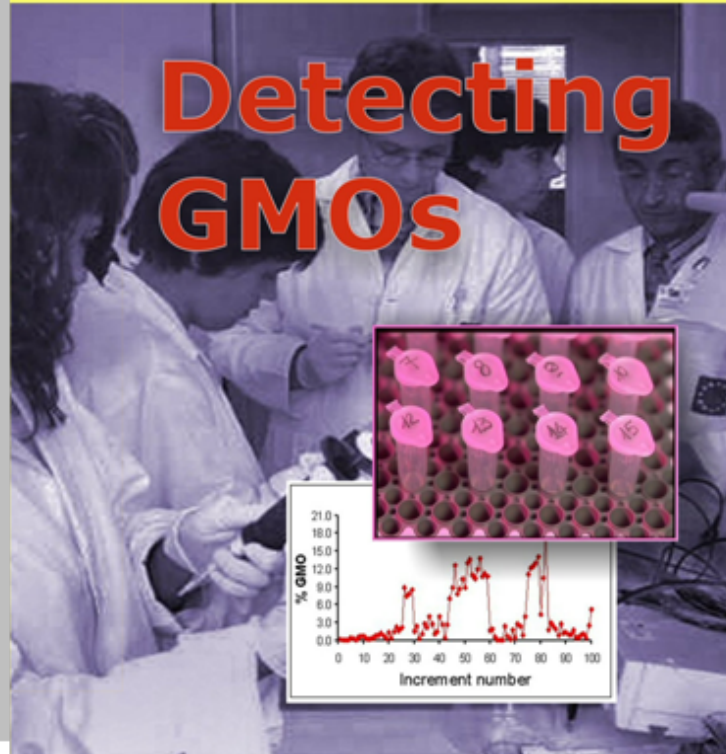


- **English**  
(edition 2006 – available *on line*)
- **French**  
(edition 2006 – available *on line*)
- **Spanish**  
(edition 2007 – available *on line*)
- **Russian**  
(edition 2007 – available *on line*)
- **Chinese**  
(edition 2007 – available *on line*)
- **Polish**  
(*in preparation* – 3 chapters *on line*)
- **Rumanian and Turkish**  
(*in preparation* – publication foreseen mid 2009)


Downloadable from:  
<http://gmotraining.jrc.it>


## The JRC Advanced Training Series


# Detecting GMOs



European Commission DG Joint Research Center - The JRC's advanced training series - Detecting GMOs

 **EUROPEAN COMMISSION**  
DIRECTORATE-GENERAL  
**Joint Research Centre**

 **ihcp**  
Institute for Health  
and Consumer Protection

 **Biotechnology and GMOs**

*The JRC's advanced training series*

# Detecting GMOs

The analysis of food and feed samples  
for the presence of  
genetically modified organisms

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European Commission DG Joint Research Center - The JRC's advanced training series - Detecting GMOs

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## Didactical Units

- General introduction and overview of current EU legislation on Genetically Modified Organisms
- Introduction to the training course
- Experimental set-up and sample preparation
- Extraction and purification of DNA
- Agarose gel electrophoresis
- Qualitative Polymerase Chain Reaction
- Quantitative real-time PCR for the detection of GMOs
- Serological approach for the detection of GMOs
- Appendix I - Sampling: principles and strategies for GMO analysis
- Appendix II - Design and management of the GMO testing laboratory

**START COURSE**

European Commission DG Joint Research Center - The JRC's advanced training series - Detecting GMOs

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## Extraction and purification of DNA

### Extraction and Purification of Nucleic Acids

The extraction and the purification of a nucleic acid (DNA or RNA) is the first step of almost all recombinant DNA studies.



Theoretical principles and protocol details can be found in the User Manual Section 5, while a visual practical demonstration of the technique is provided in video format.

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You are here: Home > Quantitative PCR > Laboratory - part 1

## Quantitative real-time PCR for the detection of GMOs




Manual Title Content Theory Lab

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You are here: Home > Quantitative PCR > Laboratory - part 2

## Quantitative real-time PCR for the detection of GMOs



Manual Title Content Theory Laboratory Quit See also

The "course"



**An overview of EU activities  
for the development and harmonisation  
of GMO detection methods and  
sampling procedures**

Biotechnology and GMOs Unit of IHCP  
(EC Joint Research Centre, Ispra)





# 1<sup>st</sup> Global Conference on GMO Analysis

Villa Erba, Como, Italy  
24-27 June 2008

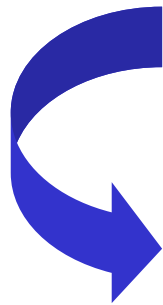
<http://gmoglobalconference.jrc.it/>

 **JRC**  
EUROPEAN COMMISSION



## The way towards the Project Proposal

- 1998 – *ongoing* Expertise in molecular approaches for GMO analysis
- 2000 – *ongoing* Training and capacity building programme
- 2002 Establishment of the European Network of GMO Laboratories (ENGL)
- 2003 Community Reference Laboratory for GM Food and Feed (CRL-GMFF)
- 2004 Community Reference Laboratory for GMOs (CRL-GMO)
- 2008 1<sup>st</sup> Global Conference on GMO Analysis



- 2009 International Collaboration and Capacity Building kick-off
- 2011 2<sup>nd</sup> Global Conference on GMO Analysis

# ‘Towards Global Harmonisation of GMO Analysis by Creating and Supporting Regional Networks of Excellence’

*...to face the overall growing need for enhanced harmonisation of means and methods in GMO analysis and to respond to the constantly increasing requests*

