

# **Genetically Engineered Food and Crops in Poland**

**A report prepared for ANPED,  
The Northern Alliance for Sustainability  
and MURE,  
The Malopolska Union for Organic Farming**

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### **The Northern Alliance for Sustainability (ANPED)**

ANPED is a network of 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. ANPED is a democratic network of NGOs and voluntary organisation, with most of its 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. It now includes groups from 8 countries in the region working together to raise public awareness of GE food in their countries. ANPED's core activities are funded by the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) and the EU DG Environment

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## Executive Summary

A recently issued regulation requires approval and labelling of genetically engineered (GE) food in Poland, but this regulation is not enforced by the administration, and no labelled food can be found in Polish supermarkets. Hence, most if not all products containing GE ingredients are probably illegal on the Polish market, and Polish consumers have no protection at all from the possible health risks of genetically engineered food.

In theory, the new GE regulation provides considerable safeguards against the risks of genetic engineering, but in practice it offers little protection to consumers and to the environment in Poland. Large amounts of (highly likely) genetically engineered crops are imported from the USA and Canada, but labelling of GE food is not enforced. Even the lead agency, the Ministry of Environment, openly stated that the regulation is „*just a paper tiger*“. Only one application for approval of GE food (presumably for a GE soybean product) has been filed at the Ministry, and no company is labelling its products as genetically engineered.

Field trials are approved by the very same geneticists that are working on GE plants, with no independent or critical experts involved in the approval process. The big transnational companies are getting ready to flood the Polish market with genetically engineered crops. At least 20 field trials have been performed during the last two years, mainly by Monsanto, AgrEvo and Pioneer. Precise information on field trials could not be obtained as the Polish Ministry of Agriculture is reluctant to inform the public about ongoing field trials, bending to the wishes of industry instead of respecting the rights of the public to full information on environmental matters. Commercial planting of GE crops is still prohibited in Poland but is foreseen for 2002, when a new comprehensive law on genetic engineering will enter into force. In course of the Polish EU accession process, this new law will follow the EU regulations 90/219 and 90/220.

There is no awareness at all - either in the regulatory agencies or in the scientific community - about the environmental and health risks of uncontrolled „contained“ applications of genetic engineering. A new factory to produce human insulin with genetically modified bacteria is in its last stage of development and will enter production by the end of this year, with no regulatory oversight that would address the specific risks of GE bacteria. Scientists in Poznan developed an edible vaccine, a lettuce that contains a vaccine against Hepatitis B, and tested it on themselves. Researchers in Warsaw performed taste tests with GE tomatoes without due attention to possible health or environmental risks.

The regulatory agencies are understaffed and have neither the expertise nor the resources to perform sound risk assessments. They rely solely on the expertise of scientists that are personally involved in genetic engineering and can therefore hardly be considered objective. The open statements of the key persons in the Polish government and administration that there will certainly be no law enforcement and that there are no means for detecting genetically engineered organisms (GMOs) in Poland is an open invitation to food companies to ignore the law and to betray Polish consumers. Food companies have obviously understood the message and seem to be ignoring the GMO regulation.

In the light of these findings, MURE urges the Polish government to take all necessary measures to safeguard the environment and protect the Polish people from possible risks posed by genetically engineered organisms in Poland. Most urgently, the Polish food producers must source GE-free raw material and must ensure to provide GE-free food to the consumers. The Polish government must immediately:

- issue a moratorium on **all** releases into the environment of genetically modified organisms;
  - issue administrative procedures to enable enforcement of the GMO regulation;
- take measures to prevent any accidental releases of GMOs into the environment.

## **Introduction**

In 1994, for the first time ever, a genetically engineered (GE) plant was grown commercially. The introduction of the FlavrSavr-tomatoes in the USA was the beginning of a global change in agriculture - or so it was planned by the big transnational companies Monsanto, AgrEvo, Pioneer and DuPont.

However, when in 1996 the first harvest of GE soybeans was about to be shipped to Europe, an unforeseen rejection of manipulated food was voiced by European consumers. Consumers demanded the right to know, they wanted to know what they were eating and asked for the labelling of GE food. In many EU countries, the introduction of genetically engineered food onto the market failed, and the major EU food producers now guarantee a GE-free food supply. Corporate food processors, such as Nestle and Unilever, made public commitments to source only GE-free ingredients in their products. Since 1999, there is an increasing awareness about the dangers of genetically engineered crops even in the USA, and the acreage planted with GE crops is expected to drop this year.

Only Spain, and to a very limited extent France and Germany, were growing GE maize in the past two years. EU approvals for growing AgrEvo's herbicide tolerant maize and Monsanto's *Bt* maize have been granted by France, but they are being legally challenged by Greenpeace in France. Novartis' herbicide tolerant and insect resistant maize has been banned by Austria and Luxembourg. Austria has also banned the growing of Monsanto's *Bt* maize. Monsanto's Roundup tolerant maize has still to receive market approval for import into the EU.

Another nail in the coffin for GE food is the Biosafety Protocol, finally agreed in Montreal at the end of January 2000. It clarifies the issue of international trade in GMOs. The Protocol, adopted by 130 countries world wide, including Poland, allows countries to apply the 'precautionary principle' and reject imports of GMOs, if they think there is a safety risk.

The purpose of this report is to analyse the situation regarding genetically engineered crops and food in Poland. In March 2000, interviews - in person and on the phone - with experts from government, research institutions and NGOs were undertaken in Poland to gather information about the legal, administrative, scientific and political situation concerning genetic engineering in Poland.

This report aims also to alert Polish citizens to the threats posed by GE crops, including potential impacts on the environment, human health and access to the EU markets. The commercialisation of GE crops and food, which have not been approved by the EU, could hamper Poland's accession to the EU.

The report will help to close the widening gap in public awareness with respect to GE food and agriculture between Western and Eastern Europe. In this way, we want to stop Poland becoming a dumping ground for GE seeds and food that are unwanted in the West.

The issue of genetic engineering is especially important for Poland, which depends heavily on its agriculture. Poland should take the opportunity and provide strong support for organic agriculture, which will guarantee an environmentally safe and economically viable agriculture in a sustainable manner.

But, organic 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, genetically engineered food cannot be considered organic.

