UMANOTERA
Slovenian Foundation for Sustainable Development

Slovenia - A GMO-free zone

The Only Way to Protect Biodiversity and ensure Organic Agriculture can Thrive

By Iza Kruszewska
June 2001

The research and publication of this report was made possible by the financial support by the EU's Phare Access Programme and the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM)

Slovenia - A GMO-free zone

The Only Way to Protect Biodiversity and ensure Organic Agriculture can Thrive

By Iza Kruszewska

UMANOTERA
Slovenska fundacija za trajnostni razvoj, ustanova

The Northern Alliance for Sustainability (ANPED) *is a network of non-government organisations (NGOs) based in the Northern Hemisphere. We strive 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, Extended Producer Responsibility and Clean Production. 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. In May 1998, ANPED organised the first skillshare on GMOs and Agriculture for NGOs from CEE and NIS, in Budapest, Hungary. Since late 1999, ANPED has been mapping the level of commercialisation of GMOs and regulatory oversight of GMOs in specific CEE countries. To date, four reports 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's GMO programme now includes groups from over 10 countries in the 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 currently being translated into 8 Eastern European languages.

ANPED's core activities are funded by the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) and the EU DG Environment

For more information: anped@anped.org or visit our website: www.anped.org

Umanotera, The Slovenian Foundation for Sustainable Development *was founded in 1994 as an independent foundation. Its main objective is to bring the principles of sustainable development to practice through the promotion of sustainability principles as defined by Agenda 21, to raise public awareness on the environmental issues and to improve public participation in the environmental decision making. We also participate in the EU accession debate and its implications on the environment in the candidate countries.*

In 1999 we prepared an open letter calling for a moratorium on GMO use and deliberate release in the environment in partnership with three other NGOs. It was sent to the Government, without a response. We conducted a survey among food processors, retailers and seed producers on GMOs in Slovenia, organised a roundtable discussion and published a special issue of Umanotera Newsletter on the subject. Due to the financial constraints we were unable to carry on our activities in this area until 2001, when we were granted a financial support through the Phare Access grant to continue with the awareness raising on the GMO issue and to participate in the drafting of relevant legislation.

For more information: marjana@umanotera.org or Tel.: + 386 1 439 71 00

Contents

PART B: THE ENVIRONMENTAL AND HEALTH RISKS OF GMOs

Executive Summary

This report is the result of investigative research undertaken to determine the current level of commercialisation of genetically engineered[1] (GE) crops and foods and the degree of regulatory oversight over genetic technologies in Slovenia. Its purpose is to prevent Slovenia from becoming a dumping ground for this dangerous technology and its products, many of which have been rejected by the market in the European Union.

Slovenia is characterised by a rich biodiversity. Occupying less than 0,014% of the Earth's land, yet Slovenia is home to over 1% of all known species of living organisms and more than 2% of all land and freshwater species. The Government has a programme for increasing organic food production and IPM programmes,[2] which are supported by subsidies to farmers undertaking these activities.

The mountainous and karst terrain of much of Slovenia means that arable agriculture is possible on less than 20% of the country. Slovenia has only some 86,000 ha under maize, and has a shortfall of maize both for animal feed and human food. Imports of maize make up the deficit.

In the absence of a law regulating genetically modified organisms (GMOs), officials have ruled out the possibility of undertaking field trials of GE crops. Over the last few years, several companies, including Pioneer Hi-Bred, DeKalb (now Syngenta) and AgrEvo (now Aventis), have tried to get permits for field trials, but without success.

Current domestic research on genetic engineering is focused on transforming hops and onions with genes to make them resistant to disease. One of the aims of genetically engineering the onion is to make it tearless to housewives! However, research on both plants is still at an early laboratory stage.

The absence of field trials and releases associated with domestic research, however, does not mean that Slovenia is free of GMOs. Imports of maize - whether as seed or grain - from countries that are commercially growing genetically engineered maize, such as USA, Canada and Argentina, are highly likely to be contaminated by GMOs.

Figures from the Slovenian Statistical Office reveal that in 1999 and 2000, Slovenia imported maize seed from both USA and Canada. In 2000, some 13% of maize seed was imported from North America. Given that in the USA, some 40% of all maize grown is genetically engineered, it is highly likely that any maize seed bred in the USA will be contaminated with GMOs.

Information from Pioneer, a U.S. maize company, about maize seed imports contaminated with GMOs, indicates extensive contamination of Slovenian maize seed. The company claims that they had to reject one transport of maize seed, because GMO-contamination was above 1%. This suggests that other seed lots are also contaminated at levels below 1% - which would be illegal in most cases in the EU. Slovenia is becoming a dumping ground for seed, rejected in EU.

Figures from the Statistical Office reveal that in 1999 and 2000, Slovenia imported commodity maize from Argentina and USA. In 2000, some 3% (6863 tonnes) of maize imports were from Argentina, a 165-fold increase on 1999. Some 10% of Argentine maize grown in 2000 was the GE insect-resistant variety, so contamination of any exports is likely. In 1999 and 2000, Slovenia also imported small quantities of soybeans from the USA and Canada. Over half of the soybeans grown in the USA in 2000, were genetically engineered and the USA has a policy of not segregating GE from GE-free.

Further evidence of the GMOs pervading the Slovene market is provided by the Slovene company Zito Sumi, that uses corn syrup in the production of soft sweets. One of Sumi's corporate customers is the UK's supermarket chain, Safeway, which is demanding GMO-free. Sumi claims that it has encountered problems finding GMO-free corn syrup in Slovenia.

A survey of Slovene food producers and retailers to find out their policies on using and selling GE food, conducted in 2000 by the consumer organisation ZPS, revealed that most companies had no clear policy on GMOs. Several companies claimed that they cannot guarantee that their products are GMO-free.

Neither officials nor most of the food industry are undertaking any monitoring for GMOs. Everyone is waiting for regulations. Several pieces of legislation are currently in the pipeline. These include the long-awaited framework law on GMOs, whose preparation started already in 1994, and a framework Seed Law. A regulation on authorising and labelling of GE food is expected to be passed in late 2001 and a new framework law on animal feed should have its first reading in parliament in 2001.

In the light of these findings, Umanotera, a Slovenian NGO, demands that:

1. All releases of genetically engineered organisms into the environment and the food chain be prohibited immediately.
2. All imports of GMOs must be prohibited. The Government must start monitoring imports of agricultural commodities to ensure compliance with the import prohibition. This includes the monitoring of seeds for GMO-contamination, both GMOs approved and unapproved on the EU market.
3. No GE food must be allowed on the Slovene market.
4. The new laws on GMOs must implement the precautionary principle.
5. The Government needs to ensure that the Accession Treaty to the EU includes transitional agreements to guarantee that GMOs that have been approved within the EU are not automatically approved for Slovenian territory, but need to undergo a special risk assessment.
6. Parliament ratifies the Århus Convention on Access to Information, Public Participation and Access to Justice in Environmental Matters.
7. Parliament ratifies the Biosafety Protocol
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.

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 big transnational companies, such as Monsanto, Syngenta (formerly Novartis), Aventis and Pioneer Hi-Bred 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 rejection of 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.[3] 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.

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[4]), 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.[5] No GMO has been given authorisation for deliberate release in the EU since October 1998 and this de facto moratorium is set to continue for a while yet.[6] There are also bans in Saudi Arabia, Thailand, Algeria, Sri Lanka, and some regions of Brazil and Australia. Since 1999, there is an increasing awareness about the dangers of GE crops even in the US, and the acreage planted with GE maize dropped by almost 10% in 2000.[7]

Another nail in the coffin for GE food has been the Biosafety Protocol, finally agreed in Montreal in January 2000. It clarifies the issue of international trade in GMOs. The Protocol, signed by 130 countries world wide, including Slovenia, allows countries to apply the 'precautionary principle'[8] 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 April 2001 through interviews - in person and on the phone - with experts from government, research institutions, the food industry, parliamentarians and NGOs. Its purpose is to:

- Analyse the legal, administrative, scientific and political situation concerning genetic engineering with respect to food and agriculture in Slovenia;

- Alert Slovene 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 Slovenia becoming a dumping ground for GE food;
- Add pressure for the ratification of the Biosafety Protocol and Aarhus Convention;[9]
- Promote awareness of more sustainable alternatives to GE agriculture e.g. organic farming;
- Alert Slovene officials to the implications for EU accession of growing and importing GMOs (GE seeds, crops and food) that have not been approved in the EU.
- Provide arguments and present ways in which Slovenia should become a GMO-free zone.

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 Bulgaria, Poland, Russia and Croatia, launched over the past year, have been successful in starting public debate and heightening public awareness and participation in those countries - Slovenia is the fifth in the series.

The issue of genetic engineering is especially important for Slovenia, whose tourism industry relies heavily on the conservation of its rich biodiversity. Moreover, the Slovene 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, and by undermining the future use of its environmentally friendly pest control tools, such as *Bt* formulation. According to IFOAM,[10] genetically engineered food cannot be considered organic. (See Section 10: *Environmental Risks: Plants out of Control*)

Slovene 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.

2. Background - Slovenia's unique agriculture and rich biodiversity

This section provides an overview of Slovenia's agriculture, to provide a context in which to examine the potential presence of GMOs on the Slovene market. It looks at the importance of various agricultural sectors, such as animal husbandry and maize growing, to identify where GMO contamination could occur. This section also looks at Slovenia's support for organic agriculture and it efforts at preserving biodiversity.

Agriculture in Slovenia

Slovenia, with a population of some 2 million, lies at the north-eastern end of the Adriatic. Its neighbours are Italy, Austria and Hungary in the north, and Croatia in the south. Slovenia is a small country, just 20 thousand km^2 - about half the size of The Netherlands. Some 75% of Slovenia is made up of agriculturally less favoured areas, which is due to the poor soils in mountainous or karst (limestone) regions.[11]

Over 60% of Slovenia is covered by forests, leaving just 32.5% for agriculture (700,000 ha), much of which is suitable only for grazing animals. Less than 20% of Slovenia is suited to arable agriculture. Yet, despite the small agricultural area, there are some 65,000 agricultural holdings, with an average farm size of 5,6 hectares.

The mountainous and karst regions are unsuitable for intensive agriculture. As part of Yugoslavia, Slovenia's role was to produce meat and breed potatoes. The break up of Yugoslavia has caused a major imbalance of products - a surplus of poultry and pigs and **a shortage of animal feed**. Intensive agriculture can only be practised on the lowlands, which are now threatened by drinking water and soil pollution, due to livestock rearing and the intensive cultivation of crops, fruit and vines. Another major problem is the abandoning of farming, causing fields to become overgrown and resulting in depopulation of the countryside, degradation of the cultural landscape, loss of plant and animal diversity and further marginalisation of the economic, cultural and social life of these areas.

