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Proceedings of a workshop on "Market for non-Genetically Modified Identity Preserved crops and derived products"

Prepared by Pascal Tillie, Mauro Vigani, Koen Dillen and Emilio Rodríguez Cerezo

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Contact information
Pascal Tillie
Address: JRC-IPTS, Edificio Expo, c/ Inca Garcilaso 3, 41092 Seville, Spain
E-mail: pascal.tillie@ec.europa.eu
Tel.: +34 954 488 318
Fax: +34 954 488 300

http://ipts.jrc.ec.europa.eu/
http://www.jrc.ec.europa.eu/

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Abbreviations and Acronyms

ABRANGE Brazilian Association of Non Genetically Modified Grain Producers (*Associação Brasileira dos Produtores de Grãos Não Geneticamente Modificados*).

BSE Bovine Spongiform Encephalopathy

CGE Computable General Equilibrium

COCERAL European cereals, rice, feedstuffs, oilseeds, olive oil, oils and fats and agrosupply trade Committee (*Comité du Commerce des céréales, aliments du bétail, oléagineux, huile d'olive, huiles et graisses et agrofournitures*)

DDGS Dried Distiller Grains and Soluble

DNA Deoxyribonucleic Acid

EC European Commission

EMBRAPA Brazilian Agricultural Research Corporation (*Empresa Brasileira de Pesquisa Agropecuária*)

EU European Union

FEFAC European Feed Manufacturers' Federation (*Fédération Européennes des Fabricants d'Aliments Composés*)

GM Genetically Modified

GMOs Genetically Modified Organisms

IP Identity-Preserved

IPTS Institute for Prospective Technological Studies

JRC Joint Research Centre

NGO Non Governmental Organization

PCR Polymerase Chain Reaction

PE Partial Equilibrium

SCFCAH Standing Committee on the Food Chain and Animal Health

UK United Kingdom

UNIVPM Università Politecnica delle Marche

USA United States of America

USDA United State Department of Agriculture

VLOG German Non-GM food Association (*Verband Lebensmittel ohne Gentechnik*)

WTP Willingness-To-Pay

Abstract

Demand for non-Genetically Modified (GM) identity-preserved (IP) crops[1] for food, feed and other uses exists in the European Union (EU) and yet the main figures of this global market, the differences between EU Member States and sectors, and its future challenges are far from clear. In order to identify the available data and to define future research goals on the functioning of this market, the JRC-IPTS organized an International Workshop on "Markets for non-GM Identity Preserved crops and derived products" in June 2012 that brought together key stakeholders in the supply chain, leading agricultural economists and European Union staff. This JRC "Scientific and Policy Report" provides a detailed account of the presentations given during this workshop.

Due to the widespread adoption of GM crops by farmers in the main exporting countries, GM crops currently represent the bulk of the international trade of maize, soybean and canola. This constitutes the main challenge for the supply of non-GM IP crops. Segregation of non-GM IP crops involves costs at every step of the supply chain, and the price premiums for these products are increasing because, according to the available data, demand seems to be rising faster than supply. The cost of segregation and price premium differences also arise from the variety of standards set up by private operators to trade non-GM IP crops. These do not always use the criteria defined by EU Regulations 1829/2003 and 1830/2003, but instead sometimes use more stringent criteria, leading to higher segregation costs.

Until now, the EU has largely covered its needs for non-GM IP maize and canola with its own production (although this situation might change in the future if the EU trade deficit for these crops keeps growing). In the case of soybeans, the EU uses more than 30 million tonnes yearly of soybean meal (primarily for animal feed). Although reliable data is not available, experts in the workshop estimated that between 15% and 30% of these imports consist of non-GM IP soybeans or meal, a demand driven in part by the EU poultry and cattle sectors. Stakeholders reported that the price premium paid by EU

[1] This defines the share of crops that is not subject to GMO labelling as set by articles 12 and 24 of Regulation (EC) 1829/2003 and whose non-GM identity is preserved; Identity Preservation refers to the process by which the trading of specific qualities of a same commodity and its segregation are ensured.

importers of non-GM IP soybean meal has considerably increased in recent years, and now represents more than 10% of the product price. The production of non-GM IP soybeans in Brazil, the EU's main supplier, is still growing but is getting closer to its upper limit due to the increased adoption of GM soybeans by Brazilian farmers in the previous years.

EU retailers and food processors are key drivers of the demand for non-GM IP ingredients in the food chain. However, their preference for non-GM IP ingredients does not always translate into the use of "GM-free" labels for consumers as a marketing strategy, with a few exceptions. Food products labelled as "derived from non-GM IP ingredients" are still rare in the EU, although this situation is changing. The introduction of additional "GM-free" labels could lead to a 'domino-effect': the new successful labelling initiative of one retailer could tip the whole sector over to follow the shift towards this type of labelling.

The general conclusion of the workshop's participants was that there is a lack of sound information about the specific situation of the markets for non-GM IP crops. For some particular issues, this can be partially overcome by relying on experts' opinions or stakeholder information, but this situation prevents any complete analysis of the functioning and evolution of markets. This missing information also precludes the development of appropriate economic models to predict the evolution of markets and price premiums. Further research should aim to fill this gap.

Executive summary

Segmentation of agricultural commodity markets due to GM crop regulations and standards

- The main agricultural crops are traded as commodities, i.e. their harvesting, transport, processing and trade is characterised by the aggregation of many consignments into mixed bulk shipments. Compliance with certain quality parameters is essential but what matters is the realisation of economies of scale. To allow for trading commodities of specific qualities, segregation systems have to be developed throughout the whole supply chain. These Identity Preservation (IP) systems are not new in agriculture. The segregation and IP of canola varieties for industrial use or waxy maize varieties for food processing are well known examples. Yet these IP systems usually cover minor amounts of world production and trade in their respective commodities.

- In contrast, the introduction in 1996 of GM varieties in agriculture has resulted into a segmentation of certain markets (soybeans, maize and canola) of a dimension not previously seen. In 1996, GM varieties emerged as technical innovation in key agricultural crops. Worldwide, adoption of GM crops by farmers has reached high levels, even taking into account that their cultivation is not authorised in large parts of the world. In 2011, i.e. 15 years after introduction, GM maize covered almost one-third of world's maize area, GM soybean 75%, GM cotton 68% and GM canola 26% of the corresponding total cropped area[1].

- Public policies and private standards worldwide have played a key role in shaping the segmentation of crop markets by introducing mandatory labelling for GM products and products containing GM-derived ingredients. These regulations directly impact the definition of the "non-GM identity" of a certain crop or

[1] James, C. 2011. Global Status of Commercialized Biotech/GM Crops: 2011. ISAAA Brief No. 43. Ithaca, NY: ISAAA.

product by setting a threshold for unintended presence of GM materials, above which a labelling is required. These regulations and private standards (including labelling thresholds) vary across world regions.

- In the European Union (EU), Regulations 1829/2003 and 1830/2003 control the placing on the market of both food and feed containing, consisting or produced from GMOs (genetically modified organisms) and specify rules concerning the labelling and the traceability of these products. This EU-wide legislation establishes a threshold of "0.9 per cent of the food ingredients considered individually or food consisting of a single ingredient, provided that this presence is adventitious or technically unavoidable", below which no labelling requirement is obligatory. In addition private operators (animal producers, food processors, retailers), in some occasions also supported by national EU governments, have set up additional standards, often associated to labels, to ensure the delivery of "non GM" products to consumers. The corresponding specifications sometimes define lower thresholds (0.1% for instance) for adventitious presence of GM crops in non-GM production. Currently in the EU, a number of "GM free"-like labels have proliferated, with differences in terms of the type of products they cover (including animal products or not), their scope (focusing on the non-GM content attribute or in combination with other products' characteristics) or the threshold they set.

- The existence of labelling regimes and the fact that the use of biotechnology in agriculture raises concerns about its environmental and food safety impacts among a certain share of consumers in many countries, has resulted in the appearance of markets to provide consumers with food and feed derived from non-GM IP crops. Supplying those markets requires the commodity supply chains to keep separated conventional (i.e. non-GM) from GM crops, from the moment the crop is sowed in the field to the final use. Identity preservation is the commonly used term to design the process by which segregation is ensured and market specifications regarding non-GM crops are respected.

- To summarise, the introduction of GM crops in agriculture has resulted in the segmentation of some commodity grains markets (soybean, maize and canola) into three large categories: the conventional market (non-GM grain that is not identity preserved nor certified as such); the "mixed" one (GM and conventional crops mixed, undifferentiated, and sold and labelled if needed as GM) and the "non-GM IP" or identity-preserved crop market, associated to specific segregation and certification schemes. The markets for non-GM IP certified grains are the subject of this report, with emphasis on the EU. The demand for non-GM IP crops exists in the EU but its size and distribution among countries or products is not well characterised. Issues such as long term sustainability of the supply of non-GM IP crops to EU markets need also to be studied. Since segregation and IP systems all have a cost, a crucial point is the analysis of the size of these price premiums and their distribution in the supply chain, as well as the factors affecting their fluctuation in the future. Factors affecting the final demand (for example willingness-to-pay (WTP) of final consumers or the role of labels) are also important and poorly known. Overall, the feasibility and economic impacts of segregated supply chains need deeper analyses.

The JRC-IPTS Workshop

- The Institute for Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre (JRC) is currently undertaking research activities in order to fill this knowledge gap. As was recently highlighted by a Parliamentarian Question[2], there is a growing market for food products elaborated from non-GM IP crops in the EU and some private actors are already using "GM-free" labelling for food or animal food products, but data on market share for those products are unavailable. This is one of the reasons why DG SANCO is also studying existing "GM-free"-like labelling initiatives within the EU, and is assessing the need for a regulatory harmonisation at EU level.
- The JRC-IPTS inserts its research effort in this context, and it is one of its objectives to describe the current situation and functioning of the markets for non-GM Identity Preserved crops and derived food and feed products at various

[2] Question for written answer E-003152/2012 to the Commission

stages of the supply chain. As a first step, IPTS organized an International Workshop on "Markets for non-GM Identity Preserved crops and derived products" in Seville in June 2012 (see agenda in annex 2 page 65). This workshop brought together key stakeholders in the supply chain, as well as leading scientists and experts active in the field of non-GM IP markets (see the list of participants, annex 1 page 63). This JRC Scientific and Policy Report corresponds to the proceedings of this Workshop.

World supply of non-GM IP crops

- Worldwide, the adoption of GM crops by farmers is increasing but differences exist across countries with some regions of the world having virtually no GM crop cultivation. Biotech adoption is significant in four agricultural crops: soybeans, maize, canola and cotton. The top-ten maize producing countries account for more than 80% of world production and an even smaller number of countries are responsible for a higher share of world exports. Those net exporting countries also turn out to be large adopters of GM maize. World production of soybean, cotton and even canola also show a similar situation, meaning that an important share of the volume traded on world markets for those crops is now GM.

- At world level, there is very little information on the size of the market for non-GM IP crops or on the price premium for non-GM IP crops. Measuring the size of the non-GM IP market is not an easy task, since a lot of data are missing (e.g. on demand) or unreliable (e.g. farmer adoption level, since not all non-GM harvested fields are marketed with identity preservation). Different sources of data as well as methodologies to assess the market size coexist, sometimes generating a confusing situation. However, the combined use of production, trade and certification data altogether shade some light on the actual situation regarding the price premiums and share of non-GM IP crops in some specific markets.

- The existence of price premium for non-GM IP crops is a decisive element since it is both an incentive for production and an illustration of consumer preference for non-GM products. Generally, data are scarce and difficult to collect, and more

insights about the determinants of those price premiums are required. The little available data show that the price premium paid by the EU processors of non-GM IP canola has been rising recently due to increased demand by the EU biodiesel sector. Regarding the price premium for non-GM IP soybean and soy meal, precise data are missing at international market level but there are clear evidence of a premium paid by the EU feed industry. Premiums tend to be higher when the final use of the products is food[3] (and not feed), but further research about their extent and their determinants is needed.

- Even if the adoption of GM crops in net exporting countries is high, the remaining non-GM part of the production still represents a large quantity in volume. For instance, the conventional – non-GM – production of maize in the USA is equivalent to the total maize production of Argentina and Ukraine together. Also the EU domestic production of non-GM maize is almost entirely covering its needs, even if the picture varies across EU countries when considered individually. Despite of becoming a large importer of canola in the recent years, the EU is still covering most of its demand for non-GM IP canola with its domestic production.