A public relations campaign to promote genetic engineering in Poland has been started by some scientists, led by Professor Tomasz Twardowski from Poznan. He founded an Information Office in Warsaw that provides only heavily biased pro-biotech information and publishes a regular bulletin that strongly advocates a pro-biotech policy. Prof. Twardowski pointed out that he is about to target Polish consumer organisations, trying to talk them into a campaign supportive of

genetically engineered food.

The Polish consumers have a right to know. They have a right to know the true facts about genetic engineering, and they have a right to know what's in their food. This report will hopefully help to build a critical awareness about the environmental and health risks of genetically modified food in Poland.

## **Part A: Genetically engineered crops and food in Poland**

### ***1) Genetically engineered food on the Polish market***

*"The law is just a paper tiger"*

Malgorzata Wozniak, Ministry of Environment

In summary, a recently issued regulation requires approval and labelling of GE food in Poland, but this regulation is **not enforced at all** by the administration, and no labelled food is to be found in Polish supermarkets. Hence, most if not all products containing GE ingredients are probably **illegal** on the Polish market, and the Polish consumers have **no protection at all** from the possible health risks of genetically engineered food. Large imports of maize, soybeans and oilseed rape from North America indicate a high prevalence of GE food on the Polish market.

#### *The law: GE food needs approval and must be labelled*

At the end of last year, a new regulation on genetically engineered crops and food entered into force in Poland. From a consumers' point of view, the new regulation can be considered highly protective, with the provision for an in-depth risk assessment, comprehensive labelling and governmental oversight regarding GE food. Even products like oil derived from GMOs or additives like lecithin are included, and the labelling requirement is not restricted to a detection of GMOs in the final product but allows also for a process based labelling (see Annex 2). The latter points are especially important and provide the Polish consumers with a strong labelling regime that is even better than the current EU regulations.

In October 1997, the Polish parliament introduced an amendment to the Environmental Protection Act, giving the Environmental Minister the authority to issue a regulation on the release of genetically modified products into the environment (for trial purposes) and to the market. The GMO regulation to implement this law was issued 8 October 1999, published on October 22, and entered into force two weeks later, on Nov. 5, 1999. The part on labelling of GE foodstuffs entered into force on April 22, 2000.

The GMO regulation (see Annex 1 for a rough translation of the key provisions) sets out the procedure for the marketing of genetically engineered products in Poland. A risk assessment has to be performed before the Environmental Ministry can approve the marketing of GE food, which must be labelled as "genetically modified" in the list of ingredients.

Until March 2000, the Ministry of Environment received only one application (in February), presumably for genetically engineered soybeans. According to the Ministry, the approval process will take about three months, hence the GE soybeans might be approved by the time this report is published. Any GE product on the Polish market without a permit from the Environmental Ministry is probably illegal today. According to the GMO regulation, any person or company who places GE food on the market - which includes importers, food producers, wholesalers and retailers - is required to get approval for the products.

Before the new regulation entered into force last year, the Chief Sanitary Inspector issued some permits for marketing GE products in Poland. In a letter dated September 10 1999, Prof. Kazimierz Karlowski, advisor to the Chief Sanitary Inspector, indicated that approvals for the introduction of several genetically engineered foodstuffs have been issued. However, Ms. Malgorzata Wozniak from the Ministry of Environment stressed that these approvals do not replace the necessity for approval under the new GMO regulation. According to Ms. Wozniak, products that received an approval from the Chief Sanitary Inspector during the past years are still illegal on the Polish market if they have not been re-registered according to the new regulation..

Guaranteed no law enforcement: The administration ignores the will of parliament and Polish people

Although the new GMO regulation reads well and should provide comprehensive protection for Polish consumers, it is not worth the paper it is printed on, as there is absolutely no enforcement. It is outrageous that the administration ignores the will of the Polish Parliament - and hence the Polish people - and does not protect consumers from the possible health risks posed by genetically engineered foodstuffs.

Two institutions will be responsible for law enforcement and control of the food marketed in Poland: Customs inspectors should monitor whether imports are contaminated with GMOs, and the Polish Trade Inspection (PIH Polska Inspekcja Handlowa) should control and enforce the labelling of food in Polish stores. However, neither the staff at the Main Customs Office (GUS - Główny Urząd Statystyczny) at the Ministry of Finances in Warsaw, nor customs officers in the port of Szczecin have ever heard about any regulation concerning genetically engineered crops.

### **What is Genetic Engineering?**

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

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

Genetic engineering has been seized upon by scientists and industry as a way of redesigning and 'improving' living organisms. Genetic engineering in agriculture focuses on conferring new properties on commercial crops, like herbicide resistance, nutritional change, insect resistance or stress tolerance.

The Department of Quality Control of the Polish Trade Inspection is aware of the fact that they will be responsible for GMO labelling of foods in shops. They have however, no possibility to check if a product is contaminated or not. The Polish Trade Inspection have stated clearly that they rely on the honesty of producers because they have no means to check for themselves if GMOs are present in foodstuffs.

Mr. Wawiernia from the Ministry of Agriculture admitted that there is no system in place to control imported seed for GE contamination. Only if they have an indication, e.g. „*a letter from Greenpeace*“, they would test the incriminated seed batch for GMO contamination.

Confronted with the lack of awareness and absence of detection measures in the administration, the Ministry of Environment admitted that „*the law is a just a paper tiger*“. They confess that there are no reference laboratories, that no administrative procedures have been established so far, and that no instructions have been issued and sent to the enforcement services. According to the Ministry, this will not happen before the new GMO act enters into force, sometime in 2002.

Mr. Zygmunt Krzeminski, the key person in the Polish administration responsible for GMOs, went so far as to say that he „*assume(s) that for strictly ethical reasons producers should label products which contain GMOs*“, and that for now „*companies are the ones who have the problem, not the Polish Trade Inspection.*“

It can hardly be considered proper law enforcement to rely completely on the ethical standards of private companies. The open statements of the key persons in the Polish government and administration that there will certainly be no law enforcement and that there are no means for

detecting GMOs is an open invitation to food companies to ignore the law and to betray Polish consumers.

