

# Segregation up to the farm gate: agronomic measures

INSTITUTE FOR  
PROSPECTIVE  
TECHNOLOGICAL  
STUDIES

*ipts*



*“Coexistence of genetically modified, conventional and organic crops  
FREEDOM OF CHOICE”*

Austrian Presidency-European Commission-Vienna 4-6 April 2006

# Science behind on-farm coexistence measures

- Member States Programmes
- EC- VI Framework Programme (SIGMEA-COEXTRA)
- **EC- JRC –Joint Research Centre**
- Conferences GMCC-03 (Ellsinore), GMCC-05 (Montpellier) and **GMCC-07 (Seville)**

New case studies  
on the coexistence of  
GM and non-GM crops  
in European agriculture



EUR 22102 EN

**EUR 22102 EN**

**January 2006**

**[www.jrc.es](http://www.jrc.es)**

# The question

**Agronomic measures to ensure that adventitious GM presence in non-GM harvests does not exceed the threshold specified by EU legislation**

# Scope-research methodology

- GM crops cultivated in EU (maize) or in pipeline
- Crop and Seed production
- Are current farm practices enough?
- What measures can be taken at farm level?  
(farmers growing GM varieties)
- Technical and economic impact of each measure
- Efficacy of a set of measures at landscape level

# Outcome

**Current agronomic practices are enough to ensure that adventitious GM presence in harvest does not exceed the threshold specified by EU legislation**

**Examples: Potatoes, Sugar-beet, Cotton**

**Agronomic on-farm measures may be needed**

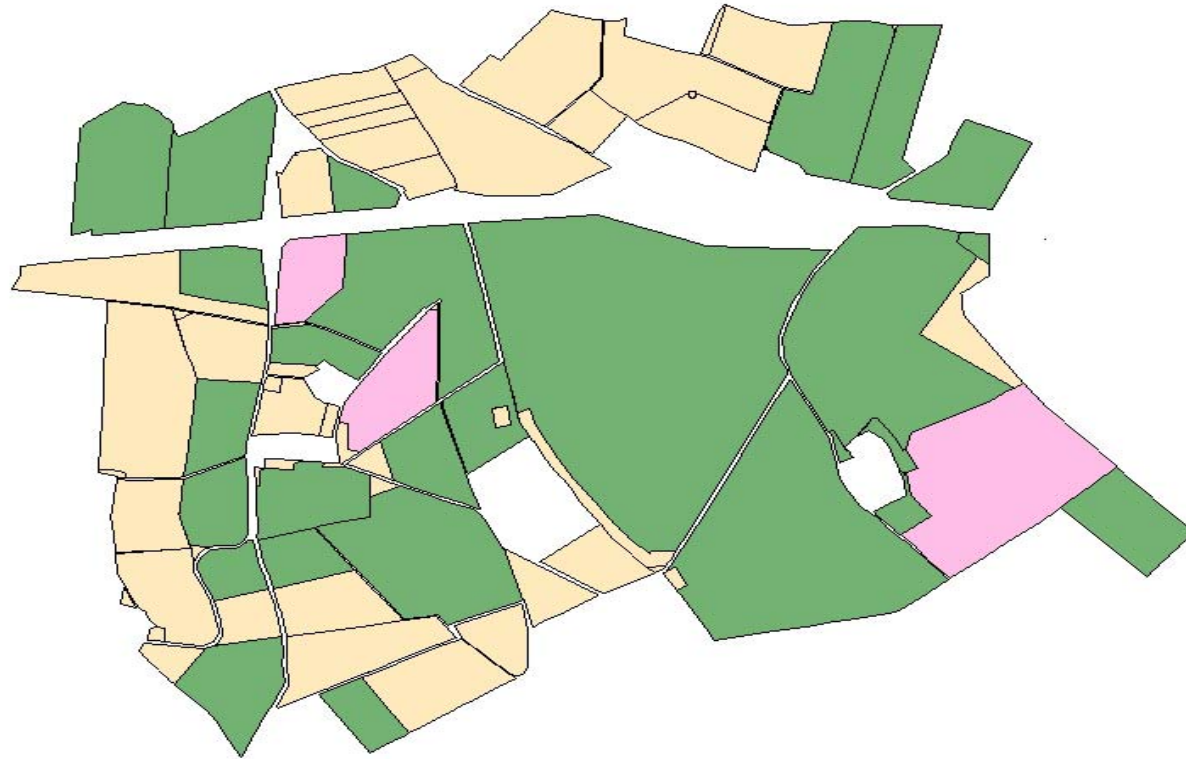
**Example: Maize**

# Coexistence in maize crop production: on farm coexistence measures



<b>GM source</b>	<b>Contribution</b>	<b>Measure</b>
<b>Seed</b>	<b>Limited to 0.5%</b>	<b>Use certified seed complying with relevant legislation</b>
<b>Machinery (harvester)</b>	<b>0-0.4%</b>	<b>Cleaning or dedicated harvester</b>
<b>Pollen flow- Out-crossing</b>	<b>Field trials</b> <b>Direct measurement</b> <b>Models</b> Actual Landscapes Quick testing of measures Calibrated	<b>Change landscape: unfeasible</b> <b>Isolation distances</b> <b>Buffer strips non-GM maize</b> <b>Flowering dates</b>

