



**ECOSENS** 

**Romania: The Dumping Ground for  
Genetically Engineered Crops -**

**A Threat to Romania's Agriculture, Biodiversity and EU Accession**

**by Iza Kruszewska  
ANPED**

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**The Northern Alliance for Sustainability (ANPED)** is a network of non-government organisations (NGOs) whose mission is to change unsustainable consumption and production patterns with an emphasis on the North. ANPED's role is to build sustainable societies by empowering grassroots organisations through sharing information and skills, common campaigns, publications and participation in international governmental conferences. ANPED networks groups working on Genetic Engineering, Local Agenda 21, Corporate Accountability and Environmental Justice. We are a democratic network of NGOs and voluntary organisations, with most of our members in Central and Eastern Europe (CEE) and the Newly Independent States (NIS). Membership is open to any such organisation sharing our aims.

ANPED's work on Genetic Engineering of Food and Agriculture in CEE and NIS started in 1996. Since late 1999, ANPED has been mapping the level of commercialisation of GMOs and regulatory oversight of GMOs in specific CEE countries. To date, we have been published:

- ANPED-Green Action: "*Genetically Engineered Food and Crops in Croatia: A Threat to Sustainable Agriculture*", published in Zagreb, February 2000
- ANPED-EcoSouthWest: "*Bulgaria: The European Corporate Playground for Genetically Engineered Food and Agriculture*", published in Sofia, May 2000
- ANPED-MURE: "*What's for dinner Mum? Genetically Engineered Food and Crops in Poland*", published in Warsaw, May 2000
- ANPED-SEU: "*Genetically Engineered Food and Crops in Russia*", Moscow, November 2000
- ANPED-Umanotera: "*Slovenia - A GMO-free Zone; The Only Way to Protect Biodiversity and ensure Organic Agriculture can Thrive*", Ljubljana, June 2001
- ANPED-Green Network of Vojvodina, Serbia: "*Biosafety Policy and Practice in Yugoslavia*", April 2002

ANPED's GMO programme now includes groups from over 10 countries in the CEE-NIS region working together to raise public awareness of genetically engineered (GE) food. Since many of these NGOs are from EU candidate countries, in 2000, ANPED commissioned research into the implications of GMO policy in Eastern Europe for EU accession. The resulting report: "*EU Enlargement and GMOs - Chasing a Moving Target*" was released in Brussels together with Friends of the Earth, in December 2000. The report is available in 8 Eastern European languages.

**For more information:** [anped@anped.org](mailto:anped@anped.org) or visit our website: [www.anped.org](http://www.anped.org)

## **ECOSSENS**

**ECOSSENS** was founded in 1992, as a non-governmental organisation (NGO) working for environmental protection. Since 14 June 1993, ECOSSENS has been registered as an organisation with legal status. The members of this organisation are physical persons. Funding of ECOSSENS comes almost entirely from international government and non-government bodies.

ECOSSENS's projects include providing training on health and environment protection, engaging with public authorities on joint environmental activities and furthering institutional development of the organisation and of the non-government sector in general.

As its main goal, ECOSSENS promotes the principles of sustainable development at a local, national and international level. The objectives of ECOSSENS, decided by the General Assembly are:

1. Initiating a project for Local Agenda 21 in Bucharest, representing a program for the sustainable development of Romania's capital.
2. Implementing the Aarhus Convention in Romania, with respect to public access to information and participation in decision-making processes and access to justice on environmental matters.
3. Widening public information on the process of Romania's integration into the European Union and on the economic, social and environmental impact.

To do this, ECOSENS initiates and runs public awareness campaigns, as well as activities to involve local communities in the decision-making process, to speed up and strengthen the democratisation process of Romanian society. We do this through roundtables, public debates, petitions, as well as informational and educational publications, including folders, leaflets, posters.

At a national level, ECOSENS is a member of several environmental NGO working groups, such as the Romanian WG for Sustainable Transportation (GRTD), the National Group for Public Participation (GNPP) and the Romanian WG on Energy (GRLE).

**For more information:** Tel/Fax: +40 21 313 8560, Tel: + 40 21 212 9514  
or visit our website: [ecosens@fx.ro](mailto:ecosens@fx.ro)



### **Asociația Bioagricultorilor “Bioterra”**

The Bioterra Association is a private, non-profit organization of Romanian farmers committed to organic agriculture. Founded in 1997, its nearly 3,000 members produce dairy, grain, fruit, vegetables, wine and other products without using chemical fertilizers or pesticides on a total of 17,020 hectares. Of these, some 16,200 ha or some 2,678 farms are already certified according to international organic standards. Most members own smallholdings of 1-15 hectares.

Since 1992, Bioterra has been working with Swiss organic farming experts in organising seminars and enabling 30-35 Bioterra members to work on organic farms in Switzerland every year.

Since 1998, Bioterra has been publishing a quarterly 32-page magazine entitled *Bioterra*, publishing 8,000 copies of every issue, of which 1,000 are in Hungarian, and 7,000 in Romanian. Romania includes a large Hungarian-speaking minority, many of whom are involved in agriculture. Bioterra has also edited a *Guidebook on Organic Agriculture*, which provides rules on the production, processing, labelling and sales of organically grown agricultural products. Every year the guidebook is updated, to include all the new EU legislation.

Bioterra's most notable achievements have been the annual Conferences on Bioagriculture. Since 1999, the Bioterra Association has hosted what has become a much-respected gathering of organic farmers and experts, including many from other countries. The 4<sup>th</sup> Annual Conference held 25-26 October 2002 in Cluj-Napoca, attracted more than 200 participants.

The Government Ordinance No. 34/20 of April 2000 on organic agricultural production was significantly shaped by information provided both by Bioterra and by a specialist hired by Bioterra to draft the technical application norms of the ordinance.

An important factor in Bioterra's success has been its close ties with many strategic partners with whom it shares information and expertise, including the Food and Agriculture Organization (FAO), USAID's ACIDI- VOCA programme, foundations from Switzerland and Germany, and the EU's SAPARD program.

At present, Romania lacks its own organic certification body. Hence, members of Bioterra have developed a partnership with a certification body in Hungary, Biokontrol that provides not only technical assistance but also certification. As Biokontrol is not accredited to control animal products, they work with Ökogarantie, from Germany, to certify Romanian livestock farms, thus extending the Bioterra Association's network. Bioterra has relationships with similar organisations in Russia, Poland, Lithuania, and Macedonia.

Bioterra continues to organise seminars on organic farming instituted by its Swiss partners and led by organic experts. These seminars are held in ten locations around Romania. Local Romanian partners include the faculty of the University of Agricultural Science and Veterinary Medicine in Cluj-Napoca, and the Romanian Agricultural Extension Service (ANCA), which is distributing the ***Bioterra*** magazine and the ***Guidebook for Organic Agriculture*** in 41 counties.

For more information, Contact Tel.: +40 (0)264 266 606; Fax:: +40 (0)264 266 709  
E-mail: [bioterra@internet.ro](mailto:bioterra@internet.ro)

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## Executive Summary

This report is the result of investigative research undertaken to determine the current level of commercialisation of genetically engineered<sup>1</sup> (GE) crops and foods and the degree of regulatory oversight over gene technologies used in agriculture in Romania. Its purpose is to stop Romania being used as a dumping ground for this dangerous technology and its products, many of which have been rejected by the market in the European Union, or are illegal in the EU.

Romania is today torn between the pro-GMO position of the US and the more cautious approach to GMOs advocated by the EU. Romania has consistently proved compliant in supporting the US on issues such as the International Criminal Court, providing US air bases for a war on Iraq and promoting GMOs, taking positions that are out of sync with the most of Europe.

Romania is important in the struggle to keep Europe GMO-free, because it is alleged to be the source of GMO contamination of the Balkan region. For example, Romania is almost exclusively cited as the source of GMO contamination of soybeans grown in Vojvodina, Serbia - a centre of seed breeding - with the Roundup Ready (RR) gene owned by Monsanto. Yugoslav policy is not to allow the cultivation of GE crops.

Agriculture plays an important role in the Romanian economy. The south of the country along the Danube basin is characterised by flat, fertile plains and large intensive farming, growing mainly maize and wheat, with some sunflowers, sugarbeet and soybeans (the latter some 1% of arable land). In the mountainous region of Transylvania, farming is smaller scale and traditional with a rich biodiversity. Interest in organic farming is gaining momentum. The National Federation of Ecological Agricultural (FNAE) brings together some 4000 organic farmers. Moreover, the Government is promoting organic agriculture, especially in mountainous areas.

### ***Commercial cultivation of genetically engineered crops***

Monsanto's genetically engineered (GE) soybeans have been grown commercially in Romania since at least 1999. Known as Roundup Ready (RR), these soybeans have been genetically engineered to be resistant to the glyphosate-based herbicide, Roundup, made by Monsanto. According to the US Department of Agriculture, in 1999 genetically engineered RR soybeans already covered 15'000 ha, some 20% of total area under soybeans.<sup>2</sup> In 2000, Monsanto was quoted as saying that 30'000 ha - nearly half of all soybeans grown in Romania - were genetically engineered.<sup>3</sup> In 2000, ISAAA, the official communications arm of the agri-biotech industry reported that in 1999 Romania "*grew introductory areas of herbicide-tolerant soybean (14,250 ha) and planted <1,000 ha of Bt potatoes*".<sup>4</sup>

The 2002 edition of the National Seed Register<sup>5</sup> lists 7 GE varieties of Roundup tolerant soybeans that can be commercially grown in Romania. One estimate puts the area under GE Roundup tolerant soybeans at some 50,000 ha, out of a total of 100,000-120,000 ha under soybeans. Farmers growing GE soybeans claim that up to 75% of Romanian soybeans are genetically engineered because some farmers are saving the GE seed for planting the following year and buying generic glyphosate. In the autumn 2002, Monsanto's permit for the commercialisation of RR soybeans expired, but was renewed for a further 3-5 years.

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<sup>1</sup> In this report, the terms 'genetically engineered' (GE), 'genetically modified' (GM) and transgenic are used synonymously. Thus GE food means genetically engineered food and GMO means genetically modified organism

<sup>2</sup> US Department of Agriculture, Foreign Agricultural Service. GAIN Report # RO0005 by Holly Higgins, US Embassy: *Romania -Planting Seeds; Romanian Legislation for GMO Seeds*, 28 Feb 2000  
<http://www.fas.usda.gov/scripts/gd.asp?ID=25667501>

<sup>3</sup> *Watchdogs monitor GMO*, by Costin Motroasa, Bucharest Business Week, 4 September, 2000 Vol. 4, Nr. 30:  
[http://www.bbww.ro/article.cfm?sec=headlines&art\\_id=619&vol=4&nr=30](http://www.bbww.ro/article.cfm?sec=headlines&art_id=619&vol=4&nr=30)

<sup>4</sup> James, C. 2000. *Global Status of Commercialized Transgenic Crops: 1999*. ISAAA( International Service for the Acquisition of Agri-biotech Applications) Briefs No. 17, [www.isaaa.org](http://www.isaaa.org)

<sup>5</sup> Catalogul oficial al soiurilor (hibrizilor) de plante de cultură din România pentru anul 2002

The 2002 Seed Register also lists Monsanto's GE potato, commercially known as Newleaf, which is designed to kill the Colorado Potato beetle. These GE potatoes contain a modified gene of the natural toxin, *Bacillus thuringiensis* (*Bt*) to provide a built-in pesticide against the Colorado Beetle. All those interviewed when researching this report claim that *Bt* potatoes are not being cultivated in Romania, because the potato varieties imported by Monsanto failed due to disease. Of the three *Bt* potato varieties imported by Monsanto: Russet Burbank, Atlantic and Superior, only the Superior found its way onto the National Seed List, because the other varieties failed due to wart disease and phitoptora. The Superior *Bt* potato was first registered on the National Seed List in 1998.

In addition to domestic cultivation of GE crops, following a severe drought in 2000, Romania imported maize and soymeal. from the US and Argentina. In both countries, most soybeans are GE and in the US, some one third of maize is GE.

#### ***World Bank Funding for development of genetically engineered potato***

The failure of American varieties of *Bt* potatoes in Romania led to a World Bank technology transfer project to insert Monsanto's *Bt* gene construct into local Romanian potato varieties. This is being undertaken under an agreement between the Ministry of Agriculture (MAAP), the University of Timisoara and Monsanto. The project started about a year ago, and is on-going.

The potential funding of a nature park in Transylvania, where agriculture is to be solely organic, by the World Bank's sister organisation, the International Finance Corporation, reveals a disconnect in the agricultural policies of these organisations.

#### ***Lack of Regulatory Oversight***

In January 2000, Romania introduced a Government Ordinance No.49 on the Development, Testing, Use and Marketing of GMOs and their products that created a National Biosafety Commission to grant permits for releases of GMOs. Between 1997 and 2000, U.S. seed companies tested and registered at least 7 GE varieties in Romania: six for corn and one for soybeans. Until the GMO Ordinance was introduced, testing was allowed using the provisions of the law for basic seeds.<sup>6</sup>

Under Ordinance No.49, once the Biosafety Commission approved a GE plant variety for field trials, after some years of trials this GE variety would automatically be included on the National Seed List. This Biosafety Commission approved the environmental release of the following crops: RR soybeans, *Bt* potatoes and field trials of RR maize. However, the US seed company Pioneer Hi-Bred claims that it also registered *Bt* maize, resistant to corn borer, and LibertyLink maize, resistant to the glufosinate-based herbicide, Liberty.

In May 2002, a new law on GMOs, 214/2002, was published to harmonise Romanian regulations with those in the European Union. The new law makes the Ministry of Waters and Environmental Protection the competent authority for GMOs. The old Biosafety Commission was disbanded and a new one created in autumn 2002, whose mandate is only to advise on - and not authorise - the release of a GMO into the environment. This advice is forwarded to the Environment Ministry, who take a decision on whether to permit the release.

To date, the new Biosafety Commission has assessed two applications, one of which is for the environmental release of a GE wheat resistant to fusarium, submitted by the National Research Institute for Cereal and Industrial Plants in Fundulea together with an American university. Following a positive opinion of the Biosafety Commission, the Environment Ministry has still to decide whether to issue a permit for this release. In the U.S. and Canada farmers are actively opposing the introduction of GE wheat, due to concerns about consumer rejection of GE crops.

A law on Labelling of Food No. 106 came into force in February 2003. This harmonises with EU regulations and requires product-based labelling for food containing more than 1% of Monsanto's RR

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<sup>6</sup> *ibid.* USDA, Foreign Agricultural Service. GAIN Report # RO0005, Feb 2000 In May 2002, a new law #214 was published entitled: "Law on Obtaining, Testing, Using and Commercialisation of GMOs resulting from modern biotechnology as or in products".

soybeans and a variety of GE maize. Responsibility for implementation lies with three departments, none of whom have the means to implement this legal requirement.

EU policy and legislation on GMOs is becoming increasingly restrictive and transparent. The new Romanian GMO law improves transparency, but is undermined by a reluctant administration that is still dominated by the old system, in which U.S. corporate interests exert a lot of influence.

### ***Seed mix-up at the Institute of Variety Testing and Registration***

A report commissioned by the Agriculture Ministry to investigate the activities of the State Institute for (Plant) Variety Testing and Registration (ISTIS) reveals chaos within this seed registration body. The investigation was undertaken between 1<sup>st</sup> January and 31<sup>st</sup> July 2002. The resulting report published in August 2002, lists a number of transgressions, including the failure of ISTIS to describe the Superior Newleaf potato as genetically engineered in the 1999 edition of the National Seed List, which ISTIS prepared. The report concludes that ISTIS deliberately ignored Government policy which is to follow the EU's Directive 90/220.<sup>7</sup> The institute used the absence of legislation to hasten the testing process for GE potato, GE soybeans and GE hybrids of maize, thus breaching plant variety testing regulations.<sup>8</sup>

### ***What is being grown in Romania?***

This is a question probably nobody can answer with any certainty. A 2002 Agriculture Ministry press release claims that starting in 1998, the National Seed List featured 12 new GE varieties of potato, soybean, sugar beet and maize. In 2000, the (old) Biosafety Commission approved the growing and commercialisation of one GE *Bt* variety of potato and 2 varieties of GE RR soybeans. It also approved GE maize and GE sugar beet for field trials.<sup>9</sup>

The 2000 Ordinance did not require post-approval monitoring, so there are unlikely to be records of the fate of the GE crops authorised for release into the environment. Moreover, to this day, there is no certified laboratory appointed to test for GMOs in Romania. The poor controls on field trials, the tradition among farmers to save seed (even maize hybrids) plus the chaos at ISTIS contribute to a picture of chaos and confusion, with some GE plants potentially out of control.

### ***No public awareness***

Despite the cultivation of GE crops and their presence on the market, there is no public awareness about GMOs. GE soybeans are milled in Romania mainly for the domestic market. The soy oil is used to make soy protein isolate for sausage filling; the soymeal is sold as animal feed. An official of the Agriculture Ministry has been quoted saying that in 1999 GE seeds were registered on the National Seed List with no information that they were genetically engineered. The same official is reported saying that the public was not informed about the seed registrations "*due to the lack of financial resources*".<sup>10</sup>

### ***Threats posed by genetically engineered plants on the loose***

Romania is today torn between the U.S. seed producers, like Monsanto and Pioneer, supported by the U.S. Government who are aggressively promoting agricultural biotechnology and the need to harmonise its policy and legislation on GMOs with those of the EU. The strategy of the U.S. Government and its companies is to foist those policies and technologies that they cannot force on the EU directly, via EU accession countries.

Agriculture plays an important role in the economy of Romania. In its rush to 'modernise' agriculture, Romania must reject agro-biotechnology in order to retain the option of growing non-GE crops

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<sup>7</sup> Directive 90/220 on deliberate release of GMOs, now revised and replaced by Directive 2001/18

<sup>8</sup> Raport privind activitatea de prevenire a coruptiei si de actiune impotriva coruptiei desfasurata de MAPP, in perioada 1.01.2002-31.07.2002 on

[www.guv.ro/presa/rapoarte/200208/com-020820-maap-rapl-31.htm](http://www.guv.ro/presa/rapoarte/200208/com-020820-maap-rapl-31.htm)

<sup>9</sup> Informatie de presa: [www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm](http://www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm)

<sup>10</sup> "*National Biosafety Commission boldly admits that the public was not warned for lack of financial resources*" by Claudia Botzatu, Cotidianul, 28 April 2000

conventionally. The commercialisation of GE crops could also have important socio-economic impacts as Romania loses its export markets for agricultural products in the European Union (EU), where consumers are demanding GMO-free food. Indeed, already in 2000, the Romanian Cereal and Oilseed Wholesalers Association, ANCER threatened to boycott GE crops by forbidding GE crops from being stored in their silos.

The cultivation of GE crops in Romania threatens biodiversity and the potential for organic farming. For example, RR soybeans are being grown in Transylvania, in the area between Cluj and Sighisoara. The widespread use of herbicides, like Roundup will destroy the rich biodiversity of the region, its potential for eco-tourism and the livelihoods of increasing numbers of organic farmers. Organic and GE agriculture are incompatible. For example, GE crops threaten organic farming due to the high rate of cross-pollination and the need to keep GE and non-GE separate from field to fork.

Romania is out of sync with the rest of Europe. This will pose problems for EU accession. Monsanto's Roundup tolerant soybeans have not been approved for cultivation in the EU. Once the EU's new regulations on Traceability & Labelling and Novel Food & Feed come into place, all soya derivatives will need to be labelled, irrespective of whether the foreign DNA can be detected. Likewise, no GE potatoes have been approved for cultivation or marketing in the EU.

By 2007, when Romania hopes to join the EU, all foods containing over 1% of GMOs or derivatives from GE plants will need to be labelled, according to a process-based system. At present, there is not even a certified laboratory for testing GMOs, never mind systems for segregating GE from non-GE from farm to fork.

All the GE crops currently grown in Romania contain antibiotic resistance (ABR) marker genes. The EU's revised directive on deliberate release of GMOs requires the phase out of GE plants with ABR genes "*which may have adverse effects*" by 2004 that have already been commercialised. By 2008, all GE crops containing any ABR genes will need to be phased out. Does Romania have a plan for how the existing GE seeds and crops are to be taken off the market?

In the light of these findings, the Romanian NGOs, Bioterra and Ecosens demand that:

1. All releases of genetically engineered organisms into the environment and the food chain must be prohibited immediately, until legislation harmonising fully with that in the EU is in force and the institutional infrastructure is in place to implement the legislation.
2. All permits must be revoked for the import and sale of GE seed, for field trials and commercial cultivation of GE crops. Any GE seed already in Romania must be destroyed.
3. No GE food must be allowed on the Romanian market, until a mandatory process-based labelling system is in place. This requires traceability of all seeds or commodities that are GMOs or contain their derivatives, from field to fork, or for imports, from port of entry to the plate.
4. All imports of GMOs must be prohibited.
5. Parliament ratifies the Biosafety Protocol and develops the Biosafety Clearing House as crucial means of providing public information.
6. The Biosafety Commission must include representatives of civil society, including NGOs, the churches, natural scientists and officials.
7. Romanians must have the right to declare their region or country a GMO-free zone.
8. The Government must provide support for organic farming, by stimulating demand for organic food through education, public procurement policies and by providing economic incentives.
9. The World Bank project for the development of GE potatoes must be cancelled.