*Food imports, food industry and consumers*

So it is not surprising that there is no food labelled as genetically modified to be found on the shelves of Polish supermarkets, although contamination of food imports with GE maize, soybeans or oilseed rape is highly likely. In 1998, Poland imported 75,000 tons of soy products from the USA, and 10,000 tons of oilseed rape derivatives from Canada. More than 50% of soybeans grown in the USA were genetically modified in 1999. In general no segregation of traditional and GE crops takes place in the USA and Canada, and thus almost every shipment of maize, soya and oilseed rape from the US and Canada will contain large amounts of genetically engineered products.

Food companies have obviously understood the message from the administration and seem to be ignoring the GMO regulation. By mid March, only one application for the approval of a GE food ingredient was filed at the Environment Ministry. The Polish Federation of Food Producers is now lobbying the Environment Ministry to introduce a 24-month transition period for the GMO regulation, instead of advising its members to abstain from sourcing GE material and to produce GE-free food.

In May 1999, Dr. Halat from the Consumer Health Protection Association in Warsaw did a survey of some 200 food companies in Poland about their use of genetically modified ingredients in the companies' products. Only around 30 food producers replied that they do not use any GM ingredients, including the companies Pudliszki, ZPC Pomorzanka, ZPC SAN, Zakłady Przemysłu Tłuszczowego, Zott, Bahlsen, Delecta and Mokate. The bulk of the companies either did not reply or did not give a clear statement, including Nestlé, Cadbury, Danone, Kraft Jacobs Suchard, Unilever and Coca Cola. Clearly, this demonstrates that the big transnational food companies operate double standards in the quality of their food. Nestlé, Unilever, Kraft Jacobs Suchard and many other big food companies guarantee GE-free production to Western consumers, while they seem to use Poland as a dumping ground for GE contaminated food products.

Polish consumers have a right to know, and they are strongly demanding the labelling of GE food. In a recent opinion poll, 89% of the respondents said 'yes' when asked whether genetically modified food should be additionally labelled. The consumers' right to know is reflected in the new regulation, but the Polish administration seems to be complying with the demands of industry, rather than those of Polish consumers and policymakers.

## ***2) Laboratory and greenhouse work (contained use) is not regulated***

*“We are in a good situation in Poland, because there are no gene rules.”*

Prof. Plucienniczak, Institute of Antibiotics, Warsaw

The new GMO regulation does not cover 'contained use' of GMOs at all, e.g. experimental work in laboratories or greenhouses, or the cultivation of GE bacteria in contained facilities. Unlike the situation in some European countries, this kind of work can be undertaken in Poland without any governmental oversight, without a risk assessment and without obligatory safety measures.

### *Coming Soon - Insulin production with genetically modified bacteria*

Researchers at the Institute for Antibiotics in Warsaw seem to be in the final stages of setting up a production plant for human insulin, produced using genetically modified bacteria in large-scale fermenters. The head of the Institute, Prof Plucienniczak confirmed that his institute co-operates with an Israeli company called “Biotech General“. He expects to introduce the insulin to the market by the end of 2000. Production will take place in a 5000 litre fermenter, which according to Prof. Plucienniczak produces enough insulin for Poland (1.5kg purified insulin per batch).

Prof. Plucienniczak was delighted about the fact that there are no regulatory procedures to follow: *“We are in the good situation in Poland, because there are no gene rules“.*

This project plays Russian Roulette with the Polish Environment and the Polish people. How contained is this „contained“ use? Growing the bacteria in a closed system does not necessarily mean that they will not escape into the environment. Special precautions are needed to avoid releases of the GE bacteria during the manufacturing process. It is standard procedure for any bacterial production in Poland to sterilise the wastewater, but when it comes to GMOs, much more sophisticated procedures are needed. These bacteria produce insulin, a potent pharmaceutical compound that must not be released into the environment. The release of just a few bacteria may lead to establish new populations of the GMO outside the facility, in wastewater plants or elsewhere in the environment. Thus, special safety measures are needed to kill all 100 percent of the GE bacteria. Considering the incredibly large number of bacteria in a single drop of fermentation liquid, even a 99.99% safety measure would still allow millions of living bacteria to escape into the environment, with unforeseen consequences.

Even Prof. Twardowski, the prominent advocate of genetic engineering in Poland, who definitely cannot be accused of being radically critical of genetic engineering, stressed in an article that in a biotechnological process *“the biological risk is additionally enhanced by the industrial and free use of GMOs which may result in an uncontrolled transfer of foreign genes and occurrences of allergens and toxic substances in the environment.”*

Who is responsible for protecting the safety of the workers at the GMO plant and of the people living in the vicinity? Who ensures that adequate safety measures are in place? Who controls the facility on a regular basis to monitor compliance with the safety protocol? Until the new law on genetic engineering is in place - and this is not expected until 2002 - there are no mandatory safety measures to ensure a high level of protection for workers and the environment.

### *Lettuce containing a Hepatitis B vaccine was developed and tested on humans in Poznan*

In the early 1990s, the very same Prof. Plucienniczak created plants containing an edible vaccine against Hepatitis B. This project was further developed in the Institute of Bioorganic Chemistry of the Polish Academy of Sciences in Poznan. The principal researcher is Dr. Kapusta, who also developed genetically modified plants with a vaccine against the swine fever virus.

The vaccine-lettuce is already in a very advanced stage of development, at clinical phase II trials with tests on humans already underway. The first human experiments were performed by the researchers themselves in Poznan, with at least 3 but probably up to 20 human test subjects

involved. According to Dr. Kapusta, they recently started trials with a larger number of volunteers, in co-operation with a Poznan hospital.

The human trials were approved by the ethical committee of the institute, but again there is no appropriate regulation in place to address the specific risks of the genetically modified lettuce. The lettuce is different from other drugs in that it has not the same degree of purity and we have less knowledge about the ingredients. It might have undergone significant changes through the process of genetic modification (see Part B: The example of tryptophan). Genetic engineering is a specific technique with unique risks that need particular safety measures that were obviously not taken in the course of undertaking experiments with the lettuce.

A more general risk of the edible vaccines lies in the fact that the GE lettuce looks exactly the same as its traditional counterpart. If for any reason - e.g. a mix-up in the laboratory or production facility - vaccine lettuce gets out of control and enters the food chain, a potent drug will be administered to people, without any control and without their consent. Even more alarming are recent indications that the intake of high doses of the vaccine neutralises the vaccination effect. Uncontrolled ingestion might thus render a previous vaccination useless.

