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Evolution of state policy on GMOs and its impact on the potential of rural areas in Poland

Abstract: *In the last dozen years or so the world experienced a dynamic growth in cultivations of genetically modified plants. Agricultural producers, achieving measurable economic benefits, have developed the production of genetically modified plants to an increasingly great scale. The number of supporters of the GMOs use has been increasing systematically, not only among farmers noting the potential to improve income owing to this technology, but also among politicians noting the chances for agriculture to contribute to providing solutions to basic problems of the world today, e.g.: ensuring food and energy safety. Genetically modified food and food produced with the use of raw materials obtained from GMO plants has become a permanent element of our diet and forms an increasing part of food consumed today. Currently, it is difficult to produce poultry and pig meat, in particular in Europe and other highly-developed countries, without feed containing genetically modified soy. The list of highly processed food products has been expanding quickly and the number of opponents of releasing genetically modified organisms into the environment has been on the raise. Social concern about unknown, long-term effects of unnatural genetic manipulations on natural environment and consumer health has been growing, though so far, despite numerous tests, no significant evidence of their negative impact on human and animal health was found. For several years, Poland has been one of the opponents of using modified plants and has been trying, by means of national legal provisions, to prevent from using this technology both in agriculture and food processing, which makes the respective provisions of acts on feedstuff and the act on seed contradictory to the EU legislation.*
This article provides a revision of evolution of views on GMO, current legal state in the European Union and Poland as well as proposed changes in this regard.

Development of genetically modified plants production in the world was also analysed, both in terms of species cultivated and countries using them in agricultural production. Selected economic and social effects, a given state policy may have on the current and future potential of rural areas in Poland, were presented against this background.
In 2011, genetically modified plants were cultivated within the area of 160 million ha, and the number of countries in which their use was permitted increased to 29. Average annual pace of increase as regards these cultivations since 1996, i.e. when commodity production with the use of modified plants was first launched, reached over 35%, i.e. ca. 10 million ha. In this period a total of 1.25 billion ha was subject to cultivation with the number of farmers involved in non-conventional production exceeding 110 million. According to estimations, global benefits of using GM plants in cultivation reached nearly USD 10.8 billion in 2009, and since 1996 they exceeded USD 64 billion in total. Under Polish conditions, from the point of view of economic aspects the problem of whether to use GMOs in field crops or not, is considerably insignificant, yet political decisions on possible prohibition of marketing of GMO products, especially including protein feed components, may have negative impact on farmers involved in commodity animal production (poultry and pig livestock, to a lesser extent bovine animals).

Keywords: *Biotechnology, GMO, biodiversity, agricultural policy*

Introduction

Development of research and use of genetically modified plants – GMOs, in agricultural production made biotechnology become an important part of the world agri-food economy in recent years, affecting not only the purely agricultural or processing area, but also more and more often fulfilling the role of political and social game. Conflict between the supporters and opponents of using GMOs has been increasing, resulting in even more evident global gap between countries using new technologies in cultivations (North and South America, Asia) and countries where the concern and social opposition in this regard (Europe) has been growing. The main benefits of cultivating GMOs include: improvement of profitability and effectiveness as regards carrying out agricultural activity, limitation of negative impact of natural fertilisers and plant protection products on the natural environment, improvement of energy supply self-sufficiency and security, limitation of CO_2 emissions and consequently counteracting the effects of global warming. On the other hand, there is still no long-term research guaranteeing environmental and health safety of using plants and products containing GMOs, the impact of these cultivations on biological biodiversity, issues of co-existence of crops using modified seed with conventional farming, in particular organic. Role of global seed companies and producers of plant protection products as well as their patent ownership remains a serious problem, which makes it necessary for farmers to purchase these means from specific producers. As a result of these issues European Union policy has recently become less strict. The EU considers legal

changes allowing Members States to introduce potential prohibitions on GMO crops within certain areas of states.