- The supply of non-GM IP soy-related products (soy bean, soy meal and other soy derived products) is by far the main critical issue regarding the supply of the EU with non-GM IP crops, though, overall the EU demand for non-GM IP soy and soy meal represents a small share of world soybean production (3 to 6% depending of the sources). Available estimations for the size of the EU market for non-GM IP soybean diverge widely, from 15% to 30% of the total EU soybean market, the picture being much more variable across EU countries.

- Brazil is by far the largest provider of non-GM IP soybean to world markets and to the EU. However, adoption of GM soybean in Brazil is around 74% and is still growing, requiring that an adequate segregation system between GM and non-GM crops is implemented along the supply chain in order to ensure the

[3] See Foster, M. 2010. Evidence of price premium for non-GM grains in world markets. 54th Conference of the Australian Agricultural and Resource Economics Society, 10-12 February 2010. Adelaide, Australia: AARES.

preservation of the identity of the non-GM soybean production. Despite the increasing share of GM soybean, improvements in the segregation system in the last few years have allowed the volume of non-GM IP soybean to increase. Hence it is expected that by 2013 about 20% of the Brazilian soybean production will have its non-GM identity preserved. Additionally, some stakeholders like the ABRANGE cooperative are taking initiatives to promote the development of the non-GM IP soybean production in Brazil, for instance by paying a premium to non-GM growers. The Brazilian agricultural research institute (EMBRAPA) also supports the non-GM soybean production by maintaining and continuously improving an important collection of soybean germplasm (both GM and non-GM). For EMBRAPA, it is essential to maintain a minimum market share for non-GM soybean in order to properly manage the development of weed resistance to herbicides, both in GM and non-GM fields.

- Economic models can be very useful to understand the functioning of worlds markets. However, simulating adequately the market segregation between GM and non-GM crops is a challenging task that requires data about production, consumption and trade of both commodities; yet in this specific case of non-GM markets such detailed data are not fully available and this gap represents the major impediment to accurate economic simulations.

Non-GM IP crops in the EU feed market

- Each year, the EU-27 consumes about 151 million tonnes of compound feed, mainly for poultry, pork and cattle (beef and dairy) farming, all animal productions that require high concentrated energy and protein feed. About 80% of the vegetable proteins (mainly soybean and soy meal) used for feed in the EU are imported, and 75% of those is GM. This represents a cultivated area of about 17 million hectares, equivalent to the EU-15 wheat area. More specifically, the EU-27 consumption of soybean meal consists of about 31 million tonnes per year: 68% of it is directly imported, 30% is produced from imported soybean, and only about 2% (0.8 million tonnes) is produced from EU soybean. The main EU suppliers are countries from North and South America.

- The EU demand for non-GM IP soybean for feed varies across EU countries and animal products: only a few Member States have a substantial demand for it (namely Austria, Germany, France and Italy) and this demand is driven by the poultry sector (15% of the feed is non-GM IP), followed by the cattle sector (10%) and the pork sector (2-3%).

- The EU supply chain of agricultural commodities has a complex structure, involving the production, collection, transport and storage of huge volumes of crops. The movement of those high volumes allows economies of scale that in turn generate shorter transport time and lower costs. Hence, the introduction of segregation and preservation of identity for non-GM crops in this supply chain may cut the benefits of those economies of scale and extend transport time as well as handling costs. Additionally, traders have to deal with issues of asynchronous and asymmetric variety approvals, safety problems, and, in some circumstances, uncertainties about non-GM identity that constrain the availability of non-GM crops to the EU market.

- All the previous facts, added to the increasing diffusion of GM crops worldwide and to the adoption of the Regulation (EC) 1829/2003 in the EU, has resulted into an increase of the premium paid by EU feed manufacturers for non-GM IP soybean meal. This premium increased from about EUR 5 per ton in the 2000-2005 period to more than EUR 30 per ton over the past few years. The average non-GM IP soybean meal premium in 2012 is around EUR 40 per ton for long term contractual agreements. But the premium for non-GM IP soybean meal is not the only cost associated with non-GM IP supply. Altogether, the need for dedicated silos, sequenced processing, rinsing, cleaning, analysis and administrative costs add another EUR 30 per ton of compound feed containing non-GM IP soybean meal.

- With the increase of the demand for meat in developing countries where GM feed is not an issue, the global demand for GM feed is likely to rise, and might generate

additional tensions on the non-GM IP markets with consequences for the price of non-GM IP feed. Hence, there are concerns that any increase in production costs for livestock farmers would affect this fragile sector and might convert the EU into a net importer of meat, with serious consequences at farm level as alternatives for imported proteins are scarce or uncompetitive.

Food products from non-GM IP ingredients in the EU

- The final demand for food products elaborated from non-GM IP ingredients is mainly driven by the attitudes of key agents in the food chain – food industry, retailers and consumers – towards GMOs. However, the actual market share of food products elaborated from non-GM IP ingredients is difficult to quantify, since most of the non-GM IP food products are marketed unlabelled and because retailers and food processors hardly publish facts and figures about this topic.

- Retailers and food processors, though, are determinant drivers of the use of non-GM ingredients in the food chain, since they are in an intermediate position and can convey consumers' preferences to the upstream part of the food chain. A recent study of the attitudes of retailers and processors highlighted their common practical view on the issue, i.e. the fact that they follow the market trends. Both adopted a careful attitude regarding GM issues: they are not willing to promote any GM food products until consumer's acceptance has been proved, but neither are they considering non-GM labels as a good marketing strategy for the moment, with a few exceptions. Food processors are even more adverse to market risks associated with GM issues than are retailers.

- With regards to consumers, their attitude towards GM-free products seems to be driven firstly by their level of awareness of GM issues, such as GM-labelling policies, or of product information: buyers of "GM-free" labelled products tend to be more informed than the non-buyers. For example, more "GM-free" labelled products buyers (77%) than non-buyers (52%) claimed to know that products with GM-ingredients had by law to be labelled, and buyers of "GM-free" labelled products also read the detailed content of the food items they bought more often

(65%) than the non-buyers (48%)[4]. The existence and nature of a specific label or the perception of a potential environmental benefit are other factors influencing consumers' behaviour. However, linking consumer stated preferences with their actual purchase behaviour is not straightforward. Indeed, few data exist about actual practices regarding the purchase of GM or non-GM food products, partly because most of them are sold unlabeled or in places where no information is available to the consumer, such as restaurants.

- Private standards or labels are intended to reduce the information gap between producers and consumers regarding the products characteristics, thus enlightening consumer's choice. Labels concerning food products derived from non-GM IP ingredients are still very few in the EU, even if the current situation is rapidly evolving. Overall, there is some complexity in the labelling schemes, some labels being specifically GM-free while others mix the non-GM quality with a range of other attributes. Indeed, the lions' share of food products consumed in the EU is produced with a non-GM standard, although this information is not delivered to the final consumer by any label. However, this situation might be moving in the future, in the form of a 'domino-effect': new non-GM labelling initiatives driven by retailers, if successful, could rapidly lead the whole sector to move in the same direction.

The use of non-GM IP crops in the EU animal food and biofuel sectors: lessons from case studies

- Four case studies of companies that have chosen to use non-GM IP crops were presented during the workshop: three are in the animal food sector and one in the biofuel industry. The approach that they follow differs regarding the strategy to supply non-GM IP crops, the pricing policy of the final food products and the use of a "GM-free" label. Case studies includes an integrated poultry company operating under its own brand, a dairy company producing cheeses with milk collected from dairy farms, beef farmers producing their own feedstuff in Italy and a bio-energy company active in the biofuel sector.

[4] Source: FP6 Project ConsumerChoice (Do European consumers buy GM foods?), final report, 2008.

- Both the poultry and the dairy companies have important needs of vegetable proteins to feed their animals, and have opted to use non-GM IP soybean from Brazil albeit following different approaches. The poultry company directly establishes contracts with farmers in Brazil and organizes the segregated supply chain from the soybean field with a local partner. This allows minimizing commingling risk with GM soybean but has an extra cost that has to be balanced by the handling of important volumes, notably for the vessel transport. The strategy of the dairy company is to source non-GM IP feed compound from feed companies and to operate regular PCR tests. However, this approach provides less control over the quality of the feed stuffs used. A last option, followed by the Italian beef farmers, is to rely on locally grown sources of proteins. The resulting higher input costs are offset by the positioning of the final product on the high quality segment.

- The sharing of costs and benefits between the different actors of the supply chain depends on various factors. The integrated poultry company provides feedstuffs to poultry farmers and buys back the final animals, assuming any additional cost related to the use of non-GM IP feed. On the contrary, the dairy company pays a slight premium to farmers using non-GM IP feed stuffs to compensate for their increased production cost. Finally, the ability of a company to recover the costs associated with the use of non-GM IP feed is primarily linked to the use of a corresponding "GM-free" label on the end product. The poultry company presented as a case study does not use any label for its animal product and is currently suffering from the price increase of non-GM IP soybean, since it can not pass it on the consumers. On the contrary, the introduction by the dairy company of a "GM-free" label on some dairy products significantly increased both sales and price, allowing the firm to retain some benefits from the use of non-GM IP crops and to transmit part of the costs to the consumers.

- The case study in the biofuel sector gave insights about the use of non-GM IP feed stuffs in this important and growing industry. The company presented in this case study produces both ethanol from maize and biodiesel from soybean and canola. The decision to use non-GM IP crops is determined by the relative situations of the market for the by-products of the biofuel transformation and the market for biofuels themselves. Sub-products of maize such as Dried Distilled Grains and Soluble are destined to the feed sector and, for the moment, most of it has to be labelled as containing GM materials. The decision to use non-GM IP maize in the future will depend on the feed industry requirements as well as on the ethanol price evolution. Conversely, glycerine, the by-product of biodiesel, is sold to the pharmaceutical industry that already requests it to be derived from non-GM IP crops. But the biofuel company's representative stated in the workshop that the price increase of non-GM IP soybean and canola will possibly force the company to find other markets to sell the glycerine.

Conclusion – main messages

- As the adoption of GM crops by farmers in main exporting countries is now reaching very high levels and is still growing, GM crops represent the bulk of international trade of maize, soybean and canola. This constitutes the main challenge for the supply of non-GM IP crops.

- Segregation and preservation of identity of non-GM crops have segmented commodity markets, which were formerly defined by aggregation of large volume and economies of scale. Segregation of non-GM crops thus has a cost at every step of the supply chain, and price premiums for non-GM IP crops are increasing since demand is rising faster than supply.

- The EU largely covers its needs for non-GM IP maize and canola with its own production. Nevertheless, this situation might evolve in the future if the EU trade deficit keeps growing for these crops. Evidences of a growing premium for non-GM IP canola already exist.

- Each year, the EU demands more than 30 million tonnes of soybean meal primarily to feed animals with vegetable proteins. Although reliable data is not available, some experts estimate that between 15 to 30% of these imports consists of non-GM IP soybeans or meal, mainly to cover the demand of the EU poultry and cattle sector. Stakeholders report that the price premium paid by EU importers of non-GM IP soybean meal has considerably increased in the last years, representing now more than 10% of the product price. Production of non-GM IP soybean in Brazil – the main supplier to the EU – is still growing because of the increasing proportion of the non-GM soybean production that is certified and that has its identity preserved. But since the non-GM soybean production *per se* is not increasing, a critical point might be reached in the next years when the entire non-GM production will be segregated. The Brazilian supply of non-GM IP soybean will thus be limited by the high, and still growing, GM soybean adoption.

- EU retailers and food processors are key drivers of the use of non-GM IP ingredients in the food chain. However, their preference for non-GM IP ingredients does not translate always into the use of "GM-free" labels as a marketing strategy, with a few exceptions.

- Labelling of food products as "derived from non-GM IP ingredients" are still very few in the EU, although this situation is changing. Further introduction of "GM-free" labels could lead to a 'domino-effect': a new successful labelling initiative of a retailer could tip the whole sector over to follow the shift towards labelling.

- The common feature of the different issues addressed during the workshop was the lack of sound information about the specific situation of the markets for non-GM IP crops. For some particular issues, this can be partially overcome by relying on experts' opinions or stakeholder information, but this situation prevents any complete analysis of the functioning and evolution of markets. This missing information also precludes the development of appropriate instruments to predict the evolution of markets and price premium. Further research should aim at filling this gap.

