SIXTH FRAMEWORK PROGRAMME

GM and non GM supply chains: Their CO-EXistence and TRAceability

Outcomes of Co-Extra

Costs and benefits of segregation and traceability between GM and non-GM supply chains of final food products

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Aims

The basic intention of this part of the project was to quantify the costs and to identify the benefits of traceability and co-existence systems for GM food (and feed) from the seed to the final product at the retail stage in several countries and supply chains respecting the 0.9 % threshold for labelling of GM food. Thereby the production and processing stages of eligible GM crops like wheat, sugar, rapeseed, soya and maize are analyzed with respect to cost structures originating from efforts to organize co-existence and segregation. The multi-national analysis of several supply chains with partly different end products allows meaningful comparison of economic and technical consequences of co-existence measures on the different stakeholders along the supply chains. As some of the analyzed foodstuffs like soy lecithin, sugar and starch derivates are used as ingredients for complex food (and feed) products (like e.g. chocolate, frozen pizza, compound feed), the impacts of GM and non-GM co-existence on the value chains of such complex products are analyzed as well. As these complex products are composed of several critical ingredients and this type of product is closer to the food retailer and consumer, the compliance with co-existence regulations and thresholds has to be realized in an even more complex environment. Another target of the project was to detect benefits emerging by the implementation of product differentiation systems and assess their impacts on the different levels of the value chain from the seed producer to the private consumer of foods.

Methodology

For calculating the co-existence and segregation costs, an Excel-based simulation model has been developed which includes potential cost categories on each level of the value chains. The total costs at each level follows the principle to aggregate all incurred costs for cultivating, transportation and processing of the raw material crops on the different levels and to increase the price of the final product at each level. The resulting price for the secured non-GM crop or product represents automatically the non-GM commodity price on the next level of the value chain, while the price of GM commodity is assumed as the current price level without any co-existence and traceability

measures. This principle is used at all stages of the supply chain thus aggregating the additional costs for respecting the 0.9 % threshold of adventitious presence on all levels (at the seed level the 0.5% threshold is mainly respected) and setting the price for the non-GM product at the end of the value chain.

This conceptual approach is also perpetuated when identifying the costs in the processing of complex food and feed products like chocolate, frozen pizza and compound soy and wheat feed. The model allows for an isolated view on every single ingredient that carries potential risk of GM contamination and the emerging cost types can be calculated separately.

Subsequently, benefits of introduced co-existence and product differentiation systems (IP, segregation or traceability systems) are analyzed within a literature research and finally the emerging benefits of such systems are confronted with the originating costs.

Results

The generated cost calculation model was applied on the food and feed value chains of wheat (starch, flour, feed additive), sugar (sugar beet as raw material), rapeseed oil, soy (feed additive) and maize (starch, feed additive) in the participating countries Germany, Denmark, Poland, UK and Switzerland. Basically, the cost structures and the results of the cost calculations between the single countries do not only differ because of national differences in implementing the existing co-existence regulations of the EU, divergent farming or industry structure, but also due to the information given in the conducted interviews and available data e.g. concerning costs of specific activities. While for a Swiss oil mill company the commodity delivering system is quite manageable and the input testing of elevated rapeseed is negligible, the bigger companies in Germany and Poland, with several processing sites cannot manage threats of admixture without monitoring systems at the entry gates. Another example for differing cost structures is the impact of field structures on co-existence schemes in farming in the different countries. Several possible strategies of maintaining isolation distances between GM and non-GM fields can be applied depending on the regional field distribution and national regulation of liability. While for the German farmers it is assumed that the GM rapeseed farmer has to compensate the loss of gross margin by cultivating alternative crops on a certain discard width by the non-GM farmer, the conditions in Polish agriculture determine buffer zones on GM fields as additional effort to maintain co-existence in rapeseed production. Thus, the individual combination of cost types and the particular origin of data have to be respected by the comparison of the country-specific results of the cost calculation.

The project team faced the most uncertain figures at the producer levels (seed and crop production) of the regarded value chains. Due to the still lacking threshold on GM adventitious presence for most crops in the EU only very few information exist concerning the necessary measures and additional costs of co-existence in certified seed production. Additional costs of co-existence and segregation efforts are calculated with 38 or 86 € per ha respectively for the Danish and German wheat crop production. For rapeseed, a crop with a quite high risk of receptiveness of pollen from other plants and varieties, the total additional costs are stated from 40 € per ha in Denmark up to 74 € per ha in Germany and Poland. At elevator level, within its functions of storage, drying and distribution the risk of admixture is determined as quite high. Depending on the size of the elevator company and its capacities, the additional costs vary from 7 to 16 € per ton wheat (Denmark, Germany), 18 to 64 € per ton rapeseed (Germany, Denmark, Switzerland) and are estimated with around 30 € per ton for the elevating of maize in Germany. The high ranges in the cost figures can be explained with the different possibilities of the company to apply certain segregation strategies. Transfering these additional costs to the final processing level, the mills, crushers and processors, the increased expenses for the used raw materials caused by the co-existence activities in the previous levels of the value chain result in the highest costs for commodities and transport when implementing co-existence and traceability management systems. Over all regarded chains these commodity costs together with costs for required monitoring systems form more than 90% of all costs for

implementing co-existence systems. The total additional co-existence costs at the end of the value chain, which had to be added on the general producer price, are calculated with at least 25 € per ton wheat starch in Germany, 11 € per ton wheat flour in Denmark or 22 € per ton rapeseed oil in Poland. The additional co-existence costs in the case of sugar show the lowest exaltations, as beet production and processing imply lower risk and better conditions to avoid admixture and maintain thresholds. The identified additional prize loadings of mono-food products are included in the cost calculation of compound feed and multi-ingredient food products in order to analyze the economic impact of co-existence systems when handling several raw materials in one final consumer product.

Conclusion

According to the results of the analysed food supply chains, significant additional costs are expected by organising co-existence between genetically modified and non-GM products in the value chain from production of farm crops up to the production/processing levels of the single supply chains and by maintaining mandatory (or voluntary) thresholds and regulations. Depending on factors like crop requirements, farming, storage and elevating systems, processing strategies, monitoring managements etc, the total additional costs of co-existence and product segregation systems can raise up to 13% of the total product turnover at the gates of rapeseed oil mills or starch industry processing wheat and maize. However, as in most value chains the question of co-existence currently is a theoretical one in the EU, the implementation and permanent running of co-existence and segregation systems in the food industry can decrease the additional costs due to savings e.g. in the testing requirements of raw materials or routine procedures during the documentation process.