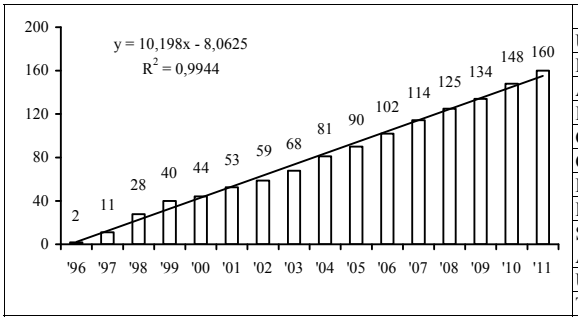
Global development of GMO crops

Commodity plant cultivation with the use of genetically modified seed was initiated in 1996. The first countries to apply the new production technology included the USA, Argentina, Canada, China, Australia and Mexico, and the initial sown area reached ca. 2 million ha (James, 2011). Confirmation of socio-economic and environmental benefits of GM plants cultivation (Brookes, Barfoot 2011) resulted in dynamic growth of farmers' interest in such cultivations throughout the subsequent 15 years. In 2001, genetically modified plants were cultivated within the area of 160 million ha, and the number of countries allowing their use increased to 29. Average annual pace of increase (Luderer, Nollau, Vetters, 2009) of these cultivations between 1996 and 2011 was over 35%, i.e. ca. 10 million ha. In total, 1.25 billon ha was allocated for cultivation in that period, with the number of farmers involved in non-conventional production exceeding 110 million. Inasmuch as in the first period of GM plant production growth the technology was reserved mainly for highly developed countries (ca. 80% of crops), in the subsequent years the sown area increased faster in developing countries, and in 2011 the share of these two country groups became equal. In developing countries, these are the small farms that benefit from technological progress in the majority of cases. There farms, for the reason of relatively lower labour costs, are not only able to satisfy to a greater extent the basic food needs, but often to sell a part of harvest, which contributes to the improvement of economic situation. The share of arable land intended for GM plants cultivation currently exceeds over 10% of world land resources.

In 2011, 172 genetic modifications, covering 22 plant species, were approved for cultivation worldwide. Despite the decreased significance of soy in GM cultivations in recent years, it has remained the dominating species in crop structure with a 47% share. The role of maize (32%), cotton (15%) and rape (5%) has been increasing systematically. Gene modification is meant to give plants characteristics desired by man, i.e. increased tolerance for herbicides, insects and diseases, resistance to adverse environmental conditions or improvement of qualitative characteristics (taste, smell, shape). Ornamental plants are also subject to modifications. They become more durable and have more intensive colour. In majority, cultivations use varieties with transformation making plants resistant to herbicides (59% of crops), followed by resistance to insects (15%) and two- or three-level modifications (26%).

The main agricultural producers using GM seed in cultivations include the USA, Brazil and Argentina. In 2001, their share in world GMO crops reached 77%; these crops are dominated by soy, maize and cotton. GMO has the greatest importance for agriculture in Argentina, where its share in total

crop structure stands at 70%. In the other two countries the percentage fluctuates around 50%. Adoption percentage in the case of the most important plants in the respective countries varies. Over 90% of soy crops in the USA and Argentina and 70% in Brazil cover GM varieties. In Argentina the GM varieties also dominate maize crops, and in the USA this share exceeds 85%. Legal conditions and social reluctance (in majority outside agriculture) has prevented the development of plant production with the use of modified seed on a considerable scale in the EU MSs. In recent years it has ranged from 80 to 110 thousand ha, unexpectedly exceeding the level of 114.5 thousand ha in 2011, i.e. by 25% than in the previous year. In the European Union only two GM varieties are approved – maize and potato, yet nearly all crops cover maize (in 2011, modified potatoes were used only within 17 ha). Among all the MSs, GMO crops were noted in 6 (Spain, Portugal, Czech Republic, Poland, Slovakia and Romania), and Spain has for years been the leader with an 85% share in sown area.



State	2000	2009	2010	2011
USA	30.3	64.0	66.8	69.0
Brazil	-	21.4	25.4	30.3
Argentina	10.0	21.3	22.9	23.7
India	-	8.4	9.4	10.6
Canada	3.0	8.2	8.8	10.4
China	0.5	3.7	3.5	3.9
Paraguay	-	2.2	2.6	2.8
Pakistan	-	-	2.4	2.6
South Africa	0.2	2.1	2.2	2.3
Uruguay	<0.1	0.8	1.1	1.3
Total	44.2	134.0	148.0	160.0

Figure 1. World area of crops and main producers of GM plants (million ha)

Source: James C. 2001-2010: Global Status of Commercialized Biotech/GM Crops; no. 21, 39 and 43, ISAAA.