Proceedings of the Workshop

Session 1: Situation and availability of non-GM Identity Preserved crops on world markets

The objective of this session was to get an overview of world markets for non-GM IP crops: how is supply meeting the demand, what quantity is actually traded and at which price. A special focus was given to Brazil, where most of the non-GM IP soybean is produced. The issue of the availability of non-GM soybean seeds for Brazilian farmers was also raised. A recurrent question in this session was the availability of reliable sources of data for quantity of non-GM IP crops available, that are required for any type of market and economic analysis.

Presentation S1-1: World supply and demand conditions for non-GM IP crops

Nicholas Kalaitzandonakes, Economic and Management of Agrobiotechnology Center, University of Missouri, USA

Worldwide, the area cultivated with GM plants has increased linearly from 1996 onwards to exceed now 150 million hectares. In countries where the technology is available, adoption levels generally are high, reflecting farmer attraction for the benefits of GM crops, either pecuniary or not. However, as the history of GM maize adoption in the USA shows, the main driver of adoption of GM crops remains market conditions, and no farmer in the world will cultivate GM crops if he can not sell it profitably. At the global level, the adoption of the four main GM crops cultivated still varies in a large extent: in 2011, the proportion of total cultivated area that is GM was 75% in the case of soybean, 68% for cotton, 29% for maize and 26% for canola. The main commodity-producing countries are generally also big adopters of GM crops, a pattern that has implications for the international market. Effectively, the adoption level of GM crops in these key countries determines the potential supply and international trade of GM and non-GM IP crops.

The top-ten maize producing countries account for more than 80% of world production, and an even smaller number of countries are responsible for a higher share of world exports. Additionally, those net exporting countries also turn out to be large adopters of

GM maize. World production of soybean, cotton and even canola also show a similar situation. It is also worth mentioning that current trends observed have been long lasting: the dominant producers of one specific crop today were almost the same back in the 1960s, with only a few changes occurring slowly. Finally, data on global crop use show that feed production is the main destination for maize and soybean, and that even for cotton and canola it is a significant market. Any shift in world crop market will therefore have implication in the feed compound and livestock production sectors.

Sizing markets for non-GM IP crops

Measuring the market size for non-GM IP crops is an ongoing challenge. From the supply side, it is possible to rely on figures for GM adoption as a first rough estimate. Based on farmer surveys or projection from seed sales, they give quite accurate estimation for the area cultivated with conventional and GM crops. Nevertheless, the conversion of area figures into volume of production is not straightforward, as it varies according to crops, farmers and regions. In addition, the supply of conventional crops only defines the potential supply of non-GM IP crops, as in practice some other factors (certification, location, quality of the crop, time availability) might affect its conversion into effective supply. Other difficulties that arise in measuring the effective supply are the possibility of illegal GM planting in some countries, the heterogeneity of non-GM IP crops with different threshold for different regions in the world, the fact that two subproducts from a same crop might not be marketed in the same way according to their final use, etc.

From the demand side, the assessment of the size of the market for non-GM IP crops is much more challenging because of the variability across products and over time, and also due to the strong reluctance of actors in the market to provide information about their activity and marketing strategy regarding the use of non-GM IP crops and derived products.

Thus a solution to size non-GM IP markets is to rely on a variety of trade data. The reduced number of exporters and traders facilitates the task. However, the use of trade data mostly provides an upper limit for non-GM market size rather than a range. The analysis relies mainly on the trade flow matrix, that gives quantities traded from one country to another, and is supplemented by data on production, GM adoption in the producing country, origin by harbour and extent of non-GM market in the country of

destination. Crossing those different sources of information makes it possible to draw some conclusions about the size of non-GM IP markets:

- The demand for non-GM IP crops has remained fairly stable in last decade and mostly concerns Japan, South Korea, and Europe.

- In the EU, the non-GM IP soybean/soy meal market represents about 15% of total uses (i.e. 6 million tonnes equivalent of soy), with important variations across EU countries: UK, Germany, France, Austria, Sweden are more stable markets for non-GM soybeans and meal whereas feed markets in Spain, Portugal, Denmark, or the Netherlands seem less sensitive to the non-GM issue and thus are very small market for non-GM IP soy.

- Altogether, Japan and Korea account for 3 to 4.5 million tonnes of non-GM IP maize and 1.5 to 3 million tonnes of non-GM IP soybean.

Availability of supply of non-GM IP crops in the future

Even if the adoption of GM crops in net exporting countries is high, the remaining non-GM part still represents a large quantity in volume. For instance, the conventional – non-GM – production of maize in the USA is equivalent to the total maize production of Argentina and Ukraine together. Also the EU domestic production of non-GM maize is almost entirely covering its needs, even if the picture varies across EU countries when considered individually. Despite of becoming a large importer of canola in the recent years, the EU is still covering most of its demand for non-GM IP canola with its domestic production. In the case of soybean, the EU demand for non-GM IP soy and meal represents less than 3% of soybean world production. On the supply side, India and the Ukraine have only played a limited role in the non-GM IP maize and soybean markets until now, but might count in the future.

Demand elasticity of non-GM IP crops

The difference between the price of non-GM IP crop and the commodity price is commonly referred as price premium. The main factor driving the price premium is actually the commodity price: following the food price peak of 2007-08, the premium also registered a dramatic increase, in proportion of the commodity price. In general terms, price premiums for non-GM IP maize and soybean usually stay in a range of 5 to

15% of the commodity price. In Japan and Korea, the so-called "food price crisis" led to a 20%-increase in the premium for non-GM maize and soybean, but the demand was not affected. On the contrary, a dramatic price increase of non-GM maize starch caused a very significant reduction of its demand in the paper industry. To conclude, the price premium is actually functioning as an opportunity cost, and should theoretically correspond to the sum of the cost of testing and certifying the non-GM IP crops, the opportunity cost supporting by farmers producing non-GM crops (foregone revenues) and the cost of ensuring the segregation along the supply chain.

Presentation S1-2: Factors shaping price premium for non-GM IP crops

Max Foster, Australian Bureau of Agricultural and Resource Economics and Science, Australian Government, Australia

Differentiation in world grain markets

World markets for grains can be separated into four segments: the conventional market (non-GM grain that is not certified as such); the mixed one (GM and conventional undifferentiated); the non-GM IP (certified) crop market; and the organic one. Due to the high adoption of GM crops in the world, the mixed segment has grown dramatically during the 2000s, and is the most important one for some crops such as soybean or cotton. In addition, the share of the volume of crop traded on world market that is GM is generally even higher than the adoption level. The market for non-GM IP soybean and soy meal represents respectively only 5% and 3% of the corresponding world supply, according to certifiers. Organic production covers 0.9% of world agricultural land, but reaches 5.1% in the EU, with global sales having threefold during the 2000s.

Evidence of price premiums

Price premium for segregated crops are usually observed for non-GM IP canola and soybeans, and additionally for organic grains and vegetables. In the case of canola, trade flows are determined by the GM or non-GM nature of the volume exchanged. The world largest canola importer, the EU, is essentially buying canola from Ukraine and Australia, where no or very little cultivation of GM occurs (5% in the case of Australia). On the

contrary, the remaining important canola importing countries (China, Japan and Mexico) are essentially buying Canadian canola, where GM adoption is over 80%. The EU situation has recently changed: the demand for non-GM IP canola has risen due to its use in the biodiesel industry. Formerly a net exporter, it is now the largest importer of canola in the world, with implications for price premium. Indeed, the premium observed in Australia, that used to be in the range of 1 to 3% of the commodity price, has now reached higher levels in Western Australia ports, mainly because of the EU demand. The Japanese situation is different: the Australian canola, that used to be largely imported by Japan, has now been replaced by Canadian canola that was less expensive. Evidence of a premium paid by Japanese importers for Australian non-GM IP canola still exists on the Tokyo Grain Exchange, but being now a reduced market, the price series is not reliable anymore.

With regard to soybean, the evidence of a price premium for import of non-GM soy into the EU is rather thin. No precise data are available, and the comparison between the price for imports from Brazil (the main source of non-GM IP soybean meal) and the import price for soy meal from Argentina and USA is not conclusive. Brazilian soybean meal is generally more expensive than the Argentinean one, but remains cheaper that imports from the USA. On the contrary, premium for organic products are very large, although a downward trend is observed according to observations in Illinois reported by the United State Department of Agriculture (USDA). Premium for organic food products are usually higher than those paid for organic feed.

Reasons for existence or non existence of price premiums

While adoption of GM cotton is reaching high levels, no premiums for non-GM IP cotton seeds are paid. The explanation might be that no consumer and therefore no buyer is willing to pay for non-GM IP cotton, especially since oil products contain no DNA and therefore need no labelling in some countries (with the exception of the EU), and most of the cotton meal is intended for animal feed. The high degree of substitutability between GM and non-GM IP cottonseed prevent any price premium in the market.

Conversely, premiums for organic products are high when compared with prices for conventional products. This is justified first by the significant difference in yields between organic and conventional crops – the average organic-to-conventional yield

ratio being of 0.75 – that translates into higher production costs for the organic production. Secondly, price for organic products may be significantly supported by their intangible characteristics perceived by consumers, in terms of environmental and health benefits. Consumers with middle to high income are thus willing to pay more for organic products.

With regards to non-GM IP maize and soybeans, premium are explained by the use of these crops for food in some markets, notably Japan. From the supply side, higher price are requested in order to compensate for the foregone benefits of non using GM technology, as well as to account for segregation costs. For instance in Western Australia, Identity Preservation costs represent a 4-6% increase of farm gate price, in a typical year. Increasing premium over time might reflect the diminishing availability of non-GM IP crops due to rising adoption of GM. The influence of consumer's behaviour on this trend is less clear: on one hand, rising incomes should affect premium positively, but on the other hand, there is some evidence that consumer acceptance of GM crops is increasing.

Overall, the evidences of price premium for non-GM IP crops are in fact limited, and apply mainly to a few crops in the EU market, where GM labelling is mandatory for food and feed products. In any case, premiums for non-GM IP crops are by far lower than those for organic products, which can reach from 30 up to 120%, despite the reduced size of the organic market.

Presentation S1-3: Focus on the Brazilian supply of non-GM IP crops

Cesar Borges de Sousa, ABRANGE, Brasil

ABRANGE (Brazilian Association of Non Genetically Modified Grain Producers) was established in 2008 with the objective to provide final consumers with non-GM grains and by-products as well as to secure a consistent supply of products.

Brazil is one of the largest producers of soybean and maize in the world, and is by far the largest provider of non-GM IP soybean to world markets. However, as GM adoption is increasing in Brazil, stakeholders involved in the chain have to make sure that the identity of the non-GM share of the production is well preserved.

Production of non-GM IP soybean in Brazil

ABRANGE is an association of companies and cooperatives involved in the production of non-GM IP grains. It is Brazil's first producer and exporter of non-GM IP soybean. The segregation and IP of non-GM soybean is achieved through traceability and certification programs that involve many partners, including research institutes like Embrapa. The IP scheme applies to soya beans, but also to soymeal, soy protein concentrate and lecithin. Forecast for the 2012/2013 cropping year indicates that total land dedicated to soybean should be around 25.8 million hectares, 26% of those being non-GM (not necessary with IP) i.e. representing an extension of 6.71 million hectares. Non-GM IP soybean is exported from 10 different Brazilian States although the adoption of GM soybean is highly variable across them, ranging from 1% to 88%. In Northern States where a high proportion of soybean is still non-GM, no segregation is required since the non-GM production is concentrated in some specific areas. Despite the rise in adoption of GM soybean, the non-GM IP soybean production is also increasing thanks to improvements in segregation systems. By 2013, 20% of the Brazilian soybean production (15.2 million tonnes) is expected to have its non-GM identity preserved and certified, while 75% will be GM and the remaining part a mix of both GM and non-GM soybean.

However, the situation varies according to the type of soy product considered. 65% of the Brazilian soybean production is exported and 24% of this volume is non-GM IP. With respect to soybean meal or to soybean oil taken separately, around 40% of the exported volume is certified non-GM. Overall, about 25% of the non-GM IP soybean production is not exported and is used internally.

