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**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND
THE COUNCIL**

**on socio-economic implications of GMO cultivation on the basis of Member States
contributions, as requested by the Conclusions of the Environment Council
of December 2008**

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Directive 2001/18¹ on the deliberate release of genetically modified organisms (GMOs) into the environment provides that the Commission should, after 3 years, provide a report on the implementation of the Directive including an assessment of the socio-economic implications of deliberate releases and placing on the market of GMOs. When submitting its 2004 report, the Commission noted that there was not sufficient experience to make such an assessment.

In December 2008, the Council invited the Commission and Member States to work again on this question. Therefore the Commission launched a consultation of the Member States on the socio-economic implications of GMO cultivation via a questionnaire.

Member States were invited to

- Report *ex post* on the socio-economic impact of GMOs cultivated in their territory;
- Assess *ex ante* the possible socio-economic implications of future cultivation of GMOs.

All Member States except 2 (BG, IT²) sent contributions. Whilst all other Member States considered the implication of the cultivation of GMOs, LT only referred to the impact of GMOs in food and feed. Norway (NO) and some stakeholders also participated.

Member States regularly stressed that their contributions were compilations of public bodies and stakeholder's views, and should not prejudice of any political position to be taken later on.

Non-exhaustive compilations of the individual contributions of the Member States are in the Commission staff working paper accompanying this report. All the received contributions are available in full on the website of the Commission³.

1. OUTCOME OF THE CONSULTATION

1.1. Data sources

An indicative questionnaire was provided to assist Member States in submitting their input. The questionnaire was articulated around the following headlines:

- (1) Economic and social implications
- (2) Agronomic sustainability

¹ OJ L 106, 17.4.2001, p. 1.

² List of acronyms for Member States: <http://publications.europa.eu/code/en/en-370100.htm>

³ http://ec.europa.eu/food/food/biotechnology/index_en.htm

- (3) Environmental impact
- (4) Other implications

18 Member States reported along the lines of the indicative questionnaire. Member States also had the option of sending contributions in alternative formats.

According to the received contributions, the majority of Member States carried out formal consultations of national institutions and stakeholders to prepare their answer. It has to be underlined however that answer rates were rather disparate, and the contributions of answers over the stakeholders' spectrum was not uniform. Indeed, for example, 6 Member States⁴ explicitly regretted that their contributions covered only a part of the relevant national stakeholders.

Contributions included inputs from ministries, regional authorities, professional federations, companies, Non Governmental Organisations (NGOs), research centres and individuals. These inputs as received by the Commission were not uniform and consisted either of a compilation of views that had been synthesised by a national competent authority, or of an unabridged set of answers from different stakeholders put together and transmitted directly to the Commission.

Data produced by the Member States originated from a wide range of sources, including peer reviewed studies, opinion polls, field trials, outcomes of national controls, scenario building and analysis, stakeholders and individuals' assumptions.

According to the contributions, only 7 Member States⁵ have past or present experience in cultivating pest resistant (Bt) maize MON 810 for commercial purposes. RO cultivated Herbicide Tolerant (HT) soybean before joining the EU and the cultivation of GM potato Amflora has started in 3 Member States⁶.

1.2. Analysis of the answers

In analysing the contributions received from the Member States, NO and the stakeholders, the Commission identified the following main elements:

- The understanding of the meaning and scope of the socio-economic dimension of GMO cultivation varies widely among the Member States and the stakeholders. The questionnaire helped to frame thinking, but several participants regretted that the terms, indicators and baseline for comparison (conventional and/or organic sectors) were not sufficiently defined. Several additional topics were suggested, e.g. ethics (the meaning and scope of the term is subject to different interpretations - e.g. some include added-value of the GMO for the whole society, or impact on third countries).
- Many contributions appeared to be raw catalogues of the wide diversity of opinions on GMO cultivation at national level, without further filtering or analysis by the Member States on the ground of relevance or quality before

⁴ BE, CZ, ES, PL, RO, UK.

⁵ CZ, DE, ES, FR, PT, RO, SK.

⁶ CZ, DE, SE.

being forwarded to the Commission. It was therefore difficult, and often impossible to pinpoint clear positions or trends at national or European levels, and to report them in a statistically relevant way.