After independence from Yugoslavia in 1991, Slovenia's agricultural policy started to be restructured to comply with the principle of sustainability and the requirements of the European Union. Agricultural support shifted away from production-linked subsidies towards direct payments and agricultural support. Today, the main objectives of Slovenia's policy for rural development are to:

- Improve the standard of living of the rural population;
- Preserve the rural population density through environment-friendly farming methods;
- Maintain the traditional rural landscape;
- Preserve soil fertility and water quality by using environment-friendly agricultural production and processing techniques;
- Protect nature and preserve biodiversity.[12]

Agriculture today accounts for 3,5% of GDP and supports a rural population of some 6% of total population,[13] as compared to the UK's 1,9%, Spain's 8,1% or France's 3,7%.[14] The food processing industry is important and together with agriculture and tourism, the rural economy employs around 27% of the population.[15]

The main agricultural crops are maize, wheat, rye and oats, sugar beet, potatoes, vegetables, fruit and vines. However, the areas under these crops are small: some 86,000 ha of maize, 50,000 ha of cereals, 15,000 ha under potatoes and 10,000 ha under sugar beet.[16] About half of the maize grown is for silage (animal feed) and the rest for grain (food and feed).[17] Slovenia used to grow some 3000 ha of oilseed rape, but stopped several years ago.[18] There is very little soybean, if any, grown in Slovenia.[19]

Animal husbandry is also important for production of dairy and meat (poultry, pork and mutton), but Slovenia is not self-sufficient in animal feed and imports from the US, Canada and Argentina.

Important agricultural exports - mainly to CEFTA[20] countries - are fruit juices, live animals, cured meets, cheeses, pasta products, vegetable preserves and wine. Slovenia is a net importer of food, mainly from CEFTA countries.

Organic Farming

Slovenia recognises that complete globalisation and trade liberalisation is particularly risky for small countries without highly-developed economies, threatening the loss of cultural identity and damage to natural resources.[21] Thus, its National Rural Development Programme of market-neutral payments to farmers recognises **the multifunctionality of agriculture**, and consists of two sub-programmes:

- Compensation to farmers in less favoured areas of agriculture;
- Agri-environmental programme, whose purpose is to preserve the farming tradition in order to ensure healthy and secure livelihoods for people, preserve diversity and the unique cultural landscape.

Within its agri-environmental programme, Slovenia has allocated SIT 3bln (US$12,3 mln) to supporting various measures including organic agriculture, integrated pest management (IPM) for fruit, vine and vegetable production, extensification of crop produc-

tion and animal rearing, hand-mowing of grass and breeding of indigenous, traditional crops, such as spelt wheat and buckwheat.

In 2000, Slovenia had some 600 organic farms. In 2001, a further 1000 farms are applying for organic certification. Thus organic agriculture now constitutes some 0,6% of agricultural land, which is rather low as compared to the EU, but the growth rate is incredibly high.

The first regulations on the certification and control of organic production were introduced in 1998. During the same year, farmer organisations established a certification system based on the Austrian one, or were being certified directly by Austrian certification bodies. In 1999, the Institute of Agriculture created a unit to control organic production and undertake certification. The 2000 Framework Law on Agriculture states that organic production must be free of genetically modified organisms (GMOs).

Besides official efforts, NGOs also promote organic farming. The most prominent is the Union of Slovenian Organic Farmers Association (USOFA) that unites 8 farmers associations. USOFA is a member of IFOAM - International Federation of Organic Agriculture Movements - and has developed the BIODAR label for certified organic production, based on IFOAM standards.[22]

Biodiversity

"Biodiversity is more important to Slovenia than genetic engineering"[23]

Slovenia covers less than 0,014% of the Earth's land, yet it is home to over 1% of all known species of living organisms and more than 2% of all land and freshwater species. Thus, Slovenia ranks among the richest in biodiversity in Europe and even in the world. The reason for such exceptional biodiversity lies in the convergence of four biogeographical regions: the Alps, the Dinaric Alps, the Mediterranean and the Pannonia. More than 3000 plant species and over 50,000 animal species live here. Slovenia is especially rich in endemic species, (those that inhabit very limited areas) most of which live in the karst underground. Thus Slovenia considers itself a biodiversity 'hot spot' of the Earth.[24]

Slovenia ratified the Convention on Biological Diversity through the Law on Nature Protection. At present, some 8% of Slovenia is protected, mainly within the Triglav National Park and the Trebèe Memorial Park.[25] However, the National Environmental Action Plan envisages that by 2008, protected areas, encompassing national, regional and landscape parks, will be increased to 30% of Slovenia's territory.[26]

Part A: Genetically Engineered Crops and Food in Slovenia

3. The Political, Legislative and Scientific Climate

Despite official concerns about the use of GMOs in food and agriculture, Slovenia's National Environmental Action Plan,[27] states that the country "*needs to ensure control of the use and release of and trade in GMOs while involving the public in such a way that a normal flow of goods continues and development of gene technology is not hindered*".[28] (emphasis added) Although this is a position taken by many governments around the world, Slovenes should be aware that these types of publicly-voiced statements about GMOs by the Government are double-edged and subject to pressure from the biotech (GE) industry. Only public pressure can prevent the balance being tipped in favour of the industry.

Moreover, the Ministry of Agriculture despite their financial support for organic agriculture, claims that the use of GMOs in agriculture signifies progress and believes that Slovenia cannot allow itself to become isolated.[29]

Attempts to undertake experimental field trials of GMOs

In the absence of a law, officials have ruled out the possibility of undertaking field trials of genetically engineered crops. Field trials are primarily used to assess the performance of GE crops. They are the first step to commercialisation, after which the new GE variety can be listed on the National Seed Register and cultivated commercially. The absence of field trials suggests that despite the ambiguous statements of the Agriculture and Environment Ministries, officials seem to be doing their job, and we urge them to keep this position.

Since 1988, the Agriculture Ministry has been approached by several companies that wanted to undertake field trials.[30]

In 1998, Pioneer Hi-Bred applied to undertake trials of two GE varieties of maize - insect-resistant *Bt* and herbicide tolerant maize.[31] According to Prof. Javornik, a pro-biotech scientist who tried to help interested companies apply for field trials, the Ministry of Agriculture approved the field trials on the basis of the Plant Testing and Variety Protection Law, but the Environment Ministry objected. Prof. Javornik claims that:

> *"*There is no political will in both the Agriculture and Environment Ministries to allow field trials; insufficient professional support and no willingness to set up a Committee to oversee the work and undertake risk assessments*".*[32]

It is interesting to note that where Pioneer failed in Slovenia, they were successful in persuading officials in neighbouring Croatia to use variety testing laws to permit field trials of these 2 varieties of GE maize.[33]

Other attempts to do field trials of *Bt* maize, took place several years ago, when DeKalb (now Syngenta) wanted to do trials in Savinjska Dolina.[34] Moreover, AgrEvo (now Aventis) was also pressuring the Agriculture Institute to undertake field trials.[35] Aventis claims to have abandoned all attempts to do field trials in Slovenia two years ago - at least for the moment.[36]

Domestic Research on GMOs[37]

Plant breeding research in Slovenia mainly uses traditional breeding, (without the use of genetic engineering) and is focused on potatoes, buckwheat and grasses, as well as hops.

Past genetic engineering research in Slovenia, focused on introducing a virus gene into a local variety of potato, to make it resistant to the virus. The research was discontinued because further research in the greenhouse provided too few virus-resistant lines with which to do outdoor field trials and there was no legislation to allow field trials.

Current GE research at the Centre of Plant Biotech and Breeding is focused on 2 crops:

- ***Developing onions to stop housewives crying!*** - establishing a basic protocol for several onion varieties using marker genes, in order to transform the onion with the gene responsible for causing tears, and with a gene to make the onion resistant to the onion fly;
- ***Developing "Frankenstein beer"*** - a protocol is being established for the hop plant, with a view to transferring resistance to three diseases, two of which are fungal and one insect (aphid).

Although GE hop research is only at a very initial stage, hop buyers in Germany and Japan are already demanding GE-free hops. The scientists are hoping that in three years time, when they are ready to start field trials with GE hops, consumer opinion about the safety of GE foods will have become more positive.[38]

But, who will want to eat the tearless onion or drink the "Frankenstein beer", given the unknown risks associated with genetic engineering?

4. Potential sources of GMO-contamination in Slovenia

Because of the absence of any laws relating to GE food and agriculture, it is highly likely that GMOs are entering the country as imports of maize seed or in agricultural commodities, such as maize, soybeans, soybean lecithin or corn starch, destined for human food and animal feed. This section explores potential sources of GMO contamination of seed, food and feed.

Releases of GMOs into the environment can be directly into soils or via the food and feed chain. They can take place either deliberately or accidentally:

- Deliberate release of GMOs during experimental field trials, commercial cultivation of GE crops and when products, such as human food or animal containing GMOs e.g. GE maize in polenta, or derivatives of GMOs e.g. corn starch, soy lecithin, are put on the market.
- Accidental release of GMOs, if imported seeds are contaminated with GMOs or foods on the market are contaminated with GMOs. Moreover, GMO-contaminated maize feed can contain viable maize grains that can germinate and grow in the open environment.

Slovenia traditionally imports most of its maize seed and maize, both for human food and animal feed, from CEFTA countries.[39] However, many of these countries suffered a drought in 2000, resulting in very poor maize harvests. For example in November 2000, Hungary - Slovenia's main source of maize - was forced to impose a temporary ban on maize exports due to the poor harvest[40] and the EU's insatiable demand for GMO-free maize.[41]

With shortages of maize in the CEFTA countries, Slovenia is importing more from Argentina and USA. Figures from the Statistical Office confirm that in 2000, Slovenia imported some 165 times as much maize from Argentina as it did in 1999. (See Table 2) Both these countries grow substantial amounts of GE crops.

U.S. markets in particular, have been disrupted by the contamination of its maize with StarLink, a variety of GE insect-resistant *Bt* maize[43] that was not approved for human consumption, because of its allergenic potential. (See Section 11: *The StarLink Maize Fiasco*) This has resulted in Europe and Asia rejecting imports of U.S. maize, and paying a premium for identity preserved GMO-free maize. Since price is the key to decision-making among Slovenian grain traders,[44] the cheaper shipments of GMO-contaminated maize, including seed, from Argentina, U.S. and Canada, are the ones they are likely to buy.

Global Status of Commercialised Transgenic Crops: 2000[42]

In 2000, four countries grew 99% of the global transgenic crop area: USA (68%), Canada (7%), Argentina (23%), and China (1%).

The two main transgenic crops grown globally are:

- **GE soybeans, occupying 58%** of the global area of transgenic crops in 2000;
- **GE maize, occupying 23%** of the global area of transgenic crops in 2000

The two most common traits engineered into these crops are:

- **herbicide tolerance**: In 2000, herbicide tolerant soybean, corn and cotton occupied 74% of the 44.2 million hectares;
- **insect resistance** engineered with the bacteria *Bacillus thuringiensis* (*Bt*): In 2000, *Bt* crops occupied 19% of the global area of transgenic crops; combined herbicide tolerance and insect resistance deployed in cotton and corn occupied 7% of the global transgenic area.

The most dominant transgenic crop grown commerically in 2000 was herbicide tolerant soybean, grown mainly in USA, Argentina and Canada. The second most dominant crop was insect-resistant *Bt* maize, occupying 15% of the global transgenic area and grown mainly in USA, Canada and Argentina.

GMO-Contaminated Maize Seed?

*"*Slovenia does not control seed imports*"*

Jose Illersic, Director of Plant Variety Protection and Registration Office[45]

There is almost no maize seed production in Slovenia.[46] The director of Pioneer's office in Slovenia Mr. Mikolèiè, states that 90% of its maize seed comes from Europe, mainly from Romania, but also Hungary and Austria; some of the remaining 10% is imported from the U.S. and Canada. The company claims to have a policy of selling GMO-free seed and revealed that they had rejected one seed lot, because GMO-contamination was above 1%.[47] This suggests that seed lots with contamination of less than 1% would have been exported to Slovenia!