Initiatives, effort and costs to organize the non-GM IP production in Brazil

In last years, ABRANGE has encouraged any type of initiative promoting the development of the non-GM soybean production in Brazil. ABRANGE itself has been making contacts up and down the supply chain to promote the production and the consumption of non-GM soybean. A special attention has been drawn to support farmers willing to produce non-GM soybean, by providing information and technical advice to growers. ABRANGE is also involved in the "Soja Livre" program, a label for non-GM seed and food products in Brazil, which attempts to promote the use of non-GM soybean seed in response to the marketing effort in favour of the GM technology. This program

organizes the distribution of non-GM seed through seed companies and conducts demonstrative field trials to compare yield and cost/benefits performance of non-GM vs. GM soybean varieties. According to this program, non-GM versus GM soybean production costs are equal to lower, whereas yields are equal to higher, partly because of the presence of weeds resistant to glyphosate in GM soybean fields. Non-GM farmers save about R$ 0.43 per kg of seed (EUR 0.17), and get an additional R$ 41.6 per tonnes of soybean (EUR 16.7) – the premium. Accordingly, the aggregate additional value arising from non-GM IP soybean planting amounts to R$ 658 million, i.e. EUR 263 million.

Presentation S1-4: Breeding programs and availability of non-GM IP seeds for farmers in Brazil

Alexandre Jose Cattelan, Embrapa, Brazil

Empraba is the Brazilian Agricultural Research Corporation. It coordinates the national agricultural research system in Brazil and has for mission to provide solutions for the sustainable development of Brazilian agribusiness through knowledge and technology transfer. As such, it is involved in the development of GM and non-GM soybean varieties to provide farmers with the best germplasm they want.

Soybean in Brazil

The area devoted to soybean in Brazil has been multiplied by about 60 in the last 50 years, while in the same time average yield has increased by 150%. Currently about three fourth of Brazilian soybean production is coming from only four States (by order of importance, Mato Grosso, Paraná, Rio Grande do Sul and Goías). In last years, the adoption of GM soybean by Brazilian farmers has still increased significantly, as it went from 62% of all soy cultivated area during the 2008/09 cropping season to 81% in 2010/11. However, there is an important variation across regions, since some States are still free of GM planting (e.g. Rondonia in the North, representing 1% of national soy production) and other are virtually integrally using GM soybean seeds (e.g. Rio Grande do Sul, 17% of national soy production). The most important States in terms of non-GM soybean production are Mato Grosso, Paraná and Goías States, which together accounted for about 70% of the non-GM soy production in 2009/10.

Soybean breeding program of Embrapa

Embrapa maintains an important collection of soybean germplasm, including both GM and non-GM varieties, and constantly improves it in order to meet the Brazilian farmer's most exigent needs. Accordingly, this germplasm portfolio includes cultivars with genetic resistance to the main diseases affecting soybean production in Brazil, notably the Asian rust, as well as varieties adapted to a second summer crop cycle, i.e. with early life cycle and resistance to higher rust incidence. So far, more than 200 cultivars have been commercially released. Nowadays, the attention of breeders is turning towards the genetic resistance to nematodes, an increasing problem especially where soybean is grown in monoculture or within short crop rotations. Another area of improvement is to breed cultivars more suitable for human consumption (higher protein content or low antinutritional factors, etc.).

In the framework of the "Soja Livre" program that promotes non-GM soybean seeds and ensures their multiplication by farmers, Embrapa is regularly assessing the performance of its non-GM cultivars compared to control varieties. Results show that in their majority non-GM cultivars perform very well, across regions and over different cropping seasons. Farmers cultivating Embrapa's non-GM varieties even won regional and national yield contest, reaching more than 6 tonnes per hectare i.e. about twice the Brazilian average yield for soybean. However, the main driver of GM soybean adoption is not about yield or cost difference, which are similar, but about easiness of weed control, certainly an area where GM soybean owns a clear advantage.

Embrapa policy regarding non-GM soybean program

Embrapa considers the maintenance of the non-GM soybean breeding program as a strategic issue, notably to meet existing farmers' demand for non-GM IP seeds (including organic seeds) not covered by other companies. Indeed, most of the private seed companies had discontinued their conventional breeding programs but now start to commercialize non-GM seeds again, following Embrapa's initiative. Additionally, Embrapa policy is to maintain high quality germplasm available, even for genetic transformation. Many genes of minor interest for private seed companies are nevertheless of great interest for farmers or for consumers.

An additional important justification for Embrapa conventional soybean breeding program is the concerns about herbicide-resistant weeds, a problem intensified by the use of GM glyphosate-tolerant soybean. A proper management of weed resistance is essential to maintain the sustainability of farming systems. Tackling successfully this issue requires to keep a minimal market share for non-GM IP soybean, in order to ensure the profitability of conventional breeding program and chemical products research and development, that are essential for the management of the resistances. In the absence of market for non-GM soybean, many private companies will discontinue their corresponding research program. For these reasons, Embrapa is committed to promote the non-GM IP soybean production and to keep up with its conventional breeding program. To conclude, Embrapa stressed that price premium are essential for farmers to keep cropping non-GM soybean, otherwise its market share will fall down.

Presentation S1-5: Economic models and tools to simulate the non-GM IP markets

Emanuele Ferrari, European Commission JRC-IPTS, Seville, Spain

Economic models are very useful to understand the functioning of markets. They can be very powerful upon condition that data are available. There are two main types of ex-ante simulation models maintained and developed by JRC[5] that could be employed in this field: (i) Partial Equilibrium (PE) models and (ii) Computable General Equilibrium (CGE) models.

Studies dealing with agricultural PE models focus on agricultural sectors, taking advantage of the detailed representation of agricultural markets and policies. However, they do not take into account the rest of the economy. In contrast, studies dealing with CGE models provide a consistent and comprehensive representation of the economy and world trade. However, agricultural sectors in these models are typically highly aggregated and the impact of the agricultural policies on specific sectors can be hidden.

[5] For more details see: M`Barek R., Britz W., Burrell A., Delince J., editors, 2012, An integrated Modelling Platform for Agro-economic Commodity and Policy Analysis (iMAP) - a look back and the way forward. EUR 25267 EN. Luxembourg (Luxembourg): Publications Office of the European Union. http://ftp.jrc.es/EURdoc/JRC69667.pdf

Moreover, CGE models might be less flexible for representing specific policies and institutional arrangements.

To overcome the limitations of both models and to take advantage of their strengths, a combination of both might result the best choice. The CGE model gives a global picture of a possible trade disruption as it takes into account vertical and horizontal linkages between all product markets (agricultural and non-agricultural) through separately identified bilateral trade relationships, impacts on production factors and macroeconomic constraints. On the other hand, the PE model with disaggregated agricultural markets highlights the reactions of the agricultural sector to the trade disruption.

Partial and General Equilibrium models to represent non-GM IP markets

The use of PE models currently available at JRC to represent the segregation between GM and non-GM IP markets presents some difficulties. In the available portfolio of PE models, the CAPRI (Common Agricultural Policy Regionalised Impact) Modelling System[6] is the only one that can take into account bilateral trade flows, while other available models are net trade models. Within the CAPRI model, in order to take into account product segregation and preservation of identity, new products have to be added into an already very complicated and demanding model and database. This means that new data about productivity, input and land costs, segregation costs, percentage of adoption, elasticities, consumer preferences, etc. are required. Hence, using one of these PE models to address the issue of market segregation is a complex task.

Segregation can be modelled more easily in CGE models, provided that some adaptations are made. But here again, data are needed about production, consumption and trade patterns. On the production side, the requirement concerns the share of the production which is GM and non-GM, the cost and benefits associated with the cultivation of both varieties (patterns of productivity change, use of pesticide and more costly seeds or other inputs) and the substitutability between GM and non-GM IP crops, i.e. the drivers of the choice of the technology used. In order to model demand properly, the market of food products has to be divided between GM and non-GM IP food,

[6] See Britz, W., Witzke, P., 2008, CAPRI Model Documentation 2008: Version 2. University of Bonn http://www.capri-model.org/docs/capri_documentation.pdf

assuming that consumers are fully informed. This implies a need for data on labelling cost. The behaviour of a representative consumer faced to the choice between GM and non-GM is also important: are they more worried about the price or about the method of production? Therefore, the elasticity of the demand and its initial share are important data to count with. Lastly, data needed to model trade are related with traceability and labelling costs. Literature provides some estimates but there are some discrepancies within figures, ranging from negligible to 5-15% of farm gate price. Who is assuming these costs is also unclear.

Linking PE and CGE to simulate non-GM IP markets

A possible solution to overcome the limits of PE and CGE models when it comes to represent the segregation between GM and non-GM IP markets is to couple the two types of models in order to take advantage of the benefits of both approaches: the PE accounts for details in the agricultural sector while the CGE provides linkage to the rest of the economy and information about prices to the PE model. This approach has been used in the past by JRC to simulate a disruption of soybean trade between the EU and Argentina, Brazil and the USA, due to production of non-yet-EU authorised GM varieties in these countries (asynchronous approval) and zero tolerance policy. However, it is essential to highlight that this approach fails to fully take into consideration short run effects, and rather gives insights of the situation after the equilibrium has taken place in the middle term.

Discussion and prospects

In the discussion following this first session about supply of non-GM IP crops emerged the issue of the different thresholds for presence of GM materials required by market actors involved in the trading of non-GM IP crops. It appears that for crops intended for food, the usual threshold is 0.1% for presence of GM materials, whereas 0.9% is the most likely to be used in the case of feed products. Concerns were expressed by some stakeholders involved in the trade of non-GM IP crops about the difficulty to respect these thresholds in some circumstances and about the subsequent risks related to liability. However, it was also stressed that those concerns about rejected shipments or financial loss due to low-level presence could be reduced if EU Regulations (EC) No.

1829/2003 and 1930/2003 were correctly interpreted by stakeholders; that is, the labelling requirement does not apply to crops or feed containing material which contains, consists or is produced from EU-approved GMOs or derived products, in which the proportion of GM is no higher than 0.9%, provided that this transgenic content is adventitious or technically unavoidable (Article 12 and 24 § 2 of Regulation (EC) No. 1929/2003). This means that the range of 0.1% to 0.9% is just a "buffer zone" between the scientific level of detection and the legal limit and is only intended to take care of occasionally inevitable low-level presence of GM material. The exemption of labelling requirement is thus depending on two conditions: (i) the threshold of 0.9% of GM material content must not be exceeded, and (ii) the presence of GM material, if any, must be "adventitious or technically unavoidable". Hence, it was highlighted by some participants that no volume of non-GM IP crops or feed should be traded with GM content above the 0.1% threshold, unless this presence is inevitable and this inevitability can be demonstrated by an individual case investigation.

Some comments were formulated about the possibility given to conventional farmers to opt for the non-GM IP market or not according to price premium paid. In Brazil, farmers have to decide before sowing and everything depends on the fact they have a contract with a buyer, otherwise their conventional production will have to go to the closest collect point and will be commingled with GM crops. In the USA, the existence of spot markets gives more flexibility to conventional farmers to choose the destination of their production.

The issue of EU self-sufficiency was also addressed in the discussion. If the EU is almost self-sufficient in maize, at individual country level it is still an important issue, as some Member States are large net importers of maize. It was also stressed that in bad cropping years, such as in 2007, the EU production could not supply the EU market. And due to asynchronous approval of new GM varieties, the number of countries able to supply maize to the EU market is limited. Currently, Ukraine appears to be the main potential provider of non-GM corn meal in case of shortage in the EU.

The discussion also went into the relationships between demand for non-GM IP products and labelling policy. A participant stated that the market for non-GM IP soybean is still a niche market or at least a reduced one because of the absence of labelling requirement for products made from animals fed with GM feed. To the

contrary, the labelling obligation for food products with GM content generated a demand for non-GM IP products. By consequence, making the label mandatory for GM-fed animal products could potentially impact the demand for those products and in turn could also determine supply. To which extent mandatory (positive) as well as voluntary (negative) labelling scheme for animal products would drive the demand for non-GM IP crops and impact the whole food chain should be the subject of further research.

At last, the issue of the influence of models on policy-makers emerged. It was stated that models' results are always presented with warnings about the assumptions used and their limitations; however, policy-markets tend to focus on the results. There are a number of weaknesses that should incite them to handle the results of models with caution, though. One is the issue of the elasticities that are used by modelers to solve the model. They are generally rather old and inappropriate for new markets and commodities; moreover, their variation across countries is not sufficiently taken into consideration. Other limitation concerns the incapacity of model to account for market adjustments in the short run, although they definitely impact the future. Alternatives to complicated models exist, e.g. special equilibrium models that rely on very simple assumptions; however they only allow simulation of small economic movements.