## Situation 4 with 10% of GM maize (in pink) in the landscape



0 125 250 500 750 1 000 Mètres



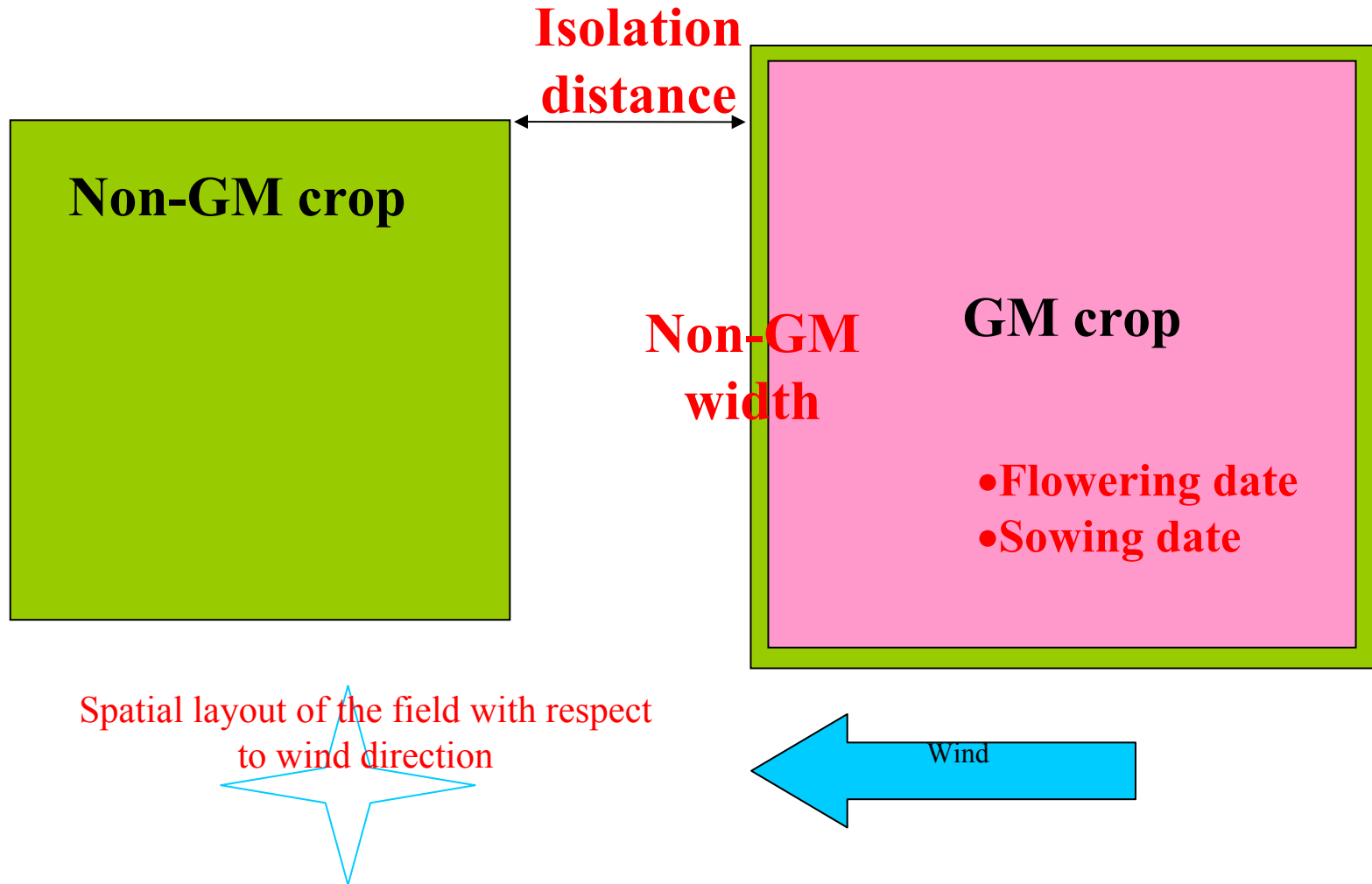
## Coexistence in maize crop production



### Efficacy at landscape level of combinations of coexistence measures

- Seeds with max. GM presence 0.5 % plus clean harvesters: majority of non-GM fields (85-90 %) will stay below 0.9%
- Ensuring all non-GM fields below 0.9% : additional measures to limit out-crossing are needed
- Decision tables based in 3 out-crossing measures in report

# Farm measures to reduce out-crossing in maize





## Measures to reduce out-crossing: efficacy at landscape level

- **(I) Isolation distance**
  - Robust and efficient
  - Can be targeted to farmers growing GM crop
  - Opportunity cost for GM crop farmers
  - Does not affect all farmers equally

## Coexistence maize crop production



- **(II) Sowing non-GM buffer strip around GM field**
  - Robust, efficient
  - Can be adopted by GM crop farmers
  - Opportunity and direct cost for GM crop farmers
  - Serves as refuge for Bt maize varieties
  - Smaller fields more costly
- **(III) Using varieties with differences in flowering date**
  - Efficacy too dependent on weather conditions
  - Hampered by associated yield losses
  - Sowing in different dates: possible only in certain areas with large sowing windows (irrigation)

## Conclusions: Coexistence crop production

- **Coexistence at 0.9% technically feasible**
  - Hypothesis: GM presence in non-GM seed max. 0.5 %
  - With no changes in current farm practices (sugar-beet, cotton, potatoes)
  - With additional farm measures (maize), simple and robust
- **Coexistence at 0.9 % entails opportunity and/or direct costs for GM crop farmers**
  - Influence in GM crop adoption?
- **Coexistence at 0.1 % technically not feasible**

## Coexistence in EU seed production

- **Can non-GM seed be produced in EU with adventitious GM presence not exceeding 0.5 %**
  - Yes with no changes (sugar beet, cotton, potato)
  - Yes, with changes building on current seed production practices (maize): increase separation of GM crop producers
  - Opportunity costs for GM crop farmers
- **Seed production with no more than 0.1 % GM adventitious presence not technically feasible**

# Thank you



## February 2004-December 2005