#### *Taste tests with genetically engineered tomatoes*

The Agricultural University in Warsaw provides another example of how un-contained an allegedly „contained“ use of GMOs sometimes is. Prof. Katarzyna Niemirowicz-Szczytt constructed genetically modified tomatoes and introduced a gene for thaumatin, a sweet protein that is used as a sugar substitute. The researchers modified a variety that was bred (traditionally) to be harvested pale orange in September and stored at low temperatures until January. However, as these tomatoes are not very tasty, they engineered thaumatin into the tomato to improve the taste. To determine the level of thaumatin produced by the tomatoes, taste tests are performed in the institute. Following a detailed procedure, a group of people is asked to estimate sweetness of tomatoes. *“They simply taste them,”* said Prof. Niemirowicz- Szczytt *„and compare them with some controls“*.

One could say that it is a personal decision on whether or not to eat the genetically altered tomato (and, as Prof. Niemirowicz- Szczytt admitted, some testers indeed objected to it). However, tomato seeds belong to those most resistant in the plant kingdom and pass the intestine tract of humans without damage. While still alive, they enter the environment through the faeces of the test persons. What sounds like a minor escape route indeed caused a major conflict in the United Kingdom in February 1999. The British administration became aware of the fact that some researchers from the company Zeneca in the UK ate GE tomatoes and considered this to be a release into the environment and a violation of the GMO regulation. *„If they were knowingly eating the tomatoes including the seeds then they are probably bringing about a release to the environment,”* commented Professor John Beringer, chairman of the UK’s Advisory Committee on Releases to the Environment. This fact was also acknowledged by a leading Zeneca official, some ten years ago. When asked in 1989 about the taste of the genetically engineered tomatoes, Dr. Simon Best from ICI seeds - which later became Zeneca - stated: *„If people swallowed the tomato seeds then plants could end up growing in a sewage farm somewhere and this would be an unauthorised release of a genetically engineered organism.“*

This example highlights again that a lack of regulation of so-called contained use provides little protection against accidental release into the environment of GMOs.

## **2) *Field trials with genetically modified plants in Poland***

*"The scientists police each other"*

Ms. A. Korzeniowska, Ministry of Agriculture

### *The law: The fox is guarding the hen house*

The new regulation that was issued on October 8 1999 (see Annex I) covers not only GE food, but also field trials with genetically modified organisms.

A company or institution that wishes to test a GMO in the environment must apply to the Ministry of Environment, which handles all applications. But the main decision-making power is still held by the Ministry of Agriculture.

All applications are forwarded to the scientific advisory body of the Agriculture Ministry, which appoints two review scientists who perform the risk assessment and give an opinion about the application. This opinion could theoretically be overruled by the Environment ministry, but only on environmental ground. As the whole risk assessment procedure, also concerning environmental and health risk, is performed by the scientific advisory committee at the Ministry of Agriculture, it is - according to Mr. Wawiernia from the Agricultural Ministry - highly unlikely that the Ministry of Environment will raise any objection.

With the exception of a few officials, all members of the scientific advisory committee are scientists whose selection has been based on recommendations from Prof. Twardowski and Prof. Malepszy, two genetic engineers. Environmental experts, NGOs, or members from important social groups in Poland are not involved in the approval process. Ms. Korzeniowska from the Ministry of Agriculture pointed out that the scientists "*police each other*".

Even if the new GMO regulation reads quite well in theory, with provisions for extensive risk assessment procedures: In practical terms, there is no real control and oversight. At the end of the day, it is a few scientists who decide whether or not a field trial can be undertaken in Poland. The advisory committee is chaired by Prof. Twardowski, the most prominent advocate of genetic engineering in Poland. The fox is guarding the hen house.

### *Field trials in Poland from 1997-1999*

The total number of field trials undertaken in Poland during the last years is unclear. The Polish administration is not providing precise information, bending to the wishes of industry instead of respecting the rights of the public to full information on environmental matters. Mr. Wawiernia from the Ministry of Agriculture refused to provide a full list of field trials simply on the grounds that the big transnational companies asked to keep this information confidential. It is shameful to see the bootlicking of Polish administrators to big transnationals, especially as these same companies accept extensive lists of their field trials in the EU or in North America being publicly available on the Internet.

According to a recent publication by Prof. Twardowski, the first field experiments in Poland were performed in 1997, with potato, corn, and beet, and about 20 experiments were performed in 1998. However, Mr. Wawiernia from the Ministry of Agriculture indicated that only some 10 field trials were approved in 1998, mainly by AgrEvo, Pioneer and Monsanto, with maize, potato, and oilseed rape. In 1999, 12 applications were filed to the Environment Ministry, 10 permissions were granted. 2 applications were rejected, solely on the grounds of missing information. One application can cover several sites where the same plant is released. The applications filed in 1999 covered oilseed rape, sugar beet, fodder beet, maize and potato.

### *Contamination risk for Polish oilseed rape and maize producers*

Already the limited number of experimental field trials with GE maize and oilseed rape could

have severe economic repercussions not only for Polish farmers, but also for animal feed producers, the animal husbandry industry, the starch and processed food industries and traders. Genetically engineered pollen can escape from the field trial and contaminate the harvest of neighbouring fields.

### **Swiss Authorities Refuse Permit for Trials of Herbicide-Resistant Maize**

In April 1999, the Swiss Agency for the Environment, Forests and Landscape refused approval to Plüss-Staufer AG to undertake a field trial using genetically modified glufosinate tolerant T25 maize. The reasons for the refusal are:

- The T25 maize may have a selective advantage, and during a mild winter, a few seeds will survive and germinate creating a new 'weed'.
- Although maize originates from Central America and there are no related plants in Switzerland, pollen dispersal between various maize fields is a problem. As a result, a product could arise on a third party's plot, which has not been approved. No tolerance value for the contamination of maize, either as foodstuff or animal feed, by genetically modified material currently exists. *“The hybridisation of genetically modified inherited material must therefore be prevented. This could be greatly reduced by removing male blossoms from T25 maize prior to flowering. Even with such sterilisation, it cannot be guaranteed that the pollen will end up on a neighbouring maize field or will be gathered by bees and end up as honey.”*
- The possibility of the transmission of genetic material, even from dead plant material from GE plants to soil micro-organisms.
- The T25 maize also contains a disrupted sequence from an antibiotic resistance gene. *“The presence of active antibiotic resistance genes in GMOs which are to be released into the environment, in view of the high level of complexity of the soil microflora and the low level of knowledge of their composition and cross linkages constitutes a presumably low, but difficult to assess and above all, unnecessary risk”.*