From the presentations it appears that there are still very few data with respect to the volume of non GM-IP soybean, canola and maize in the EU. The main reason for it is the absence of record and notification of the status (GM or non-GM IP) of crops entering the EU. No EU official statistics is kept, and the figures that are generally handled come from various kinds of stakeholders, with possible diverse interests. Collecting the data and building a reliable source of information is by consequence a desirable objective. Conversely, data for price premium exit in some specific markets, but the determinants of these remain unclear and constitute another area of possible future investigations.

Throughout the discussion questions were also raised about the way to assess EU consumer demand and willingness-to-pay for non-GM IP food products, especially because this demand determine heavily the size of the market and the extent of the premium paid for non-GM IP products. In order to improve their simulations, models also require better estimate of demand elasticity for non-GM IP food products compared to conventional food products, since the segregation between those products is rather recent and thus few data are available about consumer preference.

Session 2: Non-GM IP crops for the EU feed and livestock sector

The main objective of this session was to discuss the markets of non-GM IP crops destined for animal feed for the EU livestock sector. This topic is particularly relevant for the EU, given the dimension of its livestock sector (nearly two-thirds of the EU cereals are used for animal feed), and because European countries depend strongly on imports for feed.

Presentation S2-1: Meeting the demand for non-GM IP crops in the EU feed market: legislation and trade disruption effects

Stefan Vogel, Coceral, Brussels, Belgium

COCERAL is the EU association representing companies trading with cereals, oilseeds, feedstuffs, rice, olive oil and agro-supply. It was founded in 1958 and it has 30 members that are national associations representing grain merchants, storers and international traders in 19 countries.

Chain of production, collection, transport, and storage prior to export to the EU

The supply chain of bulk agricultural commodities from producers to European consumers is complex, involving collection, transport and storage of great volumes of commodities. Along the chain, different means of transports are used: tracks, railway, barges and ocean shipping. In order to exploit economies of scale, products coming from different production (GM and non-GM) are aggregated in many points of the chain. Starting from farm storage, there are several levels of possibility of product admixtures: primary elevator, rail and barge loading, terminals, ocean vessel, transfer elevator and, finally, grain processor. The economy of scale enhanced by the movement of high volumes of commodities permits to obtain shorter transport times (3-6 months of intercontinental transport) and lower costs.

Identity Preserved system for non-GM crops

Articles 12 and 24 of Regulation (EC) 1829/2003 establish a positive EU labeling system for the presence of GMOs in food and feed products. This regulation establishes the following requirements:

- Food & feed with presence of GMOs > 0.9% (for each ingredient) must be labelled as GM
- Food & feed with presence of GMOs ≤ 0.9% (for each ingredient) has not to be labelled as GM

The identity preservation system permits to distinguish between different quality levels among homogeneous products, enhancing producers to contract for one specific quality of product and to target commeasured market premiums. But the IP system may reduce the benefits from economies of scale, reducing volumes, increasing transport times (to 12-18 months lead time) and, consequently, transport and storage costs.

Dependency of the EU for its supply of soybean products

The EU production of soybean meals is far from being sufficient to fulfil the domestic demand of the livestock sector. EU-27 consumption of soybean meal consists of about 31 million tonnes per year. 68% of it is directly imported, 30% is produced from imported soybean, while only 2% (0.8 million tonnes) is produced from EU soybean. The main EU suppliers are countries from North and South America.

The major challenge for EU traders is to deal with the differences in varieties authorization between importers and exporters. A low level presence of GM in imported conventional food and feed products cannot be avoided because of ´asynchronous´ and ´asymmetric´ authorizations. In the first case, the exporter has authorized a GMO for cultivation while the importer is still in the process of import authorization. In the second case, the exporter has authorized a GMO for cultivation, but the importer has no intention to seek any authorization.

Worldwide availability of supply: GM versus Non-GM

Almost the 90% of the exported soybean meal is GM. In theory, about 41 million tonnes of non-GM soybean meal is globally produced, but the maximum the EU could potentially gather even when paying high premiums would be only 10 million tonnes, because some soybean sources are not completely available for the moment. For example, China produces almost 12.1 million tonnes of non-GM soybean, but do not export it; the EU does not import a lot from India because there are safety problems (salmonella) and getting the needed non-GM IP documentation is close to impossible.

Given the theoretical 10 million tonnes availability for non-GM IP soybean meals on 31 million tonnes of EU needs, non-GM IP soybean can only be a niche product.

Presentation S2-2: Demand for non-GM IP crops in the EU feed market: macro and micro-economic aspects of non-GM feed production

Nicolas Martin, FEFAC, Brussels, Belgium

Jean-Michel Boussit, Thivat Nutrition Animal, Clermont-Ferrand, France

FEFAC is the European association representing the industrial compound feed and premixtures manufacturers. It is composed of 29 members, coming from 21 EU Member States plus Turkey, Croatia, Serbia, Russia, Switzerland and Norway.

European overview of non-GM IP crop demand for feed

In 2011, the consumption of feed in the EU-27 was about 467 million tonnes. Almost the half of the feed is represented by forages, while 151 million tonnes was industrial compound feed, handled by FEFAC. The rest was home-grown cereals and purchased straight feeding stuffs. The compound feed production in Europe in 2011 was concentrated in three countries, Germany, France and Spain, which all together produced almost the 60% of the European compound feed. The 34% of the industrial compound feed was used for the production of poultry meet and eggs, 33% for pork and 26% for cattle.

According to Regulation (EC) 1829/2003, the feed with a content of GMOs higher than 0.9% per each ingredient must be labelled. At present market conditions, a lower threshold would mean that all the supplied feed would be labelled as "containing GM material".

Across EU countries there is a great variation in the demand for non-GM IP crops destined for feed. Only less than half of the EU-27 countries have a substantial demand compound feed made from non-GM IP crops, led by Austria, Germany, France and Italy. Despite the demand is increasing in other countries, to date the non-GM IP compound feed market remains a niche market in the EU, representing only 15% of the EU market.

Poultry meat is the main driver for demand of feed from non-GM IP crops in the EU. The market share of poultry meat fed with non-GM IP crops is about 17%, followed by cattle (beef and dairy), with 10%, and pork, with 2-3%. The challenge of producing feed from

non-GM IP crops varies according to the animal species. In most cases it is not necessary to use GM crops to provide energy content in the animal diet. Soybean meals are more important for some species than others, but there are not many alternative sources of non-GM IP proteins excluding soybean. The most important substitutes are not reliable. For example, fish meal is not allowed, groundnut meal has high levels of aflatoxins and vinasses proteins consist of non proteic nitrogen.

Premium for non-GM IP soybean meal and costs of non-GM IP compound feed production

At the feed industry level, there are some important constraints in sourcing proteins from non-GM IP crops. The EU dependency on imports for proteins is a threat for non-GM IP crop supply.

Between 2000 and 2012, there were two successive periods regarding the level of the premium for non-GM IP soybean meal in the EU market. From 2000 to 2005 the premium was only about EUR 5 per ton, mainly as an effect of the authorization of GMOs cultivation in Brazil. From 2005 to 2012, the premium went up to EUR 30 per ton, due to the labelling regulation 1829/2003. The premium is not necessary linked with soybean meal market prices and is highly volatile. Indeed, in some spot markets, the premium can rise up to EUR 100 per ton of soybean meal. The average non-GM IP soybean meal premium in 2012 is around EUR 40 for long term commitment. But the premium is not the only cost associated with non-GM IP supply and the fast diffusion of GM crops at global level makes the industrial management of non-GM IP compound feed more complex and costly. Altogether, the need for dedicated silos, rinsing, cleaning, analysis and administrative costs add another EUR 30 per ton of compound feed containing non-GM IP soybean meal.

Feasibility of non-GM compound feed production

A single feed mill produces different recipes for different animal species, therefore it handles different products from different crops. The same machines are used for all recipes and often dedicated lines or feed mills are not economically viable. In the compound feed industry there are three main potential sources of admixture with GMOs. The first is the botanical impurities in the feed material. Second, because same machines are used for all recipes, carry-over is technically unavoidable. Third, GM

analysis performed on compound feed are not always consistent across laboratories and are not as reliable as analysis performed on soybean meal. This issue is particularly relevant, because those inconsistencies might generate uncertainty and risk associated with the legal responsibility of the feed manufacturer. Therefore the feed industry considers that analyses are not the best approach to check compliance of compound feed with non-GM requirements.

Presentation S2-3: Feeding animals with feed from non-GM IP crops: situation and costs faced by farmers

Paul Temple, COPA-COGECA, Brussels, Belgium

Copa and Cogeca are two organizations representing European farmers and farmer's cooperatives respectively. The number of associates is around 30 million farmers and 40 000 agri-cooperatives across Europe. They are the biggest organizations representing farmers and agri-cooperatives at European level, dealing with 35 sectorial issues.

In the EU there are only two GM crops authorized for cultivation, the insect resistant maize MON 810 and the starch potato Amflora, developed specifically for industrial use. Other 39 GM events are authorized for commercialization for feed or food purposes, but not for cultivation.

In the EU, this sector is strongly dependent on imports of vegetable proteins. Almost the 80% of the vegetable proteins used for feed in the EU are imported, and within these imports, the 75% of the material is GM, mainly sourced from South America. This amount of imports represents a cultivated area of about 17 million ha, equivalent to the EU-15 wheat area.

The diet of animals producing white meat is based on soybean and maize, which constitute 60-70% of the daily ration, while 60% of the red meat consumed in the EU is coming from the dairy livestock, which needs high concentrated energy and protein feed.

In the last fifteen years the demand of meat in EU has been stable, and it will not substantially increase for the next fifteen years. On the contrary, it is expected that the demand of meat in developing countries will double in the period 2000-2030. This suggests further future difficulties for the EU livestock sector willing to source non-GM

IP feed. Most of the demand increase is located in countries where concerns on GM use are limited, hence the supply of GM feed crops is likely to increase with the demand.

A wide use of non-GM IP feed may generate market disturbance, threatening farmers' income also because of increasing production costs. The EU production of pork may fall by 29% to 35%, poultry meat may fall by 29% to 44% and beef fall by 11%. IP schemes incur in increased costs for all operators, but to date no study provided reliable examples of economic returns to compensate this extra-cost. The assessed cost to replace the GM feed by other raw materials shows an over-cost of EUR 900 million for the EU livestock sector for 6 months, with consequent rise of meat prices. Europe is a meat exporter on the international market, but an increase in prices may turn Europe into a net importer of meat, with serious consequences at the farm level.

The possibility for the EU to produce its own vegetable protein is limited and damaged by the political consequences of indecision on GM. Romania for example was a net exporter of soya until EU membership, as a result of adopting GM soya gaining significant productivity gains and becoming market competitive.

Farmers are capable of taking their part in IP non GM feed use but they are aware of the consequences of cost to the consumer. There are major issues surrounding labelling that need to be resolved in order for the consumer to be properly informed in their choice. Against a backdrop of financial recession, remaining competitive in all market areas, not just premium IP non GM is important if EU farming is to remain both competitive and fully able to play its role in global food security.

It has to be remembered that this is an area that lends itself to fraudulence the moment a premium is attached to animal products derived from IP non GM feed, as non of the subsequent food products can be tested as such. This means that the products are completely reliant on audit trails and testing building in additional unnecessary cost and bureaucracy when food safety is not an issue.

Presentation S2-4: Mechanism and impact of private standards and labels in the EU feed and animal food products markets

John Fagan, Global ID Group, United-Kingdom

Global ID Group operates at global level, with offices in 4 countries and with own and licensed laboratories in 16 countries. The group companies include Genetic ID (testing laboratories) and CERT ID (certification companies) that provide analysis of GMOs in food and agricultural products, third-party certification, and laboratory testing for food safety, quality, and authenticity issues.

Drivers of private standards

The main driver for private certification is the on-going globalization and industrialization of the world's food system. This integration of the food system at international level caused a loss of the trust relationship between consumer and producer, triggering the demand for product verification systems. With respect to the past, where there was a direct connection between producer and consumer based on local markets and easier from farm-to-fork chains, today there are 7 to 30 middlemen between producer and consumer. This contributes to increased consumer uncertainty regarding the safety and origin of production of the food, and to supplier liability if any unexpected safety or authenticity issue arises. Moreover, food safety crises (e.g. pathogenic Escherichia Coli in spinach; the bovine spongiform encephalopathy (BSE), commonly known as "mad cow" disease, dioxin contamination of livestock products) and social or environmental issues (e.g. child labor; habitat destruction, water pollution) have boosted consumer demand for assurance of safety and social and environmental responsibility.