- In general, the contributions seemed to reflect polarised opinions built upon a limited fact-based background on the specific European context, and influenced by the initial positive or negative perception of contributors on Bt and HT crops cultivation in Europe and worldwide. The core of the discussion concerns the co-existence between the GM and conventional/organic approaches all along the seed-to-shelves chain (control of GM adventitious presence in neighbouring fields, constraints of GM/non-GM products segregation along the feed/food chain, consumer's choice), impact on biodiversity, modification of farming practices and marketability of products, with a wide range of different views on almost all these matters.
- Answers covered all the items raised in the questionnaire, though comments largely focused on the social and economic impacts of GMO cultivation at the initial stages of the seed-to-shelves chain (i.e. seed production, cultivation, apiculture, and livestock breeding).
- The scientific literature and studies referred to by contributors were mostly focused on economic impacts of GMO cultivation on the in-farm level. It is noticeable that respondents usually backed their estimations of the likely impacts of GM crops cultivation with extrapolations of literature and experience from third countries, with the exception of respondents from Member States having experience in GMO cultivation, who also referred to *ex post* studies performed on their own territory. These national studies show the following results:
 - Bt maize yields would increase in regions infested with corn-borers. For instance, ES mentioned a study performed by the Joint Research Centre (JRC)⁷ showing that, for some pest-infested Spanish provinces, Bt maize growers experienced higher average yields than conventional farmers over a period of 3 years (up to 11,8% in the province of Zaragoza⁸) as well as increased gross margin. PT⁹, RO¹⁰ and CZ¹¹ also reported average yields increases between 7 and 12,5% associated to Bt maize cultivation.
 - RO reported that HT soybean cultivated on the Romanian territory until 2007 generated yield gains of an average of 31%¹².

⁷ Gomez-Barbero *et al.* (2008). Bt corn in Spain—the performance of the EU's first GM crop. *Nature Biotechnology* 26, 384-386.

⁸ These higher yields were statistically significant for only one of the 3 investigated provinces.

⁹ Brookes, G. (2008). The impact of using GM insect resistant maize in Europe since 1998. *International Journal of Biotechnology* 10 (2/3), 148-166.

¹⁰ Brookes, G., and Barfoot, P. (2009). Global impact of biotech crops: Income and production effects 1996-2007. *AgBioForum*, 12(2), 184-208.

¹¹ Inquiry by CZ towards growers of MON810.

¹² Brookes, G. (2005a) The farm-level impact of herbicide-tolerant soybean in Romania. *AgBioForum*. 8, 235-241.

- Other socio-economic impacts on the rest of the seed-to-shelves chain and the wider society (e.g. transport, insurances, food industry, testing laboratories, employment/work patterns, administrative activities, consumers' choice) were also largely commented in contributions of both cultivating and non-cultivating Member States. However, the views expressed are scarcely scientifically and statistically documented.
- Contributions from AT, BE, DE, FR, NL, UK included detailed suggestions on whether and how to analyse socio-economic factors and address them in the management of GMO cultivation in Europe. Several Member States also made reference to the legislation and experience of NO on consideration of socio-economic elements in the authorisation of GMOs.
- Many contributions underlined that, if carried out in the future, the evaluations of socio-economic factors should also consider ethics, and take into account other European policies (internal market, Common Agriculture Policy, environment protection), as well as the legal opportunities and constraints at international levels (in particular regarding the compatibility with WTO Agreements and the Cartagena Protocol on Biosafety).

2. ADDITIONAL ELEMENTS ON THE SOCIO-ECONOMIC DIMENSIONS OF GMOs

Prior or concomitantly to the consultation process summarised in this report, the Commission reviewed knowledge of the socio-economic dimensions of cultivation of GMOs in Europe and worldwide, through different channels, including European and international research programs and scientific publications.

2.1. Socio-economic dimensions of GMOs cultivation in third countries

Since the vast majority of cultivation of GM crops world-wide occurs outside the EU, the Commission services compiled and reviewed the current international scientific literature on the economic and social dimensions of GMO cultivation. The compilation of publications considered by the Commission is available in the Commission staff working paper accompanying this report.

According to these sources, numerous impact studies exist for the main types of GM crops available (Bt and HT crops). Studies on farm-level impacts are the most abundant, usually based on random surveys on farmers in developing and developed countries.

In developing and developed countries, the evidence is generally conclusive that currently marketed Bt crops can be economically beneficial to farmers, by reducing insecticide requirements and/or increasing yields, although the magnitude of profits for farmers can vary per region and year (depending of the importance of the pest pressure). The relative benefits of Bt crops for smallholders seems to be equal or higher than those of larger farmers.