Consumers and food companies in a growing number of countries, including the EU, Japan and other Asian countries, are shunning genetically engineered crops. The EU market increasingly demands certified GE-free products. Food producers in the EU have been forced by the consumers to provide guaranteed GE-free food, and extensive testing of raw material for contamination with genetically engineered crops is taking place. The tests for GE crops are highly sensitive and could detect even a single GE maize kernel in a big shipment. To satisfy buyers of GE-free raw material, cross-contamination - even at very low levels - must be avoided. The safety measures for the field trials with GE maize and oilseed rape in Poland are not at all sufficient to avoid contamination of the commercial crop. The Ministry of Environment requires an isolation distance of 200m (maize) or 400m (oilseed rape) around the experimental plots. However, recent research revealed that pollen from these crops 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. The report included references showing that bees pick up pollen from maize plants and can carry it for several miles. The report concluded that *“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.

### ***Monsanto sues Canadian Farmer***

Percy Schmeiser, a farmer in Saskatchewan is being sued by Monsanto for growing Roundup-tolerant oilseed rape (Canola) seed without a licence, after samples were taken from around his fields. The farmer says that he has been growing oilseed rape for years and freely admits to saving his seed, but denies that it belonged to Monsanto. He claims that there are a lot of GE crops being grown in the neighbouring area and pollen from them is blowing everywhere. *“It’s in the ditches, and the roadsides... it’s all over.... We’re just touching the tip of the iceberg in contamination of fields by this Roundup genetic canola [oilseed rape].... It just opens up a vast area of uncertainty”*

These findings have major implications for the environment. Field trials of oilseed rape and beet pose a specific threat to the Polish environment, as Central Europe is the centre of diversity of these food crops. Their domestication from wild ancestors took place in Europe, and there are still some wild relatives growing in Europe, which could acquire the artificially introduced genes from the GE crops.

Oilseed rape can easily interbreed under natural conditions with at least four relatives that are considered weeds: *Brassica campestris*, also known as wild turnip, bird rapeseed or *B. rapa*, *B. juncea*, *B. adpressa* and *Raphanus raphanistrum*. Danish researches found that genes that have been introduced into oilseed rape by genetic engineering can easily enter a weed population. There is no doubt that any GE oilseed rape grown commercially in its centre of diversity will forward the newly introduced genes to wild and weedy relatives.

The same is true for sugar and fodder beet. In Northern Europe, spontaneous hybridisation between cultivated beet and wild beet *Beta vulgaris maritima* has been observed. The hybrids are now considered weeds in beet fields.

#### ***4) In the pipeline - Commercial planting of GE crops***

The big transnational companies are preparing the ground for commercial planting of genetically engineered crops in Poland. Pioneer-DuPont is starting joint projects with Polish research institutions, and AgrEvo is already distributing brochures about the miracles of their LibertyLink crops.

Currently, there is no law in place to regulate commercial release of GMOs in Poland. The GMO regulation that was issued last October covers only release into the environment for experimental purposes and placing of GE foodstuffs on the market.

Although there is obviously no clear legal provision in any Polish law or regulation that explicitly prohibits the commercial growing of GE crops, staff at the Ministry of Agriculture stressed that in their view it is prohibited and thus no seed variety approval would be granted to a GE variety.

##### *The seed variety regulation in Poland*

In the EU, a genetically engineered crop variety needs two approvals before it can be marketed: The first has to comply with the GE regulation and includes an assessment of the specific risks related to genetic engineering, and the second for the seed variety registration similar to any non-GE variety.

The Polish law regulating seed variety approval is very similar to the EU law. For variety approval, two years of pre-registration trials must be performed by the applicant on his own premises (but it must be in Poland). Based on these trials, an application for variety approval can be filed at the Ministry of Agriculture, followed by another two years of registration trials that are performed by the governmental institution COBORU (Centralny Ośrodek Badania Odmian Roslin Uprawnionych - Research Centre for Agricultural Plant Varieties). Registration in any of the EU member states does not replace the need for the Polish registration process.

The Polish seed variety law is currently under revision. The revised version will enter into force around the end of 2000 and will also contain provisions on GE seed.

So far, no applications for variety approvals of GE seeds have been filed in Poland. It is currently under discussion in the ministry and at COBORU, whether or not the addition of a single gene to an old variety is enough to register this line as a new variety.

It can be anticipated that the experimental field trials that are currently performed in Poland by AgrEvo, Pioneer and Monsanto will serve as pre-registration trials. With a revised version of the seed variety law in place by the end of 2000, the first genetically engineered seeds could be registered in Poland in 2002, after two years of registration trials.

##### *Potato breeding: the limited value of genetic engineering for Polish agriculture*

The import of genetically engineered crop varieties from the EU or even from the USA is of questionable value for the Polish farmers. It must be emphasised that the value of a new variety will never rely on one single trait (introduced by genetic engineering), but rather on the combination of a whole range of traits. The overall performance of a variety, including yield, stress and pest resistance, taste and other quality traits, must meet the requirements of farmers, processors and consumers.

One of the first field trials with a GE crop in Poland took place in 1998 in Mlochów at the potato breeding station of Plant Breeding Institute IHAR (Instytut Hodowli i Aklimatyzacji Roslin - Institute for Plant Breeding and Acclimatisation). The GE potato contained genes to confer resistance to the potato viruses PVY and PLRV, and the field trials were performed to assess the ability of genetic engineering to help breed potatoes with a high virus resistance. However, it became evident that these GE potatoes are valueless for the Polish market, for two reasons:

- The virus resistance conferred by the new gene was not as high as in some traditional varieties. Poland has a very high standard for the virus resistance of its potato varieties. As more than 90% of the potato acreage in Poland is sown with farm-saved seed potatoes and not with certified, virus-free potatoes, there is a high infection pressure on the PVY and the PLRV viruses in Poland. A potato variety can only be registered in Poland if it exhibits a high degree of virus resistance. Most western varieties do not meet this standard - not even Monsanto's GE potato NewLeafplus. The new GE variety tested in Mlochow was also unable to reach resistance levels as high as in some of the old varieties.
- The overall performance of the GE varieties was not as good as the currently marketed commercial varieties. Potatoes in Poland, and in Europe in general, must meet many different and very high quality standards demanded by the consumers, which makes breeding very difficult. More than 50 different traits have to be optimised in a single variety. In the USA where most potatoes are used for making chips, the situation is entirely different, since processing plants require only that a few key traits are present in the potatoes. This enabled Monsanto to develop and market the NewLeafplus-potato in the USA, - a potato used solely for processing - in a relatively short time. But the Potato Breeding Station in Mlochow found a loss of many valuable traits in their GE potatoes and does not consider these potatoes suitable for commercial planting. The process of genetic engineering imposes very harsh conditions onto the potatoes and causes a high variation of important traits.