This 1% threshold for GMO contamination quoted by Pioneer probably refers to EU requirements for food labelling purposes.[48] Given that this contamination is of **seeds** and **not food**, it is outrageously high. Moreover, testing of Pioneer maize seed in Austria revealed the presence of two varieties of GE maize that have not been approved for cultivation in Austria.[49]

GMO Pollution of supposedly conventional Seeds

In 2000, several countries in the EU encountered contamination of supposedly conventional seed by genetically engineered varieties. This happened in several countries such as France, Germany, Greece, Sweden and the UK, and involved different crops, including oilseed rape, maize, soybeans, sugarbeet and cotton. (See Section 10. *GE Plants out of Control*)

One of the most widespread cases was the import of GMO-contaminated rape seed to Western Europe from Canada, by the company Advanta. The seeds contained traces (0.03 - 2,6%) of several genetically engineered rapeseed lines which are hitherto not authorised for planting in Europe. The Swedish Board of Agriculture announced on 24 May 2000 that all fields planted with contaminated rapeseed in Sweden had to be destroyed.[52] The French environmental minister demanded the destruction of all 600 hectares of rapeseed sown with GE contaminated seeds and guaranteed compensation for the affected farmers.[53] After negotiations with the French and the UK governments, Advanta agreed to compensate affected farmers in France[54] as well as in the UK.[55]

During March and April 2001, Italian Police seized several hundred tonnes of Monsanto maize and soybean seeds, as part of the Agriculture Ministry's campaign against illegal GE material. Tests of Monsanto maize by the Italian Health Ministry in March revealed the presence of the banned GE Monsanto MON 810 maize variety.[56] The Agriculture Minister, Alfonso Pecoraro Scanio states on the ministry website that "*I shall evaluate what steps can be taken to deal with Monsanto because we will not tolerate genetic and illegal pollution of Italian agriculture*".[57]

In March 2001, the Agriculture Minister asked authorities to suspend Monsanto's seed import licence on the grounds that the seeds were suspected of containing GE material. A Monsanto spokesman did not rule out the possibility of accidental contamination during processing in the U.S. "*If there is contamination, the amount would be less than 0,1 percent - almost zero*", he said. [58]

The EU is currently developing a seed policy that is likely to reject any non-approved GE variety (See Section 5: Slovenian Legislation on GMOs). Since no GMOs have been approved for putting on the Slovene market, any seed lot contaminated with GMOs must be rejected, regardless of the percentage of contamination. The French and Swedish governments once ordered the destruction of oilseed rape fields that were contaminated with GE varieties lower than 0.1%.

Maize seed bred in the US or Canada is likely to be contaminated with GMOs. In 2000, *Bt* maize, an insect-resistant variety of GE maize, was grown on 6,8 mln ha, mainly in USA, Canada and Argentina. Assuming that the country of export is also the country of origin of the seeds, Slovenia has been importing maize seed from the USA and Canada during the last 2 years. In 2000, some 40% of the maize grown in the US was genetically engineered. It is therefore highly likely that some of this seed will have been contaminated with GMOs - both by GMOs approved and illegal in the EU. The imported GMO-contaminated maize seed was sown by Slovene farmers in the spring. By autumn, this GE seed would have produced its GE harvest, and cross-pollination with conventional maize growing nearby, would have increased the area of genetic pollution. This is not scare-mongering, it has already happened.

Table 1: Main countries of Import of Maize seed to Slovenia 1999 and 2000[50]

Country of Import	1999 (in tonnes)	2000 (in tonnes)
Hungary	323	705,8
Croatia	604	557,3
Austria	529	274,8
Yugoslavia	9,9	151,2
USA	228	139,7
France	98	70,3
Canada	5,5	25,6
Italy	19,9	14,2
Total seed imports[51] (minus seeds re-exported)	1220,4	1227,7

There is mounting evidence that this year's (2001) harvest in the Europe will be contaminated with GMOs. At least three cases discovered in Europe in spring 2001, involve contamination with GE varieties, which are illegal to plant in Europe, since none have been approved in the EU.[59]

German court prohibits food use of rapeseed adjacent to a GE field

In August 2000, a German court in Münster decided in a preliminary ruling to prohibit the trade in oilseed rape that was grown on fields directly adjacent to field trials with GE rapeseed. The jurors justified their decision on the grounds that pollen can be transmitted by insects and wind and could thus contaminate the adjacent crop. They argued that the right of citizens to be protected from the risks of genetic engineering must be valued higher than those of the farmer who had been prohibited to market his harvest.[60]

In early 2001, Chancellor Gerhard Schoeder postponed plans to do field trials of GE corn citing the need to reassure consumers already worried by the mad cow disease crisis. Schroeder has notified farm lobby groups that their influence will be diminished and said he aims to "massively increase" organic farming in Germany.[61]

Slovenia is currently preparing a new framework seed law, which will be implemented by regulations, based on those in the EU. However, EU policy on regulating GE seeds and GMO-contamination of conventional seed varieties is still evolving. Although some of the issues arising from the introduction of GE seeds have been addressed in the general seeds directive[62], a special 'Novel Seed' Regulation for GM seeds is soon to be proposed by the European Commission. However, it will be many years before a law is developed out of any such proposal.

The National Institute of Biology and the Institute of Agriculture are developing capacity for testing GMOs, to enable enforcement of the new regulation. If the Institute gets the appropriate accreditation, they will be ready for testing for GMOs sometime in autumn 2001. However, they plan to test only EU-approved GMO varieties.[63] The question arises: who will test for EU-unapproved GMO varieties? Or, will this mean a policy of "no look; no see"?

GMOs on the Kitchen Table?

The absence of any monitoring of maize grain for GMOs means that GE maize is likely to be already eaten by Slovene consumers - without their knowledge or consent. Maize is an important staple in the diet of Slovenians, found in polenta, but also in many processed foods, often in the form of cornstarch or corn syrup. Soybeans imported both for human food and animal feed, from North America are also highly likely to be contaminated with GMOs. Soybean derivatives, like soy oil and lecithin are used in many thousands of processed food, including chocolate and bread. Soybeans are an important source of protein for vegetarians and for babies who suffer cow's milk intolerance and drink soymilk instead.

Table 2: Main Countries of Maize Imports to Slovenia 1999 and 2000[64]

Country of origin	1999 (tonnes)	2000 (tonnes)
Hungary	179486	160654,2
Austria	18.5	34570,4
Argentina	41,7	6863,8
Croatia	4705,5	1086,6
Slovakia	1686,9	None
USA	39,4	81,3
Czech Republic	996,4	None
Germany	202,3	0,02
Italy	32,5	24,5
Total maize imports[65] minus maize exports	187233,4	203240,1

Two sources of potential GMO-contamination of food and feed in Slovenia are: imports of maize and soybeans from Argentina, USA and Canada; and to a lesser extent, domestic maize grown from GMO-contaminated imported maize seed.

Table 2 shows the main countries from which Slovenia imported maize in 1990 and 2000. Maize is used both for food and animal feed. Assuming that the country of export is also the country of origin of the maize, the table shows how maize imports from Argentina increased from 41,7 tonnes in 1999 to 6863,8 t in 2000 - 165 times the amount imported in 1999. In 2000, some 10% of the Argentina's corn crop was the genetically engineered *Bt* insect-resistant variety.[66] However, according to information leaked to Greenpeace, substantial amounts of Monsanto's herbicide tolerant Roundup Ready corn (GA21) were also planted last year. This GE variety has not been approved for planting, human or animal consumption in Argentina, or for import to Europe.[67]

Table 3: Main Countries of Soybean Imports to Slovenia 1999 and 2000[68]

Country of origin	1999 (tonnes)	2000 (tonnes)
Austria	280	593,2
Italy	245,7	220,9
USA	8,0	12,4
Canada	5.5	5,7
Total soybean imports[69]	546,9	838,8

Table 3 shows imports of soybeans by country. Although soybean imports from Canada and USA are relatively small, it is important to know that 54% of the US soybean area (of 30,2 million ha) in 2000 was under transgenic soybeans.[70] With the U.S. policy of commingling GE soybeans with GE-free, one could expect half of every shipment of soybeans from the U.S. to be transgenic.

Survey of Food Retailers and Processors

In 2000, the Slovene consumer organisation ZPS (Zveza Potrosnikov Slovenije) conducted a survey to find out the policy on GMOs, of Slovene food producers and retailers. Many of the companies that replied claimed that they did not understand the questions, or wondered why they were being asked these questions, since they did not consider it their job to track the source of ingredients in their products. Several food processors believed that the ingredients they use are GMO-free, because the suppliers do not certify them as containing GMOs.

ZPS sent questionnaires to 8 retailers and received only two rather vague replies, from Mercator and SPAR. SPAR replied that they were reluctant to use GMOs. Mercator, a supermarket chain with stores throughout the region, claimed to have no clear policy on GMOs. They stated that they were not asking their suppliers about the presence of GMOs and that they were waiting for legislation or until their suppliers provided them

with relevant data.[71] In an interview with a representative of Mercador, the company claims to be unable to avoid GMOs. It admits that some of the maize used in its products comes from Argentina, yet it does not demand certificates of purity, even though it buys some of its products from food companies, like Kraft, who were embroiled in the Starlink scandal in the US last year.[72] Starlink, a type of insect-resistant *Bt* maize was approved in the US in 1998 for animal feed, but not human consumption, due to potential for causing allergic reactions. StarLink was first discovered in Kraft taco shells sold on the US market, in September 2000.[73] (See Section 11: *The Starlink Maize Fiasco*)

Questionnaires were also sent to 13 food processors. Most companies replied that they will introduce labelling only once required to do so by law. Companies, such as Intes, Mlinotest and Sana, stated that they do not use GMOs, but provided no evidence of how they enforce this policy. Most of the companies claim to follow EU policy, but some of them (Sana, Mlinostest and Gea) have no clear strategy with respect to GMOs. Three companies belonging to the Zito corporation (Zito Gorenje, Zito and Zito Sumi) claimed to be against GMOs and in the process of obtaining certificates for soya and maize ingredients. Nevertheless, they cannot guarantee that their products are GMO-free.[74]

One exception is Zito Sumi, that have been demanding certificates to guarantee that the ingredients they use are GMO-free for over a year. Since April 2000, Sumi started phasing in GMO-free labelling of their products. One of Sumi's products is soft sweets, whose production uses corn syrup. One of Sumi's corporate customers, is the UK's Safeway supermarket chain, that is demanding GMO-free. Sumi claims that because of problems sourcing GMO-free corn syrup in Slovenia,[75] they temporarily changed their production process to use maltose syrup and thus avoided the corn derivative altogether. After they were able to obtain certificated GMO-free corn syrup, they switched back to corn.[76]

Another player on the Slovene food market is Kolinska, a food processor, which uses maize and soybean derivatives, including corn flour and soybean lecithin, in many of its products. These include snack foods, vegetable and fruit products, such as tomato ketchup, as well as dehydrated products, like soup powders and instant desserts. The prospect of a GE labelling law, which is expected to be passed in late 2001, (See Section 5: Legislation in the Pipeline) is spurring Kolinska to demand statements from their raw material suppliers, guaranteeing that their products are GMO-free. However, only a few suppliers, mainly of soybeans, attach a laboratory analysis. These often enclose a statement claiming that the GMO threshold does not exceed 1% and thus satisfies the European Commission's Regulation 49/2000 with respect to GE labelling requirements and European Commission's Regulation 50/2000.[77] The latter requires "*the labelling of food stuffs and food ingredients containing additives and flavourings that have been genetically modified or have been produced from genetically modified organisms*".