10. The Environment Ministry must not approve the release of GE wheat.
11. The EU must play a stronger role in advising the Romanian Government on its policies, especially on GMOs

## 1. Introduction

In 1994, for the first time ever, a genetically engineered (GE) plant was commercially grown. The introduction of the FlavrSavr tomato in the US was the beginning of a global change in agriculture - or so the biotech companies had planned. However, when the first harvest of GE soybeans and maize was about to be shipped to Europe in 1996, consumers there voiced an unforeseen opposition to this food. Consumers wanted to know what they were eating and asked for the labelling of GE food. In many countries of the European Union (EU), the introduction of genetically engineered food onto the market failed, and the major EU food producers and retailers now guarantee a GE-free food supply.<sup>11</sup> Corporate food processors, such as Nestlé and Unilever, and food retailers, such as the UK's Tesco and the French Carrefour, have made public commitments to source only GE-free ingredients in their products in several countries. By 2001, companies such as Stollwerck, Nestlé Hungaria, Danone, Kraft Hungaria, Frito Lay, McDonalds and Unilever operating in Hungary were also claiming that they are avoiding GMOs.

### What is Genetic Engineering?<sup>12</sup>

Genetic engineering is a relatively new branch of science, often misleadingly called the new biotechnologies in an attempt to liken it to the centuries-old industrial use of biological processes, as in bread-making and beer brewing. The term 'biotechnology' refers to the science of using living organisms, for example, the use of yeast cells to make bread and wine. The term is also used to describe the careful breeding of plants or animals to produce a particular, desired result. Traditional biotechnologies have given us hothouse roses with unique colouring and cows with higher meat or milk yields.

Genetic engineering, on the other hand, involves taking genes out of an organism's cells and altering them in some way. It enables scientists to transfer genes between different species to produce genetically modified organisms (GMOs) with new characteristics.

Genetic engineering has been seized upon by scientists and industry as a way redesigning and 'improving' living organisms. Genetic engineering in agriculture focuses on conferring new properties on commercial crops, like herbicide resistance, nutritional change, insect resistance or stress tolerance. Industry claims that these 'improvements' will increase efficiency and productivity. In fact, their main motive is increased profits.

Only Spain, and to a very limited extent France and Germany, were growing GE maize 1997-1999. To date, the EU has approved the deliberate release of 18 GMOs (under Directive 90/220/EEC<sup>13</sup>), but their status is uncertain, given that national bans have been imposed on 8 of these GMOs by 5 different EU countries. Of the 18 GMOs approved in the EU, 10 are agricultural crops and include soybeans, maize and oilseed rape.<sup>14</sup> No GMO has been given authorisation for deliberate release in the EU since October 1998 and since June 1999 a de facto moratorium was imposed until new

<sup>11</sup> In this report, 'GE-free food' means food not containing any raw material derived from GE plants.

<sup>12</sup> The internationally recognised and legally binding definition of GE and GMO<sup>12</sup> as used in the Cartagena Protocol on Biosafety:

**"Living modified organism"** means any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology;

**"Living organism"** means any biological entity capable of transferring or replicating genetic material, including sterile organisms, viruses and viroids;

**"Modern biotechnology"** means the application of:

a. **In vitro nucleic acid techniques**, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles, or

b. **Fusion of cells** beyond the taxonomic family, that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection.

<sup>13</sup> Revised Directive 90/220/EC on Deliberate Release of GMOs into the environment is now Directive 2001/18/EC

<sup>14</sup> The remaining GMOs approved by the EU include vaccines, carnations, a tobacco tolerant to bromoxynil and a test kit to detect antibiotic residues in milk.

regulations on Traceability & Labelling and Novel Food & Feed are in place.<sup>15</sup> There are bans on certain GMOs and GE foodstuffs in China, Saudi Arabia, Thailand, Algeria and New Zealand and some regions of Brazil and Australia. Since 1999, there is an increasing awareness about the dangers of GE crops even in the US. In 2002, Monsanto spent \$6 million on a campaign to defeat a GE food labelling initiative in the State of Oregon<sup>16</sup> and wheat farmers in the US are resisting the introduction of GE wheat.<sup>17</sup> A recent survey of US citizens showed that 92% want labels on GE food.<sup>18</sup>

Another setback for GE food has been the Biosafety Protocol, agreed in Montreal in January 2000. It clarifies the issue of international trade in GMOs. The Protocol, signed by 103 countries world wide, including Romania, and ratified by 44 countries (Feb. 2003) allows countries to apply the 'precautionary principle'<sup>19</sup> and reject imports of GMOs if they think there is a safety risk.

### ***Objectives of this Report***

The research for this report was undertaken in February 2003 through interviews - in person and on the phone - with experts from government, research institutions, farmers and NGOs. Its purpose is to:

- Analyse the legal, administrative, scientific and political situation concerning genetic engineering with respect to food and agriculture in Romania;
- Alert Romanian citizens and societal sectors, such as farmers, consumer groups and churches to the dangers posed by GE crops, including potential impacts on the environment, human health and access to EU markets;
- Close the widening gap in public awareness with respect to GE food and agriculture between Western and Eastern Europe, and thus prevent Romania becoming a dumping ground for GE seeds, food and animal feed;
- Add pressure for the ratification of the Biosafety Protocol;
- Add pressure for the implementation of the Aarhus Convention, which Romania has ratified
- Promote awareness of more sustainable alternatives to GE agriculture e.g. organic farming;
- Alert Romanian officials to the implications for EU accession of growing and importing GMOs (GE seeds, crops, food and feed) that have not been approved in the EU.

This report is one in a series of country reports being undertaken by ANPED with a partner NGO in Central and Eastern Europe and Newly Independent States (NIS). Reports on Croatia, Bulgaria, Poland, Russia Slovenia and Serbia launched since 2000, have been successful in starting public debate and heightening public awareness and participation in those countries.

The issue of genetic engineering is especially important for Romania, whose eco-tourism potential will rely heavily on the conservation of its rich biodiversity. Moreover, the Romanian Government promotes organic food production by providing subsidies to farmers in transition. But, organic farming and GE agriculture are incompatible. For example, GE crops threaten organic farming due to the high risk of cross-pollination. According to IFOAM,<sup>20</sup> genetically engineered food cannot be considered organic. (See Section 10: *Environmental Risks: Plants out of Control*)

Romania must not be lured by the false promises of the biotech industry that genetically engineered crops will feed the world. The UN Food & Agriculture Organisation recently warned: *"Today, 85% of*

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<sup>15</sup> Full text of press release announcing the continuing moratorium issued by the European Commission, 13 July 2000 available: [www.europa.eu.int/comm/dgs/health\\_consumer/library/press/press62\\_en.html](http://www.europa.eu.int/comm/dgs/health_consumer/library/press/press62_en.html)

<sup>16</sup> *Monsanto battles effort to require labeling of genetically modified food*, by Bill Lambrecht, St. Louis Post-Dispatch, USA, 19 Sept 2002

<sup>17</sup> *Bill touted as protector of wheat farmers*, by Courtney Lowery, Billings Gazette, 6 Feb 2003

<sup>18</sup> "US Consumers trust US farmers the most on food safety", @griculture on line at:

[www.agriculture.com/default.sph/AgNews.class?FNC=goDetail\\_ANewsindex.html\\_\\_\\_49413\\_\\_\\_1](http://www.agriculture.com/default.sph/AgNews.class?FNC=goDetail_ANewsindex.html___49413___1)

<sup>19</sup> The Cartagena Protocol on Biosafety states: *"Lack of scientific certainty due to insufficient relevant scientific information . . . shall not prevent the Party of import, in order to avoid or minimise such potential adverse effects, from taking a decision, as appropriate, with regard to the import of the living modified organism in question."*

<sup>20</sup> International Federation of Organic Agriculture Movements

*all plantings of transgenic crops globally are herbicide-resistant soybean, insect-resistant maize and genetically improved cotton varieties, designed to reduce input and labour costs in large scale production systems, not to feed the developing world or increase food quality.*"<sup>21</sup> A recent report by the development group, Christian Aid, reads: *"Farmers are losing control over their crops and becoming locked into dependence on seed companies. Traditional practices of saving seed for planting the next season's crops are threatened by patents on seed varieties, short-term pest resistance, built-in sterility and genetic uniformity.*"<sup>22</sup>

A recent report by the Economic Research Service of the US Department of Agriculture raises concerns about increasing corporate control of the food chain. It reads: *"The increasing dominance of a few major players and biotechnology and chemical patent restrictions on what competitors can do raise questions about the potential for too much market power in parts of the seed and chemical industries....In addition, grower agreements signed by producers and seed companies impose planting restrictions on producers, raising fear that farmers might become 'hired hands' for biotechnology companies.*"<sup>23</sup>

Romanian consumers have a right to know the true facts about genetic engineering and what is in their food. Farmers have a right to know what seed they are sowing. Moreover, society has the right, based on full disclosure of information, to make an educated decision about which agricultural path they want to follow. Until now, there has been minimal public awareness, and no national debate.

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<sup>21</sup> Quote from Louise Fresco, FAO Assistant Director-General in FAO News Release "*FAO warns of 'molecular divide' between North and South Biotechnology*", 18 Feb 2003 at: [www.fao.org/english/newsroom/news/2003/13960-en.html](http://www.fao.org/english/newsroom/news/2003/13960-en.html)

<sup>22</sup> "*Hunger for Profit: the genetic modification of developing country agriculture*", Christian Aid, UK, 6 Feb 2003 at [www.id21.org/society/s2bas1g1.html](http://www.id21.org/society/s2bas1g1.html)

<sup>23</sup> "*Economic Issues in Agricultural Biotechnology*", by Robbin Shoemaker, Joy Harwood et al, ERS Agriculture Information Bulletin No. 762, March 2001.(Quote taken from summary p. 5) at: [www.ers.usda.gov/publications/aib762/](http://www.ers.usda.gov/publications/aib762/)

## 2. Background - Romania's agriculture and rich biodiversity

This section provides an overview of Romania's agriculture, to provide a context in which to examine the potential threats posed by GMOs. It also looks at Romania's initiatives to promote organic agriculture and describes its rich biodiversity.

### *Agriculture in Romania*

Romania with a population of 22,4 million lies in the eastern Balkans and shares borders in the North with Ukraine and the former Soviet republic of Moldova, in the west with Hungary and Yugoslavia and in the south with Bulgaria. Romania has one of the most differentiated climates in the world, with winter temperatures down to -40°C and summer temperatures of up to 40°C.

Already of primary importance when Romania served as breadbasket to Western and Central Europe in the 19th century, agriculture remains central to the Romanian economy. Agriculture represents one fifth of GDP and has grown in terms of employment from 39.6% in 1997 to some 42,8% today. The share of livestock in agricultural output fell by 7% over the same period.

Of Romania's total 23.8 million ha, 28% is covered by forest and more than 60% is used for agriculture. Of the agricultural area, one third is permanent pasture and some 63% is arable, more than half of which is planted with cereals, mainly maize and wheat. Around a tenth is under oilseeds. Soybeans are grown on some 120,000 ha or 1,3% of arable land.

In 1989, nearly 90% of agricultural land was occupied by State and Co-operative farms; independent farmers took up less than 12%, with small plots. Privatisation and redistribution of agricultural land has caused the average farm size to fall to less than 2 ha of arable land and 3 ha in total. Today, some 85% of land has been privatised. The restructuring of agriculture has resulted in some 1 mln ha of arable (out of total of 9 mln ha) lying fallow, encouraging the spread of weeds and increasing the appeal of growing herbicide-tolerant crops, such as Monsanto's Roundup Ready soybeans.

1997 was an excellent year for cereals, confirming Romania's return to being a net cereals exporter since 1995. The deterioration of production conditions in the early 1990s led to a sharp increase in maize production. Sugar also suffered from the economic disorganisation that followed privatisation, while oilseeds production recovered in 1995.

Following a severe drought in 2000, Romania used a US\$ 100 million credit from the US to import maize and sunflowers.<sup>24</sup> In 2001, Romania was reported to be looking to Brazil, Argentina and the US as suppliers of soyameal, to replace imports of meat and bone meal, banned as a precaution against BSE (mad cow disease).<sup>25</sup> In the US and Argentina, most soybeans are GE and in the US, some one third of maize is GE.

### *Organic Agriculture*

Most farmers in Romania, particularly in Transylvania, consider themselves organic. They cannot afford to buy pesticides and fertilisers. While the situation bodes well for the possibility of developing modern organic farming, this potential is threatened by the introduction of GE crops.

According to the Research Institute for Organic Agriculture (FiBL), the area under certified organic agriculture in Romania in 2001 was some 18,690 or 0,2% of agricultural land.<sup>26</sup> There are five organic agriculture organisations in Romania: Bioterra, ASAD, Ecorural, Agrieco and Agroecologia. The are represented by the National Federation of Ecological Agriculture (FNAE) which has some 4000 individual members, mainly farmers growing winter wheat, maize, sunflowers and forage crops.

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<sup>24</sup> Agrafod East Europe, November 2000

<sup>25</sup> Agrafod East Europe, June 2001

<sup>26</sup> Organic Farming in Europe - Provisional Statistics 2001. See:

[www.organic-europe.net/europe\\_eu/statistics.asp](http://www.organic-europe.net/europe_eu/statistics.asp)

A major obstacle to the profitability of Romanian organic farmers is the lack of a Romanian certification organisation. In 2000, the Romanian Government adopted Law No. 34/2000 on organic agriculture, which stipulates that GMOs are not allowed in organic farming. It also prescribes the process for setting up an organic certification body. However, at present, Biokontrol of Hungary and Ökogarantie of Germany are certifying Romanian organic farmers, which is costly. Other certification bodies active in Romania are BioSuisse (Switzerland), Oekop (Germany) and others from The Netherlands, Austria and Italy.<sup>27</sup> Bioterra is working to develop a Romanian certification organisation, which can provide certification at affordable prices.

### **Biodiversity**

*"Romania probably has some of the most extensive old grasslands in Europe, in terms both of quality and quantity of species present, occurring in the uplands of Transylvania and Maramures and in the Carpathians."*

John Akeroyd, a distinguished UK botanist who has studied European flora for 30 years<sup>28</sup>

As a consequence of its geographical location and evolution of the human society in the region, Romania has a unique and high level of biodiversity and intact ecological systems. The vast reed beds of the Danube Delta, the high density of large carnivores and the extensive forests covering the Carpathian Mountains are some of the most significant and best known aspects attesting Romania's biological richness.

As much as 47% of the country's surface bears natural and semi-natural ecosystems. Since almost half of the Romanian forests (covering about 13% of the country) have been managed considering watershed conservation rather than production, Romania still has one of the largest areas of undisturbed forest in Europe. The natural integrity of Romanian forest ecosystems is indicated by the presence of the full range of European forest fauna, including 60% and 40% respectively of the European brown bear and wolf populations. Europe's largest wetland, the Danube Delta, lies predominantly in Romania. Major grasslands, caves and an extensive network of rivers add to the country's ecosystem richness.

A matter of wider European importance, Romania's territory is a confluence area between biogeographical regions such as the arctic, alpine, Western and Central European, Pannonic, Pontic, Balkanic, sub-Mediterranean. The high level of geographical diversity in Romania and the consequence of being a place of biological confluence have resulted in a floral diversity including more than 3,700 species, and diversity of fauna estimated to more than 33,802 species. These figures include a large number of endemic and subendemic plants (228) and animals (1,000) adapted to the specific local conditions, and only occurring in Romania. Species that once thrived in many parts of Europe either occur only in Romania nowadays, or can be found in large or significant populations in Romania.<sup>29</sup>

The release of GE crops into this region poses unquantifiable risks. Romania has many relatives of crop plants that occur in the wild. All GE plants have weedy derivatives. Some GE crops, such as oilseed rape from the *Brassica* family and sugar beet from the *Beta* family have been shown to cross with their wild relatives. (See Annex II: Crop plant relatives that occur in the wild in Romania)

The cultivation of Roundup tolerant soybeans requires the use of broad-spectrum glyphosate-based herbicides, if the benefits of the genetic engineering are to be reaped. Glyphosate kills all plants indiscriminately, leaving just the herbicide tolerant crops in tact. *Bt* toxin in *Bt* potatoes has been shown to harm species higher up the food chain, may prove harmful to many beneficial organisms, and may further disturb the ecological balance. For more information, see: Part B: The Environmental and Health Risks of GMOs.

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<sup>27</sup> Meeting with Dr. Ion Toncea, President of FNAE and Head of Department for Ecological Agriculture at Institute of Agricultural Research & Development in Fundulea, 11 Feb 2003

<sup>28</sup> "Protecting Romania's lost world", by John Akeroyd, Plant Talk magazine, no.30, October 2002

<sup>29</sup> This section is taken from: <http://www.grida.no/enrin/biodiv/biodiv/national/romania/robiodiv.htm>

In February 2003, the UK's Lake District National Park took the first steps towards trying to win GMO-free status to protect the National Park from the risks posed by GE crops. Under the EU's revised directive on deliberate release of GMOs 2001/18, an Authority can ask the Commission to exempt their area from the scope of a GMO marketing consent.<sup>30</sup>

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<sup>30</sup> "Parks seek GM Crop Exemption Status", by Amanda Brown, PA News/The Scotsman, UK, 18 Feb 2003, at: <http://news.scotsman.com/latest.cfm?id=5767396>

## **Part A: Genetically Engineered Crops in Romania**

### **3. Commercial Cultivation of genetically engineered crops in Romania**

Romania has a relatively long history of releasing genetically engineered crops into the environment. Given that the first commercial planting of GE soybean and maize took place in North America only in 1996, Romania started cultivation just 2 years later. According to the Agriculture Ministry, the 1998 edition of the National Seed List<sup>31</sup> introduced 12 GE hybrids of potato, soybeans, sugar beet and maize.<sup>32</sup>

#### ***First Commercial plantings***

A November 1999 report by the US Department of Agriculture (USDA) reads: "*In the absence of any specific legislation, the Government of Romania [GOR] allowed the three major U.S. companies to start testing GMO seeds in Romania in 1998. Based on field test results, two GMO varieties (one for corn and one for soybeans) were approved by the GOR for registration and sale in 1999.*"<sup>33</sup>

In 2000, ISAAA, the official communications arm of the agri-biotech industry reported that in 1999 Romania "grew introductory areas of herbicide-tolerant soybean (14,250 ha) and planted <1,000 ha of Bt potatoes".<sup>34</sup> In October 1999, the English-language Bucharest Business Week reported that with regulations becoming stricter in other countries, Romania provides an easier place for experiments on GM crops to be conducted on a widespread scale. The same article states that after a 2-year evaluation, the Ministry of Agriculture gave approval for the open production of soybeans and large-scale field trials of GE potatoes, maize and sunflowers.<sup>35</sup>

#### ***Commercial cultivation of GE soybeans***

A February 2000 report by USDA states that in 1999 genetically engineered Roundup Ready (RR) soybeans already covered 15'000 ha, some 20% of total area under soybeans.<sup>36</sup> The RR variety of soybeans are owned by the US company, Monsanto and have been genetically engineered to be tolerant to the glyphosate-based herbicide made by Monsanto and sold as Roundup. In 2000, Monsanto was quoted as saying that 30'000 ha - nearly half of all soybeans grown in Romania - were genetically engineered.<sup>37</sup> Elsewhere, Monsanto claims that in 2000, over 40,000 ha were planted with Roundup tolerant soybeans.<sup>38</sup>

In 2002, the USAID estimates the area under GE Roundup tolerant soybeans to be some 50,000 ha, out of a total of 100,000-120,000 ha under soybeans.<sup>39</sup> However, farmers growing RR soybeans claim that up to 75% of Romanian soybeans are genetically engineered, given that some farmers are saving the GE seed for planting the following year and use generic glyphosate.<sup>40</sup> There are some 10 generic

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<sup>31</sup> Lista oficiala a soiurilor cultivate in Romania

<sup>32</sup> Agriculture Ministry press release, 30 May 2002 See: Informatie de presa:

[www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm](http://www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm)

<sup>33</sup> US Department of Agriculture (USDA), Foreign Agricultural Service (FAS). GAIN Report # RO9001 by Jamie Rothschild, US Embassy: "*Romania -Planting Seeds; Romanian Legislation for GMO Seeds, 1999*", 1 November 1999 <http://www.fas.usda.gov/scripts/>

<sup>34</sup> James, C. 2000. *Global Status of Commercialized Transgenic Crops: 1999*. ISAAA( International Service for the Acquisition of Agri-biotech Applications) Briefs No. 17, [www.isaaa.org](http://www.isaaa.org)

<sup>35</sup> "*Gene-changed foods hit local market*", by Tim Johnson, Bucharest Business Week, 4 October 1999, Vol. 3. Nr. 35 at [www.bbww.ro/article.cfm?sec=homepage&art\\_id=36&vol=3&nr=35](http://www.bbww.ro/article.cfm?sec=homepage&art_id=36&vol=3&nr=35)

<sup>36</sup> USDA FAS. GAIN Report # RO0005 by Holly Higgins, US Embassy: "*Romania -Planting Seeds; Romanian Legislation for GMO Seeds*, 28 Feb 2000 at: [www.fas.usda.gov/scripts/gd.asp?ID=25667501](http://www.fas.usda.gov/scripts/gd.asp?ID=25667501)

<sup>37</sup> "*Watchdogs monitor GMO*", by Costin Motroasa, Bucharest Business Week, 4 September, 2000 Vol. 4, Nr. 30: [http://www.bbww.ro/article.cfm?sec=headlines&art\\_id=619&vol=4&nr=30](http://www.bbww.ro/article.cfm?sec=headlines&art_id=619&vol=4&nr=30)

<sup>38</sup> AgraFood East Europe, March 2001

<sup>39</sup> Interview with Lawrence Johnson (Senior Agriculture & Agribusiness Advisor) and Carmen Podani, USAID, Bucharest, 10 February 2003

<sup>40</sup> Interviews with farmers in the Giurgiu region, south of Bucharest, 14 February 2003

glyphosate preparations on the Romanian market, imported from China. This would suggest that in 2002, the area under GE soybeans was some 80,000 ha.