Crop breeding should be driven by consumer and farmer demands, and not by the short-term financial goals of a transnational company. The complex traits that are needed for sustainable agriculture and a healthy and tasty food supply are provided by sophisticated traditional breeders in a much better way than by the single-trait focussed genetic engineers.

Proponents of the new technology must be cautioned not to adopt a technique that has already proven to lower crop yields. A scientific review of over 8,200 university-based soybean variety trials in 1998 in the USA revealed that across all the varieties tested the yield of the genetically engineered RoundupReady soybeans was 5.3 percent lower on average compared to conventional varieties. Failure of genetically engineered cotton or soybeans has repeatedly been reported during the last years.

## ***5) What type of agriculture for Poland?***

### *EU Accession*

The commercialisation of GE crops and food, which have not been approved by the EU, and the Polish administration's current policy of non-enforcement of the law could hamper Poland's accession to the EU. Two months ago it became evident, that Poland is lagging behind in environmental reforms that are needed for EU accession. During a visit to Poland, EU environment commissioner Margaret Wallstrom pointed out that in Poland „*legal work is too slow, (the requested) transition periods are too many and too long, we need to see more work on administrative structures for taking care of environment issues and more political will has to be manifested.*“ This critique applies to all aspects of GMO regulation and its (non-)enforcement by the Polish administration.

### *The precautionary principle must prevail*

MURE, a Polish environmental NGO, believes future generations should not have to inherit a nature that has been catastrophically redesigned for the sole purpose of profit.

The release of GMOs into the environment presents unknown hazards. Their release into the environment 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, MURE 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, MURE is opposed to all releases of GMOs into the environment.

Today's approach, advocated both by industry and international bodies such as UNIDO and UNEP, is to use risk assessments and risk management plans, in the belief that this will make the risk disappear. 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. In addition, the risk management approach does not aim to prevent harm. The opposite is true. Risk management plans are prepared on the strong probability that harm might occur (otherwise why do them) to mitigate harm when disaster strikes.

MURE demands that all releases of genetically engineered organisms into the environment be prohibited immediately before the survival of numerous species is put at further risk. For some, it may already be too late.

### *Demands for a safe and sustainable agriculture and food production*

In light of the findings reported above, MURE urges the Polish government to take all necessary measures to safeguard the environment and protect the Polish people from possible risks posed by genetically engineered organisms in Poland. Specifically, MURE demands:

- No release into the environment of genetically modified organisms.

Moratorium on **all** releases into the environment of genetically modified organisms, including experimental field trials.

The Polish government must promote organic agriculture instead of the development of genetically engineered crops.

Polish food producers must source GE-free raw material and provide food to the consumers that does not contain any genetically modified organisms or products thereof. This makes sense not only from an environmental and health point of view, but also to retain the EU market for Polish agricultural exports.

The Ministry of Environment must immediately issue administrative procedures to enable enforcement of the GMO regulation on the approval and labelling of genetically engineered food. Food industry and importers in Poland must know that any non-compliance with the GMO regulation will be detected and pursued.

The Ministry of Environment must ensure that the labelling requirement of GE food both in the existing and the new comprehensive GE law to be passed in 2001, is not product but process based. What is important is not whether or not a laboratory test can detect GE material in food, but whether or not the source of the raw material was non-GE.

The Ministry of Environment must not agree to a 24-month transition period for the new GMO regulation, as is being demanded by the food industry. This would expose Polish consumers for another two years to the risks of genetic engineering without any control and with no right to choose.

Measures must be taken to prevent any accidental releases of GMOs into the environment.

Critical contained use applications, e.g. the insulin production or the tomato taste tests must be postponed until the new, comprehensive GE law will enter into force.

Access to information and public participation must be guaranteed for the approval process for environmental releases of GMOs. In June 1998, Poland signed the Aarhus Convention on Access to Information, Public Participation and Access to Justice, which gives citizens the right to information about GMOs. It is high time that Poland ratified this Convention.

A balanced Advisory Body which is representative of all society must be established at the Ministry of Environment, including NGOs, political scientists, church, natural scientists including ecologists, and officials.

We call on all concerned social organisations - environmental, consumer, church groups - to join our campaign and support our demands. In the countries of the European Union (EU), public pressure has resulted in an announcement by the governments of France, Italy, Denmark, Greece and Luxembourg that they would block any attempt to approve new GE crops in the EU.

A public relations campaign to promote genetic engineering in Poland has been started by some scientists, led by Professor Tomasz Twardowski from the Institute of Bioorganic Chemistry of the Polish Academy of Sciences in Poznan. He founded the Information Office for Genetically Modified Food in Warsaw that provides only heavily biased pro-biotech information. AgrEvo propaganda brochures are handed out at this Information Office, and they publish a regular bulletin that strongly advocates a pro-biotech policy and tries to discredit recent findings about the risks of GMOs (e.g. the Monarch-study described in Part B of this report). It is scandalous that the very same Prof. Twardowski is the Chairman of the advisory committee that issues permits for field trials in Poland.

## Part B: The environmental and health risks of GMOs

### *6) 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.

### *7) 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:

- **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, microorganisms 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.
- **destroying biodiversity by replacing native species:** GE crops with a survival advantage could escape fields, invade other ecosystems and replace other species. This

type of 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*. 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 of genetically engineered plants

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, potato tubers can be removed by bigger mammals, 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, fertilise it, resulting in seeds that will also contain the engineered gene. It has been proven that oilseed rape, maize, sunflowers, potato, sorghum, and many other crops can crossbreed with wild plants that grow near agricultural land in many parts of the world. .