Polish experience with cultivation of GM plants is relatively small. Commercial crops of maize resistant to *Ostrinia nubilalis* were launched in 2007 with the crop area of 327 ha. The area increased in subsequent years to 3 thousand ha[1], yet due to the lack of appropriate legal regulations this volume is not registered in any way and bases on estimations of trade organisations and seed companies. Due to the prohibition on entering GMO varieties in the national register of cultivated plant varieties there is also no control of the manner and volume of seed material obtained by farmers.

Legal aspects of GMO in the European Union and Poland

The way GMO issues are put in the legal framework varies from one country or country group to another. In general, three basic approaches may be identified: sectoral (vertical), horizontal and mixed (Erechemla, 2006). The sectoral

[1] Annual monitoring report on the cultivation of MON 810 in 2010 Czech Republic, Poland, Portugal, Romania, Slovakia, and Spain, Monsanto Europe S.A., July 2011.

approach is based on the assumption that GMOs are perceived as any other element of a given product and as such are subject to existing regulations on the whole product as part of legal schemes on food, plant protection, etc. In practice it means that the use of the same modified organism may be interpreted differently, thus a certain comprehensiveness of control is lacking. Such an approach is preferred e.g. in the USA. On the other hand, horizontal approach recognises GMO as a whole, irrespective of their use, and regulations of this kind are used in the EU legislation and that of respective Member States. However, they do not exclude effective sectoral regulations, which often have fundamental meaning for GMO functioning in a given state.

GMO-related issues are, in a way, also regulated by international acts. This includes the Convention on Diversity of 1992 (ratified by Poland in 1995[2]) and the Cartagena Protocol on Biosafety (ratified by Poland in 2003[3]). The purpose of the convention is "conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding". Meanwhile, the protocol specifies the rules and procedures regarding safe transfer (in particular cross-border movement of organisms), provision and use of living modified organisms which may have negative impact on maintenance and sustainable use of biological diversity, taking into account the threat to human health.

Controversies related to cultivation and use of GM plants made the legal regulations focus mainly on assurance of tight control of the whole process of creating new plants and their products, beginning from laboratory works through the possibility of their transition to finished products on shelves with relevant labelling.

The field of GMOs has been regulated quite thoroughly in the EU legislation[4] (Dzwonkowski, Hryszko, 2011). The rules of conduct as part of closed use of genetically modified organisms and deliberate GMO release into the environment were first established in 1990. In the years to come, the provisions were

[2] Drawn up in Rio de Janeiro on 5 June 1992 (OJ No 184, item 1532 of 6 November 2002).

[3] Cartagena Protocol on Biosafety to the Convention on Diversity, drawn up in Montreal on 29 January 2000 (OJ No 216, item 2201 of 4 October 2004).

[4] GMO-related issues are, in a way, also regulated by international acts. This includes the Convention on Diversity of 1992 (ratified by Poland in 1995, OJ No 182, item 1532 of 6 November 2002) and Cartagena Protocol on Biosafety signed as part thereof (ratified by Poland in 2003, OJ No 216, item 2201 of 4 October 2004). The purpose of the convention is "conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding". Meanwhile, the protocol specifies the rules and procedures regarding safe transfer (in particular cross-border transfer of organisms), provision and use of living modified organisms which may have negative impact on maintenance and sustainable use of biological diversity, taking into account threat to human health.

supplemented and amended, and the currently applicable ones are those of 2001 and 2009. Conditions for carrying out laboratory tests were strictly defined in the Directive of European Parliament and of the Council 2009/41/EC of 6 May 2009 on the contained use of genetically modified micro-organisms[5], while issues of marketing GM products and the release of GMO into the environment were regulated in the Directive of the European Parliament and of the Council 2001/18/EC of 12 March 2001 on the deliberate release into the environment of genetically modified organisms[6]. The latter Directive was amended in 2003 by two Regulations of the European parliament and of the Council: No 1829/2003 of 15 July 2003 on genetically modified food and feed[7] and No 1830/2003 of 22 September 2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms[8]. The Regulations refer mainly to the provisions on marketing of GM products. They extend and complement the procedures related to control and granting consents to market foodstuffs and feed as GMO or containing GMO. They also introduce a new labelling system. The EU legal scheme regulating the GMO issues is also composed of the Regulation of the European Parliament and of the Council No 1945 of 15 July 2003 on transboundary movements of genetically modified organisms[9]. Common position on the co-existence of GMO crops with other crops is still lacking. The Commission only issued recommendations for the development of national strategies in this regard[10]. Putting GMO in legal framework in the European Union is therefore largely horizontal and perceives GMO as a whole, irrespective of the manner of using the plants, seed or products. However, it does not exclude the application of sectoral regulations, which are still exceptional. The provisions on GMO referring to specific branches of the economy can be found e.g. in the Regulation of the European Parliament and of the Council No 258/97/EC of 27 January 1997 concerning novel foods and novel food ingredients[11], or in the seed and forest law.