The authority of some of the certificates guaranteeing GMO-free may be doubtful. An investigation into the falsification of certificates of purity of maize in South America and the USA, by the Polish farmers Union, Solidarnosc, revealed that it is very easy to

obtain bogus certificates claiming maize is GMO-free. The farmers union is now undertaking a sampling programme of maize imports to Poland, together with the appropriate sanitary inspectors and have already sent some samples for testing to Germany.[78]

Although there is some awareness of the potential GMO contamination of imports of soybeans and maize among food processors and retailers, there is inertia among most companies when it comes to acting on their suspicions. Exceptions include Zito Sumi and Kolinska, both of which are making considerable efforts to ensure their products are GMO-free.

5. Legislation in the Pipeline

Although many officials claim to be concerned about the impact that GMOs released into the environment might have on Slovenia's biodiversity and ability to grow organic crops, there is little action. A Commission on Ethics and Biotechnology was established already in 1994, but achieved nothing, due to cross-departmental squabbling between the agriculture, environment and health ministries. Work on preparing a GMO law has been ongoing for six years!

Slovenia still has no law to regulate the release of GMOs into the environment, either during field trials or for introducing GE foods on the market. The first attempts to prepare legislation, based on the Austrian law, were started in 1995. Several new laws and regulations relating to GMOs are currently in preparation. They include:

- the long-awaited framework law on GMOs. A draft law has now been prepared and has had its first reading in parliament in February 2001;[79]
- a framework seed law;
- regulations on authorising and labelling of GE foods, under the Law on Food Safety
- framework law on animal feed

Slovenia, as a first-round EU candidate country is harmonising its GMO laws with those of the EU. But, EU policy and lawmaking on GMOs is very dynamic and constantly changing. The fast speed of commercialisation of GE seeds and food and the unforeseen consumer rejection of GE food in the EU, has resulted in continuous revisions of existing EU laws and a plethora of proposed and possible new legislation. This makes it difficult for EU candidate countries, such as Slovenia, to keep up. Despite the volatility of EU policy on GMOs, one thing is clear: the EU is moving towards more transparent and increasingly restrictive laws regulating GMOs.[80]

At the moment, there is no monitoring of GMOs in seeds, food or feed, to enforce labelling requirements. Clearly, there is a lot to be done. Once the framework laws are in place, regulations enforcing the general principles in the framework laws need to be passed and enforced. Slovenia has agreed that all food laws should be fully harmonised with those in the EU by January 2003.[81]

To ensure that Slovenia meets this deadline, monitoring of food products for the presence of GMOs on the market must start immediately. Results of food and seed testing must be widely publicised, since without a legal basis for taking action, the Government must rely on consumer pressure to keep GMOs out of Slovenia.

Given the unique and rich biodiversity in Slovenia, its efforts to introduce organic farming, and the fragmented and dispersed nature of its agriculture, all the laws relating to GMOs need to be especially restrictive. (*See* Section 8: Recommendations)

Framework Law on GMOs

The first reading of the draft framework law on GMOs by the Parliamentary Environment Committee took place 13 February 2001. The Committee identified two key problems: first, the inclusion of human genetics in the framework law; second, too many overlapping competencies of the different ministries.[82] It was also agreed that the public participation provisions in the draft law should be strengthened by a mechanism to ensure that public opinion is taken into account.[83]

The draft framework law requires that all GMOs be approved prior to release and that this approval be linked to a risk assessment. The draft law also includes requirements for labelling GMOs. In anticipation of an EU law on environmental liability, Slovenia's draft law is also to contain provisions for liability. It also espouses the precautionary principle, as one of its underlying principles. The Ministry of Agriculture wants to see traceability provisions, in line with those being discussed in the EU.[84] According to work plan of the Environment Ministry, the GMO law should be ready for its third reading sometime during the third quarter of the year 2001.

Framework Seed Law

The Ministry of Agriculture is preparing a framework seed law, that provides for labelling of GMOs. However, it does not elaborate how this labelling should be done, nor does it refer to the (draft) GMO law.

The seed law is supposed to harmonise with the EU's Directive 98/95/EC on the marketing of seeds. This directive establishes that GE seeds have to undergo an environmental risk assessment, in accordance with the revised Directive on Deliberate Release of GMOs, the new 2001/18/EC.[85] The EU directive on marketing of seeds also states that the public must be informed about the use of GE seeds; Article 18 reads: "*The published note shall clearly indicate those [seed] varieties which have been genetically modified*".

The European Commission recognises that there are still policy gaps and problems specific to GE seeds that are not addressed by Directive 98/95/EC. For this reason, the European Commission is soon to propose a special 'Novel Seed' Regulation for GE seeds. In January 2001, the European Commission's Consumer Affairs department, DG-Sanco produced an internal Working Paper entitled: "*Adventitious presence of GM seeds in seed of conventional plant varieties*", as a precursor to a future Proposal for an EU Regulation.[86] The Commission is proposing that only seed contamination by GE varieties, approved by the EU for cultivation, would be tolerated at all. It is recommending a threshold of 0,5% for self-pollinating crops and 0,3% for cross-pollinating crops, for approved varieties, and zero contamination for non-approved varieties. The proposal would also forbid farmers from growing plants for seed on land used for

GE crop cultivation within the previous 2-5 years, (depending on crop type) instead of one year as at present. The Paper also proposes doubling the separation distances when non-GE varieties are being grown for seed near their GE counterparts.[87]

Given the urgency of addressing the potential problem of widespread GMO contamination of seeds imported to Slovenia, the Government should not wait for the Commission's proposal, but should press ahead with a transparent and restrictive seed law, based on the precautionary principle. Since the process of formulating and adopting any EU law out of a Commission proposal is very long and cumbersome, often taking 3 to 5 years, it could well be that Slovenia will be an EU member before such an EU Seed Law comes into being.

Article 11 of Slovenia's Draft Seed Law provides for labelling of GMOs, but it does not state how this should be elaborated, nor does it refer to draft GMO law. Clearly, the two laws will need to be cross-referenced to ensure joined-up Government policy.

Regulation on Authorising and Labelling of genetically engineered food

On 31 May 2000, Slovenia passed a Framework Law on Food Safety, which is to be enforced jointly by the Ministries of Health and Agriculture. The framework law is based on the EU's "Novel Food" Regulation[88] and provides for GE foods to be labelled. However, the EU's "Novel Food" Regulation is not just about labelling. The Regulation provides a system for authorising GMOs in food, based on the approval systems contained in the EU Directive on Deliberate Release,[89] which require that a risk assessment be undertaken.

Slovenia's Law on Food Safety does not explicitly require a risk assessment be undertaken before a novel food can be approved for putting on the market. However, Article 9 of this Law states that regulations defining special requirements that novel foods must fulfil and labelling procedures are to be issued by the Minister of Health, in agreement with the Ministers of Agriculture and Environment. Moreover, the draft GMO law requires that a risk assessment be undertaken before a product can be placed on the market. Applications for putting GE food on the market will need to be filed with the Ministry of Agriculture, which may issue a permit, in agreement with the Ministry of Health. Clearly, the different laws relating to GMOs used in food and agriculture will need to be cross-referenced to ensure coherent Government policy.

Regulations requiring labelling of GE food, under the Food Safety Law, are expected to be passed by the end of 2001.[90] According to the consumer organisation, ZPS, GMO labelling is unlikely to be required before 2003.[91] Umanotera demands that the labelling regime be process- and not product-based. This means that labelling must not be based on the identification of GE material in the final product, regardless of the analytical means that are currently at hand, but on certification of the production process from plough to plate. For process-based labelling, a paper trail throughout the complete chain of production and all components of the final product must be taken into consid-

eration, with spot-check analysis to verify the certificates. This is important for those consumers whose principles do not allow them to eat GMOs. Process-based labelling is also essential, because small changes in the molecular composition of the product caused by the process of genetic engineering may not be evident. (See Section 11 Health Risks: *The Example of Tryptophan*) For a model process-based labelling system, see Annex I.

Framework Law on Animal Feed

The Ministry of Agriculture has prepared a new framework law on feed that includes provisions on GMOs, whose first reading in parliament is expected to be sometime in 2001. The feed law is to be implemented by the Agriculture Inspectorate.[92]

6. Market Concerns

Slovenia has no laws to regulate imports, exports or domestic trade in GE seeds and foodstuffs. Until very recently, there was no international agreement requiring segregation of GE-free crops from GE ones and labelling of bulk commodities to enable traceability. This situation is going to change following agreement on a Biosafety Protocol, under the Convention on Biological Diversity, in late January 2000.

The Biosafety Protocol, agreed by 130 countries, including Slovenia, gives them rights, for the first time, to restrict imports of GE crops without breaking international trade rules. 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 GE-free commodities in countries like Brazil 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 Roundup tolerant maize has still to receive market approval for import into the EU, and hence any contamination of Slovenia's food exports with this maize, or other unapproved GE maize, such as StarLink, or indeed unapproved GE soybean varieties, could be refused.

The discovery in the USA, in September 2000, that many brands of taco shells and chips contained StarLink, a GE variety of maize that had not been approved for human consumption, is hurting 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 corn can be kept free of genetic modification.[93]

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 trying to figure out 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*".[98]

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…*".[99]

In March 2001, the US Department of Agriculture (USDA) announced that it will buy up to US$ 20 million worth of maize seed that shows traces of the GE StarLink variety.[94] Using funds normally lent to farmers faced with natural disasters, such as drought or flood, the Agriculture department is trying to keep any contaminated seed off the market, and will destroy all confiscated seed.[95]

In a separate development, Monsanto announced in March 2001, that it will stop selling the Naturemark *Bt* potato, resistant to Colarado beetle, 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.[96] In February 2001, Syngenta (formerly Novartis and Astra Zeneca) announced that it would stop field trials of GE sugarbeet, due to the bad consumer climate in Europe. 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*".[97]

Meanwhile, the public debate in the EU is now 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 and the Food and Agriculture Organisation (FAO) are now both calling for mandatory labelling of animal feeds - 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.[100] 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.

Problems for EU Accession?

The passivity of the Slovene Government and its administration on the issue of imports of potentially GMO-contaminated seeds and crops, could have severe economic repercussions not only for Slovene farmers, but also on animal feed producers and processed food industries.

Indeed, Government inertia could also hamper Slovenia's accession negotiations. The potential presence of GMOs on the Slovene market, which have not been approved in the EU, could obstruct the functioning of the EU's single market, once Slovenia joins the EU. Moreover, its failure to label even those GMOs that have been approved in the EU, could also create problems for accession.

If Slovenia continues turning a blind eye to imports of GMO-contaminated seeds and crops, but wants to meet the demands of the EU market by providing GE free crops and food, it needs to be pro-active. Segregation of crops after harvest and in storage to avoid contamination of GE and non-GE is not feasible in Slovenia, given the small size of its agricultural economy e.g. maize is grown on 86,000 hectares. Moreover, the requirement for segregation of GE and GE-free crops would require additional investment in farm and grain storage capacity.

