

## Effects of applying EU legislation on cultivation of transgenic herbicide-resistant soybean in Romania

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**Abstract** Romania is one of the few European countries with favorable conditions for soybean production. Herbicide tolerant soybeans (Roundup Ready, RR) were grown commercially beginning with 1999 and accounted for 68% of all soybeans planted in 2006. This technology has provided farmers with productivity improvements through a combination of yield improvements and cost reductions. On January 1, 2007, when joining the European Union, Romania had, in accordance with obligations under the Treaty of Accession, to stop GM soy cultivation, although growing this crop generated substantially higher net farm income gains per hectare than in any of the other country using this technology. Following the implementation of EU law, Romania became the only country that prohibited the use of transgenic plants, plants that brought substantial profits not only to farmers. In only two years, the area planted to soybeans has shrunk with 70%, while Romania became a net importer of vegetable protein, just like the European Union itself. In 2008, EU-27 produced only 0.65 million tones of soybean. The EU annually imports 15.4 millions of soybean and 24-25 millions of soybean meal. Therefore, this GMO is not cultivated, but is imported in huge quantities in the form of grains and meals, from Argentina, Brazil, USA, etc., large countries that grow transgenic soybeans. In 2009, genetically modified cultivars in the United States occupied 91% of the total area allocated to soybeans in Argentina - 99% and in Brazil - 69%, with evident upward trend. Following the implementation of legislation governing the cultivation of transgenic plants in the European Union, from a growing RR soybean, Romania became an importing country of this product. The effect of no longer using the current widely used biotech trait in the soybean, at the national economy's level, is hard currency losses (as a result of increased imports) estimated to exceeded millions of euros per year.

### Key words

RR soybean, EU legislation, GMOs

The legislation adopted by the European Union, after two rounds of debate and amendments, through co-decision procedure between the European Parliament (directly elected) and Council of Ministers (from the Member States), is mandatory for all 27 Member States. The regulatory framework of Member States is thus determined by legislation adopted at European level.

EU legislative framework governing the activities and the introduction of GMOs into the environment is based on several Directives and regulations transposed and assumed into Romanian legislation:

- ✓ European Union Directive 2001/18/EC concerning the introduction of genetically modified organisms into the environment, implemented by law 247/2009 approving

Government Emergency Ordinance (GEO) no. 43/2007;

- ✓ European Union Directive 90/219/EC regarding the use in conditions of isolation of genetically modified microorganisms (GMM), transposed by law no. 3/09.01.2008 for the GEO approval no. 44/2007;
- ✓ EC Regulation 1829/2003 concerning the imports of genetically modified food and feed, taken by the National Sanitary Veterinary and Food Safety Authority (ANSVSA), by Government Decision (GD) no. 173/2006 [9];
- ✓ EC Regulation 1830/2003 on traceability and labeling of products from / with genetically modified organisms, assumed by ANSVSA by GD no. 256/2006 [10];
- ✓ Recommendation 556/2003 concerning the coexistence of genetically modified crops with

conventional (pursuant to subsidiarity principle, Member States should develop national strategies and implement the appropriate coexistence measures, as holdings structure, agricultural production systems, natural and economic conditions in the EU are very different).

According to EU biosafety regulation:

- risk follows from breeding method not from traits;
- only breeding based on recombinant DNA generates risk to biosafety; all others are safe and need no regulation

For cultivation of GMPs and their use as food and feed are granted authorizations. A genetically modified plant whose marketing has been approved by the European Commission's decision was considered, in advance, safe for the environment, and human and animal consumption, by EFSA [8]. Decisions on the introduction in commercial crops are taken at EC level and applied, in principle, by all EU countries.

It is widely acknowledged that agriculture requires new technology to grow plants under rapid climate change, to increase production and to stop the spread of diseases and pests. Large-scale use of new products developed through modern biotechnology would enable the completion of at least some of these goals [11].

This paper summarizes the impacts of discontinuing RR soybean cultivation as consequence of applying UE legislation regarding cultivation of genetically modified plants. Before EU membership, Romania was approved for commercial cultivation of soybeans tolerant to glyphosate herbicide active ingredient. The EU does not approve the cultivation of these GM plants. In contrast, EU imports every year, millions of tons of soybeans from the main countries growing transgenic soybeans [12, 6]. Following the implementation of legislation governing the cultivation of transgenic plants in the European Union, from a growing RR soybeans, Romania became importer of this product. In other words, it can not cultivate what is consumed!

## A record 87-fold increase in hectareage between 1996 and 2010, making biotech crops the fastest adopted crop technology in the history of modern agriculture

### Genetically modified soybean: a global perspective

While 29 countries planted commercialized biotech crops in 2009, an additional 30 countries, totaling 59 have granted regulatory approvals for biotech crops for import for food and feed use and for release into the environment since 1996. It is noteworthy that 75% of the world's population live in the 59 countries that have approved biotech crops for planting or import. A total of 964 approvals have been granted for 84 events for 24 crops [11].