## Project Aim

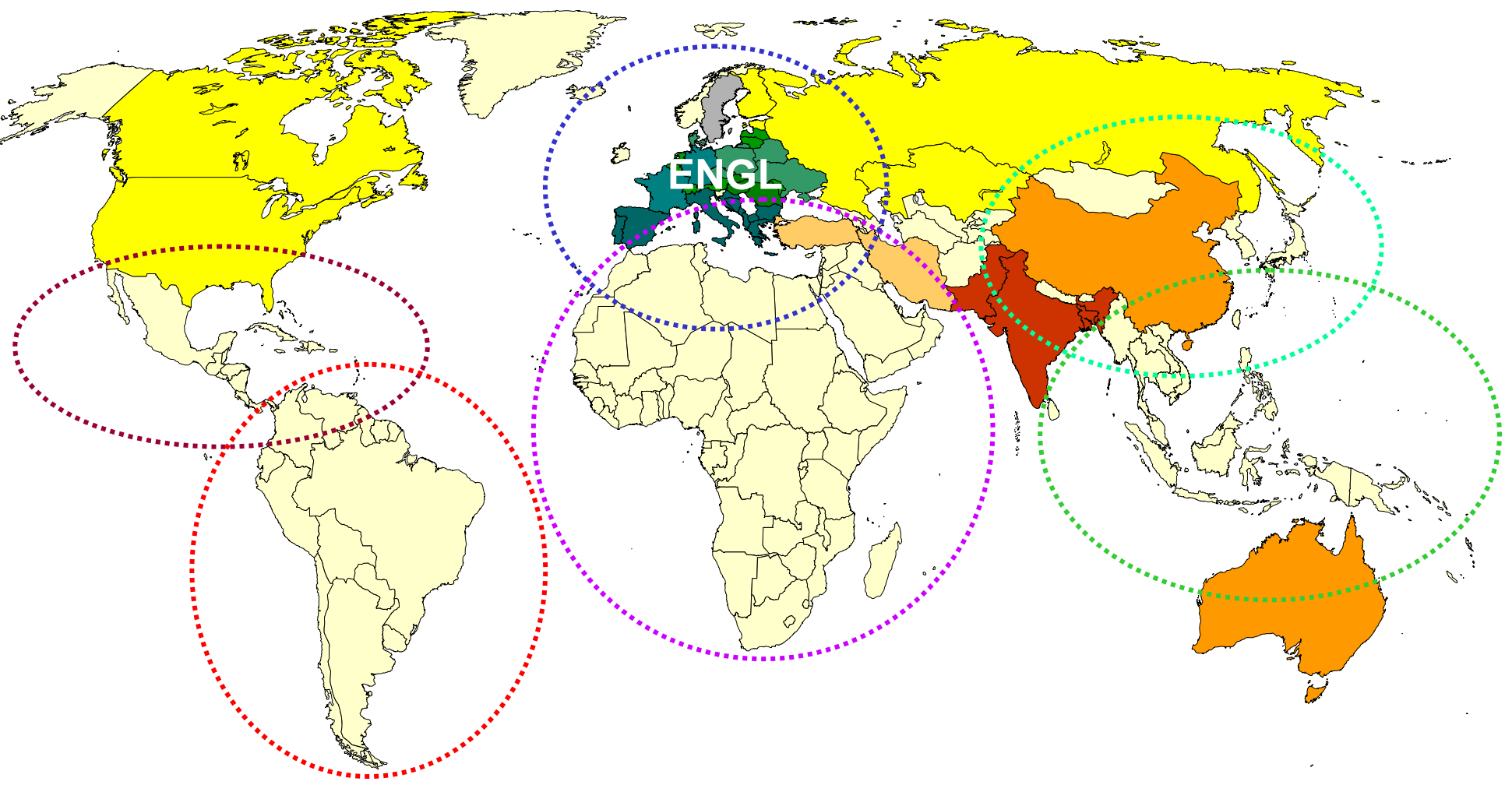
- To foster the concept of networking, to diffuse awareness on the benefits derived from such a networking in Europe and on the potential benefits that could derive from the establishment of similar initiatives in other parts of the world
- To facilitate the establishment of regional networks outside the EU following the concept of the ENGL
- To build capacity by providing training to enforcement laboratories

# ‘Towards Global Harmonisation of GMO Analysis by Creating and Supporting Regional Networks of Excellence’

## Project structure

- Developed at 3 different layers:
- Managerial and decisional level
  - Scientific society
  - Actors directly engaged in technical & scientific aspects of GMO analysis, control/testing laboratory staff

- Developed via:
- Networking workshops
  - Support toward the establishment of regional networks
  - Regional training courses
  - Dedicated web page



## Roadmap 2009 - 2011

### 2009

- **Enlargement/Networking Workshop** (for new MS, Candidate Countries, Potential Candidate Countries and Territories, Countries incl. in the European Neighbourhood Policy, and Others, e.g. Turkish Cypriot Community and Russia)  
*(Turkey, 27-28 April 2009)*
- **Training Course** for Central American Countries  
*(Cuba, October 2009)*
- **Training Course** for Asian Countries (EC TrainSaferFood Programme)  
*(Malaysia, June 2009)*
- **Regional Networking Workshops** (for Central & South America)  
*(Chile/Paraguay, November/December 2009)*

## Roadmap 2009 - 2011

### 2010

- **Training Course** for South American Countries (Brazil/Chile)
- **Regional Networking Workshop** Africa
- **Training Course** (Turkey)
- Training Course Africa (.....)

### 2011

- **2<sup>nd</sup> Global Conference on GMO Analysis (20 – 24 June 2011)**
- ....

# Thank you!