But Slovenia 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 Slovenia. It must set up certified laboratories to test for GMO contamination of seed, food and feed within a routine monitoring programme. All GMOs detected in Slovenia 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, Slovene food products may be banned from most EU markets altogether, and possibly also the domestic market due to EU harmonisation requirements, e.g. for GMO approvals and labelling. This would lead to bankrupt farmers and difficulties in meeting the requirements of EU Accession.

7. Conclusions

1. It is highly likely that GMOs are already being released into the environment and are present in food available on the Slovene market, but there is no monitoring for GMOs.

Imports of 'conventional' maize seed bred from North America are highly likely to be contaminated by GMOs, but no one is monitoring seed imports for GMOs. The sowing of GMO-contaminated seed in spring results in GMO-contaminated food by the autumn. Moreover, GE maize volunteers emerging in fields the following year could perpetuate the cycle of GMO pollution.

Maize grain and soybeans imported for feed or for the milling industry, some of which are for human food, are not being monitored by the Government for GMO contamination. While everyone is waiting for regulations to come into force, many food processors are relying on certificates guaranteeing GMO-free, which may not be worth the paper they are written on as no analytical spot-checks are undertaken.

Moreover, some of GMOs finding their way to Slovenia may not have been approved in the EU. Many GE varieties of maize grown commercially in North America and Argentina have not been approved for cultivation or even for import and processing in the EU. These include:

- AgrEvo's (now Aventis) Liberty Link maize, tolerant to the glufosinate-based herbicide, Liberty;
- Monsanto's Roundup Ready maize
- DeKalb's (now Syngenta) GR (DeKalb DLL25) and BtXtra (DeKalb T418) maize
- AgrEvo's (now Aventis) StarLink maize.

2. The absence of legislation on GMOs may hamper EU Accession

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.[101] If GE varieties that are still unapproved at the time of Slovenia's accession to the EU, are found to be present in Slovenia, they will be need to be taken off the market at high cost. Those GMOs that have been approved in the EU should require re-authorisation to take account of Slovenia's unique biodiversity.

Moreover, exports of GMOs or products thereof or any GMO-contaminated agricultural commodities or foods from Slovenia to the EU, even prior to accession, are likely to be hampered for two reasons: these GMOs are either not authorised within the EU or the markets reject them due to consumer demands for GMO-free products.

3. Organic farming or GE agriculture in Slovenia?

Although the Slovenian Government claims to support organic agriculture and sustainable rural development, the National Environmental Action Plan states that gene technology should not be hindered. Moreover, there are no targets for the area under organic production that Government wants to achieve within a given timeframe. Yet, the State's financial support for organic farming and its refusal to allow of releases of GMOs in field trials, creates ambiguity. If Slovenia really wants to nurture its fledging organic agriculture programme, it must unequivocally reject GMOs.

Genetically engineered food production is the antithesis of organic farming. It violates the principles of organic agriculture. According to IFOAM,[102] 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*".[103]

If Slovenia 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, demand for organic products, which has accelerated since the debate about GE foods hit the headlines,[104] is growing so quickly that 75% of the organic produce sold has to be imported;
- In France, according to the Minister of Economy and Finances, farmers can hardly keep up with a consumer demand that rose by 25% in 1996 alone;
- 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.[105]

The BSE crisis in Germany has triggered a huge increase in the demand for organic meat, which might be the biggest and most profitable market for Slovenian exports – if they can guarantee GE-free animal fodder![106]

8. 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, Umanotera advocates the precautionary principle and condemns 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, Umanotera is 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.

Slovenia - a GMO-free zone

Slovenia is in an ideal position to declare itself a GMO-free zone. Unlike most countries in Europe, it has no field trials of GMOs. The small size of Slovene farms and the high degree of fragmentation of arable land means that cross-pollination of conventional maize, by their GE cousins, is inevitable.

In declaring itself GMO-free, it would be following similar initiatives in other parts of the world:[107]

- **Italy**: Four regions, Tuscany, Molise, Lazio and Marche and around 25 provinces, cities and municipalities have banned GE crops, including Rome, Milan, Turin, Brescia and Genoa; In 2000, Italy banned four varieties of GE maize.[108]
- **Austria**: Bans on three GE maize varieties; no field trials,[109] Austrian supermarkets carry hardly any GMOs, Austria is often called "GMO-free", the Federal Institute for Less-favoured and Mountainous Areas is pressing for GE-free legislation and published a study on GE-free zones;

- **Norway**: Ban on the import of 6 GE crops and products which contain antibiotic resistance genes - two GE vaccines, GE maize, tobacco, chicory, and oil swede rape, some of which have been approved in EU. 31 GE applications have been rejected to date;[110]
- **Greece**: moratorium on GE crop trials
- **Spain**: The Basque Government has a 5-year complete ban on GMOs
- **Algeria**: Banned the import, distribution, commercialisation and use of GE plants, except for research purposes.
- **Brazil**: Planting of GE seeds is banned by federal law; the states of Rio Grande do Sul and Mato Grosso have declared their intentions to remain GE-free; 18 states have called on the Government to block commercial GE crop plantings.
- **UK**: The Church of England has refused permission for GE crop trials on 60,000 ha of its land; dozens of local authorities supply GE-free school meals, the House of Common banned GE foods for its catering. The island of Jersey banned GE crops
- **Sri Lanka** banned all imports of raw and processed GE food from 1 May 2001[111]
- **Yugoslavia** introduced an Order banning the import of GMOs and products derived from GMOs.

To enable Slovene communities and interest groups to declare GE-free zones, the national law on GMOs should contain a provision saying: "*Nothing in this Act shall be understood to prevent communities, regions or other public bodies from prohibiting the cultivation of genetically engineered crops on their land*".[112]

A 1998 study commissioned by the Austrian Federal Ministry of Women's Affairs and Consumer Protection outlines the basic arguments and frameworks concerning GMO-free zones, from a scientific and legal perspective. To preserve "natural" biodiversity resulting from natural evolution, the study argues that as a minimum, a GMO-free demarcation of the following areas is required:

- Protected areas for the preservation of biodiversity (e.g. Natura 2000 network) and adjoining areas;
- Areas for organic farming, to secure at least partially GMO-free agricultural production (as far as possible) and to guarantee GMO-free organic seed breeding and the propagation of such seeds, as well as to provide an alternative technological option;
- Areas for the enhanced in-situ (on-farm) preservation of plant genetic resources under GMO-free conditions;
- Development or "transition" areas for sustainable agricultural development - similarly defined as in UNESCO's Man and the Biosphere programme (especially in the Statutory Framework of the World Network of Biosphere Reserves) to contribute to the conservation of landscapes,

ecosystems, species and genetic variation and to foster economic and human development which is socio-culturally and ecologically sustainable;

- Mountain areas, whose ecological sensitivity merit special consideration - following Agenda 21, Chapter 13 (Managing Fragile Ecosystems: Sustainable Mountain Development)

Such GMO-free areas would have to cover relatively large biogeographical regions to be effective in the long-term in avoiding future gene transfer to a large extent.[113]

Implications for EU accession

At the moment of Slovenia's EU membership, all national laws will have to be harmonised with EU law. The overriding principle in the EU's GMO policy is that no GMO may be released into the environment or the food chain without approval by the authorities; such approval can only be granted on a case by case basis following a scientific risk assessment.

In the EU, responsibility for permitting field trials rests with Member States. Hence, even with pending EU membership, Slovenia can ban all field trials on its territory, on the grounds of protecting its unique biodiversity. Slovenia can also use its domestic regulations under the Law on Nature Protection, which enables protection zones to be controlled by limiting the types of activities that can be undertaken there. Environmental releases of GMOs should be banned in all protected areas.

Authorisation for commercial cultivation and marketing of GMOs is an EU matter. Any EU-wide marketing application has to undergo the scrutiny of several scientific committees and be evaluated by the Competent Authorities (and their respective Scientific Committees) of all Member States, plus those of the European Commission.

However, the revised Directive on Deliberate Release, 2001/18/EC, Art. 18 (2) on marketing consents allows Member States to attach conditions to the permit, for the protection of particular ecosystems/environments and/or geographical areas. This could allow Member States to demand a no-grow condition in the consent permit for designated areas in their territory.

The Government must start a widespread monitoring programme to identify what GMOs are already present in seeds, food and feed on the Slovene market, and to assess the extent of the GMO contamination. Such monitoring will also reveal whether the GMOs identified in Slovenia have been approved in the EU.

In principle, GMOs that have been approved within the EU will also be approved in Slovenia as of accession. However, since the EU's environmental risk assessment did not include Slovenia's unique ecosystems, such as the karst regions, a new, special risk assessment must be conducted. To ensure this, Slovenia must demand, in the course of accession negotiations, that an automatic "Article 16 procedure'[114] be con-

ducted for each of these GMOs when it joins the EU. This allows a Member State to ban a GMO in its territory, while a new commitology procedure is initiated, during which all other Member States and the Commission review the new scientific evidence submitted by the Member State wanting to ban the GMOs. Although this process should be completed within 3 months, over the past few years, five Member States have invoked such a national ban in eight cases, and none of these national bans have been overturned so far. Some of them have already been in place for years.

For GMOs on the Slovenian market that have no EU approval, these must immediately be taken off the market immediately.

Umanotera demands 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 the framework laws are passed and all the regulations under these laws are in force.

   If monitoring reveals the presence of GMOs in seeds, food and feed, they must be taken off the market and destroyed.

2. All imports of GMOs must be prohibited. The Government must start monitoring imports of agricultural commodities to ensure compliance with the import ban.

   Slovenia needs to monitor imports of agricultural goods, especially from North America, Argentina and other GE crop-growing countries. The Government needs to build institutional and technical capacity to identify GMO contamination of crops, foods and seeds being imported. This monitoring must include all GMOs, both those approved and unapproved on the EU market.

   This will enable all GMOs to be rejected - even those with EU approval, as Slovenia has no law to regulate their use. In addition, during EU accession negotiations, Slovenia must demand an automatic “Article 23 procedure”[115] to be conducted when it accedes. (see above) This will ensure that the Accession Treaty to the EU includes transitional agreements to guarantee that GMOs which have been approved within the EU are not automatically approved for Slovenian territory, but need to undergo a special risk assessment.

3. No GE food must be allowed on the Slovene market

   We believe that Slovenians do not need GE food.

4. Slovenians must have the right to declare their country a GMO-free Zone

   Given Slovenia’s exceptionally rich biodiversity and small-scale farming, the law should contain provisions that allow communities to declare their territory a GMO-free zone.

5. The new laws on GMOs must implement the precautionary principle

   The draft framework law on GMOs states precaution as one of its underlying principles. This is in line with the EU's current approach and the Biosafety Protocol, which allows countries to apply the precautionary principle and close their markets to GE seeds, crops and food, without conclusive evidence of harm.

   The GMO law and the regulations passed under this law, must implement the precautionary principle by introducing:

   - a ban on releases of GMOs into the environment;
   - a requirement for traceability and labelling. All imports of GMOs or products thereof must be labelled and handled separately from conventional crops, from plot to plate, or for imports from port of entry to the plate. The labelling regime must be process- and not product-based; (See Annex I)
   - a comprehensive risk assessment, based on the precautionary principle, of all applications of genetic engineering regarding their direct and indirect, as well as long-term impacts on environment, human health and socio-economic conditions;
   - a rule of absolute liability on the producer or importer, as well as an obligation for adequate insurance.