**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 hybridization 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*, *B. juncea* *B. adpressa* and *Raphanus raphanistrum* are all known as weeds at least in 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. 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.

Oilseed rape has a moderate ability to out-cross, with a selfing rate between 70 and 90 percent, i.e. 70-90 percent of all seeds are the result of a pollination within one flower, and only 10-30 percent of the seed result from cross-pollination, where the pollen comes from another plant. 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 genetically engineered 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 genetically engineered oilseed rape, whilst others found 1.2% outcrossing even at a distance of 1.5 kilometer.

There are probably two reasons for these contradictory results: First of all the experimental design differed significantly. Some of the experiments were designed like field trials, with border rows surrounding the genetically engineered plants. These resulted in low outcrossing rates. Other experiments had no border rows but an isolation area around them. These led to larger outcrossing rates at higher distances. A second explanation for the big differences might be the different localities. It is well known that pollination effectivity is strongly influenced by environmental parameters - insect pollinator abundance, food and water sources for insect pollinators in vicinity, weather conditions, wind etc. - which could cause big differences in outcrossing rates.

**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. 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. The decision for this moratorium was taken by France in view of the fact that any release of genetically engineered oilseed rape or beet would be irreversible due to the high probability of outcrossing and hybridization with wild relatives.

### **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 USA 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 (1998) 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 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.

### *Selective advantage and competitiveness*

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

Many crop species – such as oilseed rape, potato, tomato, or beans – have close relatives that are already considered major weeds. It is obvious that many of the traits favoured by genetic engineers would confer a fitness advantage, especially resistance to pest and diseases or tolerance to drought and salinity. Researchers at the University of North Carolina found recently that insecticidal 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 that *'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.'*

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 proven 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.

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.

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

Insect resistance is one of the key traits currently engineered in the laboratories of the big seed companies. 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. The toxins are selective in that they do not kill any 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 transgenic crops has the same favourable characteristics as the Bt toxin in its natural state. There is now an 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. However, in transgenic Bt crops, such as Pioneer's maize, the toxin will occur as a soluble pre-activated plant protein, which is produced throughout the entire plant life. Genetically engineered insect resistance crops may therefore prove harmful to many non-target species, and may further disturb ecological balance:

- Last year, a study by researchers at Cornell University, USA, received considerable public attention, as it showed the deleterious effect of genetically engineered maize on the monarch butterfly. Milkweed dusted with pollen from Bt maize led to lowered survival and growth rates in the monarch butterfly.
- A recent 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.
- 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 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.
- In laboratory experiments at New York University, researchers found that active forms of Bt, like those found in some types of transgenic crops, do not disappear when added to soil, but instead become rapidly bound to soil particles. Unlike the naturally occurring forms of Bt, they are not degraded by microbes, nor do they lose their capacity to kill insects. The accumulation of these toxins, which could be released into the soil as farmers

incorporate plant material into the ground after harvest, could represent a serious risk to soil ecosystems.

- Very recently laboratory studies have shown that *Bt* toxin can leak from the roots of *Bt* crops into the soil. 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. Collembola (springtail) is a flightless insect, which feeds on fungi and debris in soil, and which is generally considered as a beneficial insect.

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 is one of the most important tools for modern pest management. For example, the green lacewing together with the ladybird are the most important beneficial predatory species to control pest insects.

#### *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.

Crop plants, such as maize, have now been engineered with the gene for the *Bt* toxin to give them an in-built insecticide. These transgenic 'insect-resistant' crops were grown on 7.7 million hectares worldwide in 1998. 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.

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 further use of natural *Bt* formulation in environmentally friendly farming systems.

*Bt* resistance has already been noticed among some insect populations, and the US Environmental Protection Agency (EPA) has predicted that most target insects could be resistant to *Bt* within 3-5 years.

Insect resistance to natural insecticides, such as the *Bacillus thuringiensis* (*Bt*) toxin, is a major problem for organic farming. Organic farmers have been using natural preparations of *Bt* toxin as an environmentally friendly pest control tool for decades. For example, in the USA, potato farmers have been using the natural *Bt* formulation to control the Colorado potato beetle (CPB). In some areas where there was widespread resistance of the CPB to synthetic insecticides, the natural *Bt* sprays saved the potato industry.

Natural preparations of *Bt* toxin are composed of natural crystals of toxin contained in spores. These 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 and although spores can remain viable in soil for two years, they are inactivated within a few days on leaves. In contrast, the *Bt* toxin from genetically modified crops is produced on an on-going basis in the crop and herbivores are therefore likely to be exposed to it for long periods.

In the USA, 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. This selected CPB strain could survive for two generations on the transgenic *Bt* plants.

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.

*Herbicide use on herbicide resistant 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

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 27.8 million hectares of GE crops planted worldwide in 1998, 71% were herbicide-resistant. Herbicides themselves are known environmental pollutants found in food, soil and water. By developing herbicide-tolerant plants, it is clear that the intention is to use them in agricultural systems that include the use of herbicides.

In Bulgaria, farmers can buy Monsanto's sowing package, which includes 5 packets of Roundup-tolerant maize seeds and 30 litres of Roundup herbicide. Last year, a study on herbicide use in herbicide resistant plants revealed that US-farmers growing RoundupReady soybeans used 2 to 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. A grower survey in Missouri revealed that most if not all fields planted to RR soybeans received at least one herbicide application.

Margaret Mellon, from the Union of concerned Scientists believes that many farmers may be turning towards GE herbicide-resistant crops because they are becoming desperate for new weed control tools. Farmers growing monocultures of maize and soybeans are facing serious weed problems. Many weeds have become resistant to chemical herbicides and multiple applications of herbicide are no longer effective as new weeds emerge.

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 that resisted either Monsanto's Roundup herbicide, Cyanamid's Pursuit or Aventis's Liberty. In 1999, he found weeds that resisted all three herbicides. Only more toxic herbicides, such as 2,4-D, will now be able to control the new superweeds.

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.

## 8) *Health risks*

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

Consumers in Western Europe first became aware of GE food in 1996, when Monsanto's herbicide-tolerant soybeans grown in the US started to arrive in Europe. Over 40% of the US soybean harvest is exported and the GE soya is mixed in with the conventional harvest. The American Soybean Association rejected calls to segregate the GE soya on the basis that it was 'substantially equivalent' to ordinary soya.