HT crops are usually cultivated by larger farmers and not by smallholders. Numerous studies show little or no yield difference between HT or conventional soybean (with exceptions such as situations where conventional weed control was very inefficient, i.e. conventional soybean in Romania). Overall, HT technology reduces production

cost but the premium price for HT seeds may result in small or no effects on economic gross margin for farmers (studies in USA and Canada). In these cases, the rapid adoption by farmers is not associated with effects on-farm income but with improved weed control, crop management simplification, facilitation of no-tillage practices and improvement of farmers off-farm income due to time savings. However, in some cases (Argentina) the cheaper price of HT soy seeds results in positive gross margin effects for farmers.

Studies on wider micro-economic effects (impacts on non-adopter farmers, on rural employment, poverty and household income) in developing countries are very scarce (limited to few case studies in India).

On the macro-economic level, sector studies looking at the total size of economic impacts of cultivation of GM crops and their distributions among economic agents of the seed-to-shelves chain (seed companies, GM farmers, non-GM farmers, food/feed producers, consumers) are less abundant than farm-level impact analyses. Sector studies are based on economic modeling, and model parameters lead to wide variation of results. The "seed price premium of GM crops" is one of the critical determinants of the pattern of distribution of welfare created by GM crops between different actors in the seed-to-shelve chain.

Finally, few economic analyses have been conducted *ex ante* on new generation GM crops not yet in the market (drought resistant crops, nutritionally enhanced crops). It is likely that due to the characteristics of these crops, evaluation of social and economic impacts need different methodologies to be developed.

In conclusion, economic analyses have provided a good picture on economic impacts at farmer level world-wide, but less on social impacts.

Methods to measure economic impacts should be improved; particularly methods to assess impacts *ex ante* would be particularly relevant for the EU situation. Current limitations mainly relate to low number of surveyed farmers, use of partial budgeting methods instead of more complex econometric analyses and scarcity of studies on wider micro-economic impacts. Impact studies above (seed sector) and below (food/feed/consumers) the farm level are few. The same can be said for segregation rules (labeling-coexistence rules). Methodological issues need to be further developed to address these topics.

2.2. EU funded research projects to date addressing socio-economic perspectives of GMO cultivation

The Commission has been funding research programs on GMOs for more than a decade, under the fifth and sixth Framework Programmes for Research¹³. Some of these projects appear as particularly relevant in the context of the assessment of the socio-economic impacts of GMO cultivation in the European Union.

¹³ For more details, please consult the compendium of results of EU funded research on genetically modified crops ("A decade of EU-funded GMO research (2001-2010)") ftp://ftp.cordis.europa.eu/pub/fp7/kbbe/docs/a-decade-of-eu-funded-gmo-research_en.pdf.

- *Results and perspectives on the coexistence and traceability of GM and non-GM supply chains (CO-EXTRA – 2005-2009)*¹⁴

The CO-EXTRA project addressed the whole issue of co-existence of GM and non-GM supply chains from seed production to retailer's shelves. The most relevant findings in relation to socio-economic implications are the following:

- Technical measures could ensure that coexistence at the 0.9% labelling threshold for corn hybrids would be achievable on a long-term basis, as far as seed lots are pure enough.
 - Coexistence in the field is considered feasible but highly dependent on local environmental conditions and practices.
 - Coexistence in the supply chain is considered possible with an appropriate organisation of the chain, generating specific costs related to keeping the products separate from farm to factory, to performing analytical tests and to maintaining product traceability.
 - Considering consumers' attitudes to GM labelling, in the countries studied, between 40 and 70 % of the consumers wanted to be able to choose whether to buy and eat GM food.
- *Sustainable introduction of GM crops to European agriculture (SIGMEA – 2004-2007)*¹⁵

The SIGMEA project aimed at creating a science based framework to inform decision-makers about the appropriate co-existence and traceability measures for GM crop cultivation.

The project developed, *inter-alia*, a qualitative multi-attribute model for the assessment of ecological and economic impacts.

Results obtained generally demonstrated that coexistence costs depend on the agricultural context (landscapes, cropping systems, climate, practices), the share of GM crop in the Agricultural Used Area and the willingness of farmers to cooperate. Furthermore SIGMEA studies demonstrate that the economics and appropriateness of different measures are mainly determined by the spatial and temporal patterns of fields and crops. This indicates that coexistence management measures should be as flexible as possible and based on local information on field characteristics whereas regional and national governance provides only general guidelines and rules.