Private certification offers a mechanism for improving trust between producers and consumers, increasing the market benefits of vertical differentiation. There are many certifications today available for producers:

- Absence of pesticides & hormones
- Non-GMO
- Regional quality & authenticity
- Absence of antibiotics
- Environmental sustainability
- Social responsibility

- Energy & carbon
- Food Safety

In particular, non-GM certification arises from the demand for meat and dairy products of animals fed with no-GM IP feed. Results from the Eurobarometer survey show that a substantial and growing proportion of consumers prefer non-GM products. Another survey recently commissioned by NGOs shows that 66% percents of consumers prefer meat and dairy from animals fed with non-GM feed; 63% of consumers want products produced with GM feed out of the supermarkets; 89% of consumers want clear labelling of GM fed animals and 72% would pay a premium for non-GM fed products. The demand for non-GM products is confirmed by the recent market success of milk brand commercialised in Germany, which increased its market share by 15% in the first year after the company began labelling the product as being produced "without gene technology" (ohne gentechnik).

The additional price of non-GM IP soybean meal translated into final product price increase was estimated, in the British market, at EUR 0.004 per litre for milk, EUR 0.023 per kilogram for pork and EUR 0.034 per kilogram for poultry meat. These negligible increases are recognized to be within the range that consumers are willing to pay.

Size of the EU non-GM IP soybean market and availability of certified soy

Global-ID has data on the quantity of soy beans imported into the EU, certified as non-GM by its certification programs. In 2011 the volume was 4.8 million tonnes (representing about 12% of total soya beans used in Europe), while the quantity of non-GM soy meal certified to Cert-ID standard and imported into the EU was around 2.95 million tonnes (corresponding to 14.8% of total EU imports of soy meal). Considering that there are at least 4 other companies certifying non-GM IP soybean meal, a conservative estimate is that together these 4 companies certify at least as much soy meal than Cert-ID. Thus, the total share of non-GM IP soybean meal can be estimated to be comprised between 30 and 40% of the total EU soy meal imports. This quantity can be supplied by Brazil, which already produces about 22 million tonnes of non-GM soybean (not necessary IP certified). India, China and Eastern Europe are also viable sources of non-GMO soy, depending on market prices. The conclusion is that non-GM IP

certified soy and soy derivatives already represent a significant portion of the soy and soy meal market in Europe and this proportion is growing as demand is growing.

Non-GM IP feed availability is conditional to business-to-business contracts. Because not all exporting countries require a systematic IP system, in order to ensure feed producers the quantity of non-GM IP soybean they need, and in order to have it at a reasonable price, it is necessary to plan early in the year their purchases with suppliers. This is critical for assuring good prices and reliable availability.

Discussion and prospects

The main issue that emerged from the discussion closing this session is the need for reliable data to analyse economic and market effects of the use of non-GM IP crops in EU. Different sources of data have been presented, and these data provide a contradictory picture of the market. For instance, some speakers underlined the scarcity of non-GM IP soybean at global level, while others suggested that supply of non-GM soybean is enough to cover the demand for non-GM IP soy products. Moreover, different estimations of IP cost and market premium have been presented.

Current data do not allow to properly assess market factors driving the production and the purchase of non-GM IP commodities, namely producers' costs and premiums, and consumer prices.

Participants stressed the importance of data clarification, to properly answer the following question: which is the total amount of non-GM IP soybean available? It appeared also important to clarify the future role that China, India and Eastern Europe may have on the market.

Moreover, almost 50% of the meat consumed in the EU is processed or sold in restaurants, where currently there is no labelling available to the end consumer. In order to study the differences in consumption behaviour of food products derived from non-GM IP crops, researchers should also take into account that a large fraction of meat is not commercialized through retailers.

Session 3: EU demand for food products from non-GM IP crops and derived ingredients

This section aims to clarify the elements of the demand of products derived from non-GM IP crops. The main driver for the final demand is the attitude of key agents of the food chain towards GM and non-GM crops and ingredients derived from GMOs. Food industry companies, retailers and consumers are the most important actors shaping the final demand for food products derived from non-GM IP ingredients.

Presentation S3-1: Attitude of the EU food industry towards ingredients derived from GM and non-GM IP crops

Linde Inghelbrecht, Ghent University and the Institute for Agricultural and Fisheries Research (ILVO), Belgium

Preliminary results from a qualitative research study were presented. This study attempts to understand companies' decision-making process for a GM-policy choice, based on a case study in Flanders (Belgium). By in-depth interviews, we've investigated the reasons why (inter)national companies of the agri-food chain opt (or not) to commercialize ingredients derived from GM crops on the European market. The sample of 40 stakeholders included biotech suppliers, farmer organizations, food and feed processors, retailers and non-governmental organizations. The data were analysed by content analysis.

An inductive analysis of the data unraveled the general basis of a company's decision-making process on GM crops and ingredients in a non-sector specific way. A set of perspectives were identified, which are essential aspects and/or parameters in this decision-making process.

The perspectives enable us to reduce the complexity of the decision-making process into a well-structured framework without losing argument-diversity. The interrelationship between the perspectives resulted in an analytical framework with different dimensions of influence on the decision-making process. The framework can be used to get a

structured and in-depth understanding of a sector's decision-making process, and enables to analyze this process across different sectors of the agribusiness.

The framework was applied to analyze the food sector's attitude and decision-making process about the use of ingredients from GM crops in the EU market. This test-case only included interviews with food manufacturing processors and retailers. Each perspective was discussed separately in the workshop as to understand the food sector's current (dis)interest in GM-ingredient commercialization in Europe. No extrapolation of these results was made, since qualitative research is context and time dependent.

A more detailed analysis of the results will be presented and discussed in a forthcoming paper, with the provisionary title "Understanding the (lack of) commercialization of genetically modified crops and their ingredients in the agribusiness".

Presentation S3-2: Understanding the role of retailers in the promotion of "GM-free" labels

Jochen Koester, TraceConsult, Switzerland

TraceConsult is a company based in Switzerland that operate at global level providing consultancy on Corporate Social Responsibility (CSR) and Ethical Governance to the actors of the food supply chain (processors of raw material, international traders, providers of logistics, distributors, feed compounders, animal producers, food manufacturers and retailers).

Looking at recent developments, it is likely that in the near future retailers will increase the availability of products derived from non-GM IP crops on their shelves, but to date the market is still in transition.

It is difficult to quantify the actual market share of products derived from non-GM IP crops, because most of the non-GM IP ingredients still go to unlabelled products and because retailers and processors mostly do not publish figures. Similarly, it is difficult to quantify the price premium at consumer level, because, without labelling differentiation, the product price is the same as for the standard product. Product differentiation is not clear also because some companies are still cautious to adopt a defined *pro* non-GM IP ingredients position. For example, in some retail companies the majority of the products are obtained with non-GM IP ingredients, but the retailer does not publicly come out with any "GM-free" claim.

In the EU, the first GMO-free private standard at retail industry level appeared in 2004. Austria and Germany were the pioneer countries for "GM-free" claim, and private labels, almost exclusively for animal products, like dairy, poultry and pork, progressively spread in other EU countries. In 2004 Austrian retailers adopted the "GM-free" claim ''Gentechnik-frei erzeugt'', but the big surge of labelled products began in 2006-2008, when Germany enacted the ''EGGenTDurchfG'' Act. The Act permitted the use of the label ''Ohne GenTechnik'' ("Without Genetic Engineering") on products delivered to consumers. Recently one of the biggest German retailers adopted this standard, suggesting a potential domino effect to other groups. Austria and Germany were thus the first EU countries with a defined-by-law "GM-free" private claim. Since July 2012, France's new regulation, in the form of a decree, has gone into effect for a "sans OGM" label. Before the end of 2012, Luxembourg is to follow.

The success of the "GM-free" labels depends on the ability of the supermarkets in delivering food products derived from non-GM IP crops. This requires an expanded retailer responsibility system to drive the supply chain, starting from the producing countries. At the European level, very few retailers provide animal products obtained with ingredients derived from non-GM IP soybean. In those cases, this has been possible by the creation of agreements and effective communication channels with Brazilian, sometimes also Indian, soybean meal producers.

Today the main products with a "GM-free" claim available on the retailers' shelves are milk, other dairy products, eggs and poultry. Some of these are considered strategic products by the retail sector, as illustrated by the fact in some supermarkets eggs from animals fed with non-GM feed are sold at a lower price than regular (i.e. from undetermined feed) eggs.

It is expected that the next food product with a "GM-free" claim available in the German supermarkets will be pork. In this case, major European suppliers of pork meat, as the Netherlands and Denmark, would be asked to meet ''Ohne GenTechnik'' criteria, triggering a supply chain for pork feed with non-GM IP crops in the livestock sector of these countries.

Presentation S3-3: Consumer preference for food products labelled as "GM-free"

Vivian Moses, King s College, United-Kingdom

Many consumers want to buy products that do not contain GMO and in several countries, retailers and food producers are already advertising their products as "GM-free". For example, in Germany more and more products are sold under the GM-free "Ohne GenTechnik" label, while in the UK "GM-free" claims are reported on products packages. Within Europe, there is a strong fragmentation in consumers' preferences on GM and non-GM products. These issues have been addressed in a recent Parliamentary Question to the Commission[7]:

- How large a share of the EU market consists of foods labelled as "GM-free"?
- How great is the market potential for export of products that are labelled "GM-free" and "growth hormones" free to countries other than European Union Member States?
- What is the additional willingness to pay of consumer from, for instance, the United States, for products with no GMOs or growth hormones, compared with products that cannot provide this guarantee?

Consumers' characteristics

Several factors drive the purchase of food products labelled as "GM-free". From the one side, buyers of "GM-free" labelled products tend to be more informed than the non-buyers. For example, more "GM-free" labelled products buyers (77%) than non-buyers (52%) claimed to know that products with GM-ingredients had by law to be labelled, and buyers of "GM-free" labelled products also read the detailed content listings of the food items they bought more often (65%) than the non-buyers (48%). Buyers of "GM-free" labelled products (60%) are more reluctant to buy food that contains GM-ingredients than the non-buyers (50%). On the other side, non-buyers of "GM-free" labelled products mostly welcome the "GM-free" claim, but they do not show real preferences. For example, significantly more non-buyers (67%) than buyers of "GM-

[7] The questions were directed to the Commission on 22 March 2012. See: http://www.europarl.europa.eu/sides/getDoc.do;jsessionid=888D11CD51415D182269C0BD14EC0116.node2?secondRef=0&language=DE&type=WQ&reference=E-2012-003152

free" labelled products (59%) said they did not know how to distinguish products containing GM-ingredients from conventional equivalents. For these reasons, buyers of "GM-free" labelled products are more likely to be willing to pay an extra-premium for products with a "GM-free" claim.

A recent study conducted in three Greek cities[8] analyzed why some consumers buy "GM-free" labelled products. The authors show that the main factors driving consumers are the products' certification as GM-free or organic, the perceived environmental protection and nutritional value, marketing issues such as advertising, packing and brand, and, finally, the perceived price and quality.

Export possibilities for EU products with a "GM-free" claim depend on consumers' preferences in other countries. About the US market, the most preferred products are, respectively, "US grown", ''GM-free'', "locally grown" and, finally, ''organic''. Regarding consumer characteristics, women who are not partnered and live with children from one side, and men who have a low to moderate income level and less than college education[9], are more likely to choose products with a "GM-free" claim.

Presentation S3-4: Overview of the EU and national legislation and label for food products derived from non-GM IP ingredients

Elta Smith, ICF GHK, London, United-Kingdom

ICF GHK is an international, multi-disciplinary consultancy based in the UK. ICF GHK provides research, evaluation, financial and impact assessment on public policy, international development and logistics to the public and private sectors.

ICF GHK was commissioned by the Directorate General for Health and Consumers (DG SANCO) of the European Commission to conduct a study that examines existing "GM-free" labelling schemes in the EU and identifies and analyses elements to be considered in the context of a possible harmonized approach to "GM-free" labelling at EU level.

Different approaches to labelling may present challenges for consumers and food business operators across the food chain. Indeed different standards applied by existing schemes may generate consumer confusion and increase supply chain costs. A study conducted by the Food Chain Evaluation Consortium (2010) found that almost two-

[8] Tsourgiannis L., Karasavvoglou A., Florou G., 2011. (http://www.ncbi.nlm.nih.gov/pubmed/21718730)
[9] Bellows A.C., Alcaraz V.G., Hallman W.K., 2010. (http://www.ncbi.nlm.nih.gov/pubmed/20851727)

thirds of the Member State representatives and almost half of the European stakeholders consulted favour harmonised "GM-free" labelling.