The event that has received regulatory approval in most countries is herbicide tolerant soybean event GTS-40-3-2 with 23 approvals.

Tolerant soybeans to glyphosate herbicide active ingredient approved for marketing in 1996, the U.S., in 2010, was cultivated in 11 countries (Table 1), on 65.8 million hectares [11]. The data in Table 1 shows that Romania is the only country where the cultivation of transgenic plants was prohibited several years after the adoption rate has increased steadily [6].

In 2009, genetically modified cultivars in the United States occupied 91% of the total area allocated to soybeans in Argentina - 99% and in Brazil - 69%, with evident upward trend [3].

Roundup Ready soybean (event 40-3-2) is approved for marketing in EU (Commission Decision 96/281/EC dated 3 April 1996). This decision allows for the importation of seed into EU for industrial processing into non-viable products including animal feeds, food and any other products in which soybean fraction are used, only. In 2008 from its own production, only 0,68 million tons, can only address 2% of soy milk [13]. The RR soybean is approved for marketing only in Australia, China, Korea, Swiss, Philippines, Japan and Russia (Table 2).

Table 1

**Countries in which is/was approved commercial cultivation of RR soybean**

Country	1996	97	98	99	2000	01	02	03	04	05	06	07	08	09	10	11
USA	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Canada		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Brazil								x	x	x	x	x	x	x	x	x
Argentina	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Mexico				x	x	x	x	x	x	x	x	x	x	x	x	x
South Africa						x	x	x	x	x	x	x	x	x	x	x
Romania				x	x	x	x	x	x	x	x	-	-	-	-	-
Paraguay										x	x	x	x	x	x	x
Uruguay						x	x	x	x	x	x	x	x	x	x	x
Costa Rica														x	x	x
Chile														x	x	x
Bolivia														x	x	x

It can already speak about a history of consumption of products derived from RR soy, which does not record any adverse effect on consumer health. The history of agriculture has not known another case of such rapid

adoption of new technologies. In 2010, global glyphosate tolerant cultivars occupied 81% of the 90 million hectares allocated to soybean [11].

Table 2

**The approvals given of herbicide tolerant soybean utilization**

Country	Year of environmental release approval	Year of food and/or feed utilization approval	Year of food utilization approval	Year of feed utilization approval	Year of marketing approval
South Africa	2001		2001	2001	
Argentina	1996				
Australia			2000		
Bolivia	2008				
Brazil	1998				
Canada	1995				
China		2004			
Colombia		2005			
Korea			2000	2004	
Switzerland			1996	1996	
Russian Federation			1999		1999
Philippine			2003	2003	
Japan	1996		1996	1996	
Mexico	1998		1998	1998	
Paraguay	2004	2004			
Czech Republic			2001	2001	2001
United Kingdom of The Great Britain			1996	1996	
USA	1994	1994			
Taiwan			2002		
European Union		2005			1996
Uruguay	1997		1997	1997	

Source:www.AGBIOS.com

### Soybean production in Romania

Table 3

**Soybean production in Romania**

Year	Harvested area (ha)	Production (tonnes)	Yield per hectare (kg/ha)
1989	512,000	303,900	593.32
1990	190,228	141,173	742.13
1999	99,800	183,400	1838.0
2000	117,000	69,500	994.02
2001	44,800	72,700	1623.0
2002	71,800	145,900	2033.0
2003	128,800	224,900	1840.06
2004	122,400	298,506	2452.0
2005	143,100	312,800	2186.0
2006	190,800	344,900	1807.0
2007	113,100	107,400	949.0
2008	53,000	90,000*	1700.0*
2009	63,000		

Sources: FAOSTAT 2006; Ministry of Agriculture and Rural Development (MARD), 2008

\*Current official estimates

In 1989, soybean was grown on 512,2 thousands hectares. Since 1990, when liberalization and market-economy orientation, decreased interest in

conventional soybean. Between 1990 and 2002, with few exceptions, surfaces that conventional soybeans grown were kept below 100 000 hectares and total

production were obtained under 140 000 tonnes (Table 3).

In 2000, Romania was the only country in Europe approving market release of genetically modified soybean. Romania is one of the European countries with favorable conditions for soybean production and, in 2006, was one of the nine countries in the world that cultivated this GM crop (Table 1).

As member of the European Union beginning with 2007, Romania must comply with the rules for

placing on the market of genetically modified organisms as laid down by EU legislation. Consequently, as of 2007, Roundup Ready soybean cultivation was banned in Romania. With no access to the RR technology, the soybean area has started to decline in 2007, reaching 113 thousand Ha, while in 2009 only 63000 Ha were planted to this crop [2]. This is equivalent with a 70% reduction in three years. Romania is currently increasingly dependent of soybean imports.

Table 4

**Farm level income impact of using herbicide tolerant soybeans in Romania 1999-2006**

Year	Cost saving (\$/ha)	Cost savings net of cost of technology (\$/ha)	Net increase in gross margin (\$/ha)	Impact on farm income at a national level (\$ millions)	Increase in national farm income as % of farm level value of national production
1999	162.08	2.08	105.18	1.63	4.0
2000	140.30	-19.7	89.14	3.21	8.2
2001	147.33	-0.67	107.17	1.93	10.3
2002	167.80	32.8	157.41	5.19	14.6
2003	206.70	76.7	219.01	8.76	12.7
2004	63.33	8.81	135.86	9.51	13.7
2005	64.54	9.10	76.16	6.69	12.2
2006	64.99	9.10	58.79	7.64	9.3

Source: Brookes & Barfoot, 2011

According to Brookes & Barfoot [3], the growing of GM HT soybeans in Romania, in the period 1999-2006, had resulted in substantially greater net farm income gains per hectare than any of the other countries using the technology. In the first year of cultivation yield gains of an average of 31% have been recorded. In the last years, as fields have been cleaned of problem weeds, the average yield gains have decreased and were reported at +13% in 2006. The relatively high cost of the technology to farmers (\$120/ha to \$130/ha) however, did not deter adoption of the technology because of the major yield gains, improvements in the quality of soybeans produced (less weed material in the beans sold to crushers which resulted in price premia being obtained) and cost savings derived. The average net increase in gross margin in 2006 was \$59/ha (an average of \$105/ha over the eight years of commercial use (Table 4).

At the national level, the increase in farm income amounted to \$7.6 million in 2006. Cumulatively in the period 1999-2006 the increase in farm income was \$44.6 million (in nominal terms). The yield gains in 2006 were equivalent to a 9% increase in national production (the annual average increase in production over the eight years was equal to 10.1%).

In added value terms, the combined effect of higher yields, improved quality of beans and reduced cost of production on farm income in 2006 was equivalent to an annual increase in production of 9.3% (33230 tonnes).

#### **The economic impact of RR soybean cultivation interdiction in Romania**

Respecting the obligations by signing the Accession Treaty, Romania banned GM soy cultivation on its territory. Immediate result was a sharp decline on the area that was cultivated with soybean from 200000 hectares in 2006 to 46900 hectares in 2009. Total production fell from 344900 tonnes in 2006 to 86300 tonnes in 2009.

Compared to 2006, in 2007, Romania had to work additional currency, amounting to €60.5 million to compensate for deficient quantities of grain (over €30 million), the meals (about €20 million) and €10 million for soybean oil that was no more exported [6].

In 2008, the value of the trade deficit for the three products has increased. The difference between trade balances in 2008 and in 2006 reached €117.353 million, of which €58,084 million were due to additional imports of soybean meals, €39.322 million for grain imports, and €19,947 million for soy oil [6].

In real terms, the increasing trade deficit is found as an indirect loss to soybean cultivators farmers, but especially those who had to abandon the transgenic soybeans.

Following the interdiction of GM soy cultivation, most Romanian farmers dropped soybean cultivation in general, considering that the subsidy scheme is not sufficiently remunerative up for a lack of competitiveness of conventional crop varieties.

**The reserve of farmers to conventional soybean cultivation is fully justified. No farmer will not accept economic losses, to practice masive energy consumption agriculture, to infest the soil with weed seeds or harmful chemicals [4].**

**In conclusion, transgenic soybean interdiction cultivation caused [6]:**

- sharp drop in soybean allocated areas and thus the production of grains, resulting in problems to ensure the chain of transformation of raw materials;
- significant increase in imports of soybeans, Romania becoming net importer of soybeans, with an additional currency rate effort of € 60,5 million in 2007 and of €117,353 million in 2008;
- potential profit loss of €11,1 million by farmers in 2007 and €19,85 million in the second year;
- allocation of direct support by the state for conventional soybean cultivation of €9,7 million in 2007 and €8,3 million in 2008, although insufficient to overcome the lack of competitiveness of this culture and make it attractive for farmers;
- indirect loss of €3,4 million in 2007 and of €5,865 million in 2008 caused to farmers without taking into account additional efforts to combat weed problems.

Romania having a potential of more 500 000 ha of soybean cultivation is harvesting about ten time less (65 000 ha, in 2009) and instead of exporting one million tons importing about 315000 t.

The existence of a legal framework is a necessary, but not the sufficient, conditions for adopting right decisions. Up to date in EU, although the biological and biosafety research on GM major crop plants were both intensively and extensively carried out, and many events are imported for processing and food and feed utilisation, only two events were approved for commercialization. This policy is thought to bring about enormous effects to the agricultural production of Romania.

**There is an urgent need for appropriate cost/time-effective regulatory systems that are responsible, rigorous and yet not onerous, requiring only modest resources that are within the means of most developing countries [11].**

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