   Legislation in the pipeline relating to GMOs used in food and agriculture must be cross-referenced to the framework GMO law to ensure joined-up Government policy. For example, regulations introduced under the Law on Food Safety on authorising GMOs for putting on the market and their labelling must adhere to the principles and procedures (e.g. requirements for risk assessment) laid down in the framework law on GMOs.

6. Parliament must ratify the Århus Convention on Access to Information, Public Participation and Access to Justice in Environmental Matters

   This Convention, which the Slovene government signed in June 1998, gives the public the right to have information about GMOs and will help ensure transparency and public participation by guaranteeing citizens' access to information on all genetic activities. The Government must establish processes and procedures for public participation in decision-making.

7. Parliament must ratify the Biosafety Protocol.

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.

   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 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 genes 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:[116]

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.

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.[117]

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[118]

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 cross-breed 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,[119] 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.[120]

***The example of rape seed*:** An array of oilseed rape relatives grow in Europe, some of them are cultivated as crops, others are known as weeds. Spontaneous hybridisation between oilseed rape and at least four weedy relatives has been proven in several scientific experiments. *Brassica campestris*, also known as turnip, bird rapeseed or *B. rapa,*[121] *B. juncea B. adpressa* and *Raphanus raphanistrum*[122] are all known as weeds in at least some areas of Europe, and they can form fertile offspring with cultivated oilseed rape under natural conditions.

Danish researches found that genes that have been introduced into oilseed rape by genetic engineering can easily introgress into a weed population. In an experiment, one backcross was sufficient to obtain plants that resemble the weedy *B campestris* but contained the transgene from oilseed rape.[123] There is no doubt that any genetically engineered oilseed rape grown commercially in Europe - its centre of diversity - will forward the newly introduced genes to wild and weedy relatives.

As oilseed rape was one of the first major crops to be genetically engineered in Europe, several experiments to assess its ability to pollinate plants in the vicinity were performed during the past decade. The aim was to determine a "safe" distance for field trials with GE oilseed rape plants. However, the results differed by orders of magnitude, some researchers found only 0.1% outcrossed seeds at 1 meter distance from a field with GE oilseed rape, whilst others found 1.2% outcrossing even at a distance of 1.5 **kilo**meter.[124]

There is no "safe" distance: The conclusion that can be drawn from the multitude of experiments is the lack of any "safe" distance for oilseed rape in a field trial. Depending on environmental conditions, pollen can travel even over large distances and pollinate plants far away from the experimental plot. Similar multiple trials are lacking for most other crops.

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.[125]

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 outcompete 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.[126] 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.*"[127]

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.

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.[128] 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[129]

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, but the year 2000 was probably the worst in history. Major scandals involving the release of unauthorised GE varieties into the environment rocked Europe and North America in 2000. Some examples:

1. 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.

2. Contaminated soybeans in France

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.

3. 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.[130]

4. 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 Bt-maize variety 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.[131]

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[132] 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.[133] Azteca Milling, a US company that was amongst those first affected, is now recalling any 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."*[134] Aventis has agreed to withdraw its StarLink registration in the USA.[135]

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.[136] In Germany, a governmental lab screened maize samples and found genetic contamination in 2 out of 57 seed batches tested.[137]

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.

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.[138] 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.

In 1999, a study by researchers at Cornell University, USA showed the deleterious 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.[139] A recent study by researchers at the University of Iowa (US) published in the scientific journal Oecologia in August 2000,[140] 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.

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.[141]

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.[142]

A 1999 laboratory study showed that *Bt* toxin can leak from the roots of *Bt* crops into the soil.[143] 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.[144]

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, the threat to predatory species also 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.

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.

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 There is overwhelming scientific data showing that resistance to *Bt* toxin will develop with the 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.[145] This selected CPB strain could survive for two generations on the transgenic *Bt* plants.[146] Moreover, the development of resistance of an insect to one *Bt* toxin often leads to cross-resistance with 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.[147]

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*[148]

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. Of the 44.2 million hectares of GE crops planted worldwide in 2000, 74% were herbicide-resistant.[149] Herbicides themselves are known environmental polluters 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.[150]

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.[151] 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 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*."[152] 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 real world, it is simple psychology and not the weed that triggers applications of herbicides.[153]

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.*"[154] This will have severe implications to birds, such as skylarks that already in serious decline due to intensive farming methods.

But, 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.[155] 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.[156]

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.

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 market 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[157] 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.[158] The group is soon to meet with the EU Food Safety Commissioner to recommend the establishment of a register of diseases thought to be linked to GE foods.

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 commerical 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 market genes in GE food. In addition, they highlight the need for further research to determine the full health and environmental impact of GMOs.[159]

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 to be rigorously tested on the assumption 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.[160] 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.[161]

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.[162]

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, because it "*exhibits some characteristics of known allergens*". 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 a heightened 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.

On 18 September 2000, the Genetically Engineered Food Alert (GEFA),[163] 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 26 September 2000, by announcing a stoppage of sales of StarLink seeds. Then, on 9 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.[164]

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.[165] 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.[166]

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 commericalised, 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."[167]

The Example of Tryptophan[168]

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 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 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.[169] 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 when 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. 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. A study published in La Recherche[170] indicates that the preconditions for such transfer are now present. In this paper, 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.

Given the above, current scientific knowledge strongly supports the assumption that antibiotic resistance genes can be taken up from bacteria in the intestines of animals and humans. Experience in normal agricultural practice shows that antibiotic resistance can move from animal pathogens to bacteria that are also harmful to humans.

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 bac-

teria, 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 Ampillicin-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 Amoxycillin. 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. Such resistance 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.

Annex I: A process based labelling system, proposed by Greenpeace

The following text is an extract of Greenpeace policy on labelling in the European Union.[171] It is based on the concept of process based labelling, which does not depend on an analysis of the final product, but rather on a certification of the production process from plot to plate:

All food products that have been produced, processed, grown or cultivated under one of the following preconditions have to be marked with a clear and easily visible label, to inform consumers about the production process and to allow an informed choice between genetically engineered and conventional food products. For the labelling process, the complete chain of production and all components of the final product must be taken into consideration. All ingredients and components of the final product must be listed. The technical capability to detect GMOs is not a criteria for labelling. Additional information on the product must clearly state if the product contains proteins from plants, animals or micororganisms known to initiate allergies.

A) Labelled "Genetically Manipulated"

Food products must be marked with the label "Genetically manipulated" if one or more of the following preconditions applies to either the finished product or one or more of its components:

1. Food products and/or their components that consist of or contain genetically modified organisms (according to the definition set out in the EU-directive 90/220/EEC). This regulation applies both for finished products and their components, regardless whether the genetic modification can be detected by currently available scientific standards or not.
2. Food products and/or their components that are produced or derived from genetically modified organisms. This regulation applies both for finished products and their components, regardless of whether the genetic modification can be detected by currently available scientific standards or not.
3. Food products, if their additives are produced or derived from genetically modified plants or animals.
4. Food products obtained or derived from animals raised and fed with genetically modified animal fodder.

5. Animal fodder must be labelled as genetically manipulated if the fodder or its components consist of or contain genetically modified organisms or their parts; or if the fodder or its essential components are produced or derived from genetically modified organisms.

6. Animals that are genetically engineered and sold for food or animal fodder (such as fish meal).

B) Labelled "Produced with Genetic Engineering"

Food products have to be marked "Produced with genetic engineering" (without a label; in written form, placed within the list of ingredients), if one or more of the following preconditions applies to either the finished product or one or more of its components:

1. Food products that are produced with the help of production processes that operate with genetically modified organisms or their derivatives.

2. Food products that contain or are produced with the help of additives (vitamins, enzymes, flavoured substances (flavourants)) that are produced or derived from genetically modified organisms.

Annex II: Contacts and Resources

Contacts in Slovenia

NGOs

Marjana Dermelj
Umanotera,
The Slovenian foundation for Sustainable Development
Resljeva 20, P.O. Box 4440
1000 Ljubljana
Tel.: +386 1 49 71 00
E-mail: marjana@umanotera.org

Anamarija Slabe,
Institute for Sustainable Development
Metelkova 6
1000 Ljubljana
E-mail: anamarija.slabe@itr.si

Breda Kutin, General Manager,
International Consumer Research Institute
Zveza Potrosnikov Slovenije (ZPS)
Tel: +386 1 474 0600
E-mail: breda.kutin@guest.arnes.si;
zveza.postrosnikov-slo@guest.arnes.si

Ervin Kuhar
Chamber of Agriculture
Miklošièeva 4
1000 Ljubljana
Tel: +386 1 21 46 300

Government Officials

Mladen Breginc and Dr. Biserka Strel,
Ministry of Environment and Spatial Planning
Mladen Breginc, State Undersecretary;
Tel: +386 1 478 7390
E-mail: maden.berginc@gov.si

Biserka Strel; Tel: +386 1 478 7338
E-mail: biserka.strel@gov.si

Joze Illersic, Director,
Plant Variety Protection and Registration Office,
Ministry of Agriculture, Forestry and Food
Tel: +386 1 436 3344
E-mail: joze.ilersic@gov.si

Mira Zupanc-Kos, State Under-Secretary,
Ministry of Agriculture, Forestry and Food
Tel: +386 1 478 9110
E-mail: mira.zupanc@gov.si

Marta Hrustel Majcen,
State Undersecretary,
Ministry of Agriculture, Forestry and Food
Tel: +386 1 478 91 17
E-mail: marta.hrustel@gov.si

Dmitrij Grcar, State Undersecretary,
Ministry of Economy,
Foreign Economics Relations Division
Tel: +386 1 478 3553
E-mail: dimitrij.grcar@gov.si

Dunja Sever, Counsellor to the Government,
Ministry of Health, Health Inspectorate
Tel: +386 1 436 22 98
E-mail: dunja.sever@gov.si

Majda Benja Mihelic, counsellor to the Government,
Ministry of Health
Tel: +386 1 478 6061
E-mail: majda.mihelic@gov.si

Barbara Miklavicic, Deputy Director,
Office for Consumer Protection,
Ministry of Economy
Tel: +386 1 478 3731
E-mail: BMIKLAVCIC@gov.si

Parliamentarians and associated bodies

Prof. Franc Lobnik,
President of the Council for Environmental Protection
(an advisory body to Slovene parliament)
Tel: +386 61 130 6070
Mobile: +386 41 663 713
E-mail: franc.lobnik@bf.uni-lj.si

Silva Crnugelj,
MP in The National Assembly
Tel: +386 1 478 9631
E-mail: silva.crnugelj@dz-rs.si

Branka Berce Bratko, Counsellor,
Research Dept,
The National Assembly
Tel: +386 1 478 9430
E-mail: branka.berce@dz.rs.si

Scientists

Peter Raspor
Secretary General,
Federation of European Microbiological Societies (FEMS)
Dept. of Food Science and Technology,
Biotechnical Faculty,
University of Ljubljana
Tel: +386 1 423 1161
E-mail: peter.raspor@bf.uni-lj.si

Prof. Branka Javornik
Centre for Plant Biotech and Breeding,
University of Ljubljana, Biotechnical Faculty
Tel: +386 1 423 1161 or 256 3376
E-mail: branka.javornik@uni-lj.si

Business and Industry

Primoz Stuhec, Director of Seed Division,
Semenarna Ljubljana d.d.
Tel: +386 1 427 3301 Direct: 427 3031
E-mail: primoz.stuhec@semenarna.si

Joze Sadar, Director of Fresh Produce
Mercator d.d.
Dunajska 156
1000 Ljubljana
Tel: +386 1 560 1313
Mobile: +386 41 680 775
E-mail: joze.sadar@mercator.si

Marko Babnik, Sales Manager
Aventis
Tr•aška 132
1000 Ljubljana
Tel: +386 1 423 4088
E-mail: marko.babnik@aventis.com

Dunja Trebar, Manager Product Development,
Kolinska Food Industry
Kolinska ulica 1
1544 Ljubljana
Tel: +386 1 4721 693 or 4721 500
E-mail: dunja.trebar@kolinska.si

Damjan Finšgar
BASF,
President of Slovene Crop Protection Association (SCPA)
Dunajska 111
1000 Ljubljana
Tel: +386 41 640 246

International Resources[172]

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
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
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.