The main objectives of the present study are to examine existing "GM-free" labelling schemes across the EU-27 and to identify and analyse elements to be considered in the context of a possible EU harmonised approach. In particular, the study will:

- Develop a baseline scenario detailing the extent to which "GM-free" claims are used in different Member States and consider their specifications, interactions and impacts;
- Propose possible strategies for harmonised "GM-free" labelling at EU level and implementation scenarios; and
- Assess the implications of the different harmonisation scenarios compared to the baseline situation.

The study has completed the evidence gathering phase, which included a literature review, desk research, survey and interviews. Surveys were circulated to national stakeholders across the food chain and to other interested organisations (e.g. NGOs) and to Member State representatives across the EU-27, including the Competent Authorities and representatives of the Standing Committee on the Food Chain and Animal Health (SCFCAH). Interviews with national stakeholders and Competent Authorities were dedicated to a set of case-study countries (i.e. Austria, Germany, France, Italy, the Netherlands, Sweden and the United Kingdom) and to EU-level representative associations, selected Commission representatives and others. A website was also developed to provide information and an opportunity to participate in the survey (www.gm-free.eu).

Preliminary results showed three types of "GM-free" labelling approaches in the EU:

- The first type considers the specific "GM-free" label as the best vehicle to transmit attributes to consumers. ''GM-free'' is the main focus of the label and the label explicitly highlights ''GM-free'' attributes to the consumer.
- The second approach combines a ''GM-free'' label with other product characteristics (e.g. organic, Protected Designation of Origin, ecolabels).
- The third approach involves a ''GM-free'' supply chain as a criterion for production, but the requirement is not supported by a specific label for consumers.

Case studies have been developed for each scheme. Facilitative, voluntary, “GM-free” labelling legislation is currently in place in Austria, Germany, France, and the Netherlands. Greece, Luxembourg, and Croatia are also developing legislation on this issue. Finland has prepared guidelines to assist operators with “GM-free” labelling. Explicit “GM-free” labels have also been developed by private operators in Austria, France, Germany, Italy, Finland, and Slovenia. The second type of labelling approach, for which a “GM-free” label appears alongside another qualitative label were identified in nine EU countries (e.g. where the "GM-free" appears alongside "sustainability" or in conjunction with an organic label). The third type of scheme, for which “GM-free” is a production requirement but not explicitly labelled on products is used by some retailers in Belgium, France, Sweden and UK (e.g. in the UK some retailers agreed to exclude GM ingredients as the basis for "best practice", but do not label products as such).

Discussion and prospects

During the discussion following the presentations, it was stated that the main products driving the market for "GM-free" labelled products are fresh poultry products (meat and eggs). These products may act as "sensor products" for consumers. Yet, the revenue share coming from fresh poultry products is limited for retailers compared to other core products.

Moreover, many retailers who want to increase the offer of "GM-free" labelled products are exploring regional opportunities for the replacement of soybean by other proteins.

It was also stressed that it is a difficult task to label a product for which, in principle, there is no possibility to test directly for GMO presence, as in the case of animal products fed with non-GM materials. Testing may only be applied indirectly, by testing the feed instead of the final product. It was also discussed that in the past, other labels have been used for non-testable products with success, but this was achievable only because of the presence of a reliable traceability system.

Finally, most of the studies on consumers' preferences and attitude towards "GM-free" labelled products have been carried out at national, regional or local level. This may create biases when trying to generalize results at European level, for example to promote a harmonized "GM-free" labelling scheme. For this reason new and more

detailed information, gathered with innovative methodologies accounting for heterogeneous consumers' behaviour and preferences, can provide policymakers with important tools in the decision making process.

Session 4: Case studies of the use of non-GM IP crops or derived product for animal or biofuel production

The goal of this session was to gain insight in the approach of private actors towards sourcing and assuring of feed from non-GM IP crops. Of special interest was the effect of the decision of using non-GM IP feed stocks on input prices and profit margins. Three of the presented case studies are situated in the animal sector while the final presentations focused on the specificities of the biofuel sector towards non GM IP feed stock use.

Presentation S4-1: Poultry and eggs production

Michael Südbeck, Wiesenhof, Germany

Wiesenhof is one of the most important players in the poultry, turkey and ducks market, operating in Germany, Poland and Hungary. Wiesenhof differentiates itself in the German market as it is the only actor offering branded chicken products. With this positioning a strict quality system is essential from a marketing point of view. Therefore Wiesenhof operates an integrated supply chain contracting 800 farmers to raise poultry. The inputs to be used by the farmers are specified in the contract and its correct use constantly monitored. Feed stuff is provided to the farmers through a company-owned feed miller. In 2000 Wiesenhof made the move to use only non-GM IP feed for its poultry, duck and turkey commercialized in Germany. This move was made with intensive cooperation with environmental NGO's and facilitated by the fact that in 2000 non-GM IP soybeans were available at a price marginally different from the GM counterpart (EUR 0.50 per ton).

Wiesenhof sources its non-GM IP soy products through a local partner, Coamo, in the Brazilian States of Paraná and Mato Grosso. Farmers are contracted to cultivate non-GM soybeans and inputs are provided by the local cooperative. As testing at different points in the supply chain is essential to assure the IP status, the protocol starts at the farm level when the soy crop is harvested. Further test on Brazilian soil are performed at the stores, crushing plants and before loading the vessel. In order to minimize comingling, the chain of IP soy is as much as possible physically separated through dedicated trucks, collection points and stores. The segregation in the harbour and on the vessel is crucial

as the harbour is governmental owned and the capacity of a typical vessel is larger than Wiesenhof's needs. To avoid commingling at this stage, Wiesenhof might engage in a partnership with other parties interested in shipping non-GM IP soy to Europe in order to fill the full capacity of the vessel. To be sure only non-GM IP feed arrives in the miller's stores, the vessel is deviated to a different buyer in case the test results reveal comingling while loading. The cost of possible comingling during loading or on board is recovered through the contract with the transporting company.

In recent years the price premium for non-GM IP soybeans increased drastically to around EUR 50 per ton in 2012. This means a significant extra cost as it represents about 14% of the total price. These extra costs can not be easily recovered in the end market since no indications that Wiesenhof poultry are fed with non-GM IP feed stuffs are reported on the sold end product. The reason for this non disclosure is twofold:

- The primary customer of poultry, duck and turkey products are the retailers (50% of the total volume goes to discounters) that do not want the product to be labelled.
- Secondly, poultry products compete with turkey meat, a product for which the supply chain is less integrated and GM soybeans are commonly used. Therefore labelling the poultry products as "GM-free" could drive consumers away from turkey, another product in the Wiesenhof portfolio.

The increase in price premium decreases the competitive position of poultry meat against pork meat as they generally use GM feed. Further increases in the price premium might lead to a reconsideration of the strategy to use non-GM IP feed in all Wiesenhof poultry products. Two possible scenarios are perceived as plausible. In a first scenario the price premium would keep on increasing, further eroding the competitiveness of the poultry fed with non-GM crops market in Germany. This would mean relative small problems for the fresh poultry as all German producers would face the same problem, but could promote the import of processed poultry products into the EU which would be fed with GM feed. In a second scenario the pork sector would also turn towards the use of non-GM IP inputs which is anticipated to create an explosion in the price premium for non-GM IP crops. This scenario would cause severe problems in the short run, but assuming a normal functioning market, a price increase would be followed by an

increase in the supply of non-GM IP crops, causing prices to drop to the level of the costs of assuring this production and the related IP.

Presentation S4-2: *Milk production*

Konrad Nassl, Zott SE & Co.KG, Germany

Zott is a family owned dairy company operating from Bavaria and situated among the top 10 dairy factories in Germany. Since 2011, part of its production uses milk from dairy cows fed with non-GM IP feed, and this amount of milk is continuingly increasing. Two brands from the mozzarella and hard cheese product line, Zottarella and Bayerntaler, are labelled as "GM-free" and distributed in the international market. The main driver in the choice for non-GM IP feed was the customer demand towards GM transparency and the feeling that the labelling rules about GMO of the EU did not fully inform consumers. To confirm the viability of a "GM-free" labelled cheese, the company performed its own market research to discover the perceptions of German consumers towards "GM-free" labels. The results showed that:

- 68 % of the interviewed consumers feel badly informed
- 82 % of the interviewed consumers favour labelling "GM-free"
- 75 % of the interviewed consumers prefer products with this labelling
- 77 % of the interviewed consumers accept higher price

With this information Zott launched the "GM-free" label in the beginning of 2011. The introduction of the label in combination with a commercial campaign increased the turnover of Zottarella by 25% between 2010 and 2011. This increase was an consequence of both an increase in the price and in the volume sold. However, the relative importance of these effects was not disclosed during the presentation.

The increase in turnover of course comes with a change in the supply chain and an associated increase in cost. First of all, dairy farmers had to be selected or convinced to take part in the IP chain. Moreover, these farmers should be geographically clustered to assure an economic milk collecting system. As a compensation for taking part, farmers receive a price premium of EUR 0.007 per litre on the supplied milk (2% price premium) and an additional EUR 0.01 per litre, if feeding stuff is sourced from the EU exclusively.

For the moment 385 farmers, or 17% of the farmers supplying to Zott, supply milk from dairy cows fed with EU stuffs exclusively. The shift towards non-GM took around 10 months as sources of non-GM IP feed had to be identified, old feed stock used and a dairy cow had to be fed with non-GM IP feed for 3 months before fulfilling the requirements of the "GM-free" label. The program started in April 2010 and in January 2011 the first milk derived from non-GM IP feed was collected from farmers. Due to the instream of non-GM IP milk, the production plant faced extra logistical costs for separation, needing a technical investment in the facilities of EUR 3 million.

Finally the "GM-free" label had to be certified under the German law and Zott became a member of VLOG, the administrative organisation behind the "Ohne Gentechnik" label.

During the process Zott encountered problems. One of them being the fact that feed stuff labelled as non-GM IP did not fulfil their requirements (about 5% of the batches were commingled). Furthermore, to deal with situations of divergent interpretation for the outcome of PCR tests of composed feed stuff, Zott established a strict and clear decision pathway. This decision path differentiates between the actions to be taken when PCR tests show commingling above 0,9 % of GM material, and - if detected - below 0,9 %. For each delivery of feeding stuff to the farmers' place, samples are taken and analysed by PCR. Results are evaluated according to the decision pathway. If required, Zott engages in a dialogue with feed producers to inform them about its needs and select those feed companies to fulfil the requirements.

The Zott representative was in favour of a harmonized EU legislation. The different regulations in different EU Member States do not coincide with the consumer demand towards transparency and make it harder for companies to trade across borders.

Presentation S4-3: *Beef production*

Stefano Tavoletti, UNIVPM, Italy

In Central Italy production chains with a "GM-free" claim were locally developed to valorise local supply chains. To reach this goal, a control over raw material production seemed critical. As irrigation is not feasible for the farmers in the specific regions, maize

and soybean were out of scope. This leaves the farmer with different cereals such as durum wheat, barley and sorghum. This can be complemented with forage crops such as alfalfa or oat and leguminous such as faba beans and field peas. The dependence on locally produced feed stuff decreased the exposure of livestock farmers to volatility in the grain markets while guarantying the supply of non-GM IP feed. However, the farmer now faces other constraints. First of all grain production is also subject to uncertainty as yields differ between years due to environmental effects such as weather, soil capacity, slope etc. Secondly, only limited breeding efforts are made in the available crops, a situation that generates a delay in overcoming yield gaps and uncertainty compared to more commonly grown crops. Moreover, the presenter stated that the cultivation of own raw material requires extra time to the farmer, limiting the effort that can be devoted to marketing the final beef production.

A case study was presented informing the participants about the practices of an organic farm located in the Marche region of Italy. The case study consists of both feeding trials with different locally produced raw materials and an economic valuation of the strategy to produce locally and market directly in an organic farm. The analysis shows that the extra value generated from delivering products derived from non-GM IP crops is a fundamental part of an overall strategy aimed at improving profitability in farms in the region. For the strategy to be a success farmers should network to avoid fluctuation in output prices, cheap analysis of feed stuff should be available and consumers should be informed about the existence and added value of the local supply chain.