One of the effects of Poland's accession to the European Union was the necessity to adjust national legal provisions to Community regulations and to assume the rule of primacy of the European Union law over the relevant provisions of national legislation. This basic rule is, however, often broken, and in many cases the provisions of national legal acts are in conflict with the directives and regulations of the relevant EU authorities, which in turn leads to the necessity to decide cases before the Court of Justice of the European Union

[5] OJ L 125/75, 21/05/2009.

[6] OJ L 106, 17/04/2001, pp. 0001 – 0039.

[7] OJ L 268, 18/10/2003, pp. 0001 – 0023.

[8] OJ L 268, 18/10/2003, pp. 0024 – 0028.

[9] OJ L 287, 05/11/2003, pp. 0001 – 0010.

[10] Commission Recommendation on guidelines for the development of national strategies and best practices to ensure the coexistence of genetically modified crops with conventional and organic forming. Brussels, 23 July 2003.

[11] OJ L 043, 14/02/1997, pp. 0001 – 0006.

and expose Poland to possible financial penalties. Legal acts relating directly or indirectly to issues pertaining to the use of GM plants provide example of such divergences of recent years.

Polish legal provisions regulating the rules of conduct as regards GMOs date back to the 1980's, when partial provisions on their controlled use were introduced, but only in 1997 it was necessary to obtain consents for field tests. The issues of GMOs were regulated comprehensively in 2001 with the subsequent stages of national law harmonisation with Community law. The act on genetically modified organisms[12] systematised the closed use, deliberate release, marketing, exporting and transit of GMOs as well as tasks of governmental administration bodies. The act was accompanied by five implementing acts, elaborating on the tasks resulting from the act (Dzwonkowski, Hryszko, 2011). Pursuant to the act, the body responsible for GMOs in Poland, in the scope of closed use and deliberate release, shall be the Ministry of the Environment, while the procedure of marketing GMO products is uniform in all Member States and adopted by voting at the Commission (by qualified majority of votes). Product allowed to be marketed pursuant to application of a given state is simultaneously allowed to be marketed within the whole EU. Decisions are issued for the period not exceeding 10 years. Contrary to legal framework applicable in the EU, sectoral acts in Poland have fundamental meaning for the functioning of GMO. Pursuant to the position of the government of 2008[13], Poland strives after obtaining a status of non-GMO state, i.e. one that prohibits cultivation, marketing and releasing into the environment for experimental reasons. Only laboratory works are supported. In order to implement these premises, the sectoral laws (feedstuffs[14] and seed laws[15]) introduce provisions allowing the production, marketing and use in animal feeding feedstuffs containing GM seed and possibility to enter GM plants in the national register of cultivated plant varieties and marketing of seed material were prohibited. Even though by the end of 2012 moratorium on the application of provisions of the act on feedstuffs will be in force and import of GMO feed is allowed, both acts, in their disputable parts, are noncompliant with Community case-law. Currently, three proceedings are pending before the Court of Justice. Next to the seed[16] and feed acts, the Commission expressed reservations as to the incomplete implementation of directives on the contained use of genetically modified micro-organisms - Directive 2009/41/EC (Kraińska, 2012). The Polish government, in its attempt to align Polish vision of non-GMO country to the EU provisions, carries out legislation works on amendment of problematic provisions of the acts. In 2011, the act on seed was amended by allowing the possibility to enter GM varieties in the

[12] Dz.U. of 2007, no. 36, item. 233.

[13] Document adopted by the Council of Ministers on 18 November 2008 (http://gmo.mos.gov.pl/pobierz/GMO_RAMOWE_STANOWISKO_POLSKI.pdf).