The 2002 edition of the National Seed Register<sup>41</sup> lists 7 GE varieties of Roundup tolerant soybeans permitted for commercial cultivation. In the autumn 2002, Monsanto's permit for the commercialisation of RR soybeans expired, but was renewed for a further 3-5 years.<sup>42</sup>

The Ministry of Agriculture keeps records of all the farmers growing GE soybeans, the location of the farms and the area under GE soybeans. However, this information is accessible only with the permission of the Minister of Agriculture.<sup>43</sup> A request for this information faxed to the Agriculture Ministry 19 February 2002, received no reply as of 17 March. Farmers growing GE soybeans confirm that when buying GE Roundup-tolerant soybeans together with the compulsory Roundup - which is sold as a package - from the Monsanto-licensed seed dealer, their farm location and quantity of seeds purchased are recorded.<sup>44</sup> However, the records held by the Agriculture Ministry are incomplete. They will only record those farmers that are buying the seed and herbicide package every year. Clearly, farmers saving GE soybeans for planting in the following year will be missing from this list.

### ***What is the fate of the genetically engineered soybeans?***

According to farmers, the whole Romanian soybean harvest is delivered to 2 oil mills, in Urziceni and Constanta. The mills press the soybeans to extract soy oil, most of which is used domestically. The soy oil is used to make soy protein isolate, used for sausage filling and processed foods, like margarine. After oil extraction, the remaining soy meal is used as animal feed. Farmers cannot feed raw soybeans directly to cattle, because soybeans contain a toxic component which requires heat treatment before it can be used as animal feed.

Although Romania is a net importer of soybeans, some soy oil may be exported to Germany. One farmer interviewed for this research confirmed that he has grown non-GE soybeans on contract for an exporter. The same farmer also grows conventional soybeans, which are likely to be GMO-contaminated due to cross-pollination.

Romania's 250,000 tonne soybean deficit is met by importing soybeans from Argentina and Brazil. Some 99% of soybeans grown in Argentina are GE.<sup>45</sup> Brazil is trying to keep its soybeans non-GE to retain the European market. However, there are claims of widespread GE-contamination in southern Brazil caused by smuggling of GE soybeans from Argentina.

### ***Commercial cultivation of Monsanto's genetically engineered potato?***

The 2002 Seed Register lists Monsanto's GE *Bt* potato, commercially known as Newleaf, which is designed to kill the Colorado Potato beetle. These GE insect-resistant potatoes contain a modified gene<sup>46</sup> of the natural toxin, *Bacillus thuringiensis* (*Bt*) to provide a built-in pesticide against the Colorado Beetle.

All those interviewed when researching this report claim that *Bt* potatoes are not being cultivated in Romania, because the potato varieties imported by Monsanto failed due to disease. Of the three *Bt* potato varieties imported by Monsanto: Russet Burbank, Atlantic and Superior, only the Superior found its way onto the National Seed List, because the other varieties failed due to wart disease and phytophthora. The Superior *Bt* potato was first registered on the National Seed List in 1998, even though the Agriculture Ministry claims that the permit was solely for import and testing.<sup>47</sup>

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<sup>41</sup> Catalogul oficial al soiurilor (hibridilor) de plante de cultură din România pentru anul 2002

<sup>42</sup> Interview with Dr Constantin Sin, Ministry of Agriculture, Food and Forests, and Prof. Elena Badea, Plant Geneticist, Institute of Biology and member of the Biosafety Commission, 10 Feb 2003

<sup>43</sup> Interview with Dr Constantin Sin, Ministry of Agriculture, Food and Forests, 12 Feb 2003

<sup>44</sup> Interviews with farmers in the Giurgiu region, south of Bucharest, 14 February 2003

<sup>45</sup> ISAAA, Preview: Global Status of Commercialized Transgenic Crops: 2002

<sup>46</sup> The cryIIIa gene from *Bacillus thuringiensis* subsp. *tenebrionis* (*Btt*)

<sup>47</sup> Interview with Dr Constantin Sin, Ministry of Agriculture, Food and Forests, and Prof. Elena Badea, Plant Geneticist, Institute of Biology and member of the Biosafety Commission, 10 Feb 2003

The permit for growing *Bt* potatoes expires in spring 2003 and to date Monsanto has not applied for its renewal.

The fate of the *Bt* potatoes is difficult to ascertain. Romania has no commercial potato processing facility and the market is very disaggregated, making it almost impossible to track the dissemination of GE potatoes.

### ***World Bank Funding for development of genetically engineered potato***

The failure of American varieties of *Bt* potatoes in Romania led to a World Bank technology transfer project to insert Monsanto's *Bt* gene construct into local Romanian potato varieties.

The overall objectives of the World Bank agricultural project<sup>48</sup> are to support agricultural research and the priorities of the sector to meet the immediate technological needs of private farmers. The overall project is valued at US\$ 14,4 million and is supported by a World Bank loan of US\$ 11 million. The component of this project relating to potatoes is entitled: *'Promoting the extension of sustainable, unpolluted and efficient technologies to potato cultivation'*. It is the result of an agreement between the University of Timisoara, Monsanto and the Ministry of Agriculture (MAAP), who had to approve the project. The project started about a year ago, and is on-going.<sup>49</sup>

The World Bank potato project is being conducted by the Foundation for Rural Development.<sup>50</sup> The project director is Paun Ion Otiman, who is also rector of the University of Timisoara.<sup>51</sup> Mr. Otiman is also a member of the Biosafety Commission and a National Liberal Party senator in the upper house.

The Biotechnology department of the University of Timisoara has both the equipment to do genetic transformations and the personnel, some of whom have been trained by Monsanto in the US.<sup>52</sup> The Institute of Potato in Brasov provided the germplasm from Romanian potato varieties and considers itself part of the project.<sup>53</sup>

According to USAID in Bucharest, Monsanto gave away its intellectual property rights on the *Bt* potato *"for humanitarian reasons"* to the University of Timisoara, as it has done in Russia, Ukraine and Bulgaria.<sup>54</sup>

The reality is that Monsanto announced already in March 2001, that it will stop selling the *Bt* potato, and will buy back any of this GE potato seed that farmers in North America had already purchased. Monsanto claims that this decision was made to enable the company to focus efforts on other crops that have bigger markets. However, the real reason was probably due to the three largest french-fry manufacturers in North America - McCain Foods, Lamb Weston and J.R. Simplot - which together account for nearly the entire market, stating that they would not buy GE potatoes.<sup>55</sup>

The World Bank *Bt* potato makes no economic sense. The *Bt* potato has not been approved for cultivation or putting on the market in the EU. Moreover, the *Bt* potato is unlikely to be approved for

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<sup>48</sup> World Bank Project No. 1864 managed by the Director, Project Management Unit "Agricultural Support Services" in the Ministry of Agriculture, Food and Forest, Simona Paranici

<sup>49</sup> Meeting with Simona Paranici, Director, Project Management Unit "Agricultural Support Services" in the Ministry of Agriculture, Food and Forest, 12 February 2003

<sup>50</sup> Interview with Dr Constantin Sin, and Prof. Elena Badea, 10 Feb 2003

<sup>51</sup> University of Agricultural Science & Veterinary Medicine of Banat, University of Timisoara

<sup>52</sup> Interview with Prof. Octavian Popescu, University of Babes-Bolyai, Cluj-Napoca, member of the National Biosafety Commission & Executive President of Romanian Academy for GMOs, 15 Feb 2003

<sup>53</sup> Telephone conversation with Director Draica, Institute for Potato Research in Brasov, 12 Feb 2003

<sup>54</sup> Interview with Lawrence Johnson (Senior Agriculture & Agribusiness Advisor) and Carmen Podani, USAID, Bucharest, 10 February 2003

<sup>55</sup> *"Monsanto abandons Potato Research"* United Press International, 21 March 2001; also *"Monsanto Pulls Plug on NatureMark Spuds"* by Peter Reschke, Ontario Farmer, 6 March 2001

growing in the EU, since infestations of Colorado beetle are strictly controlled by other means and there is consumer resistance to eating GE foods. In 2007 when Romania hopes to join the single market of the EU, any commercialised *Bt* potatoes may well have to be taken off the Romanian market.

This project reveals a disconnect in World Bank policy in Romania. On the one hand, the Bank is funding the development of a GE potato, while on the other, its sister organisation, the International Finance Corporation is looking to fund a nature park, to be exclusively farmed organically in Transylvania - the key region for potato cultivation.

For many years, GE advocates have tried to break the resistance of organic farmers towards GE crops, by the promise of GE potatoes, especially phytophthora-resistant potatoes. The parallel promotion of organic farming in a potato growing region of Romania and funding of *Bt* potato development in the same country, might be the tool used to push organic farmers onto the GE track. Once GE phytophthora-resistant potatoes are developed, this pressure is likely to increase.

### ***Releases of other genetically engineered plants into the environment***

It is unclear which other GE plants have been released into the environment and the extent to which they have penetrated the market. According to an Agriculture Ministry official, under the old GMO Ordinance, once the Biosafety Commission approved a GE plant variety for field trials, after 3 years this GE variety would automatically be included on the National Seed List.<sup>56</sup> There seems to be no register of releases approved by the Biosafety Commission and accounts vary. The GMO Ordinance provided for no post-approval monitoring of GE plants permitted for release into the environment.

According to the US Department of Agriculture, between 1997 and 2000, U.S. seed companies tested and registered at least 7 GE varieties in Romania: six for corn and one for soybeans.<sup>57</sup> A Romanian Agriculture Ministry press release states that the 1998 National Seed List introduced 12 new GE varieties of potato, soybean, sugar beet and maize.<sup>58</sup> Normally, a new plant variety is registered on the National Seed List, only once it has completed 2-3 years of field trials. Once on the Seed List, the variety can be sold commercially. Thus it is unclear if these 12 GE varieties were grown commercially on a wide scale, or were restricted to field trials. Until the GMO Ordinance was introduced in 2000, testing was allowed using the provisions of the law on basic seeds, which does not address the unique biosafety issues posed by GMOs.<sup>59</sup>

In January 2000, the GMO Ordinance created a Biosafety Commission which approved GE maize and GE sugar beet for field trials.<sup>60</sup> According to an Agriculture Ministry official, the Biosafety Commission approved field trials of Monsanto's Roundup-tolerant maize and Pioneer's LibertyLink (LL) maize, resistant to the glyphosate-based herbicide, Liberty. No GE *Bt* maize, resistant to corn borer, is being tested or grown in Romania.<sup>61</sup> A member of the Biosafety Commission confirms that no permits were granted for field trials of *Bt* maize, but contradicts the Agriculture Ministry's claim that permits were granted for testing LL maize.<sup>62</sup>

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<sup>56</sup> Interview with Dr Constantin Sin, Ministry of Agriculture, Food and Forests, & Prof. Elena Badea, 10 Feb 2003

<sup>57</sup> *ibid.* USDA, Foreign Agricultural Service. GAIN Report # RO0005, Feb 2000 In May 2002, a new law #214 was published entitled: "Law on Obtaining, Testing, Using and Commercialisation of GMOs resulting from modern biotechnology as or in products".

<sup>58</sup> Informatie de presa: [www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm](http://www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm)

<sup>59</sup> *ibid.* USDA FAS. GAIN Report # RO0005, Feb 2000

<sup>60</sup> Informatie de presa: [www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm](http://www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm)

<sup>61</sup> Interview with Dr Constantin Sin, Agriculture Ministry and Prof. Elena Badea, 10 Feb 2003

<sup>62</sup> Interview with Dr. Klaus Fabritius, Institute of Public Health and member of both the former and current Biosafety Commissions, 14 Feb 2003.

**Table 1: Commercial cultivation and field trials of GE crops (by source of information)**

	USDA	National Seed List	Pioneer	ISAAA	Monsanto
<b>RR soybean</b>					
Field trial	X, a Since 1998	X, a		X, a	X, a
Commercial growing	X 15,000 ha in 1999	X 1998 Seed Register (2002 Register: 7 RR varieties)		X 14,250 ha herbicide-tolerant in 2000	X 30,000 ha in 2000
<b>GE maize</b>					
Field trial	X, a Since 1998	X, a	X, a <i>Bt</i> and LL		
Commercial growing	X One GE variety approved in 1999 6 GE varieties approved 1997-2000	X 1998 Seed Register			
<b>GE potato</b>					
Field trial		X, a		X, a	
Commercial growing		X 1998 Seed Register (2002 Register: one <i>Bt</i> variety)		< 1000 ha in 1999 of insect resistant	
<b>GE sugarbeet</b>					
Field trial		X, a			
Commercial growing		X 1998 Seed Register			

a: variety registration implies prior field testing

The US seed company Pioneer Hi-Bred claims that it registered both *Bt* maize and LL maize for field trials. But, the company has abandoned plans to commercialise its GE maize varieties, due to public opposition to GMOs in Western Europe. Pioneer had been promoting GE maize varieties, such as Clarica and Evelina in Romania and Bulgaria by doing demonstration projects.<sup>63</sup>

Although official information from the Agriculture Ministry states that in 2000, the Biosafety Commission approved field trials of GE sugar beet,<sup>64</sup> a member of this Commission claims that no applications were ever received for releasing GE sugar beet.<sup>65</sup> However, an article in the November 2001 issue of "AgraFood East Europe", claims that tests are being undertaken in a joint project between foreign investors and the Romanian Environment at a research station near the eastern Romanian town of Braila on GE potatoes, maize and sugar beet.<sup>66</sup> The release of GE sugar beet into the environment presents a particular danger for biodiversity in Romania, because a wild relative of the beet family, Caucasian Beet (*Beta trigyna* Waldst. & Kit.) exists in the wild.

Large-scale field trials of GE sunflowers, reported in an October 1999 article in the English-language Bucharest Business Week, were not confirmed by anyone interviewed for this report.

<sup>63</sup> Interview with Dr. Nicolae Parvu, Product Manager, Pioneer Hi-Bred Seeds Agro SRL, Bucharest, 11 Feb 2003

<sup>64</sup> Informatie de presa: [www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm](http://www.guv.ro/presa/communicate/200205/com-020530-mapp-transgenice.htm)

<sup>65</sup> Interview with Dr. Klaus Fabritius, 14 Feb 2003.

<sup>66</sup> "Romania embraces GM crop production", AgraFood East Europe, November 2001

Genetically engineered food and feed may also find its way onto the Romanian market through imports of agricultural commodities from countries growing GE crops. Following a drought in 2000, Romania used a US\$ 100 million credit from the US to import maize and sunflowers.<sup>67</sup> In 2001, Romania was reported to be looking to Brazil, Argentina and the US as suppliers of soyameal.<sup>68</sup> In the US and Argentina, most soybeans are GE and in the US, some one third of maize is GE.

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<sup>67</sup> Agrafood East Europe, November 2000

<sup>68</sup> Agrafood East Europe, June 2001

#### **4. Regulatory Oversight over agricultural GMOs**

The first releases of GMOs in Romania took place in the absence of any specific laws governing biosafety. Until the GMO Ordinance was introduced, testing was allowed using the provisions of the law on basic seeds.<sup>69</sup>

##### ***GMO Ordinance No. 49/2000***

In January 2000, the Official Monitor published the Ordinance on the development, testing, use and marketing of GMOs and their products, which covers 'contained use', deliberate release and the placing of GMOs on the market. The Ordinance established a National Biosafety Commission comprising 19 members: 12 representing various Academies (Science, Agricultural Sciences, Medical and other sciences) and 7 government officials, but no representatives of civil society.

The Ordinance claims to harmonise with provisions in the EU Directive 90/220 on Deliberate release of GMOs. However, the Biosafety Commission was not set up as an advisory body to a 'competent authority' (in the EU, usually the Ministry of Environment), but was itself responsible for enforcing the ordinance and for granting permits for 'contained use', releases of GMOs and their placing on the market. Art. 48 of the Ordinance designates the Ministry of Water, Forests and Environmental Protection as the national focal point for any international agreement to which Romania is a party and for obtaining external financial assistance for the functioning of the Biosafety Commission.

The Ordinance allows the Commission to levy a fee on each application for a permit to cover its administrative costs. Thus, the more applications for GMO activities notified to the Commission, the greater its income.

The Ordinance mentions labelling of foods containing or consisting of GMOs, but sets no threshold and requires only informing the consumer about the possibility that GMOs may be present in the food.

The Ordinance allows for simplified procedures, or short cuts to getting permits for releases, if the GMO is already approved in the EU.

The only restrictive provision is Art. 4 (6) which requires the Biosafety Commission to take measures to eliminate the use of antibiotic-resistance (ABR) marker genes in GMOs, by 2002. But this provision has not been implemented. Both the Roundup resistant GE soybeans and *Bt* potatoes contain ABR genes, yet were featured in the 2002 National Seed List.

##### ***GMO Law No. 214***

In May 2002, a law on GMOs, 214/2002, replaced the interim Ordinance to harmonise Romanian regulations with those in the European Union. The new law covers both the 'contained use' and deliberate release of GMOs, and their placing on the market. The new law makes the Ministry of Waters and Environmental Protection the competent authority for GMOs.

The old Biosafety Commission was disbanded and a new one created in autumn 2002, whose mandate is only to advise on - and not authorise - the release of a GMO into the environment. This advice is forwarded to the Environment Ministry, who take a decision on whether to permit the release. According to the Agriculture Ministry, only GE varieties approved according to the new law can be put on the National Seed List. Moreover, separate approvals are required for releasing GMOs for field trials and for commercialisation.<sup>70</sup>

The new Biosafety Commission is comprised of 12 members, all of whom are scientists. To date, the new Biosafety Commission has met twice to assess two applications, one of which is for the environmental release of a GE wheat resistant to fusarium, submitted by the National Research Institute for Cereal and Industrial Plants in Fundulea together with an American university.<sup>71</sup>

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<sup>69</sup> *ibid.* USDA, Foreign Agricultural Service. GAIN Report # RO0005, Feb 2000

<sup>70</sup> Interview with Dr Constantin Sin, Agriculture Ministry and Prof. Elena Badea, 10 Feb 2003

<sup>71</sup> Interview with Dr Constantin Sin, Agriculture Ministry and Prof. Elena Badea, 10 Feb 2003

Following a positive opinion of the Biosafety Commission, the Environment Ministry has still to decide whether to issue a permit for this release.

In March 2002, Switzerland's highest court stopped an outdoor trial of GE wheat due to go ahead in late March. The Federal Court decided that the environment ministry had not taken into account the opinions and concerns of those opposing the trials when it made its decision.<sup>72</sup> In the U.S. and Canada farmers are actively opposing the introduction of GE wheat, due to concerns about consumer rejection of GE crops and their ability to sell the harvest.<sup>73</sup>

Under the new law, GE crops need post-approval monitoring. This is to be done by the Institute of Biology. When Prof. Badea, a member of the Biosafety Commission, was questioned about how this will be done, given the lack of equipment, she replied that the Institute would monitor the proliferation of weeds.<sup>74</sup>

EU policy and legislation on GMOs is becoming increasingly restrictive and transparent. Although the new Romanian GMO law improves transparency, it is undermined by a reluctant administration that is still dominated by the old system, in which U.S. corporate interests exert a lot of influence.

### ***Placing GE food on the market and its labelling***

The Environment Ministry must be notified, before a GMO or product thereof, or food containing GMOs can be placed on the market for the first time. According to the Director of the Institute of Food Research, Prof. Mencinicopschi, the Ministry of Agriculture, Food and Forests and the Ministry of Health approved the GE RR soybeans and the *Bt* potatoes for human consumption. There was no independent safety testing conducted. Approval was given on the basis of the risk assessment undertaken in the US.<sup>75</sup>

A law on Labelling of Food No. 106 came into force in February 2003. This harmonises with EU regulations 1139/98, 49/2000 and 50/2000 and requires product-based labelling for food containing more than 1% of Monsanto's RR soybeans and a variety of GE maize. However, the labelling law excludes the labelling of all other GMOs, such as *Bt* potatoes. If Romania plans to create a comprehensive and logical framework for GE food labelling, it should abstain from approving any GMO for whose products no labelling regulations exist.

Responsibility for implementation of the food labelling law lies with three departments: the Agriculture Ministry, Health Ministry and National Authority for Consumer Protection. The law states that 'the producer' is responsible for labelling. According to the National Authority for Consumer Protection, 'the producer' is understood to be the farmer. As the last player in the supply chain, the Consumer Protection authority claims that it will be unable to enforce the GE food labelling requirements, without the appropriate labelling of crops from the field to the market.<sup>76</sup> However, none of the three agencies have a laboratory for testing for GMOs, and hence the means to implement this legal requirement.