Genetic Resources Action International (GRAIN)
Barcelona, Spain
Tel: +34 93 301 1381
Fax: +34 93 301 1627
E-mail: grain@bcn.servicom.es>
Website: 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: twn@uvn.ernet.in
Website: www.indiaserver.com/betas/vshiva

Greenpeace International
Berlin, Germany
Tel: +49 30 30 889914
Fax: +49 30 30 889930
Website: 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
Website: 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
Website: 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: twn@igc.apc.org
Website: www.twnside.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.nl/anped/
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.

References

1 *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*

2 *Integrated Pest Management (IPM) programmes reduce the need for pesticides*

3 *In this report, the term 'GE-free food' means food that does not contain any raw material derived from GE plants.*

4 *The revised Directive 90/220/EC on Deliberate Release of GMOs into the environment is now Directive 2001/18/EC*

5 *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.*

6 *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*

7 *C. James, "Global Status of Commercialised Transgenic Crops: 2000", ISAAA (International Service for the Acquisition of Agri-biotech Applications) Briefs No. 21, (Ithaca, NY, ISAAA, 2000)*

8 *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."*

9 *UN ECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, signed by Environmental Ministers in Aarhus, Denmark, June 1998.*

10 *International Federation of Organic Agriculture Movements*

11 *"Agri-Environmental and LFA (Less Favoured Areas) Measures in Slovenia", Republic of Slovenia, Ministry of Agriculture, Forestry and Food, 2001*

12 *"Slovenia on the Road to Quality - Environment" Ministry of Environment and Spatial Planning, 2000*

13 *"Agri-Environmental and LFA (Less Favoured Areas) Measures in Slovenia", Ministry of Agriculture, 2001*

14 *FAO Yearbook - Production: Eastern Europe and CIS 1999, 4th edition Vol. 52 (Europa Publications: 1998*

15 *Interview with Prof. Franc Lobnik, President of the Council for Environmental Protection, 19 April 2001*

16 *Interview with Primoz Stuhec, Director of Seed Division, Semenarna Seed company, 20 April 2001*

17 *Interview with Marko Babnik, Sales Manager, Aventis, 25 April 2001*

18 *Interview with Ervin Kuhar, Chamber of Agriculture, 24 April 2001*

19 *Interview with Primoz Stuhec, Director of Seed Division, Semenarna Seed company, 20 April 2001*

20 *Central European Free Trade Area (CEFTA) includes transition countries, like Hungary and Czech Republic*

21 *Interview with Dmitrij Grcar, State Undersecretary, Ministry of Economy, Foreign Economic Relations Dept, 24 April 2001*

22 *Interview with Anamarija Slabe, Institute for Sustainable Development and USOFA, Ljubljana, 16 April 2001*

23 *Peter Raspor, Federation of European Microbiological Societies, Dept. of Food Science and Technology, Biotechnical Faculty, University of Ljubljana, interviewed 19 April 2001*

24 *"Biotic Diversity in Slovenia; Slovenia - the 'hot spot' of Europe" Narcis Mrsic, Ljubljana, 1997*

25 *"Protected Areas of Slovenia - Parks" pamphlet received from the Ministry of Environment, 20 April 2001*

26 *"National Environmental Action Programme" Ministry of Environment and Spatial Planning, Administration for the Protection of Nature, Ljubljana, September 1999*

27 *"National Environmental Action Programme" (NEAP), Ministry of Environment and Spatial Planning, Administration for the Protection of Nature, Ljubljana, September 1999*

28 *NEAP published by the Environment Ministry, September 1999*

29 *Interview with Barbara Miklavicic, Deputy Director, Office for Consumer Protection, Ministry of Economy, 20 April 2001*

30 *Interview with Mira Zupanec-Kos, State Undersecretary, Ministry of Agriculture, Forestry and Food, 23 April 2001*

31 *Interview with Joze Illersic, Director of Plant Variety Protection and Registration Office, Ministry of Agriculture, Forestry and Food, 20 April 2001*

32 *Interview with Prof. Branka Javornik, Centre for Plant Biotechnology and Breeding, Biotechnical Faculty, University of Ljubljana 19 April 2001*

33 *For more information see: "GE Food and Crops in Croatia - A Threat to Sustainable Agriculture", ANPED-Green Action Zagreb, February 2000, on www.anped.org*

34 *Interview with Primoz Stuhec, Director of Seed Division, Semenarna Seed Company, 20 April 2001*

35 *Telephone call between Marjana Dermelj, Umanotera, and Mr. Èergan, Institute of Agriculture, 9 May 2001*

[36] *Interview with Marko Babnik, Aventis Sales Manager, 25 April 2001*

[37] *This section is based on interview with Prof. Branka Javornik, Centre of Plant Biotech and Breeding, University of Ljubljana, 19 April 2001*

[38] *Interview with Prof. Branka Javornik, Centre of Plant Biotech and Breeding, University of Ljubljana, 19 April 2001*

[39] *Interview with Mira Zupanc-Kos, State Undersecretary, Ministry of Agriculture, April 23 2001*

[40] *"Hungary bans maize exports as market tightens" AgraFood East Europe, November 2000*

[41] *AgraFood East Europe June 2000: EU importers have already started turning to Hungary.*

[42] *C. James, "Global Status of Commercialised Transgenic Crops: 2000", ISAAA (International Service for the Acquisition of Agri-biotech Applications) Briefs No. 21, (Ithaca, NY, ISAAA, 2000)*

[43] *A GE variety of maize spliced with a gene from the bacteria Bacillus thurenginesis to make it toxic to pests*

[44] *Interview with Prof. Branka Javornik, University of Ljubljana 19 April 2001*

[45] *Interview with Joze Illersic, Ministry of Agriculture, Forestry and Food, 20 April 2001*

[46] *Interview with Damjan Finšgar, BASF and Slovene Crop Protection Association, 26 April 2001*

[47] *Telephone call between Marjana Dermelj of Umanotera and Karlo Mikoléiè, Pioneer office in Slovenia, based at Murska Sobota, 26 April 2001*

[48] *Regulation 258/97/EC on novel foods and novel food ingredients ('Novel Foods' Regulation) supplemented by Commission Regulation 49/2000, to establish a 1% threshold of permissible GMO contamination of food, for labelling purposes.*

[49] *Greenpeace Austria found Bt11 and MON810 maize varieties in Pioneer maize variety pr39d89. Press release 2 May 2001 www.greenpeace.at/umweltwissen/gentech/vorrang_fuer_bio*

[50] *Figures from Statistical Office of the Republic of Slovenia, received from Mr. Èièmirko, Ministry of Agriculture, Department for European Affairs*

[51] *Slovenia imported small amounts of maize seed also from Slovakia (1999 only), Germany, Romania, Bosnia (2000 only) and Chile (2000 only)*

[52] *Press release from the Swedish Board of Agriculture 24 May 2000: The Swedish Board of Agriculture has decided that the crops with genetically modified oil seed rape shall be destroyed. At http://www.sjv.se/english/genetics/Hyola/pressrelease_destroy_000524.htm*

[53] *French minister demands GM crop be destroyed. Reuters News Service May 19, 2000*

[54] *Advanta France to compensate farmers for GM mishap. Reuters News Service June 12, 2000*

[55] *Statement by Advanta Seeds UK, 2 June 2000. Contact Press Office Advanta Phone UK 44 1529 304 511*

[56] *"Italian Police seize more Monsanto seed in raid" by David Rough, Reuters, 12 April 2001*

[57] *Italian Agriculture Ministry website: www.politiche-agricole.it reported by Reuters, 26 March 2001*

[58] *"Italian minister asks for Monsanto licence to be suspended", by David Brough, Reuters, 29 March 2001*

[59] *"More Genetic Contamination of Seeds in European Market", Press release Greenpeace, 4 May 2001*

[60] *Court: Oberverwaltungsgericht Nordrhein-Westfalen in Münster, File No. 21 B 1125/00), quoted in dpa (German wire service) 1 September 2000: Gericht verbietet Verkauf von Raps aus der Nähe von Gentechnik-Feld.*

[61] *"German Government shelves research program on GM crops due to mad cow worries", Berlin, Agence Presse, 25 January 2001*

[62] *Directive 98/95/EC on the marketing of seeds*

[63] *Phone call between Marjana Dermelj and Dr. Jana •el, 9 May 2001*

[64] *Figures from Statistical Office of the Republic of Slovenia, received from Mr. Èièmirko, Ministry of Agriculture, Department for European Affairs*

[65] *Slovenia also imported small amounts of maize from Jordan and Spain in 1999, and Belgium, China, The Netherlands and Russia in 2000*

[66] *ISAAA (International Service for the Acquisition of Agri-biotech Applications) Briefs No. 21, (Ithaca, NY, ISAAA, 2000)*

[67] *"Illegal genetically engineered corn from Monsanto detected in Argentina" London/Buenos Aires, 11 May 2001, Greenpeace press release*

[68] *Figures from Statistical Office of the Republic of Slovenia, received from Mr. Èièmirko, Ministry of Agriculture, Department for European Affairs*

[69] *Slovenia also imported small amounts of soybeans from Australia, China, Germany Hungary, Switzerland, Brazil (1999 only) and Bosnia (1999 only)*

[70] *ISAAA Briefs No. 21, (Ithaca, NY, ISAAA, 2000)*

[71] *ZPS newsletter 5/2000, pages 22-24*

[72] *Interview with Jose Sadar, Director of Fresh Produce, Mercator d.d., 20 April 2001*

[73] *"USDA doesn't know how StarLink tainted 1998 corn" by Julie Vornam, Reuter, 23 November 2000*

[74] *ZPS newsletter 5/2000, pages 22-24*

[75] *Interview with Breda Kutin, ZPS Consumer organisation, 23 April 2001*

[76] *Telephone conversation between Marjana Dermelj, Umanotera and Ms. Mojca Primic, Head of the Development unit at •ito, 10 May 2001*

[77] *Interview with Dunja Trebar, Manager Product Development, Kolinska Food Company, 25 April*

[78] *Letter dated 21 April 2001 from Marian Zagorny, National Protest Committee of the Farmers Union Solidarnoœæ Rolników Indywidualnych, to the Polish Prime Minister Jerzy Buzek faxed to ANPED, 15 May*

[79] *Interview with Prof. Franc Lobnik, President of the Council for Environmental Protection, 19 April 2001*