[14] Act of 22 July 2006 on feedstuffs (Dz.U. 2006, no. 144, item 1045), as amended.

[15] Act on seed of 26 June 2003 (Dz.U. 2007, no. 41, item 271), as amended.

[16] The judgement was made on 17 July 2009 (Case c-165/08). The Commission awaits the implementation of the new law.

catalogue of cultivated plants, yet also the prohibition on purchase and sale of GM seed was introduced. The act therefore remains non-compliant with the EU legislation, which provided basis for a veto by the President of the Republic of Poland. Works on a draft new basic law regulating the entirety of GMO-related issues have been carried out for several years. Without it and in the current state, national legislation is mainly leaky and the number of institutions supervising and controlling the observance of law results in the fact that in practice GMO is used on uncontrolled basis. Proposals made for the new law, in compliance with the position of the government, strive to eliminate GMO plants and product use in Poland by way of introducing a ban on crops and marketing of genetically modified organisms. If such provisions were adopted, it would result in further conflict with the EU legislation.

However, the EU legislation contains a number of provisions allowing for certain limitation of allowing for GMO use or marketing without the necessity to introduce conflicting solutions. Directive 2001/18/EC allows for two cases (Article 23 and 26a), where limitations in this regard may be introduced. The first results from the safeguard clause, allowing a given state to provisionally restrict or prohibit the use and sale of GMO, as a result of presenting the most complete risk assessment possible to obtain in a given case, pointing to the negative impact of a given GMO on human health or the natural environment. Another article of this Directive allows Member States to introduce measures to prevent unintended GMO occurrence in other products. It is also possible for Poland, pursuant to the judgment of the General Court[17], to introduce a ban on GMO plants cultivation outside areas designated by the minister of agriculture. The law also allows for provisional suspension of use of food or its GMO ingredient pursuant to the Novel Food Regulation (Article 12). Though there exist real chances for limitation of GMO occurrence in accordance with the legislation, they have not been taken advantage of yet in Poland.

Discussion is also currently held on the European forum on the future of GMO. It focuses on amending the Directive 2001/18/EC and allowing Member States' legal independence when deciding on GMO crops on other grounds that those based on risk assessment for health and environmental risk. Agreement is currently hindered by several states (including France, Germany, Great Britain, Spain and Belgium), which justify their opposition by "fragmentation" of internal European Union market. It is worth underlining that the new provisions may again form an argument between the EU and world GMO potentates on the WTO forum.

GMO versus the development of rural areas

Attempt to make Poland a non-GMO state often results from the impact of political and economic interest groups, while the most important opinion is passed over, i.e. that of farmers, food producers and consumers. Outcomes

[17] Judgement of the Court of 9 December 2010 – Poland vs. Commission (Case T-69/08).

of ban or approval of the new technology use should also be examined in a wider perspective, in economic, social and cultural aspects as well as impact on the natural environment. Biotechnology has significant impact on these areas by modifying the current model of agriculture and the area of social relations in rural areas.

In the era of globalisation and permanent competition, GMO has primarily economic significance. According to estimations, in 2009 the global benefits following from GM plants use in cultivation reached nearly USD 10.8 billion, and since 1996 they exceeded USD 64 billion in total (Brookes, Barfoot, 2011). The greatest benefits in the whole period were produced by cultivations of modified soy, where income increased by 39%, followed by cotton (30%) and maize with a 26% share. However in recent years, the significance of soy has been decreasing to the benefit of other plants, which are often already modified on two levels and which generate greater income growth. In 2009, on average, the new technology contributed to the increase of farmers' income by 5.8%, with considerable variation of the respective species. The greatest benefits were produced by pest resistant cotton crops (income growth by 13.3%), rape with herbicide tolerance (by 7.1%) and pest resistant maize (by 5.7%). Slight economic benefits were produced by cultivation of GM plants of other species.