Imports of maize and soybeans will also need to be monitored and if found to be GE, will need to be labelled accordingly. Following a severe drought in 2000, Romania used a US\$ 100 million credit from the US to import maize and sunflowers.<sup>77</sup> Some one-third of US maize is genetically engineered.

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<sup>72</sup> "GM crop trial blocked by Federal Court", swissinfo, 12 March 2002 at: [www.swissinfo.org/sen/swissinfo.html@siteSect=105&sid=1690181](http://www.swissinfo.org/sen/swissinfo.html@siteSect=105&sid=1690181)

<sup>73</sup> "Altered wheat grain liability debated", by Jennifer McKee, The Billings Gazette, USA, 19 Feb 2003, [www.billingsgazette.com/index.php?id=1&display=rednews/2003/02/19/build/local/lxgr-wheat-grain.inc](http://www.billingsgazette.com/index.php?id=1&display=rednews/2003/02/19/build/local/lxgr-wheat-grain.inc)

<sup>74</sup> Interview with Dr Constantin Sin and Prof. Elena Badea, Institute of Biology, 10 Feb 2003

<sup>75</sup> Interview with Prof. Gheorghe Mencinicopschi, Director of Institute of Food Research, Bucharest, and member of the Biosafety Commission, 13 February 2003

<sup>76</sup> Interview with Mr. Michail Meiu, Deputy Director of the National Authority for Consumer Protection, Bucharest, 12 February 2003

<sup>77</sup> Agrafood East Europe, November 2000

However, Dr. Sin from the Agriculture Ministry claims that Romania does not allow the import of GE maize.<sup>78</sup>

### ***Seed-mix up at the Institute of Variety Testing and Registration***

A report commissioned by the Agriculture Ministry to investigate the activities of the State Institute for (Plant) Variety Testing and Registration (ISTIS) reveals chaos within this seed registration body. The investigation was undertaken between 1<sup>st</sup> January and 31<sup>st</sup> July 2002.

The resulting report published in August 2002, lists a number of transgressions, including:

- the failure of ISTIS to describe the Superior Newleaf potato as genetically engineered in the 1999 edition of the Official Plant Variety Catalogue (National Seed List), which ISTIS prepared;
- in the 1998 registration document for the Superior Newleaf potato, ISTIS did not stipulate the areas recommended for the growing of this potato;
- ISTIS issued 2 registration certificates for the Superior Newleaf potato: one describing it as GE, the other as non-GE;
- In 1999, ISTIS proposed registering 7 GE maize hybrids (Furi CB, Clarica BT, Clarica BT GLU, Clarica GLU, Evelina IT, Evelina Bt and Speciosa BT). In reality, there were 6 maize hybrids and Evelina IT is not GE;
- ISTIS issued only one registration certificate for 6 hybrids of maize, creating confusion
- ISTIS tested the hybrids of GE maize for only one year, breaching the regulations;
- In 2000, ISTIS proposed the registration of 3 hybrids of GE maize (AW 641 RR, Evelina WX and Reseda BT), that had been approved by members of the [Biosafety?] Commission, but Evelina WX (renamed PR 37B04) was not GE, creating an inconsistency between the Commission approval and the 2000 edition of the Official Catalogue.
- ISTIS presented the Commission with a variety of non-GE soybean, which in the 2000 edition of the Official Catalogue, is registered as GE.

The report concludes that ISTIS deliberately ignored Government policy, which is to follow the EU's Directive 90/220, with respect to the period of variety testing. The institute used the absence of legislation to hasten the testing process for GE potato, GE soybeans and GE hybrids of maize, thus breaching plant variety testing regulations.<sup>79</sup>

For clarification, the EU directive 90/220 on Deliberate Release of GMOs, does not prescribe testing periods for GE crops varieties. In the EU, field trials are considered a national matter and it is left to EU Member States to authorise and monitor GE crops for release during field trials.

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<sup>78</sup> Interview with Dr Constantin Sin and Prof. Elena Badea, Institute of Biology, 10 Feb 2003

<sup>79</sup> Raport privind activitatea de prevenire a coruptiei si de actiune impotriva coruptiei desfasurata de MAPP, in perioada 1.01.2002-31.07.2002 on

[www.guv.ro/presa/rapoarte/200208/com-020820-maap-rapl-31.htm](http://www.guv.ro/presa/rapoarte/200208/com-020820-maap-rapl-31.htm)

## 5. Market Concerns

Romania has already commercialised the growing and marketing of GE soybeans. There is possibly also widespread growing of GE potatoes and GE maize. But, there is no segregation to ensure that GE crops are kept separate throughout the supply chain and no systems in place for correct labelling of foods that are GMOs or contain their derivatives.

Until the Biosafety Protocol, under the Convention on Biological Diversity, was agreed in January 2000, there was no international agreement requiring segregation of non-GE crops from GE ones and labelling of bulk commodities to enable traceability.

The Biosafety Protocol, signed by 103 countries world wide, including Romania, and ratified by 44 countries (February 2003) gives them rights, for the first time, to restrict imports of GE crops in cases of scientific uncertainty about their risks. Until now, it is not politicians, but the EU market – food retailers, like supermarkets and food processors, like Nestle and Unilever – that has responded to consumer concerns about eating GE food and sought to source GE-free crops. To date, the EU and its Member States were unable to block shipments of GE crops and food, for fear of creating barriers to free trade and being taken before the World Trade Organisation Dispute Panel by governments, such as the US, wanting to export GE crops.

With its language on the 'precautionary principle', the Biosafety Protocol could set the stage for countries, such as those of the EU, to close their markets to GE crops without conclusive scientific evidence of harm.

### *Market Rejection of GMOs*

In the meantime, it is likely that the market in the EU and Asia will continue to reject GE crops and food, by looking for sources of non-GE commodities in countries like Brazil, Hungary and Western Europe. Indeed, since approval has still to be given for placing many GE crops on the EU market, the EU has a strong case for banning these imports. Monsanto's *Bt* potatoes and Roundup tolerant maize have no market approval for import into the EU, and hence any exports of potatoes or RR maize from Romania, or any other unapproved GE maize variety, like StarLink, or indeed unapproved GE soybean varieties, could be refused.

There is evidence that the EU market is already rejecting Romania's agricultural products. In 2000, the Romanian Association of Cereal and Oilseed Wholesalers, ANCER, threatened to ban GE crops from their silos. In an article in the newspaper 'Cotidianul' in 2000, ANCER states that the introduction of GE crops in Romania is hurting exports of agricultural products. In the article, ANCER states its intention to request that the General Prosecutor and the Government Control Department investigate the permits granted for releasing GMOs for any illegalities. If any illegalities are found, ANCER is demanding the revoking of permits, destruction of field trials, a prohibition on future field trials, bans on the use of fields that have grown GE crops for agricultural activities and compensation to farmers for their losses.<sup>80</sup>

The discovery in the USA, in September 2000, that many brands of taco shells and chips contained StarLink, a GE variety of maize owned by Aventis that had not been approved for human consumption, has hurt US corn exports to big buyers, like the EU, Japan and South Korea. *"It's an issue that has caused concern among some of our importers"*, said US Agriculture Secretary Dan Glickman, in November 2000. The discovery that StarLink's novel gene had spread to another variety of corn has only deepened anxieties that US maize can be kept free of genetic modification.<sup>81</sup>

In March 2001, the US Department of Agriculture announced that it will buy up to US\$ 20 million worth of maize seed that shows traces of the GE StarLink variety.<sup>82</sup> Using funds normally lent to

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<sup>80</sup> "National Biosafety Commission boldly admits that the public was not warned for lack of financial resources" by Claudia Botzatu, Cotidianul, 28 April 2000

<sup>81</sup> "Corn leaving bad taste in world markets as GMO worries build", Steve James, Reuters, 23 Nov 2000

<sup>82</sup> "US will aid companies hurt by GM corn", Washington Post, 8 March 2001

farmers faced with natural disasters, such as drought, the Agriculture department is trying to keep any contaminated seed off the market, and will destroy all confiscated seed.<sup>83</sup>

### **StarLink Disrupts Global Maize Markets**

In the wake of the StarLink crisis, some of the largest US food and animal feed processors - Kellogg, ConAgra, Archer Daniels Midland and Tyson - either temporarily closed their grain mills or announced mandatory testing for StarLink maize. Meanwhile, the Government sent emergency teams to Japan and Europe, to try and reassure major US trading partners that the StarLink controversy would be kept under control.

By the end of October 2000, consumer confidence in the safety of GE foods was severely shaken. Thousands of farmers and grain elevator operators expressed anger at Aventis and the biotech industry. The state Attorney General's office in Iowa criticised Aventis and seed dealers for not telling farmers to keep StarLink out of the human food chain.

Aventis, Kraft, Safeway and scores of other food companies and supermarket chains, grain elevators and farmers began totalling several hundred million dollars in losses. Consumers claiming to have been poisoned by StarLink maize products filed a multi-million dollar class-action suit in Chicago. Kraft and some of the supermarket chains voiced dissatisfaction with the lack of oversight of GE crops by US regulatory agencies.

Meanwhile, America's trading partners in the EU and Japan are contemplating what to do about the growing demand from consumers in their own countries to close the door on billions of dollars of GE-contaminated US agricultural imports. In October 2000, Japan rejected an entire 55,000 ton shipment of US maize, after it tested positive for StarLink "*sending shock waves through importers in Japan, as well as other Asian countries, such as South Korea and Taiwan*".<sup>84</sup>

### **No Labelling and No Safety Testing in the US**

The US government's 'no labelling' and 'no safety testing' policy has become a serious liability and source of controversy. All so-called 'regulation' until now has been completely voluntary on the part of the biotech industry. Federal officials and the biotech industry are caught in a bind. If they do what most of the public wants and require mandatory pre-market safety testing and labelling, food processors and supermarkets will do what they are already doing in Europe and Asia, that is, remove GE foods and ingredients from their brand-name products. Shops will not sell products branded with the 'skull and crossbones' of the GE label, and farmers will be reluctant to grow these crops. On the other hand, if the FDA (Food and Drug Administration), USDA and EPA continue to do the bidding of the biotech industry, they risk losing billions of dollars in US export sales.

### **International Fallout**

On the international front, the leading producers of GE crops - US, Canada and Argentina - face a similar dilemma. If they try to use the hammer of economic sanctions from the World Trade Organisation to force so-called Frankenfoods down the throats of the WTO's other 131 member states, they risk provoking a trade war. If they don't use the WTO's enforcement powers, more and more countries are going to make it ever harder for untested and unlabelled GE products to get into their countries.

The EU already has a moratorium on all new approvals of GMOs for import and cultivation. In October 2000, the EU told the US that "*the only way the European Union's de facto moratorium on new GM seeds is likely to be lifted is for US farmers to be required to segregate GM crops from those grown from traditional seeds...*".<sup>85</sup>

In a separate development, Monsanto announced in March 2001, that it will stop selling the *Bt* potato resistant to Colorado beetle, and will buy back any of this GE potato seed that farmers in North America had already purchased. Another example of a company responding to consumer rejection of GE food is Syngenta. According to Syngenta: "*it is not realistic that Europe will accept the GE sugar beet within the coming 5 years. That's why we will temporarily stop our efforts in this area*".<sup>86</sup> This

<sup>83</sup> "USDA to buy seed tainted with StarLink bio-corn", by Randy Fabi, Reuters, 7 March 2001

<sup>84</sup> Associated Press, 24 and 25 October 2000

<sup>85</sup> Bureau of National Affairs journal, 11 October 2000

<sup>86</sup> "Syngenta stops GE sugar beet trials in Europe", by Kees de Vre, in Trouw Daily (The Netherlands), 23 February 2001 (translated by Wytze de Lang)

might explain why sugar beet may have been registered in Romania for a couple of years before disappearing off the National Seed List.

### ***More U.S. scandals of crop contamination with GE maize producing foreign proteins***

The most recent scandals around GMO contamination concern the growing of so-called pharm crops, plants that are genetically engineered to make various proteins, for use as pharmaceuticals or industrial products. In November 2002, the USDA revealed that a maize crop in Iowa and a soybean crop in Nebraska, had both been contaminated by crops that were genetically engineered to make substances for use in drugs or industrial chemicals. Officials would not disclose what chemical or drug was in either GE crop.

The company responsible for the GMO-contamination is ProdiGene, a small company pushing aggressively to turn maize plants into min-factories to produce protein-based pharmaceutical or industrial products. ProdiGene is the only company to have entered commercial production of such a protein, an enzyme called trypsin, and is working on many others.<sup>87</sup>

In the Nebraska case, USDA officials ordered ProdiGene to destroy 500,000 bushels of soybeans, which were contaminated with GE maize, producing a foreign protein, grown in the same field. ProdiGene had planted a field test of GE maize designed to produce foreign proteins, but the crop failed. So ProdiGene ploughed over the field and later planted regular soybeans intended for food. According to an USDA official, after harvesting the soybeans, ProdiGene discovered a few corn stalks mixed in. Agriculture officials were on hand and notified the FDA, which impounded the crop.<sup>88</sup>

In Iowa, the USDA ordered 155 acres (60 ha) of maize to be pulled up in September and incinerated, after fearing that pollen from maize not approved for human consumption may have spread to nearby fields of ordinary maize.<sup>89</sup>

### ***Market Rejection of genetically engineered animal feed***

Meanwhile, the public debate in the EU is examining the use of GE animal feed in meat production. New human health fears over antibiotic-resistant genes in GE cattle feeds - the only use for which the EU is still importing GE crops - are prompting the EU's leading food producers and supermarket chains to ban GE animal feeds in their meat and dairy production. In late 2000, the UK's Advisory Committee on Animal Feeding Stuffs, admitted that antibiotic-resistant market genes found in GE food and animal feeds may be able to transfer antibiotic resistance to bacteria in animals' guts, giving rise to dangerous pathogens in humans that cannot be killed by traditional antibiotics. (See Section 11: *Antibiotic-Resistant Marker Genes*).

The European Commission is drafting new regulations that will require authorisation and labelling of GE feed - a move that analysts predict will all but kill non-segregated, GMO-contaminated US grain exports to Europe and Asia. In October 2000, the UK's major supermarket chains, Iceland, Sainsbury, Waitrose, Marks and Spencer and Asda, announced that they are all removing GE ingredients from animal feed.<sup>90</sup> Even fast food chain McDonalds was forced by public pressure in the UK and Germany to guarantee that their chickens are raised without GE animal fodder.

### ***Socio-Economic Impacts***

In the long term, the commercialisation of GE crops could have important socio-economic consequences. For example, the control of the entire domestic seed market by just a few Western-based corporations has implications for national food security. Today, just four companies - Monsanto, Syngenta

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<sup>87</sup> "Biotech firm mishandled corn in Iowa", by Justin Gillis, The Washington Post, 14 Nov 2002 at: [www.washingtonpost.com/wp-dyn/articles/A51859-2002Nov13.html](http://www.washingtonpost.com/wp-dyn/articles/A51859-2002Nov13.html)

<sup>88</sup> "FDA orders destruction of soybeans", Associated Press/New York Times, 12 Nov 2002

<sup>89</sup> "Biotech firm mishandled corn in Iowa", by Justin Gillis, The Washington Post, 14 Nov 2002

<sup>90</sup> BBC, 6 October 2000

(Novartis and AstraZeneca), Aventis (now Bayer) and DuPont (which owns Pioneer Hi-Bred) - control almost the whole global GM seed market.

Whole food production chains may find themselves under monopolistic control - from delivery of agricultural inputs (seeds, fertilisers, chemicals, machinery etc.) via the growing of plants up to the harvest and throughout processing. Producers may find themselves obligated to the increased use of specific agro-chemicals necessary to grow specific GE seeds. They may be crushed by transnational corporations supplying increasingly-expensive inputs and purchasing their agricultural outputs at ever lower prices.

### ***Who foots the bill for segregation?***

The acceptance of the cultivation of GE crops by the Romanian Government and its administration is likely to have severe economic repercussions. It will not only affect Romania's farmers, but its animal feed producers, the animal husbandry industry, the starch and food processing food industries, as well as grain traders and those specialising in the export of Romanian food and animals.

If Romania intends to pursue the path towards GE agriculture, but wants to meet the demands of the EU market where identity preservation is required; the following measures need to be taken at each stage in the production chain:

- Additional investment in farm and grain storage capacity to enable segregation of crops after harvest and during storage to ensure no cross-contamination of GM and non-GM produce. This would need to be enforced and controlled by an authority with sufficient credibility to satisfy buyers of non-GE crops, especially those exporting to the EU.
- Additional investment in laboratory infrastructure to enable testing and certification of non-GE crops. To be able to guarantee non-GE raw material all those involved in the production chain - farmers, food processors, and exporters - will need to certify their products as non-GE.
- Additional investment in labelling: the EU is currently discussing proposals to improve traceability and labelling of food and feed produced from GMOs.

Who is going to bear the additional costs of GE agriculture? If farmers, food processors and exporters pass on these costs to the consumer, the higher price of GE food is likely to lead to consumer discrimination against GE. The companies may consider absorbing the additional costs of testing and labelling and accept lower profit margins. However, for those Romanian farmers who are already struggling to survive, this could well spell bankruptcy. The transnationals could simply ignore all the requirements for labelling and testing and risk losing the EU market. This would be the least transparent alternative and one that would seriously hamper Romania's efforts to join the EU.

## 6. Romania - Caught between the US and the EU

Romania is today being used by the US to intervene in EU policy, by seeking support from pre-accession countries. Romania has consistently supported the US on issues such as the International Criminal Court, providing US air bases for a war on Iraq and GMOs, taking positions that are out of sync with the most of Europe.

The public is unaware that there is already widespread cultivation of GE crops in Romania. Romanian consumers are eating foods derived from GMOs without their knowledge or consent.

Although Chapter IV (Part 2) of the GMO Ordinance puts a duty on the Commission, national competent scientific authorities and others to inform the public and build their awareness about GMOs, to this day there is almost zero public awareness of this issue. An official of the Agriculture Ministry, Dr. Constantin Sin has been quoted saying that in 1999 GE seeds were registered on the National Seed List with no information that they were genetically engineered. The same official also stated that the public was not informed about the seed registrations "*due to the lack of financial resources*".<sup>91</sup>

The new GMO law (Art. 16) requires that the Environment Ministry informs and consults the public about any notification it receives to release a GMO. Chapter VI of the new law (Art 27) lays down the information that may not be kept confidential. However, the Environment Ministry has not sought comments - even from environmental NGOs - on the recent notification by the Research Institute for Cereal and Industrial Crops in Fundulea to release a GE variety of wheat resistant to fusarium. The GMO law requires that the Environment Ministry seek comments within 10 days of receipt of the notification, after which the public has 30 days in which to provide comments, which should be considered when making a decision for authorising the proposed activity.

Without access to information, there can be no public participation. The Biosafety Commission includes no representatives of civil society. Elsewhere in the region, Hungary has 4 NGO members on its 17-member Biosafety Commission: two from environmental and two from consumer groups. In Poland, the 19-member Commission includes 3 NGO representatives.

Moreover, Romania ratified the UNECE Århus Convention on Access to Information to Information, Public Participation and Access to Justice in Environmental Matters in July 2000. Art. 5 of this Convention, which came into force 30<sup>th</sup> October 2001, gives the public the right to information on GMOs.<sup>92</sup>

### ***Public Awareness Raising***

In 2000, the Romanian Centre for Small & Medium-sized Enterprises (CRIMM) received an EU Phare Access grant to run a project to build public awareness of GMOs and to encourage a public dialogue. As part of the project CRIMM organised a seminar, a workshop and a roundtable, the latter with the participation of researchers, producers, consumer organisations and officials from the Institutes of Food Research and Public Health.

Their conclusions, published in December 2002, note that there is no information about:

- the potential problems of GMOs
- the situation regarding releases of GMOs in Romania
- the methods used for risk assessments for the consumer and the environment
- the legislation and institutional framework (in Romania and the EU)

CRIMM notes that consumers confuse GMOs and E-number additives. Consumer organisations are not opposed to GMOs, because they lack information about their potential negative effects. They tend

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<sup>91</sup> "*National Biosafety Commission boldly admits that the public was not warned for lack of financial resources*" by Claudia Botzatu, Cotidianul, 28 April 2000

<sup>92</sup> More information: [www.unece.org/env/pp/ctreaty.htm](http://www.unece.org/env/pp/ctreaty.htm)

to repeat the biotech industry mantra that GMOs could reduce the use of pesticides. Likewise, associations of producers claim that labelling GMOs would lead to higher food prices and believe that GMO will improve the economic efficiency of agriculture.<sup>93</sup>

### ***Pro-biotech Activities of the US Government***

The US government and its agencies, USAID and USDA have been very active in promoting US companies selling GE seed in Romania.