¹⁴ <http://www.coextra.eu/>

¹⁵ <http://sigmea.group.shef.ac.uk/>

- *Do Europeans buy GMO foods? (CONSUMERCHOICE – 2006-2008)*¹⁶

The CONSUMERCHOICE project aimed at, *inter-alia*, comparing the measured attitudes of consumers of 10 Member States¹⁷ towards GM foods and their actual purchasing behaviour when given the opportunity to choose between GM and non-GM food stuff. On this regards, the project found that:

- Responses given by consumers when prompted by questionnaires about GM-food are not a reliable guide to what they do when shopping in grocery stores.
- Europeans buy GM-foods when they are physically present on the shelves.

3. NEXT STEPS

The contributions provided by the Member States have been helpful in clarifying where statistically relevant data on socio-economic impacts of GMO cultivation in Europe are already available (mainly economic impacts on farming). Otherwise, facts and statistics pertinent to the European context are missing to support the views expressed by the respondents. Therefore the contributions highlight that, for the time being, the present or future socio-economic impacts of GMO cultivation in Europe, across the food chain and the society as a whole, are often not analysed in an objective manner.

Based on the above, the Commission considered that, in this report, it would be inappropriate to perform a more targeted analysis of the peculiar items developed in the individual contributions provided by the Member States.

Nevertheless, the Commission believes that discussions on this sensitive topic should be deepened, to move from polarised perceptions to more tangible and objective results. Therefore the Commission suggests grouping the primary highlights of this consultation together with other initiatives on socio-economics impacts of GMOs (e.g. research projects under the 6th Framework Research Programme and, when relevant, findings in third countries), and initiating an advanced reflection at European level, with sound scientific basis, aiming at:

- Defining a robust set of factors to properly capture the actual *ex ante* and *ex post* socio-economic consequences of the cultivation of GMOs, from seed production to consumers across the European Union. A methodological framework should be built-up to define precise socio-economic indicators to be monitored in the long run, and the appropriate rules for data collection. The pool of consulted parties should embrace all the regulatory and economic actors of the "seed-to-shelves" chain, as well as the wider society.
- Exploring different approaches to possibly make use of the increased understanding of these multi-dimensional socio-economic factors in the

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<http://www.kcl.ac.uk/schools/biohealth/research/nutritional/consumerchoice>

¹⁷

CZ, DE, EE, EL, ES, NL, PL, SE, SI, UK.

management of GMO cultivation in the European Union. The expertise of the Member States having already started reflecting on these aspects should be taken into consideration.

This reflection should be set up and implemented jointly by the Member States and the Commission. Stakeholders should also be actively associated to ensure the success of this process.

ANNEX

Background information on cultivation of GMOs in the EU27 Member States

	Commercial cultivation of GMOs	Events	Surface cultivated (Bt maize – 2008)	Safeguard clause	Co-existence measures (as of April 2009)
AT	No		0	Maize-Potato	Yes
BE	No		0	No	Yes
BG	No		0	No	No
CY	No		0	No	No
CZ	Yes	Bt Maize Starch potato	8.400ha	No	Yes
DE	Yes until 2008	Bt Maize Starch potato	3.371 ha	Maize	Yes
DK	No		0	No	Yes
EE	No		0	No	No
EL	No		0	Maize	No
ES	Yes	Bt Maize	79.269 ha	No	No
FI	No		0	No	No
FR	Yes until 2007	Bt Maize	0	Maize	Yes
HU	No		0	Maize-Potato	Yes
IE	No		0	No	No
IT	No		0	No	No
LT	No		0	No	Yes
LU	No		0	Maize-Potato	Yes
LV	No		0	No	Yes
MT	No		0	No	No
NL	No		0	No	Yes
PL	No official information		0	No	No
PT	Yes	Bt Maize	4.851 ha (surface registered until July 2008)	No	Yes
RO	Yes	Bt Maize Soya until 2007	7.146 ha	No	Yes
SI	No		0	No	No
SK	Yes	Bt Maize	1.940 ha	No	Yes
SE	Yes	Starch potato	0	No	Yes
UK	No		0	No	No

For more complete information, please consult the report published on 2 April 2009 by the Commission on the coexistence of genetically modified crops with conventional and organic farming (http://ec.europa.eu/agriculture/gmo/coexistence/index_en.htm).