Benefits of using GM plants for Polish farmers would now only concern maize under reference no. MON810, which demonstrates features of resistance to Lepidoptera insects (e.g. *Ostrinia nubilalis*). This pest poses serious threat to size and quality of maize harvest in Poland, in particular grain maize (Bereś, 2011), and the area of its cultivation covers 14 voivodeships (except for Pomorskie and Kujawsko-Pomorskie). It is most often found in the South of Poland, where plant damages may reach 40-60% of crops, and in extreme cases even up to 80-100%. Conventional methods of eliminating this pest are comprehensive and combine chemical and biological measures with prevention measures, but often fail to bring the desired results. Consequently, farmers have become increasingly interested in cultivation of genetically modified plants. According to research carried out by a seed company between 2005 and 2006 within three voivodeships - Małopolskie, Podkarpackie and Lubelskie (Bereś, Gabarkiewicz, 2008), GM maize varieties demonstrated high resistance to pests, and its effectiveness ranged from 97.9 to 100%. Field research results provided basis for simulation of calculation of direct surplus in field cultivation of GM maize in Poland (Brookes, 2007). From the economic point of view, the greatest benefits of these crops would be produced within the areas of Poland with high pest presence, where the increase of harvest by nearly 1/4 would cover, with large surplus (up to 78%) the increase of production costs of necessary purchase of more expensive seed. In voivodeships of the North, farmers would, however, obtain lower direct surplus (up to 18%) as compared to conventional crops. Research of other EU Member States demonstrates that average growth of the level of direct surplus between 1998 and 2006 was from 12% (Spain) to 22% (Portugal). In 2005, a simulation was

produced for Polish conditions as regards the use of also other GM plants resistant to herbicides: rape, sugar beet and maize (Anioł, Brookes, 2005). In the case of rape and sugar beet the possible harvest growth would be by 15-30% and direct surplus would increase by 30-90%. Meanwhile, as regards maize crops, both grain and silage maize, harvest growth should not be expected, which in a slight percentage of farms may lead to deterioration of production profitability as compared to conventional plants. Theoretical growth of value added on the use of GM plants in Polish agriculture (with 65% adoption in rape and sugar beet crops, 35% for maize resistant to herbicides and 10% share for maize resistant to pests) could reach from 0.5 to 1.0% of the value of agricultural production. Under the current legal scheme and use of maize resistant to pests only the surplus may reach ca. EUR 3-4 million per annum (Józwiak, 2012). The fundamental issue concerns, however, the possible cost of co-existence of GMO crops with conventional and organic farming, as well as who would incur those costs. This refers e.g. to the level of a farm (e.g. necessity to maintain spatial isolation[18]), control of transport and processing in feed plants as well as food production. Research reveals that in order to maintain 0.9% threshold of quantification of GM content in products, average food processing holding in the European Union would have to incur costs from EUR 50 to 880 thousand per annum (Then, Stolze, 2009).

The issue of whether to use or not GMO in field crops is considerably insignificant in Poland from the point of view of economic aspects, yet political decisions to possibly prohibit marketing of GMO products, in particular protein feed components, may have negative effects for farmers carrying out commodity animal production (poultry and pig livestock, and bovine animals to a lesser extent). Every year Poland imports 1.8 – 2.0 million tonnes of soya bean meal, i.e. ca. 50% of national demand for protein meal. Replacing such great quantities of GM raw materials for feed production with non-transgenic plant varieties or other species of protein plants and raw materials of animal origin, under current market conditions, would result in the increase of feed production costs from the level of 3 to 10% (non-GMO soy) to 15-30% in the case of use of other plants or fishmeal (Dzwonkowski, Hryszko, 2011; Seremak-Bulge 2008). In the years to come, further growth of prices of non-GMO soy as compared to modified soy should be expected. Current price differences stand at ca. 20%, yet assuming that availability of non-GMO raw materials on the international market will decrease, the differences may increase to 30-40%. Consequently, the ban on import of GM meal will have considerable impact on deterioration of profitability of animal production and feed processing in Poland and limitation of competitiveness of our products on the Community market. According to IAFE-NRI (Józwiak, 2012) calculations,

[18] According to Recommendations of the European Coexistence Bureau (ECoB) it should be from 15 to 50 m, which would allow obtaining the level of 0.9% of GMO content in food and conventional feed (threshold quantification value). Limitation of the level of mixing crops to even lower levels (e.g. to the value of 0.1% - considered the threshold of quantification) is possible with the application of even greater distance (from 100 to 500 m). According to research carried out in Spain (2002-2004) the cost of maintenance of such buffer zones in maize cultivation would be EUR 84 per ha (Gómez-Barbero, Rodríguez-Cerezo 2006).

assuming that there would be a ban on import of GM soy bean meal between 1999 and 2009, income in agriculture would decrease in total by ca. PLN 6.8 billion, i.e. by the average of 5% per annum in the pre-accession period and ca. 3% in the years to come.