For example in 2000, the USDA reports that US companies organised a "Biotech Group" to counter inaccurate coverage of GMO activities and to advance the case for GMOs. The greatest concern of the "Biotech Group" was the composition of the Biosafety Commission. *"The 'Biotech Group' will lobby actively to enlist as members of the 'National Commission on GMOs' well-informed and open-minded persons who see the value of GMOs ...."*<sup>94</sup>

The same report states that for the 1999 Cochran Program, the USDA recruited six Romanian government officials responsible for testing and registering GMOs as well as drafting of legislation. As a follow-up, the Cochran Program enabled another group representing agricultural media to learn about GMO crops and foods. *"It is hoped that these Cochran Program activities will have a positive impact on the future of GMO technology in Romania"*.

### ***Problems for EU Accession***

*"It isn't enough to have the laws on your books, you have to implement them"*.  
Environment Commissioner Wallström<sup>95</sup>

The widespread cultivation of GE crops in Romania could hamper Romania's accession negotiations. The potential presence of GMOs on the Romanian market - both from domestic production and imports from the US and Argentina - such as *Bt* potatoes that have not been approved in the EU, could obstruct the functioning of the EU's single market, once Romania joins the EU. Moreover, its failure to label even those GMOs that have been approved in the EU, could also create problems for accession.

All the GMOs released in Romania contain antibiotic resistance (ABR) marker genes. The EU's revised directive on deliberate release<sup>96</sup> of GMOs requires the phase out of GE plants with ABR genes *"which may have adverse effects"* by 2004 that have already been commercialised. By 2008, all GE crops containing any ABR genes will need to be phased out. Does Romania have a plan for how the existing GE seeds and crops are to be taken off the market?

The EU is currently finalising proposals to strengthen its traceability and labelling requirements for food and feed products, derived from GMOs.<sup>97</sup> The Commission defined the traceability principle in the explanatory memorandum to proposal COM (2001) 182 (final) as: *"...the ability to trace GMOs and products produced from GMOs at all stages of the placing on the market throughout the production and distribution chains facilitating quality control and also the possibility to withdraw products"*. To make the traceability principle work, the Commission intends to introduce several traceability and labelling requirements for GMO producers. Operators will be obliged to label pre-packaged products and to transmit information to receiving operators about the unique code(s) of the GMO(s) in case the product contains or consists of GMOs.<sup>98</sup>

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<sup>93</sup> "Drepturile Consumatorului si Organisme Modificate Genetic", Fundatia CRIMM, December 2002

<sup>94</sup> USDA FAS GAIN Report # RO0005 by Holly Higgins, US Embassy, 28 Feb 2000  
<http://www.fas.usda.gov/scripts/gd.asp?ID=25667501>

<sup>95</sup> "Eastern States pressured to apply EU green laws", Environment Daily 1367, 21 January 2003

<sup>96</sup> Directive 2001/18/EC on Deliberate Release of GMOs into the Environment

<sup>97</sup> Genetically modified food and feed (COM (2001) 425) and Traceability of GMOs, GM food and feed (COM (2001) 282), both awaiting Council decision

<sup>98</sup> Article 4.2 of the proposal COM (2001) 182 (final)

The new proposals on traceability of labelling of food and feed would close several current loopholes. In future GMOs used for animal feed will require authorisation and labelling. In addition, the current product-based labelling will be replaced by a process-based system, requiring that products, such as soy oil, where the foreign DNA cannot be detected, to be labelled, if they contain above 1% GMOs. Members of the European Parliament have proposed lowering this threshold from 1% to 0,5%, above which the accidental contamination of produce by GMOs must be labelled. They also demanded a ban on products containing GE ingredients not authorised in the EU.<sup>99</sup>

If Romania continues with commercial cultivation of GE crops and imports of GMO-contaminated seeds and crops, and fails to implement a system of segregation and labelling of GE crops and food, it will be unable to harmonise with the EU. However, segregation of crops after harvest and in storage to avoid contamination of GE and non-GE will require additional investment in farm and grain storage capacity.

But Romania does have another choice. The Government needs to take control of the situation and announce an immediate moratorium on all releases of GMOs into the environment. This might seem a drastic step, but one that seems to be the only option for Romania. It must revoke all current licences for releases of GMOs and set up certified laboratories to test for GMO contamination of seed, food and feed within a routine monitoring programme. All GMOs detected in Romania must be destroyed. All shipments of GMO-contaminated seed or grain must be refused. The alternative worst-case scenario is that, due to the absence of control measures, that include testing and labelling infrastructure, Romania will be unable to harmonise with the EU and its agricultural exports may be banned from EU markets altogether. Moreover, on EU accession, Romania GE crops and food may also be excluded from the domestic market due to EU harmonisation requirements, e.g. for GMO approvals and labelling. This would lead to bankrupt farmers and disrupt the functioning of the EU's single market.

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<sup>99</sup> "EP Environment Committee strengthens Commission proposals to label GM Food", FoEE Biotech Mailout, Vol. 8, Issue 3, June 2002 at [www.foeeurope.org/biotechnology/about.htm](http://www.foeeurope.org/biotechnology/about.htm)

## 6. Conclusions

### ***1. There is widespread cultivation of GE crops in Romania, but there are no systems in place for segregating GE crops from non-GE or systems to ensure labelling of food containing GMOs or products thereof.***

Roundup tolerant soybeans and Bt potatoes have been grown commercially since at least 1999. There have also been releases of GE maize and sugar beet. With no systems in place for post-approval monitoring or segregation of the GE crops from the non-GE and thus traceability, all Romanian food becomes suspect of GMO-contamination, whether caused by cross-pollination or the absence of segregation.

Agriculture plays an important role in the economy of Romania. In its rush to 'modernise' agriculture, Romania must reject the use of genetic engineering in farming in order to retain the option of growing non-GE crops conventionally. The commercialisation of GE crops could have long-term implications for food safety, but more immediately Romania's ability to export its GMO-contaminated harvest. This could have important socio-economic impacts, especially for farmers, as Romania loses its export markets for agricultural products in the EU and Asia, where consumers are demanding non-GE food. For more information about health concerns, see Section 11: Health Risks.

### ***2. There is no independent control of GE activities***

Some of the scientists on the Biosafety Commission have a vested interest in releasing GMOs. For example, Paun Ion Otiman is a member of the Biosafety Commission and leader of the World Bank project to develop Romanian varieties of the *Bt* potato.

Where is the agriculture Ministry to defend Bulgarian agronomic interests? Where is the Health Ministry to protect public health? Where is the Environment Ministry to protect biodiversity? Without independent and democratic control of this technology, all Romanians stand to lose - farmers, food processors, exporters and consumers.

### ***3. There is no democratic control over genetic engineering activities***

Romania's regulation of the use and release of GMOs into the environment lacks any transparency. Although GMOs are released into the public domain - the environment and food chain - the public is not informed about these releases or about the food they are eating. There are no procedures for informing the public about releases of GMOs, even though Romania is a party to the Århus Convention.

Thus, environmentalists, organic farmers, church and consumer groups, as well as the public at large are excluded from participating in an informed debate, despite the fact that these new biotechnologies can have an immense impact on their livelihoods, health and environment.

### ***4. Romania's GMO law fails to harmonise with the EU***

EU policy on GMOs is becoming increasingly restrictive in response to consumer concerns about food safety. A de facto moratorium on approving new GMOs in the EU that has been in place since October 1998, is unlikely to be lifted until traceability, labelling and liability requirements are in place.<sup>100</sup>

Some of the GMOs grown in (and possibly also imported to) Romania are not approved in the EU. Monsanto's soybeans tolerant to glyphosate (Roundup) are not approved for growing in the EU; only for import and processing. Monsanto's *Bt* potatoes are not authorised for cultivation, import or processing in the EU. Other GMOs released in Romania which have no EU approval include Aventis Liberty Link maize and Monsanto's Roundup tolerant maize.

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<sup>100</sup> Statement by the Danish, Austrian, Italian, Greek, Luxembourg and French delegations during the third reading vote by the council, February 2001

If these GMOs are not approved in the EU by the time of Romania's accession to the EU, they will need to be taken off the market, at considerable cost. Moreover, according to the EU's revised directive on deliberate release 2001/18/EC, all the GE crops currently grown in Romania will have to be taken off the market by 2008 at the latest, because they contain antibiotic resistance marker genes.

### **5. Organic farming or GE agriculture in Romania?**

On the one hand, the Romanian Government passed a law on organic farming in 2000 and is promoting organic farming in mountainous regions. On the other, the Government promotes GE agriculture.

Genetically engineered food production is the antithesis of organic farming. It violates the principles of organic agriculture. According to IFOAM,<sup>101</sup> GE food cannot be considered organic. Moreover, cross-pollination is likely to genetically contaminate the organic crop. (See Section 10: *Plants out of control*) IFOAM President has demanded that *"Those who claim ownership rights to these genes should be held liable for their uncontrolled spread in the environment and into our food"*.<sup>102</sup>

Yet there is no information to farmers about what neighbouring farms may be growing. There are no measures to minimise cross-pollination of the GE crops with their conventional or organic counterparts. If Romania really wants to nurture its fledging organic agriculture programme, it must unequivocally reject GMOs.

If Romania hopes to find a market in Western Europe for its agricultural produce, it needs to stay ahead of the game, by supplying the EU's insatiable demand for GE-free and organic food.

- In the UK, the retail market for organic food is now worth over £900 million (US\$ 1,44 bln) and was £15 billion (US\$ 24 billion) in 2000,<sup>103</sup> several times larger than the global market for GE seeds estimated at US\$ 3,7 billion (the only relevant market for GE seed; there is no specific demand for GE food);
- In the EU, growth rates of organic farming are 25%. In the period 1993-98, the area under organic production methods more than trebled from 890,000 ha. to 2.9 million ha.<sup>104</sup>
- As of 2001, the EU has almost 4,5 million ha (3,24% of agricultural land) under organic. Italy leads with 1,23 million ha (7,9%) under organic production, followed by UK with 679,631 ha (3,96%) and Germany with 62,000 ha (3,7%). Austria has the highest proportion of agricultural land under organic with 11.3%.<sup>105</sup>

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<sup>101</sup> International Federation of Organic Agriculture Movements at <http://www.ifoam.org/>

<sup>102</sup> "Genetic pollution is threatening consumers' right to choose", IFOAM press release, 19 March 2001

<sup>103</sup> "Organic Food & Farming Report 2001", Soil Association, 2001

<sup>104</sup> "Conference Summary Statement" from European Commission and Austrian Government Conference "Organic farming in the European Union - Perspectives for the 21<sup>st</sup> Century, 27-28 May 1999, Baden, Austria

<sup>105</sup> Organic Farming in Europe - Provisional Statistics 2001. See:

[www.organic-europe.net/europe\\_eu/statistics.asp](http://www.organic-europe.net/europe_eu/statistics.asp)

## 7. Recommendations

The release of GMOs into the environment presents unknown hazards, which may cause irreversible harm to the biological diversity of ecosystems as well as to animal and human health. No risk assessment can ultimately ensure against such irreversible harm, and no one can therefore predict the full and long-term consequences of releasing GMOs to nature.

As more of such organisms are created and released, the more complicated cause and effect linkages become. For these reasons, the Romanian NGOs, Bioterra and EcoSens advocate the precautionary principle and condemn the current 'wait and watch what happens' attitude. The precautionary principle dictates no releases of GMOs into the environment and no use of GMOs as food. The lack of predictability of the long-term behaviour of such organisms runs contrary to the precautionary principle. Therefore, we are opposed to all releases of GMOs into the environment.

Today's approach is to use risk assessments and risk management plans. There are, however, considerable problems in undertaking risk assessments. Firstly, there is limited knowledge about the nature of the hazards involved, given the complexity of the environment and ecological processes, and our lack of knowledge of how they function. Secondly, it is not just individual GMOs being introduced that have to be considered, but the extent to which they may be able to pass on their new genes to closely-related organisms, and what kinds of unforeseen and unpredictable effects and genetic combinations might result in the long term.

### *Bioterra and EcoSens demand that:*

1. **All releases of genetically engineered organisms into the environment and the food chain be prohibited immediately.** This moratorium should stay in place until GMO policy and legislation is harmonised with that in the EU and the institutional framework is in place to implement the legislation.

The Government needs to build institutional and technical capacity to identify GMO contamination of crops, foods and seeds grown domestically and being imported. This monitoring must include all GMOs, both those approved and unapproved on the EU market. If monitoring reveals the presence of GMOs in seeds, food and feed, they must be taken off the market and destroyed.

2. **All permits must be revoked** for the import and sale of GE seed, for field trials and commercial cultivation of GE crops. Any GE seed already in Romania must be destroyed.
3. **No GE food be allowed on the Romanian market**, until a mandatory process-based labelling system is in place. This requires traceability of all seeds or commodities that are GMOs or contain their derivatives. They must be labelled and handled separately from conventional non-GE crops from field to fork, or for imports, from port of entry to the plate. We believe that Romanians do not need GE food.
4. **All imports of GMOs must be prohibited.** The Government must start monitoring imports of agricultural commodities to ensure compliance with the import ban.
5. Parliament **ratifies the Biosafety Protocol** and develops the **Biosafety Clearing House as crucial means of providing public information.**
6. The **Biosafety Commission must include representatives of civil society**, including NGOs, the churches, natural scientists and officials.
7. Romanians must have the **right to declare their region or country a GMO-free Zone**

Given Romania's exceptionally rich biodiversity and potential for organic farming, amendments to the current law (or any new GMO law) should contain provisions that allow communities to declare their territory a GMO-free zone.

8. The Government must provide **support for organic farming**, by stimulating demand for organic food through education, public procurement policies and by providing economic incentives.
9. **The World Bank project** for the development of GE *Bt* potatoes must be cancelled.
10. The Environment Ministry **must not give approval for the release of GE wheat** at the Research Institute for Cereals and Industrial Crops.
11. The EU must play a stronger role in advising the Romanian Government on its policies, especially on GMOs

We call on all concerned citizens and social organisations - environmental, consumer, church groups - to join our campaign and support our demands. In the countries of the European Union, public pressure has led to a de facto moratorium on approvals of GMOs.

## PART B: THE ENVIRONMENTAL AND HEALTH RISKS OF GMOs

### *9. The difference between traditional biotechnology and genetic engineering*

GE crops are more than just the next generation of high-tech plant varieties. They feature two specific characteristics that could make them a special threat to human health and to the environment:

Firstly, GE plants contain genes and traits that are completely new to the target species, its environmental context, and its genetic background. While traditional breeding can move genes only among related varieties or closely related species, genetic engineering allows for a movement of genes across radically different species. No traditional breeder is able to cross a carp with a potato, or a bacterium with a maize plant. There is no history of bacterial genes in maize. There was no evolution or selection over thousands of years that would have qualified the bacterial gene to be an integrated part of the maize population. The effect of newly introduced genes and gene fragments under real world conditions, in different climates or in reaction to different pests or diseases, is completely unpredictable, posing a threat not only to the crop, but also to related species and the ecosystem.

Secondly, the process of genetic engineering is neither targeted nor precise, but a rather crude intervention or bombardment. The newly introduced gene could end up being integrated anywhere in the plant genome. It can neither be directed to a specific site within the plant's genes, nor is the site of integration necessarily known afterwards. Because the expression of a given gene or gene fragment depends heavily on the site of integration and the genetic background, it is merely a matter of luck if the newly introduced gene works as expected and no major changes in the plant performance are induced. Several natural mechanisms are known (e.g. pleiotropy, epistasis, or position effects) to influence the specific outcome of a foreign gene transfer and these cannot be anticipated.

These are the two fundamental differences between conventional plant breeding and genetic engineering. Either can have unforeseen consequences when GE plants are released into the environment.

### *10. Environmental risks*

Genetic engineering and its products have only emerged over the last 20 years. It is almost impossible to evaluate the potential impact of transgenic species on the environment. However, based on what they have observed in similar situations with naturally occurring species, scientists have suggested the following effects:<sup>106</sup>

**Creating new pests:** a crop which has been genetically engineered to be salt-tolerant could escape cultivated fields, invade estuaries, stifling the natural estuarine vegetation.

**Increasing problems with existing pests:** crop plants are capable of transferring genes, via wind or insect pollination, over several kilometres to related plants, some of which may be weeds. Thus the foreign genes of crops with engineered traits, such as tolerance to herbicides or drought, could be transferred to weeds, making them even more difficult to control.

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<sup>106</sup> C.A. Hoffman, "Ecological Risks of Genetic Engineering of Crop Plants", *Bioscience*, Vol. 40, No. 6, 1990, p434; Also: T. Klinger and N.C. Ellstrand, "Engineered Genes in Wild Populations: Fitness of Weed-Crop Hybrids of *Raphanus sativus*", *Ecological Applications*, 1990, Vol. 4, No. 1, pp. 117-120; Also: I. Skogsmyr, "Gene Dispersal from Transgenic Potatoes to conspecifics: A Field Trial", *Theor. Appl. Genet.*, 88, pp. 770-774, 1994; Also: T.R. Mikkelsen, B. Andersen and R.B. Jorgensen, "The Risk of Crop Transgene Spread," *Nature*, Vol. 380, 7 March 1996; Also: R.B. Jorgensen and B. Andersen, "Spontaneous Hybridisation between Oilseed Rape (*Brassica napus*) and Weedy B. *Campestris* (*Brassicaceae*): A Risk of Growing Genetically Modified Oilseed Rape," *American Journal of Botany*, 81 (12), 1994, pp.1620-1626.

**Harming non-target species:** viruses, micro-organisms or plants engineered to kill insect pests could also affect beneficial insects. In experiments, bacteria engineered to convert plant residues, such as leaves, to alcohol for use as fuel decreased the populations of beneficial fungi. In some cases, it also killed nearby grasses from alcohol poisoning.<sup>107</sup>

**Destroying biodiversity by replacing native species:** GE crops with a survival advantage could escape fields, invade other ecosystems and replace other species. This loss of biodiversity could severely impair the ability of an ecosystem or species to successfully respond to sudden stresses, such as drought or disease.

**Squandering valuable biological resources:** the bacteria *Bacillus thuringiensis* (*Bt*) is currently used as a natural pesticide. Scientists, however, are genetically engineering many crops with *Bt* and this may speed up the process by which large numbers of insects adapt and become resistant to *Bt*, rendering it ineffective.

### ***Plants Out of Control: Outcrossing (Cross-Pollination) of Genetically Engineered Plants***<sup>108</sup>

Once released into the environment, GE plants cannot be contained or confined. Like all living organisms, GE plants reproduce and this is an opportunity for gene escape beyond the designated area of growth. Seeds can be picked up by birds and dropped elsewhere, bigger mammals can remove potato tubers, or reproducible plant parts could just be dislocated by wind. The major pathway of escape of the newly introduced gene into the wild is via pollen transfer. When a GE plant flowers, the pollen contains the newly introduced genetic material and can carry it to another plant and fertilise it, resulting in seeds that will also contain the engineered gene. It has been proven that oilseed rape, maize, sunflowers, potato, sorghum, and many other crops can crossbreed with wild plants that grow near agricultural land in many parts of the world.

#### *Pollen Flow*

Recent research has revealed that pollen can travel over much larger distances and can contaminate the harvest of innocent farmers in the vicinity:

- In January 1999, the UK's Soil Association commissioned an independent report by the National Pollen Research Unit at the University of Worcester, UK,<sup>109</sup> which included references showing that bees pick up pollen from maize plants and can carry it for several miles. The report concluded: "overall, it is clear that the maize pollen spreads far beyond the 200 metres cited in several reports as being an acceptable separation distance to prevent cross-pollination."
- Scientists in the UK planted male-sterile oilseed rape plants at various distances up to 4000 m from a field in which transgenic oilseed rape was being grown. The researchers used male-sterile plants that are not able to self-pollinate so that they would know for sure that any seeds produced must come as a result of cross pollination from the field. The scientists found that even at 4000 metres, 5% of flower buds on the test plants were pollinated.<sup>110</sup>

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<sup>107</sup> T.M. Holmes & E.R. Ingham, "The Effects of Genetically Engineered Micro-Organisms on Soil Foodwebs," Supplement to Bulletin of Ecological Society of America 75/2, Abstracts of the 79th Annual ESA Meeting: Science and Public Policy, Knoxville, Tennessee, 7-11 August 1994.

<sup>108</sup> Parts of this section is taken from Luke Anderson, "Genetic Engineering, Food and Our Environment - A Brief Guide", Green Books, Devon, UK, July 1999, Chapter Two, pp. 48-50.

<sup>109</sup> J. Emberlin, "The Dispersal of Maize Pollen", National Pollen Research Unit, 2 March 1999

<sup>110</sup> Simpson, E.C., Norris, C.E., Law, J.R., Thomas, J.E. & Sweet, J.B. (1999) "Gene flow in genetically modified herbicide tolerant oilseed rape (*Brassica napus*) in the UK", 1999 BCPB Symposium Proceedings No 72: Gene Flow and Agriculture: Relevance for Transgenic Crops, pp75-81. British Crop Protection Council: Farnham, Surrey

### **Bt-Cotton in the USA: 'Do not plant south of Tampa'**

*'In Florida do not plant south of Tampa (Florida Route 60). Not for commercial sale or use in Hawaii'*. This label is on every seed bag of Monsanto's genetically engineered *Bt* cotton sold in the US. What is special about Hawaii and the south of Tampa? What makes the US prohibit the commercial growing of a GE crop in a specific region, while the very same variety is grown on more than 2 million hectares in the rest of the country?