[80] *See "EU Enlargement and GMOs: Chasing a Moving Target", ANPED, November 2000 on www.anped.org*

[81] *Barbara Miklavicic, Office for Consumer Protection, Ministry of Economy, 20 April 2001*

[82] *Interview with Prof. Franc Lobnik, President of the Council for Environmental Protection, 19 April 2001*

[83] *Marjana Dermelj, Umanotera, 14 May 2001*

[84] *Interview with Mira Zupanc-Kos, State Undersecretary, Ministry of Agriculture, 23 April 2001*

[85] *replacing 90/220/EC*

[86] *FoEE Biotech Mailout, Vol 7, Issue 2, 1 April 2001. Visit: www.foeeurope.org/biotechnology/about.htm*

[87] *"EU Commission to propose GM seed law", Vienna, 25 January 2001. More information on website of DG Health and Food Safety: http://europa.eu.int/comm/food/fs/biotech/biotech_index_en.html*

See also: report of the Joint Meeting of the Standing Committees on "Seed and Propagating Material for Agriculture, Horticulture and Forestry (SCS), "Propagating Material of Ornamental Plants (SCO) and "Propagating Material of Fruit Plants (SCF) held 22-23 January 2001 at

http://europa.eu.int/comm/food/fs/rc/scsp/rap19_en.html

[88] *Regulation 258/97/EC on novel foods and novel food ingredients*

[89] *EU Directive on Deliberate Release 90/220/EC has been revised and is now Directive 2001/18/EC*

[90] *Interview with Dunja Trebar, Manager Product Development, Kolinska Food Company, 25 April 2001*

[91] *Interview with Breda Kutin, ZPS consumer organisation, 23 April 2001*

[92] *Interview with Mira Zupanc-Kos, State Undersecretary, Ministry of Agriculture, 23 April 2001*

[93] *"Corn leaving bad taste in world markets as GMO worries build", Steve James, Reuters, 23 November 2000*

[94] *"US will aid companies hurt by GM corn", Washington Post, 8 March 2001*

[95] *"USDA to buy seed tainted with StarLink bio-corn", by Randy Fabi, Reuters, 7 March 2001*

[96] *"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*

[97] *"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)*

[98] *Associated Press, 24 and 25 October 2000*

[99] *Bureau of National Affairs journal, 11 October 2000*

[100] *BBC, 6 October 2000*

[101] *Statement by the Danish, Austrian, Italian, Greek, Luxembourg and French delegations during the third reading vote by the council, February 2001*

[102] *International Federation of Organic Agriculture Movements at http://www.ifoam.org/*

[103] *"Genetic pollution is threatening consumers' right to choose", IFOAM press release, 19 March 2001*

[104] *Jane Meriman, "Euro stores cash in on 'Frankenstein food' fears", Reuters, London 20 April 1999*

[105] *"Conference Summary Statement" from European Commission and Austrian Government Conference "Organic farming in the European Union - Perspectives for the 21st Century, 27-28 May 1999, Baden, Austria*

[106] *Zentrale Markt- und Preisberichtsstelle Oekomarkt Forum, Feb/March 2001*

[107] *GENET GE-Free Newsletter 01/02, 1 March 2001*

[108] *"Italian minister asks for Monsanto licence to be suspended", by David Brough, Reuters, 29 March 2001*

[109] *E-mail communication from Dr. Helmut Gaugitsch, Austrian Federal Environment Agency, 18 May 2001*

[110] *www.Just-Food.com, 3 January 2001*

[111] *"Sri Lanka Sticks to Ban on GM Food", 13 May 2001, Xinhua*

[112] *Dan Leskien, lawyer and adviser on Genetic Engineering to The Greens/ EFA in the European Parliament, Brussels in e-communication to Marjana Dermelj, Umanotera, 14 February 2001*

[113] *"Concepts of GMO-Free Environmentally Sensitive Areas" Summary of Study prepared by Josef Hoppichler, Federal Institute for Less-favoured and Mountainous Areas, August 2000*

[114] *Article 16 of the old Directive 90/220/EC on Deliberate Release of GMOs is now Article 23 of the new Directive 2001/18/EC on Deliberate Release of GMOs; full text of the new directive at:*

http://europa.eu.int/eur-lex/de/oj/2001/1_106200104 17de.html

[115] *This is the former "Article 16 procedure" of the now revised Directive 90/220/EC on Deliberate Release*

[116] *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.*

[117] *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.*

[118] *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.*

[119] *J. Emberlin, "The Dispersal of Maize Pollen", National Pollen Research Unit, 2 March 1999*

[120] *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*

[121] *Mikkelsen TR, Andersen B, Jörgensen RB "The Risk of Crop Transgene Spread", Nature 380:31, 1996.*

[122] *Eber F, Chèvre AM, Baranger A, Vallée P, Tanguy X, Renard M "Spontaneous Hybridisation Between a Male-Sterile Oilseed Rape and Two Weeds", Theoretical and Applied Genetics 88:362-368, 1994.*

[123] *Mikkelsen TR, Andersen B, Jörgensen RB (1996) The Risk of crop Transgene Spread. Nature 380:31*

[124] *Pauk J., Stefanov I., Fekete S., Bögre L., Karsai I., Feher A., Dudits D. (1995) A study of Different (CaMV 35S and mas) Promoter Activities and Risk Assessment of Field Use in Transgenic Rapeseed Plants. Euphytica 85, S. 411-416; Timmons A.M., O´Brien E.T., Charters Y.M., Dubbels S.J., Wilkinson M.J. (1995) Assessing the Risks of Wind Pollination from Fields of Genetically Modified Brassica napus ssp. oleifera. Euphytica 85, S. 417-423*

[125] *"Centres of Diversity - Global Heritage of Crop Varieties Threatened by Genetic Pollution", Greenpeace, 1999, www.greenpeace.org*

[126] *NC Ellstrand and CA Hoffman, "Hybridisation as an Avenue of Escape for Engineered Genes", Bioscience 40:438-442, 1990.*

[127] *CN Stewart, "Transgenic Insecticidal Oilseed Rape on the Loose" Proceedings of the Workshop 'Commercialisation of Transgenic Crops, Canberra, March 11-13, 1997.*

[128] *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*

[129] *This section is based on a briefing paper prepared by Greenpeace International in January 2001*

[130] *KWS Press Release (in German) 9. October 2000 at www.kws.de*

[131] *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*

[132] *FDA Enforcement Report 00-44 1 November 2000 at http://www.fda.gov/bbs/topics/ENFORCE/ENF00666.html as of December 5, 2000*

[133] *USDA doesn't know how StarLink tainted 1998 corn. Reuters News Service November 23, 2000*

[134] *Azteca Milling, FAQs at http://www.aztecamilling.com/news/index.html, as of December 4, 2000*

[135] *Aventis Press Release from November 9, 2000 at http://www.aventis.com/press/docs/2000-11-09_Aventis_CropScience_Starlink.PDF as of 4 December 2000*

[136] *Sowing dissent. New Scientist 27 May 2000, www.newscientist.com*

[137] *Press release (in German) from the Ministry of Environment and Transport of the German State of Baden-Württemberg, 25 May 2000*

[138] *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*

[139] *J.E Losey, L. Rayor and M.E. Carter, "Transgenic Pollen Harms Monarch Larvae", Nature 399: 214, 1999.*

[140] *Hansen LC, Obrycki JJ (2000) Field deposition of Bt transgenic corn pollen: lethal effects on the monarch butterfly. Oecologia 125:241-248*

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

[142] *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.*

[143] *D Saxena, S. Flores and Stotzky, "Insecticidal Toxin in Root Exudates from Bt Corn", Nature 402:480, 1999.*

[144] *EPA MRID NO 434635, Bt maize (corn) leaf protein (LP176-0194) - 28 days survival and reproduction study in Collembola (Folsomia candidia).*

[145] *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*

[146] *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.*

[147] *W.H. McGaughey and M.E. Whalon, "Managing Insect Resistance to Bacillus thuringiensis Toxins", Science 258:1451-1455, 1992.*

[148] *Luke Anderson, "Genetic engineering, Food and Our Environment - A Brief Guide", (Devon, UK: Green Books, July 1999), p. 27.*

[149] *ISAAA Briefs No. 21, (Ithaca, NY, ISAAA, 2000)*

[150] *Working Document, EU DG Agriculture: "Economic Impacts of GM Crops on the Agri-Food Sector", 2000*

[151] *Charles Benbrook, Benbrook Consulting Service, July 1999, full text of the study at www.biotech-info.net*

[152] *Charles M. Benbrook : Troubled times amid commerical success for Roundup Ready soybeans. In the internet at: http://www.biotech-info.net/troubledtimes.html*

[153] *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*

[154] *Watkinson, Freckleton, Robinson and Sutherland, "Predictions of Biodiversity Response to Genetically Modified Herbicide-Tolerant Crops", Science, Vol 289, 1 September 2000*

[155] *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 canol (Brassica napus) is the cause of multiple resistant B. napus volunteers. Weed Science 48: 688-694*

[156] *New Scientist, 19 February 2000, p. 21.*

[157] *Report of the Inter-Departmental Group on Modern Biotechnology*

[158] *"Doctors criticise report on GM foods", by Gillian Ní Cheallaigh, Irish Times, Tuesday, March 13, 2001*

[159] *"The Impact of Genetic Modification on Agriculture, Food and Health - An Interim Statement", British Medical Association, Board of Science and Education, May 1999*

[160] *"Importation of Ciba-Geigy's Bt maize is Scientifically Indefensible", J. Fagan, <www.netlink.de/gen/BTCorn.htm>*

[161] *E Millstone, E Brunner and S. Mayer, "Beyond 'Substantial Equivalence", Nature 401:525-526, 1999.*

[162] *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*

[163] *Website of GEFA: www.gefoodalert.org*

[164] *"USDA doesn't know how StarLink tainted 1998 corn" by Julie Vornam, Reuter, 23 November 2000*

[165] *"Biotech corn is test case for industry - Engineered food's future hinges on allergy study", by Marc Kaufman, Washington Post, 19 march 2001*

[166] *"FDA to test for Biotech allergy", Associated Press, Washington, 19 march 2001. See: http://news.excite.com/news/ap/010319/13/biotech-corn*

[167] *New Scientist, 7 October 2000*

[168] *This section is based on a briefing paper by Dr. John B. Fagan from Genetic ID, USA, November 1997*

[169] *Mayeno, A.N. and Gleich, G.J., "Eosinophilia-myalgia Syndrome and Tryptophan Production: A Cautionary Tale," TIBTECH, 12, 346-352, 1994*

[170] *La Recherche No. 309, May 1998*

[171] *Full text at www.greenpeace.org*

[172] *This section is taken from book by Luke Anderson, "Genetic Engineering, Food and Our Environment-A Brief Guide", Green Books, Devon, UK, July 1999*

Publisher:

Umanotera, The Slovenian Foundation for Sustainable Development
p.o. box 4440, Metelkova 6, 1000 Ljubljana, Slovenia

For the publisher:

Vida Ogorelec Wagner

Author:

Iza Kruszewska, ANPED, The Northern Alliance for Sustainability

The report is also available on the following web pages:
http://www.umanotera.org and **www.anped.org**

Ljubljana, June 2001

Views and opinion of the author do not reflect the views of the Delegation of EU Commission in the Republic in Slovenia and the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM).