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EUROPEAN COEXISTENCE BUREAU

**Summary of conclusions of the 1st meeting
of the Technical Working Group for Cotton**

**20-21 October 2014
Seville, Spain**

The 1st Meeting of the Technical Working Group for Cotton (TWG Cotton) of the European Co-Existence Bureau (ECoB) took place in Seville, Spain, from 20 to 21 October 2014. Experts from the following Member States (MS), Liechtenstein and the European Commission (EC) services were present:

- Croatia (HR), Czech Republic (CZ), Finland (FI), Greece (GR), Hungary (HU); Liechtenstein (LI), Spain (ES) and United Kingdom (UK);
- Directorate General for Health and Consumers (DG SANCO);
- Joint Research Centre (JRC), Institute for Prospective Technological Studies (IPTS);
- Joint Research Centre, Institute for Health and Consumer Protection (IHCP).

The main topics for discussion were:

1. Review of the European legislation for genetically modified organisms (GMOs) and the coexistence concept in it.
2. Introduction of the European Coexistence Bureau:
 - JRC-IPTS hosting the bureau,
 - Scope,
 - Blueprint – working together,
 - Internet data exchange tools – web page and others.
3. Relevance of coexistence, best practices, and limiting factors of implementation. Lessons from GM use worldwide.
4. Study on gene flow of (genetically modified) GM cotton based on field-scale trial.
5. Summary of the 2006 study on coexistence of GM and non-GM Cotton in Andalusia (Spain).
6. Proposal for structure of Best Practice Document for cotton.

7. Review of methods for detection and quantification of GM cotton presence.
8. Discussion on work programme of TWG Cotton.

The welcoming presentation of the ECoB secretariat briefly introduced the structure and mission of the JRC, with emphasis on the activities of the IPTS, which hosts the ECoB.

1. Review of the European GMO legislation and coexistence framework.

Since it was the first meeting of the TWG Cotton, DG SANCO reviewed: the European regulatory framework for GMOs and for coexistence; Commission activities in the field; the Commission Recommendation on coexistence and the ECoB Mandate.

Brief information about the labelling requirements, thresholds and the exemptions for adventitious technically unavoidable GMO presence in food, feed and seeds were presented.

2. Introduction to the European Coexistence Bureau

The ECoB was introduced by the secretariat.

The main tasks of the ECoB are: organisation of the exchange of technical-scientific information on the best agricultural management practices for coexistence; development of crop-specific guidelines for coexistence measures based on the consensus of the group; and support for the MS in the development or refinement of national or regional approaches for coexistence.

The scope of the ECoB's work is on: technical agricultural management practices for coexistence; crop production - from sowing, harvesting, transport, storage, up to the first point of processing/sale; GM crops authorised for cultivation in the EU; and measures to ensure the compliance with the coexistence threshold.

The work of the ECoB is organized on the basis of crop-specific technical working groups. Three groups have been established so far: the TWG Maize (with experts from 20 MS), the TWG Soybean (with experts from 14 MS) and TWG Cotton (with experts from 11 MS and Liechtenstein). In the near future the creation of a TWG for potato and a TWG for sugar beet are foreseen.

The TWG Maize developed three best practice documents (BPDs) for: coexistence of GM crops with conventional and organic farming; monitoring efficiency of coexistence measures in maize crop production; and coexistence of GM maize and honey production.

The TWG Soybean developed BPD for coexistence of GM soybean crops with conventional and organic farming, which presently is in consultation process with stakeholders, managed by DG SANCO via the Advisory Group on the Food Chain and Animal and Plant Health.

The BPD for Cotton will cover commonly agreed, scientifically and technically justified measures to ensure coexistence between GM, conventional and organic cotton production in the EU.

The interplay of the TWG Cotton will take place via meetings and inter-sessional periods.

The BPD will be drafted by the ECoB Secretariat on the basis of information and contributions provided by the TWG Cotton members. The members of the TWG Cotton will submit information using templates provided by the ECoB. The templates for each round of data collection/consultation will be made available via the functional e-mail of the ECoB or via the data exchange platform on the ECoB website.

The web page of the ECoB (<http://ecob.jrc.ec.europa.eu/>) consists of two parts: one of which is publicly accessible and second which is dedicated specifically to the members of the TWGs. The area restricted to the TWG members is designed on the platform for Basic Support for Cooperative Work (BSCW). Access to the BSCW space requires a login and password granted by the web administrator. The BSCW tool allows users to store documents and follow discussions.

The members of the TWG Cotton reached a consensus, based on the previous experience of the TWG Maize and TWG Soybean that the information exchange will be done mainly via the functional e-mail of the ECoB: JRC-IPTS-ECoB@ec.europa.eu

Whenever necessary, the data exchange platform on the ECoB website also will be used.

3. Relevance of coexistence, best practices, and limiting factors of implementation - Lessons from GM use worldwide

Dr. Michel Fok from the French Agricultural Research Centre for International Development (CIRAD) was invited to present an overview of global cotton production and existing segregation system for identity preservation and coexistence of different cotton production systems – organic, conventional and biotechnological. The main topics covered were:

- coexistence matters beyond the common view;
- identity preservation schemes for cotton production and presence of GMO;
- best practices for cotton coexistence;
- conditions required for implementation of the best practices for coexistence in cotton production on farm level;
- different forms of coexistence to be considered in addition to the inter-farm coexistence;
- impact of seed features on coexistence;
- initiatives to ensure pure conventional seeds.

The experience gained in USA, India, China, and Africa shows that the lack of synchronized efforts for segregation at different steps of GM cotton utilization, beginning with individual breeding programmes and seed production, passing through optimized schemes for pesticide utilization and finishing with post marketing environmental monitoring, can severely affect the efficiency of on-farm coexistence measures.

4. Study on gene flow of GM cotton based on field scale trial

Dr. Christina Chueca from the National Institute for Agriculture and Food Research and Technology (INIA) of the Spanish Ministry of Science and Innovation (MICINN) was invited to present results for crosspollination potential of GM cotton plants base on field trials. The presentation included:

- Botanical classification of cotton and features of GM herbicide-tolerant cotton;
- World and EU production of conventional and biotech cotton;
- Field testing of GM crops for evaluation of their characteristics and impacts;
- Gene flow from GM herbicide-tolerant to conventional cotton:
- literature data for outcrossing rates of cotton;
- design of field trials;
- Hybrid detection in greenhouse by: herbicide screening; PCR detection of the presence of the *2mesps* gene; and quantitative ELISA of *CryIF* protein from leaf disks;
- Percentage of hybridization related to distance;
- Exponential model curve for outcrossing.

The potential for pollen-mediated gene flow was assessed for GM cotton in field experiments conducted in Andalusia, province of Seville, in the Guadalquivir Valley. Assays were conducted for three years (2007, 2009 and 2010) in two locations, with GM cotton spatially isolated from conventional cotton fields. For one of the locations the exponential model curve predicts average out crossing below the 0.9% at any distance. For the second location, under worst-case scenario the 0.9% was achieved at 2.46 m.

5. Summary of the 2006 study of coexistence of GM and non-GM Cotton in Andalusia (Spain)

The study is designed and coordinated by JRC-IPTS in cooperation with the Regional government of Andalucía, Spain¹. The aim of this study is to analyse how the different cotton production systems can coexist, covering:

- The whole production cycle on farm to ginning factory;
- GM cotton and non-GM cotton based farming production systems;
- Simulation of various scenarios for seeds and crop producing farms:
 - Presence of GM cotton in the region and on the farm level of: 10% and 50%;
 - Thresholds of GM cotton presence in non-GM production: 0.1% and 0.5% for seed production, and 0.1% and 0.9% for fibre production.

¹ Published on 2006 and available from: <http://ftp.jrc.es/EURdoc/eur22102en.pdf>

The analysis of the entire production process: from the planting of the crop to the entry of the product into the ginner, identifies eight possible points as potential sources of admixture:

- seeds/crop from the previous year's harvest,
- seeds for sowing,
- seed storage,
- sowing,
- cross-pollination,
- harvesting,
- transport,
- ontermediate storage.

The levels of adventitious presence of GM cotton in non-GM cotton caused by possible sources of admixture and hybridisation (A to H, listed above) are determined with a probabilistic model for each farm type and each scenario. It was admitted that the cotton production in the EU, predominantly takes place in small farms (with cotton cropping area up to 5 ha). For Spain this size of farm comprises 80.6% of total cotton producers and for Greece it is 94.1% (Eurostat, 2007). The most pronounced difference in the maximum levels of adventitious presence of GM cotton in non-GM cotton is estimated at the level of farm size. For small farms it is calculated as 1.82% and for large farms as 0.92%.

6. Proposal for structure of Best Practice Document for cotton

The ECoB secretariat proposed the following structure of the BPD for cotton:

- Legislative framework for coexistence, mandate of ECoB and Scope of the BPD;
- Cotton biology and conditions for cotton cultivation in the EU: demand and crop production;
- Existing segregation systems in cotton production;
- Review of the available information on adventitious GM presence in cotton crop production;
- Occurrence of cotton material in honey;
- Possibilities for detection of GM events in cotton plant, seeds and fibre, and in honey;
- Best practice for coexistence measures in cotton crop production;
- Cost analysis of management practices.

The mandate of the TWG Cotton of ECoB is development of consensually agreed best practices for coexistence in cotton production (GM, conventional and organic), including honey production, which are intended to assist MS in the development or refinement of their coexistence legislation or voluntary standards for good agricultural practice.

The scope of the BPD was proposed to cover:

- the cultivation of GM cotton up to the first point of processing (ginning factory) as well as coexistence of GM cotton and honey production;
- the BPD does not cover cotton seed production;
- the thresholds for coexistence to be analysed are the legal labelling threshold (of 0.9%) and the practical limit of quantification (of about 0.1%), which is required by operators in some markets;
- the BPD refers to the methods for quantification of GM cotton presence in other crops and honey;
- the BPD covers only GM cotton containing a single transformation event.

The overview of cotton biology was based on the Consensus document on the biology of cotton (*Gossypium spp.*) ENV/JM/MONO(2008)33 of the Working Group on Harmonization of Regulatory Oversight in Biotechnology of the Organisation for Economic Co-operation and Development (OECD)².

Gossypium spp. has three centres of domestication: Africa and Asia, Mesoamerica (i.e. Mexico and Central America), and South America. For Europa, it is a relatively newly introduced species.

Tetraploid *Gossypium hirsutum* and *Gossypium barbadense* account for 95% or more of world cotton production. In Europe almost 100% of the varieties are *G. hirsutum* varieties.

Cotton is one of the most important textile fibres in the world (around 35% of total world fibre use). Cotton by-products of interest are: cottonseed oil (used in many food product) and cottonseed meal (animal feed).

For 2012/13 cotton is cultivated only in three EU MS: Greece – 285 000 ha; Spain – 68 000 ha; and Bulgaria - less than 1 000 ha. Cotton has strong regional importance in the two main producing MS.

Four existing segregation systems in cotton production were identified:

- In seed cotton production³;
- Organic cotton production;
- Cotton made in Africa (CmiA);
- The Better Cotton Initiative (BCI);

Even though the segregation systems developed for seed production and BCI are not specifically designed for coexistence with GM production the measures are in line with the aims of the TWG Cotton. The detailed study of the efficiency of these practices is a prerequisite for development of BP recommendations for coexistence in cotton production.

² <http://www.oecd.org/science/biotrack/46815918.pdf>

³ Ceddia M. G. and Rodríguez-Cerezo E., 2008, A Descriptive Analysis of Conventional, Organic and GM Crop and Certified Seed Production in the EU. Chapter for cotton (<ftp://ftp.jrc.es/pub/EURdoc/JRC45170.pdf>)

It was also underlined that the main practical experience for segregation measures in cotton production is gained in North and South America, Asia and Australia as in Europe GM cotton cultivation is not authorized.