In Hawaii, the reason is called *Gossypium tomentosum* – a wild plant related to cotton. In southern Florida, feral cotton (*Gossypium hirsutum*) occurs in the Everglades National Park and the Florida Keys. In both cases, free exchange of genetic material with cultivated cotton is possible. The US Environmental Protection Agency (EPA) was concerned about gene transfer from the GE varieties to the wild relatives and asked Monsanto to keep the *Bt* cotton out of the areas where close relatives grow.<sup>111</sup>

In Summer 1998, France decided provisionally to stop any commercial growing of genetically engineered plants that have the ability to pass their genes to wild relatives, namely oilseed rape and beet. No approvals for transgenic lines of these two crops will be granted by the French government. This French moratorium was due to the fact that any release of GE oilseed rape or beet would be irreversible due to the high probability of outcrossing and hybridization with wild relatives.

### ***Selective advantage and competitiveness***

While it is commonly agreed amongst the scientific community that gene escape is a likely event, its impact is debatable. One major fear is the possibility that the newly introduced gene will confer a selective advantage and will thus enable the plant to out-compete and overrun other natural vegetation. The risk is greatest when a wild relative of a GE plant is already considered a weed. Should this weed acquire – via pollen transfer – new genetic material conferring a selective advantage, it might wreak havoc in both agriculture and natural habitats. Genetically engineered "super-crops" could transfer their foreign genes to other plants and in time, could totally displace other varieties and accelerate the disappearance of native cultivars on which organic agriculture relies. The impacts are unknown and irreversible.

Many crop species – such as oilseed rape, potato, tomato, or beans – have close relatives that are already considered major weeds. It is obvious that many of the traits favoured by genetic engineers would confer a fitness advantage, especially resistance to pest and diseases or tolerance to drought and salinity.<sup>112</sup> Researchers at the University of North Carolina found that insect-resistant oilseed rape containing a bacterial gene (*Bt*) had a higher fitness than the conventional oilseed rape. The GE plants produced significantly more seeds than their natural counterparts. The researchers concluded: "*insecticidal oilseed rape could pose an ecological risk upon environmental release. Since oilseed rape is already a minor weed in certain areas, the ability to strongly resist defoliation may allow it to selectively persist to a greater extent by replacing non-transgenic naturalised populations.*"<sup>113</sup> The development of pharmaceutical and chemical producing GE plants opens a new field of concern.<sup>114</sup>

If GMOs survive and flourish, they could displace natural wild species and those plants and animals that depend on them. The drive to create 'super-crops' designed to protect themselves against their main enemies, such as insects and disease, could result in their proliferation at the expense of native plants. The biodiversity of ecosystems located near fields of 'super-crops' could be threatened. In time, the engineered plants could entirely replace the native flora and threaten the survival of the wildlife that depend on them. A well-documented example of negative effects on gene flow from agricultural varieties to wild relatives is the extinction of Wild Rice in Taiwan. Wild Rice crosses with cultured rice. Already in the 1950s,

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<sup>111</sup> "Centres of Diversity - Global Heritage of Crop Varieties Threatened by Genetic Pollution", Greenpeace, 1999, [www.greenpeace.org](http://www.greenpeace.org)

<sup>112</sup> NC Ellstrand and CA Hoffman, "Hybridisation as an Avenue of Escape for Engineered Genes", *Bioscience* 40:438-442, 1990.

<sup>113</sup> CN Stewart, "Transgenic Insecticidal Oilseed Rape on the Loose" *Proceedings of the Workshop 'Commercialisation of Transgenic Crops'*, Canberra, March 11-13, 1997.

<sup>114</sup> NC Ellstrand, "When Transgenes Wander, Should We Worry?", *Plant Physiology* 125 1543-1545, 2001.

characteristics of cultured rice could be detected in populations of Wild Rice. According to Taiwanese researchers, the extinction of Wild Rice in Taiwan was caused by gene flow from Japonica varieties introduced in the 1930s.<sup>115</sup>

History has already taught us that introducing non-native species into new habitats can have catastrophic results. Predicting all the long-term impacts of exotics has proved to be impossible. A famous example is the introduction of Nile perch into Lake Victoria in the 1960s, which has decimated the native fish species, with over 200 species disappearing. As a further side effect, deforestation and erosion of the shoreline has occurred because Nile perch - unlike the native fish - cannot be sun dried and have to be smoked on wood fires.<sup>116</sup> The dangers of releasing GMOs could be even greater than releases of radioactivity and toxic chemicals into the environment. Unlike the products of nuclear and chemical pollution, GMOs can reproduce. Once released into the environment, they can multiply, spread, mutate and transfer their genetic material to other, often related, organisms. Once released, GMOs cannot be removed.

### ***GE Plants out of control: Examples of contamination of conventional seeds***<sup>117</sup>

Once released into the environment, genetically engineered (GE) plants cannot be controlled and will eventually show up in conventional crop varieties and foodstuff. During the past years, several cases of seed contamination with GE varieties have been reported. Major scandals involving the release of unauthorised GE varieties into the environment have rocked Europe and North America. Some examples:

#### 1. Contamination of indigenous maize varieties in Mexico

In April 2002, the Mexican government confirmed that despite its ban on the cultivation of GE maize, there is massive GMO contamination of maize crops in areas that act as the gene bank for one of the world's staple crops. This announcement by the Mexican government fuelled the controversy caused by the discovery of mutant strains of maize, which was originally reported in September 2001 in the journal *Nature* and then embarrassingly disowned by the journal.<sup>118</sup> Samples taken by the government from sites in two states, Oaxaca and Puebla - the genetic home of maize - revealed evidence of contamination at 95% of the sites.<sup>119</sup>

#### 2. Illegal GE-cotton in Greece

In March 2000, Greenpeace exposed large-scale genetic contamination of cottonseed in Greece. Three out of seven samples of cottonseed imported from the US tested positive for genetically engineered varieties. The Greek seed industry ignored the concerns and took no action to prevent planting of contaminated seed batches. They only agreed to additional testing of cottonseed samples after being forced by court orders. By August 2000, a total of 77 contaminated batches had been identified, making up a total of 847 tons of contaminated seeds, good for 34,000 hectares. 560 hectares have been identified with contamination levels above 1%. Before harvest, the Greek agricultural minister decided that those 560 hectares had to be harvested separately and excluded from any food use, such as cottonseed oil.

#### 3. Contaminated soybeans in France

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<sup>115</sup> JR Harlan, JMJ de Wet and EG Price, "Comparative evolution of cereals", *Evolution* 27: 311-325. 1973; HI Oka and WT Chang. "The impact of cultivation on populations of wild rice, *Oryza sativa f. spontanea*", *Phyton* 13: 105-117, 1959; YT Kiang, J Antonovics and L Wu, "The extinction of Wild Rice (*Oryza perennis formosana*) in Taiwan". *Journal of Asian Ecology* 1: 1-9, 1979.

<sup>116</sup> Anon, "Fishing Out the Gene Pool", *Appropriate Technology*, Vol.18, No. 4, March 1992, p.8; Also: M. Toner, "Are Test-Tube Fish Such a Hot Idea?," *International Wildlife*, Nov-Dec 1991, p.34

<sup>117</sup> This section is based on a briefing paper prepared by Greenpeace International in January 2001

<sup>118</sup> "Transgenic corn found growing in Mexico", by Rex Dalton, *Nature* 413, 365, 27 Sept 2001 at: [www.checkbiotech.org/root/index.cfm?fuseaction=newsletter&topic\\_id=2&subtopic\\_id=9&doc\\_id=1894](http://www.checkbiotech.org/root/index.cfm?fuseaction=newsletter&topic_id=2&subtopic_id=9&doc_id=1894)

<sup>119</sup> "Mexico's vital gene reservoir polluted by modified maize", by Paul Brown, *The Guardian*, UK, 19 April 2002 at: [www.guardian.co.uk/gmdebate/Story/0,2763,686955,00.html](http://www.guardian.co.uk/gmdebate/Story/0,2763,686955,00.html)

In August 2000, the French government ordered the destruction of 46 hectares of soybeans that were contaminated with GE soybeans. The beans were planted to produce seeds in the far south of France and contained between 0.8 percent and 1.5 percent of genetically modified material.

#### 4. Sugar beets with stacked genes

Even under greenhouse condition, genes can float uncontrolled between different varieties and can cause contamination of seed lots. The German seed company, KWS produced different herbicide tolerant sugar beet varieties in its greenhouse facilities. One variety that contained the gene for resistance to the herbicide, Liberty accidentally acquired an additional gene for resistance to Roundup, another herbicide. The contamination level was about 0.5%. The seeds were used in limited field trials in France, the UK and the Netherlands in 2000. The contamination only became obvious when the field trials were terminated in autumn 2000 and some of the plants unexpectedly showed resistance to Roundup. These seeds have not been used for commercial growing of sugar beet.<sup>120</sup>

#### 5. StarLink everywhere

On 18 September 2000, a GE maize variety that was only registered for use as animal fodder, showed up for the first time in food products in the USA. StarLink, a variety of *Bt* maize marketed by Aventis, was not allowed for food use by the US Environmental Protection Agency because of concerns that it could cause allergic reactions in some people. The Scientific Advisory Panel of the US Environmental Protection Agency determined on December 5 2000, that there is a “medium likelihood” that StarLink protein is a potential allergen.<sup>121</sup>

However, StarLink maize showed up first in Taco Bell corn chips and subsequently in many other products in the USA, Europe, Canada and Japan. The recall of nearly 300 contaminated food products<sup>122</sup> has been speculated to cost Aventis an estimated US\$ 1 billion. Although StarLink was grown on less than 1 percent of all US cornfields, it was commingled with much larger quantities of corn.<sup>123</sup> Azteca Milling, a US company that was amongst those first affected recalled all yellow corn products: “(..) *the best way to ensure our customers and the public that our products are safe is to make products only with white corn.*”<sup>124</sup> Aventis has agreed to withdraw its StarLink registration in the USA.<sup>125</sup>

#### 5. Indication of widespread contamination

Random samples of seed material collected in 2000 indicated that a significant percentage of seed batches could be contaminated with GE seeds. In the USA, 12 out of 20 random seed batches of conventional maize contained detectable traces of GE maize.<sup>126</sup> In Germany, a governmental laboratory screened maize samples and found genetic contamination in 2 out of 57 seed batches tested.<sup>127</sup>

These cases of GMO contamination of supposedly conventional seed increase the suspicion that the biotech industry may be deliberately contaminating nations that are resisting their products. EU legislation is unclear on how Member States should tackle cases where grain labelled as conventional is found to contain GE material. Essentially, it is up to individual governments to decide how to proceed in such cases.

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<sup>120</sup> KWS Press Release (in German) 9 October 2000 at [www.kws.de](http://www.kws.de)

<sup>121</sup> Advisory Panel Report Assesses Scientific Information concerning StarLink corn. EPA press release December 5, 2000 at <http://www.epa.gov/scipoly/sap/2000/november/starlinkpress.pdf>

<sup>122</sup> FDA Enforcement Report 00-44 1 November 2000 at <http://www.fda.gov/bbs/topics/ENFORCE/ENF00666.html> as of December 5, 2000

<sup>123</sup> *USDA doesn't know how StarLink tainted 1998 corn.* Reuters News Service November 23, 2000

<sup>124</sup> Azteca Milling, FAQs at <http://www.aztecamilling.com/news/index.html>, as of December 4, 2000

<sup>125</sup> Aventis Press Release from November 9, 2000 at [http://www.aventis.com/press/docs/2000-11-09\\_Aventis\\_CropScience\\_Starlink.PDF](http://www.aventis.com/press/docs/2000-11-09_Aventis_CropScience_Starlink.PDF) as of 4 December 2000

<sup>126</sup> *Sowing dissent.* New Scientist 27 May 2000, [www.newscientist.com](http://www.newscientist.com)

<sup>127</sup> Press release (in German) from the Ministry of Environment and Transport of the German State of Baden-Württemberg, 25 May 2000

In short, there is no GE-free guarantee for seeds imported from countries where GE varieties of the same crop are abundant. Any rapeseed from Canada, any soybean, maize, potato or cottonseed from the USA is subject to a contamination risk, and neither the respective governments nor the seed suppliers are able or willing to exclude any GMO contamination.

### ***The Killing fields: Insect resistant plants may affect non-target species***

Insect resistance is one of the key traits currently engineered in agricultural crops. Through genetic engineering, toxins are introduced into crop plants that kill insects that thrive on the plants. The most often used toxins are the so-called *Bt*-toxins, from the soil bacterium *Bacillus thuringiensis*. A whole array of different *Bt*-toxins is known, with different toxic properties.<sup>128</sup> The toxins were thought to be selective in that they do not kill every insect, but only a specific selection of some insects. There are *Bt*-toxins that are said to be specific for flies, others for larvae of butterflies or beetles. For decades, bacterial formulations have been used in agriculture - especially in organic agriculture - to fight insect pests.

A series of scientific studies have now disproved the presumption that the *Bt* toxin in GE crops has the same favourable characteristics as the *Bt* toxin in its natural state. There is now awareness among scientists that the *Bt* toxin in transgenic crops - as opposed to the *Bt* toxin in its natural form in bacteria - can harm species higher up the food chain, and may become accumulated in the environment. In its interaction with bacteria, the natural *Bt* toxin will occur in a crystalline inactive state. But, in transgenic *Bt* crops, like Pioneer's maize, the toxin will occur as a pre-activated plant protein, which is produced throughout the entire life of the plant. Thus, GE insect resistant crops may prove harmful to many non-target species, and may further disturb the ecological balance.

A 1998 laboratory study in Switzerland found that when lacewings (beneficial insects that prey on crop pests) were fed corn borers raised on *Bt* maize, the lacewings suffered from disruption to their development and increased mortality.<sup>129</sup>

In 1999, a study by researchers at Cornell University, USA showed the harmful effect of genetically engineered maize on the monarch butterfly. Milkweed dusted with pollen from *Bt* maize led to lower survival and growth rates in the monarch butterfly.<sup>130</sup> A recent study by researchers at the University of Iowa (US) published in the scientific journal *Oecologia* in August 2000,<sup>131</sup> showed that pollen from these plants killed up to 70% of Monarch butterfly larvae. This study was based on field experiments that mirrored the real world scenario.

This famous "monarch study", published three years after the first *Bt* plants were approved by the U.S. regulatory body and sown in many parts of the country, triggered a world-wide crisis in public trust in the U.S. model of company-driven, "assumption-based" risk assessments without legally binding standards. The study threatened to undermine the claims that GE crops are sufficiently regulated in the U.S. and do not pose any harm to the environment. To regain public trust and to lay the basis for comprehensive risk assessments, the biotech industry together with U.S. and Canadian authorities funded several studies. The field data for the studies were collected in 2000 and the results were published in 2001.<sup>132</sup> They appeared to be positive for the biotech industry: *The 2-year study*

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<sup>128</sup> Three types of genetically modified maize expressing the toxic *Bt* gene have been approved by the European Union: Novartis Bt 176, Monsanto MON 810 and Novartis Bt 11, but their approval is being challenged by several Member States. "Ban These Crops in Europe Now, says Friends of the Earth", Friends of the Earth Europe Press Release, 22 August 2000

<sup>129</sup> A. Hilbeck, W.J. Moar, M. Pusztai-Carey, A. Filippini & F. Zigler, "Toxicity of *Bacillus thuringiensis* CryIAb Toxin to the Predator *Chrysoperla carnea* (Neuroptera: Chrysopidae)", *Environmental Entomology*, Vol. 27, No. 4, August 1998.

<sup>130</sup> J.E. Losey, L. Rayor and M.E. Carter, "Transgenic Pollen Harms Monarch Larvae", *Nature* 399: 214, 1999.

<sup>131</sup> Hansen LC, Obrycki JJ (2000) Field deposition of *Bt* transgenic corn pollen: lethal effects on the monarch butterfly. *Oecologia* 125:241-248

<sup>132</sup> MK Sears, RL Hellmich, DE Stanley-Horn, KS Oberhauser, JM Pleasants, HR Mattila, BD Siegfried, GP Dively, "Impact of *Bt* pollen on monarch butterfly populations: A risk assessment", *Proceedings of the National*

suggests that the impact of *Bt* corn pollen from current commercial hybrids on monarch butterfly populations is negligible." The monarch butterfly was lucky as well because the most dangerous GE maize hybrid, *Bt176* had been planted on less than 2% of the estimated maize acreage. Novartis' *Bt176* is likely to be phased out in 2003 because it provides insufficient protection against the corn borer. The adoption rate of *Bt* maize in 2000 in the USA was some 19% of total maize plantings.

Alarmingly, the studies revealed that *Bt* plants could be planted in the U.S. without a knowledge-based risk assessment. The researchers could not get the necessary environmental data from the companies or authorities but had to compile them - rather hastily - years after the market introduction of *Bt* maize. Although hailed by GE proponents as proof of the harmlessness of *Bt* corn, the studies revealed that the U.S. regulatory system is itself totally inadequate. The final paper says this very politely in its concluding sentences: "*This approach to risk characterization is consistent with accepted risk assessment procedures and shares many similarities with previous risk assessments over a wide range of situations describing potential risk associated with a described hazard. It is imperative that future conclusions concerning the environmental or non-target impacts of transgenic crops be based on appropriate methods of investigation and sound risk-assessment procedures.*"<sup>133</sup>

A 1999 laboratory study showed that *Bt* toxin can leak from the roots of *Bt* crops into the soil.<sup>134</sup> Thus, beneficial non-target insects in the soil could be exposed to higher levels of *Bt* than previously thought.

It is known that Novartis' transgenic *Bt* maize is harmful to *Collembola* (springtail), a flightless insect, which feeds on fungi and debris in soil, and which is generally considered as a beneficial insect.<sup>135</sup>

These studies raise major concerns about the impacts of transgenic *Bt* crops on non-target species. As a result, species further up the food chain, such as birds, could face reduced food supplies. In addition, potential harm to predatory species threatens to undermine modern pest management. The preservation of predatory fauna associated with crop pests, such as green lacewings and ladybirds, is one of the most important tools for modern pest management.

Despite these concerns, more GE plants with built-in insecticides are in the pipeline: certain GE plants produce lectins that are special proteins that can bind to other proteins rendering them ineffective. If those target proteins play an important role in the organism, lectins exert toxic effects on that organism. In a laboratory experiment at the Scottish Crop Research Institute, it was shown that potatoes that had been engineered with a snow drop lectin gene to be resistant to insect pests could also harm beneficial insects further up the food chain. Female ladybirds (American: ladybug) were fed on aphids that had been eating transgenic potatoes, and when compared to ladybirds fed on a normal diet, they laid fewer eggs and lived half as long.<sup>136</sup>

### ***Bt-resistance: an environmentally friendly insecticide in danger***

*Bacillus thuringiensis* (*Bt*) is a soil bacterium that produces a toxin that is highly valued by organic farmers. These bacteria have been sprayed on crops for more than 50 years as a safe form of biological pest control. *Bt* targets particular species of insect, such as caterpillars, and the sprays are especially valuable to organic farmers in instances where there is a serious pest infestation.

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Association of Sciences of the United States of America 98 (21): 11937-11942 and four accompanying papers in the same issue of PNAS.

<sup>133</sup> *ibid.*

<sup>134</sup> D Saxena, S. Flores and Stotzky, "*Insecticidal Toxin in Root Exudates from Bt Corn*", Nature 402:480, 1999.

<sup>135</sup> EPA MRID NO 434635, *Bt* maize (corn) leaf protein (LP176-0194) - 28 days survival and reproduction study in *Collembola* (*Folsomia candida*).

<sup>136</sup> A.N.E. Birch et al, "*Tri-trophic Interactions Involving Pest Aphids, Predatory 2-spot Ladybirds and Transgenic Potatoes Expressing Snowdrop Lectin for Aphid Resistance*", Molecular Breeding 5: 75-83, 1999.

In marked contrast to the occasional application of the *Bt* toxin in organic farming, the transgenic *Bt* toxin is produced in the plants all the time they are growing. This means that insects are continually exposed to the toxin, and are therefore under constant pressure to develop resistance. Natural preparations of *Bt* toxin are composed of crystals of toxin contained in spores, which are simply sprayed on the crop but then are rapidly inactivated by sunlight and other environmental factors. The crystals have a half-life of around 2.7 days. Scientific data shows that resistance to *Bt* toxin will develop with the unregulated use of GE *Bt* crops. This is a most serious concern as it may jeopardise the future use of natural *Bt* formulation in environmentally friendly farming systems.