Economic effects of possible maintenance of noncompliance of national law with the EU legislation also brings certain social costs. Failing to observe the judgements of the Court of Justice may result in financial sanctions imposed on Poland to the amount from EUR 1.4 to 28.9 thousand daily in the case of first noncompliance with the guidelines of the Court of Justice. If the decision is evaded from again, the amount would increase to EUR 4.5-270.0 thousand daily and the lump sum penalty (for Poland – minimum EUR 4.163 million). In 2007, such a penalty was imposed e.g. on France for failing to enforce the Directive of releasing GMOs. The Court of Justice decided on the amount of penalty for each day of delay, which brought the amount due of over EUR 42 million.

State policy on GMOs fails to ensure basic rules on co-existence of GMO-using crops and conventional and organic farming. Due to the lack of consent to enter GM seed in the national register of cultivated plant varieties, farmers willing to apply such technology have to buy it abroad, thus bringing about uncontrolled release of GMO into the environment. Despite recommendations of the Commission, provisions on the rules of possible co-existence are lacking as well. This may expose conventional and organic farming to considerable financial losses related to the detection of GMO in products offered. The problem of lack of knowledge of possible crop contamination also relates to feed processing plants and food producers, since the farmer is not obliged to inform of the origin of seed used in cultivation[19]. This also relates to the problem of patent ownership of seed companies, since if such seed is used without licence payments, the farmers may suffer financial consequences, despite the lack of knowledge of their ownership (intervarietal cross-breeds or contamination of seed material with GMO). This may lead to future social conflicts in rural areas.

Inasmuch as economic issues usually speak in favour of the possibility to increase production potential in agriculture, possible negative impact of new technology is noted in respect of GMO impact on the environment and natural potential of rural areas (Lisowska, Chorąży, 2010). Mixing GM plant genome with conventional plants may lead to the production of uniform varieties, which would result in limitation of biological diversity of a given area. Use of herbicide resistant plants (glyphosate) in cultivation is in principle intended to decrease the consumption of the quantity of plant protection products and simplify agricultural engineering. However, there is a risk that excessive use of one type of herbicide may lead to immunisation of weed to these products and development

[19] In 2009, Swedish company Lantmannen detected 3.9% share of modified seed in maize declared as GMO free imported from Poland.

of the so-called superweed, and this will consequently require the increase or substitution of products with more toxic ones and consequently not to the decrease but increase of chemicals-based approach to plan protection. Possible negative impact of GMOs containing Bt gene on other insects and soil fauna is also noted. Research to date fails to confirm the possibility of negative impact on livestock fed with GMO feed (Brzóska, Świątkiewicz, 2011). However, it seems that detection of such risks would require multiannual observations.

Conclusions

Genetically modified plants have quickly become part of the global agri-food economy by arousing much controversy and discussions. Seed companies, in order to retain their economic existence, strive after presenting their products in the best possible light, while numerous social groups oppose to technical interference in the natural environment. Between these groups there is a country which should provide for rational use of the new technology without discriminating any of the parties through legal provisions. Many years of conflicts between the respective interest groups in Poland lead to the application of legal regulations which unfortunately fail, above all, to guarantee whether a given product was produced with or without GMO ingredients. Willingness to make Poland a non-GMO state through certain legal provisions lead in practice to uncontrolled release of GMO into the environment, without due control, registration and information. Farmers, making use of primacy of Community law over national law, draw benefits from GM plants cultivation, risking possible losses of other farmers involved in traditional and organic farming. Polish side has, so far, failed to benefit from a number of possibilities offered by the EU legislation as to the formal ban on crops or marketing of GMO products and active participation in shaping the new policy on the European forum in this regard. Law was chosen, which may soon result in measurable financial costs in the case of unfavourable judgments of the Court of Justice, ordering the Polish side to modify the faulty law. However, it should be borne in mind that there are certain agricultural producers and processing plants (poultry, pork producers, feed industry), for whom the lack of possibility to use GMOs may signify the loss of good competitive position on the market. Large numbers of unknown effects of long-term use of GMO should, however, speak in favour of caution while establishing law.

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