Cotton features typical for cultivation in European conditions were extensively discussed:

- Cotton is expensive to grow, requiring regular pesticide and fertilizer applications as well as irrigation;
- Commercially, cotton is cultivated as an annual, with destruction of plants after harvesting the fruit for seed and fibre;
- *G. Hirsutum* needs for normal development 180-200 frost-free days, with an average of 150 days of suitable temperatures (i.e. 1200 heat units above 15.5°C accumulated);
- The optimum daytime temperature for *G. hirsutum* is from 30 to 35°C, with a loss of fruit at temperatures above 35°C and with a 50% yield reduction at 25°C;
- Seeds do not germinate, nor seedlings begin their activity, until the temperature rises to 15°C; they are delayed above 38°C;
- Cotton sowing dates are: for Bulgaria – April, for Greece – 2nd half of April and for Spain – end of April to 1st half of May;
- Harvesting dates for Spain are from September to mid-October; for Bulgaria, October; and for Greece October to mid-November.

Although cotton is mostly self-pollinating, in the presence of suitable insect pollinators cotton is also cross pollinating, which although it is generally at low levels nevertheless improves yields (McGregor, 1976; Tanda, 1984; Mamood et al., 1990; Rhodes, 2002; Sanchez and Malerbo-Souza, 2004; Llewellyn et al., 2007). Therefore the cross-pollination rates in cotton were discussed too.

For conditions in Greece, Xanthopoulos and Kechagia (2000) reported cross-pollination rates of: 2.17% in adjacent rows; 1.42% at 2 m and near zero at 10 m when the glandless trait is used as a morphological marker. When the red-leaf trait is utilized as the morphological marker the cross pollination in adjacent rows is reported as 3.85% and at 10 m as 0.31%.

For conditions in Turkey Bozdek et al. (2008) detected cross-pollination rates of 1.7% in adjacent rows and near zero at 10 m.

For California, USA, Van Deynze et al. (2005) measured cross-pollination rates of 7.65% at 0.3 m and less than 1% beyond 9 m.

Under European conditions it is very difficult for a plant that has germinated from a seed in autumn to survive the winter cold and go on to flower. Ungerminated seeds may remain and then germinate in spring, but with current agricultural practices, both these possible plants and those that might have germinated in autumn would be eliminated in spring when the soil is prepared for sowing.

The starting adventitious presence of GM cotton seeds in seed lots is a key factor for final adventitious presence in harvests and should be considered in the further analysis for coexistence measures in the farm. The use of farm-saved seeds will be examined as a possible transmission vector for GM adventitious contamination, as long as they are used in cotton production in the EU.

The discussion about machine management practices during sowing and harvesting of cotton also took place.

For the cost analysis of the management practices, the main challenge was identified as the lack of experience in cultivation of GM cotton in Europe.

After an extensive discussion of all presented information it was agreed that the background information chapter of the BPD will include a dedicated section on coexistence and honey production.

7. Review of methods for detection and quantification of GM soybean presence

The JRC-IHCP presentation for detection and quantification methods for the presence of GM cotton reviewed:

- a) The relevant EU legislation for:
 - development of standardised and reliable detection methods for GMO;
 - establishment and function of the EU Reference Laboratory for GM Food and Feed (EU-RL GMFF) in the JRC and European Network of GMO Laboratories (ENGL).
- b) EU Reference Laboratory for GM Food and Feed:
 - validation of methods for GMOs in food & feed;
 - support for official control labs;
 - science based policy advice;
 - networking and capacity building.
- c) GMO methods: EU database of Reference Methods for GMO analysis⁴.
- d) Availability of validated methods for GM cotton analysis:
 - cotton methods in the EU-RL GMFF pipeline;
 - other methods' databases.
- e) LOD and LOQ of EU-RL GMFF validated methods cotton event-specific qPCR.
- f) DNA extraction from cotton seeds.
- g) GM cotton and official control in the EU.
- h) Absolute, relative and practical LOQ/LOD.

⁴ <http://gmo-crl.jrc.ec.europa.eu/gmomethods/>

8. Discussion on work programme of TWG Cotton

After extensive discussion about the availability of data sources concerning coexistence in cotton production and in cotton and honey production, it was decided that the ECoB secretariat will circulate by the end of October a detailed template (following the agreed structure of the BPD) among the members of the TWG Cotton requesting a contribution of background information. The deadline for submission of background information to the secretariat was agreed as the end of November 2014.

Once contributions are received the ECoB secretariat will prepare the first draft of the background document for consultation in the TWG Cotton by the end of December 2014.

After the finalization of the consultation process, the second plenary meeting of the TWG Cotton is foreseen for the first quarter of 2015.