In the US, all field populations of the Colorado potato beetle (CPB) are still susceptible to *Bt* toxins. However, a *Bt* resistant CPB has been detected in a laboratory experiment.<sup>137</sup> This selected CPB strain could survive for two generations on the transgenic *Bt* plants.<sup>138</sup> Moreover, the development of resistance of an insect to one *Bt* toxin often leads to cross-resistance to other *Bt* toxins. For example, insects selected for resistance to CryIA(c) *Bt* toxin also developed resistance to CryIA(a), CryIA(b), CryIB, CryIC, and CryIIA *Bt* toxins.<sup>139</sup>

### ***Herbicide Use on Herbicide-Tolerant Plants***

*"The ability to clear fields of all weeds using powerful herbicides which can be sprayed onto GE herbicide-resistant crops will result in farmlands devoid of wildlife and spell disaster for millions of already declining birds and plants."*

-- Graham Wynne, Chief Executive of the UK's Royal Society for the Protection of Birds<sup>140</sup>

Until now, most of the research by the biotech industry has focused on making crops resistant or tolerant to their own 'broad spectrum' herbicides. These herbicides are non-selective: they kill every green plant. This means that a field can be sprayed with chemicals and nearly all plants will die except the resistant crop. In 2002, herbicide tolerance, used in soybean, maize and cotton, occupied 75% of the 58.7 million ha, and stacked genes for herbicide tolerance and insect resistance used in cotton and maize occupying 8% of the global transgenic area.<sup>141</sup> Herbicides themselves are known environmental pollutants found in food, soil and water. By developing herbicide-tolerant plants, it is clear that the intention is to use them in agricultural systems that include the use of herbicides.<sup>142</sup>

In 1999, a study on herbicide use in herbicide-tolerant plants revealed that US farmers growing RoundUp Ready (RR) soybeans used 2-5 times more herbicide measured in pounds applied per acre, compared to the other popular weed management systems used on most soybean fields not planted to RR varieties in 1998.<sup>143</sup> A detailed analysis of the data provided by the US Department of Agriculture, published in May 2001, revealed that US-wide between 3.6% (in tillage production systems) and 7.1% (in no-till systems) more herbicides were used on RR soybeans than on conventional varieties. In six states of the USA, over 30 percent more herbicides were applied on RR soybeans. The author concludes: "*RR soybeans clearly require more herbicides than conventional soybeans, despite claims to the contrary. (...) Looking ahead to crop year 2001, it is likely that the average acre of RR*

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<sup>137</sup> M. E Whalon, D.L. Miller, R.M. Hollingworth E.J. Grafius and J.R. Miller: "*Selection of a Colorado Potato Beetle (Coleoptera: Chrysomelidae) Strain Resistant to Bacillus thuringiensis*" J. Econ. Entomol 86:226 33, 1993

<sup>138</sup> M. Whalon and D Ferro, "*Bt Potato Resistance Management*", Now or Never. Serious New Plans to Save a Natural Pest Control. Union of Concerned Scientists, USA, edited by M. Mellon and J. Rissler, 1998.

<sup>139</sup> W.H. McGaughey and M.E. Whalon, "*Managing Insect Resistance to Bacillus thuringiensis Toxins*", Science 258:1451-1455, 1992.

<sup>140</sup> Luke Anderson, "*Genetic engineering, Food and Our Environment - A Brief Guide*", (Devon, UK: Green Books, July 1999), p. 27.

<sup>141</sup> "*PREVIEW: Global Status of Commercialized Transgenic Crops: 2002*", ISAAA

<sup>142</sup> Working Document, EU DG Agriculture: "*Economic Impacts of GM Crops on the Agri-Food Sector*", 2000

<sup>143</sup> Charles Benbrook, Benbrook Consulting Service, July 1999, full text at [www.biotech-info.net](http://www.biotech-info.net)

*soybeans will be treated with about 0.5 pounds more herbicide active ingredient than conventional soybeans. As a result over 20 million more pounds of herbicides will be applied this crop year.*"<sup>144</sup>

A grower survey in Missouri, USA revealed that most if not all fields planted to RR soybeans received at least one herbicide application, irrespective of the actual occurrence of weeds in the field. The authors explained this by the fact that farmers have to pay twice for transgenic seeds, for the seed itself and for the in-built technology. Obviously, the only way for the farmer to benefit from this investment is to apply the herbicide – otherwise he would have paid the technology fee for nothing. In the world of the farmer, it is simple psychology and not the weed that triggers applications of herbicides.<sup>145</sup> The underlying reason for the "package solution" is the unholy alliance of the combination of patents and genetic engineering. Under U.S. patent laws, GE crops can be patented and through careful wording of the patent claims, their use can be exclusively combined with application of the company's patented herbicide. This system creates a perfect monopoly and excludes any market competition.

In September 2000, on the basis of findings of new research carried out by the University of East Anglia into the predicted impacts of GE herbicide tolerant crops on wildlife, the researchers predicted: "*weed populations might be reduced to low levels or practically eradicated, depending on the exact form of management. Consequent effects on the local use of fields by birds might be severe, because such reductions represent a major loss of food resources.*"<sup>146</sup>

Herbicide tolerant plants could themselves pose environmental risks:

- Herbicide-tolerant plants may themselves become weeds;
- Weeds which are resistant to herbicide may evolve, in the same way that 'super-rats' have evolved which are resistant to rodenticide and bacteria have become resistant to antibiotics;
- The GE plants may transfer the 'foreign' genes for herbicide tolerance via pollen to other plants, encouraging the emergence of herbicide resistance, requiring new generations of herbicides. This will perpetuate the dependence on polluting agro-chemicals.

The latter point is already a reality. In 1997, a farmer in Alberta, Canada planted separate fields with oilseed rape (canola) that either resisted Monsanto's Roundup herbicide, Cyanamid's Pursuit or Aventis' Liberty. In 1999, he found weeds that resisted all three herbicides - glyphosate, glufosinate and imidazolinone.<sup>147</sup> Herbicide-resistant volunteer canola could become one of Canada's most serious weed problems because of the large areas of the Prairie Provinces that are devoted to this crop. Such "gene stacking" represents a serious development because to control multiple herbicide-resistant volunteer canola plants, farmers are forced to use older, more toxic herbicides, such as 2,4-D.<sup>148</sup> This example refutes the claim of GE proponents that herbicide resistant crops allow a more environmentally friendly agriculture.

Clearly, the solution to weed control lies not in GE technologies, but in restoring more sustainable farming practices, such as crop rotation and smaller plots, which reduce the weed problem in the first place.

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<sup>144</sup> Charles M. Benbrook : Troubled times amid commercial success for Roundup Ready soybeans. In the internet at: <http://www.biotech-info.net/troubledtimes.html>

<sup>145</sup> Smeda RJ, Allen JA, Johnson WG (1998) Herbicide Resistant Weed Update for Missouri. University of Missouri-Columbia, at <http://www.psu.missouri.edu/agronx/weeds/newsletterarticles/98agchemshcourse.html>

<sup>146</sup> Watkinson, Freckleton, Robinson and Sutherland, "*Predictions of Biodiversity Response to Genetically Modified Herbicide-Tolerant Crops*", *Science*, Vol 289, 1 September 2000

<sup>147</sup> Derksen, D.A., P.R. Watson, 1999. *Volunteer Crops: The Gift that Keeps on Giving*. Poster, Expert Committee on Weeds. Ottawa: ECW; Also: Downey, R.K. 1999. *Gene flow and rape - the Canadian experience*. In *Gene Flow and Agriculture: Relevance for Transgenic Crops*, 109-16, Farnham, Surrey, UK: British Crop Protection Control; Also: Hall L, Topinka K., Huffman J., Davis L., and Good A. 2000. *Pollen flow between herbicide tolerant canola (Brassica napus) is the cause of multiple resistant B. napus volunteers*. *Weed Science* 48: 688-694

<sup>148</sup> *New Scientist*, 19 February 2000, p. 21.

## 11. Health Risks

The main concerns over the food safety of GE foodstuffs centre on the following:

- The existing analytical tests and databases of natural toxicants and nutrients that are present in traditional foodstuffs are not adequate to assess unintended changes in GE foodstuffs;
- Genetic engineering can have a large impact on the toxins, allergens and nutrients in foods;
- Food allergies could be exacerbated by genetic engineering;
- The use of antibiotic resistance marker genes in some GE foods poses health concerns.

Two reports by medical doctors reveal growing concerns in the medical profession regarding the safety and regulation of GMOs. A report by the Irish Doctors' Environmental Association, published in March 2001 in response to a Government-commissioned report<sup>149</sup> challenged all three grounds on which the latter report based its conclusion that GE foods pose no threat to human health. The Irish Doctors' association rejected the report's contention that *"the scientific evidence about the safety of current GM food products is supported by the absence of reports of adverse effects from their consumption"*. Dr Cullen from the Irish Doctor's Association said: *"The complete lack of labelling means it's virtually impossible to trace back possible allergies."* She added that there had been a recent increase of allergies to soya among Irish children, and there was no way to tell if it was related to foods containing GE soya products, because there is no obligation to label them under EU law.<sup>150</sup>

The call by the Irish medical group echoes concerns raised by the British Medical Association (BMA), who in their 1999 Interim Statement said: *"any conclusion upon the safety of introducing GM materials into the UK is premature, as there is insufficient evidence to inform the decision making process at present."* The BMA urges the application of the precautionary principle in the development of GE crops and food, and asserts that GMOs should not be released until the level of scientific certainty is sufficient to ensure safety to health and environment. The BMA calls for a moratorium on the commercial planting of GE crops in the UK, the establishment of proper segregation and identity preservation systems for GE crops, and a ban on the use of antibiotic marker genes in GE food. In addition, they highlight the need for further research to determine the full health and environmental impact of GMOs.<sup>151</sup>

A recent highly authoritative report by the Austrian Government presents the results of examining applications for GE crop market introduction under EU law with respect to health safety data.<sup>152</sup> The report characterises the documents prepared by the biotech companies as follows:

*"Toxicology: In general toxicological information is rather a minor part of the dossiers. ... Most toxicity tests are displayed as summaries or are just references to the literature and can therefore not be verified and reviewed. Internal references are often used improperly. Statements which are closely related to each other are sometimes scattered over the dossier. ... Data on the toxicity of the whole GMP<sup>153</sup> are not provided in any dossier. ... Potentially toxic effects resulting as a secondary effect from the gene insertion are not considered in any case. Most of the toxicological testing were not carried out in compliance with quality assurance programs such as Good Laboratory Practise (GLP). GMP are very often declared as being safe just by assumption based reasoning. Furthermore these assumptions are sometimes not easily or not at all verifiable. Risk assessment procedures which are carried out in a systematic way consisting of a hazard assessment of the GMP on one hand and of an analysis of exposure on the other hand, are lacking in the dossiers."*

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<sup>149</sup> Report of the Inter-Departmental Group on Modern Biotechnology

<sup>150</sup> "Doctors criticise report on GM foods", by Gillian Ní Cheallaigh, Irish Times, 13 March 2001

<sup>151</sup> "The Impact of Genetic Modification on Agriculture, Food and Health - An Interim Statement", British Medical Association, Board of Science and Education, May 1999

<sup>152</sup> Federal Environment Agency (Austria), Toxicological and allergological safety evaluation of GMO, Monograph 109, English Summary at <http://www.ubavie.gv.at>, 2003

<sup>153</sup> GMP - Genetically modified plant

*Allergology: No direct testing of potentially allergic properties of GMP and products derived therefrom was carried out. The absence of allergenic properties was justified solely in an either argumentative way and/or by giving rather indirect evidence (e.g., digestion studies, sequence homology comparisons). Some quotations of literature intended to confirm the safety of the GMP in the dossiers are cited wrongly or are outdated or are even suspected to be selectively quoted. ... Furthermore, unintended secondary effects possibly caused by the gene insertion, such as the possible unregulated expression of other allergens through insertion and expression of the foreign gene in the GMP, are not considered at all. A safety evaluation which is based exclusively on the above described approaches is insufficient."*

### ***The Notion of 'Substantial Equivalence'***

The concept of 'substantial equivalence' has been at the root of international safety assessment and testing of GE food. According to this principle, selected chemical characteristics are compared between a GE product and any variety within the same species. If the two are grossly similar, and if it is shown that the genetic engineering has not inadvertently led to the production of known toxins and allergens, the GE product does not need rigorous testing because it is assumed that it is no more dangerous than its non-GE equivalent.

The use of 'substantial equivalence' as a basis for risk assessment is seriously flawed, and cannot be used to determine food safety. It focuses on risks that can be anticipated on the basis of known characteristics, but ignores unintended effects that may arise.<sup>154</sup> GE food may, for example, contain unexpected new molecules that could be toxic or cause allergic reactions. A product could not only be 'substantially equivalent', but even identical to its traditionally produced counterpart in all respects bar the presence of a single harmful compound. It has also been argued that substantial equivalence acts against rigorous scientific inquiry because it prevents testing of the assumption that GE does not cause changes that are more dangerous than traditional breeding.<sup>155</sup>

### **Genetic Engineering - The Potential to cause Allergies**

GE raises the possibilities of an increased incidence of allergies among consumers unaware of alien genes and proteins in their food. In 1996, a GE soybean spliced with Brazil nut DNA patented by what is now Dupont's seed subsidiary, Pioneer Hi-Bred, was pulled off the market before commercialisation, after researchers learnt that it could set off a deadly allergy in humans. The discovery of the allergenic potential of Pioneer's GE soybean was thanks to a unique advantage: the donor organism for the gene, Brazil nut, was a known food allergen, and serum samples of persons known to be allergic to brazil nuts were available for testing.<sup>156</sup>

### ***The Starlink Maize Fiasco***

In 1998, the US Environmental Protection Agency (EPA) approved the commercial cultivation of insect-resistant StarLink maize - a GE maize variety, spliced with a powerful *Bacillus thurengiensis* (*Bt*) toxin. Developed by a subsidiary of the French-German company Aventis, StarLink was approved only for animal feed because of fears that this GE maize could set off food allergies in humans. This is due to the presence in StarLink of a protein called Cry9C, which makes the maize 50-100 times more potent than other *Bt*-spliced GE varieties. StarLink is suspected of causing allergies because the Cry9C protein has an increased ability to resist heat and gastric juices, giving the body more time to overreact. The molecular weight of the protein is also consistent with something that can trigger an allergic reaction.

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<sup>154</sup>"*Importation of Ciba-Geigy's Bt maize is Scientifically Indefensible*", J. Fagan, at: [www.netlink.de/gen/BTCorn.htm](http://www.netlink.de/gen/BTCorn.htm)

<sup>155</sup> E Millstone, E Brunner and S. Mayer, "*Beyond 'Substantial Equivalence'*", *Nature* 401:525-526, 1999.

<sup>156</sup> Nordlee J.A., Taylor S.L., Townsend J.A., Thomas L.A. and Bush R.K. (1996) *Identification of a brazil-nut allergen in transgenic soybeans*, *The New England Journal of Medicine*, Vol 334, No 11:688-692; Also: Nestle M (1996) *Allergies to transgenic foods - question of policy*. *The New England Journal of Medicine*, Vol 334, No 11: 726-728

On 18 September 2000, Genetically Engineered Food Alert (GEFA),<sup>157</sup> a coalition of U.S. environmental groups, revealed that StarLink maize had been detected in a major US consumer food product, Kraft taco shells. The StarLink scandal made headlines and brought home the realisation to American consumers that the nation's supermarkets are filled with an extensive inventory of untested, unlabelled, genetically engineered food.

The biotech industry, Kraft (a subsidiary of Phillip Morris) and the EPA at first tried to deny the validity of the GEFA laboratory tests, but within days, public pressure forced Kraft to recall 2,5 million boxes of the maize tacos. Aventis followed on 26<sup>th</sup> September 2000, by announcing a stoppage of sales of StarLink seeds. On 9<sup>th</sup> October, the US Department of Agriculture (USDA) issued a formal recall order for all 350,000 acres (140,000 ha) of StarLink maize planted across the US. Further testing of food products for StarLink forced more recalls of products being sold in thousands of supermarkets. Since then over 300 kinds of chips and flour have been recalled, food processors' production lines have been disrupted, and Japan and other key buyers of US corn have put purchases on hold.<sup>158</sup>

#### Allergic Reactions reported by U.S. Consumers

Allergic reactions have been viewed for years as the primary threat to human health posed by GE foods, which typically have proteins from other organisms spliced into them. But the health complaints about StarLink are the first lodged by consumers against an engineered food.

In late 2000, 48 people across the U.S. reported allergic reactions from eating StarLink corn. Their cases are being investigated by the Food and Drug Administration (FDA) and the federal Centers for Disease Control and Prevention. In November 2000, the FDA said that about a dozen of the complaints appeared to involve bona fide allergic reactions.

In November 2000, Aventis once again asked the EPA to approve StarLink for human consumption, pointing to new research. However, an EPA expert panel recommended that the EPA not act on Aventis' request until a test was created and used to evaluate reports of allergic reactions to StarLink.

It has taken months for the FDA to develop a test for that potential allergic reaction, but officials say they believe they have one. However, it has not been double-checked and researchers warn the test will not give a definitive answer.<sup>159</sup> In March 2001, The FDA announced that it will soon begin blood-testing people who say they may have had an allergic reaction to StarLink.<sup>160</sup>

The StarLink fiasco bodes ill for future generations of GE crops. As the UK's New Scientist notes: *"If biotech companies and the FDA are unable to keep an unapproved variety like StarLink out of the human food chain,... what are they going to do once the next generation of bio-pharm plants begin to be commercialised, plants containing vaccines and pharmaceutical drugs, crops that could harm and poison unsuspecting consumers? The food industry needs to get its act together before the new generation of modified plants arrives. Next time, the consequences could be serious."*<sup>161</sup>

#### ***The Example of Tryptophan***<sup>162</sup>

Food supplements such as amino acids, are often manufactured by fermentative processes, in which large quantities of bacteria are grown in vats, and the food supplement is extracted from the bacteria and purified. One amino acid, tryptophan has been produced in this way for many years. In the late 1980s, the Japanese company Showa Denko K.K. decided to use genetic engineering to accelerate and

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<sup>157</sup> Website of GEFA: [www.gefoodalert.org](http://www.gefoodalert.org)

<sup>158</sup> "USDA doesn't know how StarLink tainted 1998 corn" by Julie Vornam, Reuter, 23 November 2000

<sup>159</sup> "Biotech corn is test case for industry - Engineered food's future hinges on allergy study", by Marc Kaufman, Washington Post, 19 March 2001

<sup>160</sup> "FDA to test for Biotech allergy", Associated Press, Washington, 19 March 2001. See: <http://news.excite.com/news/ap/010319/13/biotech-corn>

<sup>161</sup> New Scientist, 7 October 2000

<sup>162</sup> This section is based on a briefing paper by Dr. John B. Fagan from Genetic ID, USA, Nov 1997

increase the efficiency of tryptophan production. They genetically engineered bacteria and altered the cellular metabolism substantially, leading to greatly increased production of tryptophan. These GE bacteria were immediately used in commercial production of tryptophan, and the product was placed on the market in the US in 1988.

Showa Denko was allowed to sell the tryptophan produced by GE bacteria without safety testing because they had been selling tryptophan produced in non-GE bacteria for years without ill effects. It was considered that the method of production (whether via natural or genetically engineered bacteria) was immaterial. In effect they considered it **substantially equivalent** to the tryptophan that had been sold for many years.

This product was placed on the market, and within a few months it caused the deaths of 37 people and caused 1500 more to be permanently disabled.<sup>163</sup> It took months to discover that the poisoning was due to toxin present in the tryptophan produced using Showa Denko's genetically engineered bacteria. The disease caused by this toxic product is called Eosinophilia Myalgia Syndrome (EMS).

It was later shown that the tryptophan produced in GE bacteria contained one or more highly toxic contaminants. The most prominent of these, called EBT, was identified as a dimerization product of tryptophan. It comprised less than 0.1% of the total weight of the product, yet that was enough to kill people. This compound was probably generated when the concentration of tryptophan within the bacteria reached such high levels that tryptophan molecules began to react with each other. Thus, it appears that genetic engineering led to an increase in tryptophan biosynthesis, which led to an increase in cellular levels of tryptophan. At these high levels, these compounds reacted with themselves, generating a deadly toxin. Being chemically quite similar to tryptophan, this toxin was not easily separated from tryptophan, and contaminated the final commercial product at levels that were lethal to some consumers.

The tryptophan case is complicated by the fact that the company had also cut corners in the purification procedure at the same time as they introduced the GE bacteria. Until now it has not been definitively established whether toxicity resulted primarily from the use of GE bacteria or from cutting corners in the purification procedure. At the start of the investigations the company did not allow access to its bacterial strains and facilities to enable independent investigation. Later, the production process was again changed preventing simulations of the original production circumstances. In any case, this example highlights that the concept of substantial equivalence is flawed. The product that resulted from the new production process (after introducing GE bacteria and altering the purification process) was considered substantially equivalent to the former product.

This example highlights the danger that a genetic alteration in an organism can shift the metabolic pathway and cause the production of toxins that might not be detected during superficial safety tests.

### ***Antibiotic resistance marker genes***

Most of the currently marketed GE crops contain antibiotic resistance marker genes, in addition to the desired trait like insect or herbicide resistance.

There is the risk that the gene can be transferred from the plant to disease causing germs, whether the transgenic plant is used as animal fodder or as a food product for humans. These bacteria would then be immune to antibiotic treatment.

Research on if and to what extent such gene transfer can happen has only recently started, so the available scientific data is incomplete. In 2002, British scientific researchers demonstrated for the first time that genetically modified DNA material in food is finding its way into human gut bacteria, raising potentially serious health questions. Many GE crops have antibiotic-resistance marker genes inserted into them at an early stage in development. If genetic material from these marker genes finds

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<sup>163</sup> Mayeno, A.N. and Gleich, G.J., "Eosinophilia-myalgia Syndrome and Tryptophan Production: A Cautionary Tale," TIBTECH, 12, 346-352, 1994

its way into the human stomach, as experiments at Newcastle University (UK) suggest is likely, then the effectiveness of widely used antibiotics could be compromised.<sup>164</sup>

In a study published in La Recherche,<sup>165</sup> Professor Patrice Courvalin of the French Pasteur Institute points to the likelihood that antibiotic resistance will transfer from transgenic plants in the environment, and to the potential for transfer in the digestive tract. The paper warns that widespread cultivation of transgenic crops will significantly add to already problematic issues of resistant bacteria. There is sufficient scientific proof that:

- Genes can be relatively stable in the intestine;
- Bacteria can in principle take up genes in mammalian intestines;
- Horizontal gene-transfer from genetically modified micro-organisms to bacteria has been observed in the intestines of insects (e.g. spring-tails);
- Soil bacteria are known to take up genes in the soil.

The risks of antibiotic resistance genes used in genetic engineering are often trivialised by the industry, with the argument that a large proportion of the bacteria in our environment is already resistant to antibiotics. In their opinion, occasional gene transfers from GE plants to pathogens is statistically insignificant. Several research results contradict this argument. Novartis (now Syngenta) often states that about 40-60% of intestinal bacteria are already resistant to Ampicillin and related antibiotics. But they present no scientific data for these figures. An analysis of scientific literature shows that the frequency of antibiotic resistance varies considerably. Depending on the variety of bacteria, and also depending on the country where the research has been carried out, the results are completely different. The percentage of antibiotic resistant germs in samples of one variety of bacteria (*Bacteroides fragilis*) varied between 3 and 30%; in samples of another bacteria (Shigella) between 5.9 and 80.7%. A general statement of 40-60% is completely unfounded. It also has to be assumed that not every human being carries antibiotic or Ampicillin-resistant germs. Each antibiotic therapy is based on the bacteria being and staying sensitive to the chosen antibiotic. Ampicillin antibiotics are widely used in the treatment of human illness as well as on animals. In 1994, for example, 40 million courses of Ampicillin were prescribed in the US (that is, an average of 1 in 6 of the population). Furthermore, the resistance gene present in transgenic maize confers resistance to both the antibiotics Ampicillin and Amoxicillin. To maintain the effectiveness of antibiotics for as long as possible, it is simply irresponsible to put further resistance genes into circulation.

#### It is an unnecessary, obsolete technology

Antibiotic resistance genes do not serve any purpose in transgenic crops. These genes are used as markers in the laboratory by genetic engineers, to distinguish cells where their engineering of other traits has been successful from those where they failed. If the cells are treated with antibiotics after the gene transfer, only those containing the resistance gene survive - those cells also will be the only ones containing the desired genes, like insect- or herbicide-resistance. Today, it is possible to replace their use with other markers. It is also possible to remove antibiotic resistance genes after the genetic engineering event.

Because they are unnecessary and dangerous to human health, many regulatory authorities in Europe oppose the use of antibiotic resistance markers. The German GE advisory commission (ZKBS) recommends the rejection of clinically important antibiotic resistance genes. The French Committee of Prevention and Precaution recommends a ban of all transgenic crops containing antibiotic resistance genes. The US Biosafety Advisory Committee says that antibiotic resistance should not be trivialised. Norway prohibits all transgenic plants with antibiotic resistance. The French government will not allow such plants (other than Novartis' already-approved maize). Several EU member states such as the United Kingdom have announced their opposition to the approval of the Novartis maize in Europe.

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<sup>164</sup> "GM genes found in human gut", by John Vidal, The Guardian, 17 July 2002 at: [www.guardian.co.uk/gmdebate/Story/0,2763,756666,00.html](http://www.guardian.co.uk/gmdebate/Story/0,2763,756666,00.html)

<sup>165</sup> La Recherche No. 309, May 1998

Article 4 of the new GMO Directive 2001/18/EC demands a phasing out of antibiotic resistance genes:

*"Member States and the Commission shall ensure that GMOs which contain genes expressing resistance to antibiotics in use for medical or veterinary treatment are taken into particular consideration when carrying out an environmental risk assessment, with a view to identifying and phasing out antibiotic resistance markers in GMOs which may have adverse effects on human health and the environment. This phasing out shall take place by the 31 December 2004 in the case of GMOs placed on the market according to part C and by 31 December 2008 in the case of GMOs authorised under part B."*

Article 16 of the Cartagena Protocol on Biosafety opens the possibility of a world wide ban of certain GMOs - earlier versions of the draft Protocol made explicit reference to GMOs with antibiotic resistance genes: *"Parties shall cooperate with a view to:*

- (a) Identifying living modified organisms or specific traits of living modified organisms that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health; and*
- (b) Taking appropriate measures regarding the treatment of such living modified organisms or specific traits.*

## Annex I

### Contacts and Resources

#### Contacts in Romania

##### *NGOs*

Dan Craioveanu  
Bioterra/CET  
3400 Cluj-Napoca  
J. Jaures St. 12B ap2  
Tel: +40 264 431 626  
E-mail: [dan@ngo.ro](mailto:dan@ngo.ro)

Gabi Paun  
Ecosens  
Str. Dr. Felix 85, sector 1,  
Bucharest  
Tel/fax: +40 21313 8560  
Tel: +40 21 212 9514  
E-mail: [ecosens@fx.ro](mailto:ecosens@fx.ro)

Emilian Burdusel  
UNESCO ProNatura  
Calea Plevnei 61  
Bucharest  
Tel: +40 21 311 2644  
Fax: +40 21 312 1920  
E-mail: [pronatura@ccs.ro](mailto:pronatura@ccs.ro)  
[www.pronatura.ro](http://www.pronatura.ro)

Romanian Centre for SMEs  
Fundatia CRIMM  
Str. Ion Campineanu 20  
Bucharest 1  
Tel: +40 21 311 1995  
Fax: +40 21 312 6966  
E-mail: [crimm@imm.ro](mailto:crimm@imm.ro)  
[www.imm.ro/](http://www.imm.ro/)

##### *Government Officials*

Dr. Constantin Sin,  
Advisor, Biotech Dept  
Ministry of Agriculture, Food and Forests  
24 Carol1 Blvd  
7044 Bucharest 3  
Tel: +40 21 307 2402  
Fax: +40 21 313 2187  
E-mail: [c.sin@maa.ro](mailto:c.sin@maa.ro)

Simona Paranic  
Ministry of Agriculture, Food and Forestry  
Project Management Unit  
"Agricultural Support Services"  
1B Negustori St

Bucharest 3  
Tel/Fax: +40 21 315 2950 or 2955  
E-mail: [simonaparanici@artelecom.net](mailto:simonaparanici@artelecom.net)

Adriana Baz  
Ministry of Waters & Environment  
Directorate of Biodiversity Conservation  
12 Libertatii Blvd, sector 5  
70005 Bucharest  
Tel/Fax: +40 1 410 0531  
E-mail: [biodiv@mappm.ro](mailto:biodiv@mappm.ro)  
E-mail: [baz@mappm.ro](mailto:baz@mappm.ro)

##### *Scientists*

Prof. dr. Elena Badea  
Institute of Biology  
79651 Bucharest  
PO Box 56-53  
Splaiul Independentei 296  
Tel: +40 21 223 9072  
Fax: +40 21 221 9071  
E-mail: [biotech@xnet.ro](mailto:biotech@xnet.ro)

Dr. Natalia Cucu  
Bucharest University  
Institute of Genetics  
Aleca Portocalelor 1-3  
Bucharest 6  
Tel/Fax: +40 21 224 8846  
E-mail: [centragen@elt.ro](mailto:centragen@elt.ro)  
E-mail: [ntlc@botanic.unibuc.ro](mailto:ntlc@botanic.unibuc.ro)

Dr. Klaus Fabritius  
Institute of Public Health  
Str Dr. Leonte 1-3  
762563 Bucharest  
Tel/Fax: +40 21 224 9209

Dr. Ion Toncea  
Head of Ecological Agriculture Dept  
Institute of Agricultural Research -  
Fundulea  
N. Titulescu 1  
8264 Fundulea - Calarasi  
Tel: +40 21 315 0805  
Fax: +40 21 311 0722  
E-mail: [toncea@ricic.ro](mailto:toncea@ricic.ro)  
E-mail: [fundulea@ricic.ro](mailto:fundulea@ricic.ro)

Prof. dr. Gheorghe Mencinicopschi  
Institute of Food Research

1 Garlei St  
71576 Bucharest  
Tel: +40 21 230 5090 or 2040  
Tel/Fax: +40 21 230 0311  
E-mail: [ica@sunu.rnc.ro](mailto:ica@sunu.rnc.ro)

### ***Business and Industry***

Dr. Nicolae Parvu  
Pioneer Hi-Bred Seeds Agro SRL  
Str. G. Calinescu 13, sector 1  
Bucharest, Cod 71203  
Tel: +40 21 230 9810  
Fax: +40 21 230 9833  
E-mail: [nicolae/parvu@pioneer.com](mailto:nicolae/parvu@pioneer.com)

### ***International and Foreign Agencies***

Dan Petrescu  
Senior Communications Officer  
The World Bank Office Romania  
83 Boulevard Dacia  
Sector 2 Bucharest  
Tel: +40 21 201 0311 or 0328  
Fax: +40 21 201 2021  
E-mail [petrescu@worldbank.org](mailto:petrescu@worldbank.org)  
[www.worldbank.org.ro](http://www.worldbank.org.ro)

Lawrence Johnson  
Sen. Agriculture & Agribusiness Advisor  
USAID  
Opera Center Building  
1-5 Costache Negri St. 4<sup>th</sup> floor  
Bucharest 5  
Tel: +40 21 410 1222 ext 122  
Fax: +40 21 410 1202  
E-mail: [lajohnson@usaid.gov](mailto:lajohnson@usaid.gov)

Cristina Cionga  
USDA  
Foreign Agricultural Service  
American Embassy  
9 Tudor Arghezi St  
Bucharest  
Tel: +40 1 210 0398  
Fax: +40 1 210 5998  
E-mail: [Cionga@fas.usda.gov](mailto:Cionga@fas.usda.gov)

### **International Resources**<sup>166</sup>

There are hundreds of groups around the world campaigning on GE issues. Some focus on the genetic engineering of crops; others focus on patenting and human GE. Some want complete bans and moratoriums, others the labelling of GE products. Listed below are a few of these organisations.

#### **Campaign for Food Safety**

Minnesota, USA  
Tel: +1 218 226 4164  
Fax: +1 218 226 4157  
E-mail: <alliance@mr.net>  
Website: [www.purefood.org/index.htm](http://www.purefood.org/index.htm)

Dedicated to healthy, safe and sustainable systems of food production. Acts as a global clearinghouse for information on GE; offers grassroots technical assistance

#### **Council for Responsible Genetics**

Cambridge, Massachusetts, USA  
Tel: +1 617 868 0870  
Fax: +1 617 419 5344  
E-mail: <marty@gene-watch.org>  
Website: [www.gene-watch.org](http://www.gene-watch.org)

Focuses on human genetics issues including genetic discrimination and patenting. Also active on biosafety and consumer 'right to know' issues. Produces and distributes educational materials.

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<sup>166</sup> This section is taken from book by Luke Anderson, "*Genetic Engineering, Food and Our Environment-A Brief Guide*", Green Books, Devon, UK, July 1999

**Genetic Resources Action International (GRAIN)**

Barcelona, Spain

Tel: +34 93 301 1381

Fax: +34 93 301 1627

E-mail: [grain@bcn.servicom.es](mailto:grain@bcn.servicom.es)

Website: [www.grain.org](http://www.grain.org)

**Research Foundation for Science, Technology & Natural Resource Policy**

New Delhi, India

Tel: +91 11 696 8077

Fax: +91 11 685 6795

E-mail: [tw@uvn.ernet.in](mailto:tw@uvn.ernet.in)

Website: [www.indiaserver.com/betas/vshiva](http://www.indiaserver.com/betas/vshiva)

### **Greenpeace International**

Berlin, Germany

Tel: +49 30 30 889914

Fax: +49 30 30 889930

Website: [www.greenpeace.org/~geneng/](http://www.greenpeace.org/~geneng/)

International environmental organisation that lobbies and takes non-violent direct action. Opposed to the release of GMOs into the environment. Their website includes information on a range of issues, as well as press releases, info about actions etc.

### **Pesticide Action Network (PAN) North American Office**

San Francisco, USA

Tel: +1 415 981 1771

Fax: +1 415 981 1991

E-mail: [panna@panna.org](mailto:panna@panna.org)

Website: [www.panna.org/panna](http://www.panna.org/panna)

Has campaigned to replace pesticides with ecologically sound alternatives since 1982. PANNA is one of 5 PAN regional centres, the others being in Africa, Asia/Pacific, Latin America and Europe.

### **Rural Advancement Foundation International (RAFI)**

Winnipeg, Canada

Tel: +1 204 453 5259

Fax: +1 204 925 8034

E-mail: [rafi@rafi.org](mailto:rafi@rafi.org)

Website: [www.rafi.org](http://www.rafi.org)

An international NGO dedicated to the conservation, sustainability and improvement of agricultural biodiversity, and to the socially responsible development of technologies useful to rural societies. RAFI is an important contact for info on patenting, terminator technology, the biotech industry, loss of genetic diversity, relationship of these issues to human rights, agriculture and world food security.

### **Third World Network**

Penang, Malaysia

Tel: +60 4 226 6728 or 226 6159

Fax: +60 4 226 4505

E-mail: [tw@igc.apc.org](mailto:tw@igc.apc.org)

Website: [www.twinside.org.sg/south/bio.htm](http://www.twinside.org.sg/south/bio.htm)

Network of organisations and individuals involved in issues relating to development, the Third World and North-South. Their website is useful source of information about biopiracy, patents, the World Trade Organisation (WTO) and GE.

### **ANPED, The Northern Alliance for Sustainability**

Amsterdam, The Netherlands

Tel. +31 (0)20 4751742

Fax +31 (0)20 4751742

Website: [www.antenna.org](http://www.antenna.org)

ANPED works to build capacity among NGOs in Central and Eastern Europe and the Newly Independent States to undertake campaigns to build public resistance to GE food and agriculture.

## Crop plant relatives that occur in the wild in Romania

**GM = GM crop variants have been developed**

**GM cross = reported to cross with GM crops**

Cannabaceae

**Hemp** (*Cannabis sativa* subsp. *spontanea* (Vavilov) Serebr. ex Serebr. & Sizov.) - weed of cultivation and waysides

**Hop** (*Humulus lupulus* L.) - damp woodland

CHENOPODIACEAE - includes the beets and sugar-beets

**Garden Orache** (*Atriplex hortensis* L.) - weed of cultivation and waysides

**Caucasian Beet** (*Beta trigyna* Waldst. & Kit.) - weed of waysides

Portulacaceae

**Purslane** (*Portulaca oleracea* L. subsp. *oleracea*) - weed of cultivation and waysides

Ranunculaceae

**Black Cumin** (*Nigella sativa* L.) - weed of cultivation and waysides

Ranunculaceae

**Opium Poppy** (*Papaver somniferum* L.) - weed of cultivation

CRUCIFERAE - includes the cabbages, mustards and rapes

**Horse-radish** (*Armoracia rusticana* P. Gaertner, B. Meyer & Scherb.) - waysides

**Long-stalked Rape** (*Brassica elongata* Ehrh. subsp. *integrifolia* (Boiss.) Breistr.) - dry grassland (meadow-steppe)

**Chinese Mustard** (*Brassica juncea* (L.) Czern.) - weed of cultivation and waysides

**Oilseed Rape** or **Canola** (*Brassica napus* L. subsp. *oleifera* (DC.) Metzger) - crop that escapes to become weed of cultivation and waysides (**GM crop, GM cross**)

**Black Mustard** (*Brassica nigra* L.) - weed of waysides; also a crop (mustard)

**Wild Turnip** (*Brassica rapa* (L.) subsp. *sylvestris* (Lam.) Janchen (**GM cross**))

**Gold-of-Pleasure** (*Camelina sativa* (L.) Crantz) - weed of cultivation

**Rocket** or **Roquette** (*Eruca vesicaria* (L.) Cav. subsp. *sativa* (Miller) Thell.) - weed of cultivation and waysides

**Hairy Rocket** (*Erucastrum gallicum* (Willd.) O.E. Schulz) - weed of cultivation and waysides

**Watercress-leaved Rocket** (*Eruca nasturtiifolium* (Poir.) Cav.) - weed of cultivation and waysides

**Wild Radish** (*Raphanus raphanistrum* L. subsp. *raphanistrum*) - weed of cultivation (**GM cross**)

**White Mustard** (*Sinapis alba* L.) - weed of cultivation (**GM cross**); also a crop (mustard and as forage)

**Charlock** (*Sinapis arvensis* L.) - weed of cultivation (**GM cross**)

**Woad** (*Isatis tinctoria* L.) - dry grassland

Grossulariaceae

**Blackcurrent** (*Ribes nigrum* L.) - woods; also as crop

Rosaceae

**Crab Apple** (*Malus sylvestris* (L.) Miller; fully interfertile with cultivated and semi-wild **Apple** (*Malus pumila* Miller)

**Wild Cherry** (*Prunus avium* (L.) L.) woods; fully interfertile with cultivated and semi-wild cherries

**Wild Plum** (*Prunus domestica* L. subsp. *insititia* (L.) C.K. Schneider); fully interfertile with cultivated and semi-wild **Plum** (*P. domestica* subsp. *domestica* Miller)

**Steppe Cherry** (*Prunus fruticosa* Pallas) - dry scrub; **Morello or Sour Cherry** (*Prunus cerasus* L.) probably derives from a cross between this species and Wild Cherry

**Wild Pear** (*Pyrus pyraeaster* Borkh.) - woods, scrub and hedges; fully interfertile with cultivated and semi-wild **Pear** (*Pyrus communis* L.)

**Blackthorn** or **Sloe** (*Prunus spinosa* L.) - scrub and hedges (*Pyrus eleagnifolia* Pallas) (*Pyrus nivalis* Jacq.) - montane woods

**French or Lancaster Rose** (*Rosa gallica* L.) - dry scrub

**Raspberry** (*Rubus idaeus* L.) - damp montane woods; also as crop

**Service Tree** (*Sorbus domestica* L.) - woods; also in gardens and orchards

Leguminosae - includes the clovers, medicks and vetches

**Narrow-leaved Lupin** (*Lupinus angustifolius* L.) - fallow fields and waysides

**Grass Pea** (*Lathyrus sativus* Roth.) - grassland and cultivated land; also a fodder crop

**Bird's-foot Trefoil** (*Lotus corniculatus*) - grassland

**Sickle Medick** (*Medicago sativa* L. subsp. *falcata* (L.)

Arcangeli) - dry grassland; fully interfertile with cultivated and semi-wild

**Sainfoin** (*Onobrychis viciifolia* Scop.) - dry grassland (also closely related *O. arenaria* (Kit.) DC.

**Wild Pea** (*Pisum sativum* L. subsp. *elatius* (Bieb.) Aschers. & Graebn.) - scrub, grassland and waysides

**Alfalfa** (*M. sativa* subsp. *sativa*)

**White Clover** (*Trifolium repens* L. subsp. *ochranthum* (Maly) Nyar.) - grassland (endemic to Romania); also subsp. *orbelicum* (Velen.) Pawl. - montane grassland

**Alsike Clover** (*Trifolium hybridum* L.) - grassland; also a fodder crop

**Crimson Clover** (*Trifolium incarnatum* L.) - grassland; also a fodder crop

**Red Clover** (*Trifolium pratense* L.) - grassland; also a fodder crop (including variants of var. *sativum* Sturm)

**Subterranean Clover** (*Trifolium subterraneum* L.) - grassland

**Blue Fenugreek** (*Trigonella caerulea* (L.) Ser.) - fallow fields and waysides; also a fodder crop

**Fodder Vetch** (*Vicia villosa* Roth.) - grassland, scrub and fallow fields; also a fodder crop  
**Common Vetch** (*Vicia sativa* Roth.) - grassland and cultivated land; also a fodder crop

Linaceae

**Hairy Flax** (*Linum hirsutum* L.)  
**Perennial Flax** (*Linum perenne* L.)

Vitaceae

**Grape Vine** (*Vitis vinifera* L. subsp. *sylvestris* (C.C. Gmelin) Hegi) - damp woodland

Umbelliferae

**Wild Celery** (*Apium graveolens* L.) - brackish marshes  
**Caraway** (*Carum carvi* L.) - dry grassland and waysides  
**Wild Carrot** (*Daucus carota* L. subsp. *carota*) - dry grassland  
**Wild Parsnip** (*Pastinaca sativa* L. subsp. *sativa*) - dry grassland

Compositae

**Chicory** (*Cichorium intybus* L.) - dry grassland and waysides  
**Least Lettuce** (*Lactuca saligna* L.) - dry grassland and waysides; somewhat interfertile with cultivated **Lettuce** (*Lactuca sativa* L.)  
**Prickly Lettuce** (*Lactuca serriola* L.) - rough grassland and waysides; fully interfertile with cultivated **Lettuce** (*Lactuca sativa* L.)  
**Black Salsify** (*Scorzonera hispanica* L.) - dry grassland  
**Salsify** (*Tragopogon porrifolius* L.) - dry grassland

Liliaceae

**Asparagus** (*Asparagus officinalis* L.) - dry grassland (meadow-steppe)