Presentation S4-4: *Biofuel sector*

Carmen Cortes Puya, Abengoa, Spain

Abengoa is a bio-energy company generating energy from the sun, desalinating sea water, recycling industrial waste and producing biofuels. It has a production capacity of 3,175 million litres of ethanol and a significant presence in all 3 key markets, Europe, the US and Brazil. In Europe, Abengoa is present in Spain, France and the harbour of Rotterdam. This global coverage gives the company a unique position with a large asset base, access to various regions and inputs and elaborated logistic chains.

For the production of biofuels, the company processes different grains and oilseeds. During the process different by-products are produced such as Dried Distiller Grains and Soluble (DDGS) for the feed sector in the case of ethanol and glycerine for the pharmaceutical sector in the case of biodiesel. These by-products are important for the respective industries and the income of Abengoa. DDGS for example make up 4% of the protein rich feed material in the EU-27 from which Abengoa supplies 28%.

In the case of DDGS, Abengoa has to fulfil the European legislation on traceability and GM labelling in the food and feed sector. In general 30% of cereals used by Abengoa is GM. All of this is because of the use of GM maize which represents 50% of total maize used and even 100% in the case of Spanish maize. This results in the fact that the majority of the produced DDGS contain GM above the 0.9% threshold for labelling. When specific actors in the feed industry require non-GM IP DDGS, Abengoa will attempt to supply them if possible but the availability and price of ethanol inputs decides the feasibility in the end. For biodiesel the situation is more complicated as the pharmaceutical industry generally requests glycerine derived from non-GM IP crops while the production of biodiesel needs GM inputs to be competitive. If no balance can be found between supply and demand, Abengoa will sell the glycerine to other industries.

The future of non-GM IP crops as an input for biofuels will depend on what the clients want and the respective EU legislation. The sector itself is flexible and can react quickly to changing environments and requests. In the mean time Abengoa will use the better quality cereals and oil at the better price and invest in second generation biofuels to decrease the dependence on food and feed crops.

Perspectives

From the presented case studies it is clear that the use of non-GM IP feed and labelling products as "GM-free" increases the costs. This increase comes from both increased input prices and the cost of testing and separation. Actors will only be able to bear these costs as they are compensated in the market. Throughout the presentations it is also clear a price premium exists at different stages in the supply chain. However, the mechanism behind this price premium remains unclear. It is not clear whether the price

premium covers the incremental costs of non-GM IP schemes or if some actors are capturing extra profits. Moreover, it is not clear how much of the extra costs is paid by the final consumer and what the revealed willingness to pay for products derived from non-GM IP crops is. Extra research on the price mechanism and the distribution of margins along the supply chain is therefore needed.

Annexes

List of participants to the workshop

Name		Organisation	Country
EXTERNAL PARTICIPANTS			
1.	APOTEKER Arnaud	The Greens / EFA Group in the European Parliament	Belgium
2.	BORGES DE SOUSA Cesar	ABRANGE	Brazil
3.	BOUSSIT Jean-Michel	Thivat Nutrition Animal	France
4.	CATTELAN Alexandre	Embrapa Soja	Brazil
5.	CORTÉS PUYA Carmen	Abengoa Bioenergy Trading Europe	Spain
6.	FAGAN John	Global ID Group	UK
7.	FOSTER Max	ABARES - Australian Bureau of Agricultural and Resource Economics and Sciences	Australia
8.	HEGENBERGER Johannes	Zott GmbH & Co. KG	Germany
9.	INGHELBRECHT Linde	Ghent University	Belgium
10.	KALAITZANDONAKES Nicholas	University of Missouri	USA
11.	KOESTER Jochen	TraceConsult	Switzerland
12.	MARTIN Nicolas	FEFAC - European Feed Manufacturers' Federation	Belgium
13.	MOSES Vivian	King's College	UK
14.	NAßL Konrad	Zott GmbH & Co. KG	Germany
15.	PÖHNER Ralph	Gebrüder Poehner GmbH	Portugal
16.	SMITH Elta	ICF GHK (Inner City Fund, Guilmore Hankey Kirke)	UK
17.	SOREGAROLI Claudio	Università Cattolica del Sacro Cuore	Italy
18.	SÜDBECK Michael	Lohmann & Co. AG	Germany
19.	TAVOLETTI Stefano	Università Politecnica delle Marche	Italy

Name		Organisation	Country
20.	TEMPLE Paul	National Farmer Union / COPA-COGECA	UK
21.	VARACCA Alessandro	Università Cattolica del Sacro Cuore – PRICE Project	Italy
22.	VOGEL Stefan	COCERAL - Comité du Commerce des céréales, aliments du bétail, oléagineux, huile d'olive, huiles et graisses et agrofournitures	Germany

EUROPEAN COMMISSION		
23.	BREGEON Thomas	Directorate General Health and Consumers (DG SANCO) Unit "Biotechnology"
24.	DE BACKER Walter	Directorate General Agriculture and rural development (DG AGRI), Unit "Cross-compliance, food and feed legislation" (POSEI)
25.	DELINCÉ Jacques	JRC IPTS - Agrilife Unit, Head of Unit
26.	DILLEN Koen	JRC IPTS - Agrilife Unit, Agritech Action
27.	FERRARI Emanuele	JRC IPTS – Agrilife Unit, Agritrade Action
28.	KRUPPA Bertalan	Trainee in Directorate General Agriculture and rural development (DG AGRI)
29.	PARISI Claudia	JRC IPTS - Agrilife Unit, Agritech Action
30.	RODRIGUEZ-CEREZO Emilio	JRC IPTS - Agrilife Unit, Agritech Action Leader
31.	TILLIE Pascal	JRC IPTS - Agrilife Unit, Agritech Action
32.	VAN NES Pieter	JRC Adviser for External Evaluations
33.	VIGANI Mauro	JRC IPTS - Agrilife Unit, Agritech Action

Agenda of the workshop

WORKSHOP ON "MARKETS FOR NON-GM IDENTITY PRESERVED CROPS AND DERIVED PRODUCTS"

21 & 22 June 2012

European Commission (EC), Joint Research Centre (JRC)
Institute for Prospective Technological Studies (IPTS)
Unit "Agriculture and Life Sciences in the Economy" (AGRILIFE)

Venue: JRC-IPTS, Isla de la Cartuja, Edificio Expo, 1st floor, Room A30, c/ Inca Garcilaso 3, Seville, Spain
Contact: Pascal Tillie pascal.tillie@ec.europa.eu

AGENDA

Thursday 21 June 2012		
09:00 - 09:30	Welcome and objectives of the workshop	**Jacques Delincé** **Emilio Rodríguez Cerezo** (JRC-IPTS)
Session 1	**Situation and availability of non-GM IP crops on world markets** Chair: Emilio Rodríguez-Cerezo (JRC-IPTS)	
09:30-10:00	World supply of non-GM IP crops • Total production by country and crop (GM, non-GM with and without IP) • Global trade of crop in each marketing channel	**Nicholas Kalaitzandonakes** (EMAC, University of Missouri)
10:00-10:30	Factors shaping price premiums for non-GM IP crops • Past and current price premium • Determinant of price premium and future trend	**Max Foster** (Australia Agricultural and Resource Economics Society)
10:30-11:00	Focus on the Brazilian supply of non-GM IP crops • Potential for non-GM soy and maize production and export in Brazil • Feasibility, cost and risk of segregation and identity preservation of non-GM soybean	**Cesar Borges de Sousa** (ABRANGE Brazil)
11:00-11:30	***Coffee break***	
11:30-12:00	Availability of non-GM IP seeds for farmers • Feasibility and cost of the production of non-GM IP seeds • Breeding effort for non-GM genetic material	**Alexandre Cattelan** (EMBRAPA Brazil)

12:00-12:30	Models and tools available to simulate the non-GM IP markets • Availability of data for modelling tools • Available models to assess market segregation and identity preservation • Main results of modelling tools	**Emanuele Ferrari** (JRC-IPTS)
12:30-13:00	Discussion	
13:00-14:00	***Lunch break***	
Session 2	**Non-GM IP crops in the EU feed and livestock sector** Chair: Claudio Soregaroli (Università Cattolica del S. Cuore)	
14:00-14:30	Meeting the demand for non-GM IP crops in the EU feed market: legislation and trade disruption effects • Past disruption of trade related to GM issues and impacts for the feed sector • Strategy of traders and buyers to face a possible shortage of crops for the feed industry	**Stefan Vogel** (Toepfer International - COCERAL)
14:30-15:15	Demand for non-GM IP crops in the EU feed market: Macro and micro-economic aspects of non-GM feed production • Overview of the animal feed sector and its demand for crops (share of imports, share of non-GM IP crops, according to the final use) • Feasibility and cost of non-GM feed production – case study of leading "non-GM" feed manufacturer in France	**Nicolas Martin** (FEFAC) **Jean-Michel Boussit** (Thivat Nutrition Animale)
15:15-15:45	Feeding animals with non-GM IP feed: situation and costs faced by farmers • Demand and cost for non-GM IP feed for farmers • Alternative options to feed livestock	**Paul Temple** (COPA-COGECA)
15:45-16:15	***Coffee break***	
16:15-16:45	Mechanism and impact of private standards and labels in the EU feed and animal food products markets • Drivers of private standards and labels and their mechanism • Share of production covered by a non-GM IP scheme for the main animal food products	**John Fagan** (Global ID Group)
16:45-17:15	Discussion	
17:15-17:45	General Discussion for Day 1	
17:45-18:00	Presentation of the PRICE project (Work Package on supply chain)	**Claudio Soregaroli** (Università Cattolica del S. Cuore, Italy)
18:00	***End of Day 1***	

Friday 22 June 2012		
Session 3	**Final demand for food products derived from non-GM ingredients** Chair: Koen Dillen (JRC-IPTS)	
09:00-09:20	Attitude of the food industry towards GM crops and non-GM ingredients • Market share of processed food products with non-GM preservation of identity • Attitude of food industry toward GM ingredients • Possible change in this attitude in the light of second generation GM crops	**Linde Inghelbrecht** (University of Ghent, Belgium)
09:20-09:40	Understanding the role of retailers in the promotion of food products derived from non-GM ingredients • Market share of food products with non-GM IP • Price premium at consumer level • Requirements toward suppliers regarding GM content of food or fed for animal products	**Jochen Koester** (TraceConsult)
09:40-10:00	Consumer preference for food products derived from non-GM ingredients • Preference of consumers for non-GM food • Role of non-GM IP labels in shaping consumer preference for non-GM food products	**Vivian Moses** (King's College, UK)
10:00-10:20	Overview of the EU and national legislation and labels for food products derived from non-GM ingredients • Panorama of national legislation for the labelling of non-GM food in the EU • Existing non-GM IP label at EU level and socio-economic impacts	**Elta Smith** (ICF GHK)
10:20-10:50	Discussion	
10:50-11:10	***Coffee break***	
Session 4	**Case studies of animal food produced with non-GM IP feed** Chair: Pascal Tillie (JRC-IPTS)	
11:10-11:30	Case study 1: poultry and/or eggs production	**Micheal Südbeck** (Wiesenhof – Germany)
11:30-11:50	Case study 2: milk production	**Konrad Naßl** (Zott – Germany)
11:50-12:10	Case study 3: beef production	**Stefano Tavoletti** (UNIVPM - Italy)
12:10-12:30	Case study 4: the biofuel sector • Use of GM and non-GM IP crops in the global biofuel industry • Attitude of the biofuel industry toward GM crops, considering the by-product issue	**Carmen Cortés Puya** (Abengoa - Spain)
12:30-13:00	Discussion of the case studies	
13:00-14:00	***Lunch break***	
14:00-14:30	Closing of the workshop and discussion of future steps	
14:30	***End of the workshop***	

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Abstract

The Institute for Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre (JRC) is currently undertaking research activities in order to describe the current situation and functioning of the markets for non Genetically Modified Identity Preserved crops and derived products.
For this purpose, JRC-IPTS organized an International Workshop on "Markets for non-GM Identity Preserved crops and derived products" in Seville on 21&22 June 2012. This workshop brought together key stakeholders in the supply chain, as well as leading scientists and experts active in the field of non-GM IP markets.

This JRC Scientific and Policy Report provides the proceedings of the June 2012 workshop, that covered the following topics:
Session 1: Situation and availability of non-GM Identity Preserved crops on world markets
Session 2: Non-GM IP crops for the EU feed and livestock sector
Session 3: EU demand for food products from non-GM IP crops and derived ingredients
Session 4: Case studies of the use of non-GM IP crops or derived product for animal or biofuel production

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Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.

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