The concept of 'substantial equivalence' has been at the root of the 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 the non-GE equivalent.

The use of 'substantial equivalence' as a basis for risk assessment is seriously flawed, and cannot be depended on as a criterion for food safety. It focuses on risks that can be anticipated on the basis of known characteristics, but ignores unintended effects that may arise. Genetically engineered 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 with 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.

### *The example of tryptophan*

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 1980's 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 genetically engineered bacteria were immediately used in commercial production of tryptophan, and the product placed on the market in the USA in 1988. Showa Denko was allowed to sell the tryptophan produced in genetically engineered bacteria without safety testing because they had been selling tryptophan produced in non-genetically engineered 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. 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 was called eosinophilia myalgia syndrome or EMS.

It was later shown that the tryptophan produced in genetically engineered 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 manipulations led to

increased tryptophan biosynthesis, which led to increased 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 genetically engineered bacteria. Until now it is not definitively established whether toxicity resulted primarily from the use of genetically engineered 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 substantial 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 some 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 maize 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 recent study published in *La Recherche* 309, May 1998, 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. Widespread cultivation of transgenics, warns this report, 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 microorganisms 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 resistances can move from animal pathogens to bacteria that are also harmful to humans.

The risks of antibiotic resistance genes used in genetic engineering is 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 genetically modified plants to pathogens is statistically insignificant. Several research results contradict this argument. Novartis often states that about 40-60% of intestinal bacteria are already resistant to Ampicillin and related antibiotics. But they present no scientific data for these figures. An analysis of scientific literature shows that the frequency of antibiotic resistance varies considerably.

Depending on the variety of bacteria, and also depending on the country where the research has been carried out, the results are completely different. The percentage of antibiotic resistant germs in samples of one variety of bacteria (*Bacteroides fragilis*) varied between 3 and 30%, in samples of another bacteria (*Shigella*) between 5,9 and 80,7%. A general statement of 40-60% is completely unfounded. It also has to be assumed that not every human being carries antibiotic or

Ampicillin resistant germs. Each antibiotic therapy is based on the bacteria being and staying sensitive to the chosen antibiotic. Ampicillin antibiotics are widely used in the treatment of human illness as well as on animals. In 1994, for example, 40 million courses of ampicillin were prescribed in the USA (that is, an average of 1 in 6 of the population). Furthermore, the resistance gene present in the transgenic maize confers resistance also against 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 use other markers instead. It is also possible to remove antibiotic resistance genes after the genetic engineering event.

Because they are unnecessary and dangerous, 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 resistances should not be trivialised. Norway prohibits all transgenic plants with antibiotic resistance. The French government will not allow such plants (other than Novartis's 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.

### ***9) Socio-Economic Impacts***

In the long term, the commercialisation of GE crops could have important socio-economic consequences. For example, the control of the entire domestic seed market by just a few Western-based corporations has implications for national food security. Whole food production chains may find themselves under monopolistic control - from delivery of agricultural inputs (seeds, fertilisers, chemicals, machinery etc.) via the growing of plants up to the harvest and throughout processing. Producers may find themselves obligated to the increased use of specific agro-chemicals necessary to grow specific GE seeds. They may be crushed by transnational corporations supplying increasingly-expensive inputs and purchasing their agricultural outputs at ever lower prices.

Producers may be played off against each other as powerful vertically-integrated firms manipulate markets. Finally, production may shift from small farms to large estates, and from large estates to bio-reactors, with attendant job losses.

### ***Market Concerns***

Until very recently, there was no international agreement requiring segregation of GE-free crops from GE ones and to label 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, adopted by 130 countries, including Poland, acknowledges the sovereign right of countries to restrict imports of GM crops as precautionary measure to protect biodiversity without getting forced by international trade rules to accept these GMOs. 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 GM food and sought to source GM-free crops.

With its language on the 'precautionary principle', the Biosafety Protocol could set the stage for countries, such as the EU, to close their markets to GM crops without conclusive scientific evidence of harm. Once the Protocol comes into effect, which could take a couple of years, commodity shipments that may contain GMOs will have to be labelled “*may contain*” genetically modified organisms.

In the meantime, it is likely that the market in the EU 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.

The countries where most of the GE crops are being grown are the USA and Canada,. However, even in the USA the percentage of the maize and soya acreage covered with GE varieties is decreasing this year. GE soya is down from 57% last year to 52% this year, and GE maize is down from 33% to 25%.

Farmers are worried that the export markets in Europe and Asia are rejecting GE foods, and this may reduce prices and demand for American agricultural products. They are also coming under pressure from environmental and consumer groups in the US who are demanding labelling of GE foods.

Meanwhile, the public debate in the EU is now examining the use of GE animal feed in meat production. Indeed, in late 1999 several UK food retailers, such as Iceland and Tesco, announced that they intend to phase out the use of GM ingredients in animal feed. This is bad news for Polish farmers feeding GE crops, like maize, to their animals.

The non-enforcement of the new GE regulation by the Polish administration could have severe economic repercussions not only on Polish farmers, but also on animal feed producers, the animal husbandry industry, the starch and processed food industries and traders.

If Poland continues on the route of GE agriculture, but wants to meet the demands of the EU market by providing GE-free crops and food, segregation of crops after harvest and during storage must be ensured to avoid cross-contamination of GE and non-GE. As outlined above, already small scale field tests may contaminate the harvest of neighbouring fields. Segregation would need to be enforced and controlled by an authority with sufficient credibility to satisfy buyers of GE-free, especially those exporting to the EU. Any suspicion of contamination could result in a shipment being tested for GEcontamination. The requirement for segregation of GE and GE-free crops would require additional investment in farm and grain storage capacity as well as for certified laboratories capable of detecting GE contamination with the PCR test.

But Poland 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 Poland. The alternative worst-case scenario is that, due to the absence of adequate segregation and control measures and testing and labelling infrastructure, Polish food products may be altogether banned from most EU markets, and possibly also the domestic market, due to EU harmonisation. This would lead to an economic downturn due to loss of EU markets, bankrupt farmers and difficulties in meeting the requirements of EU Accession.

## Annex

### *Annex I: The Polish regulation on GMOs*

Regulation of the Ministry of Environment, Natural Resources, and Forestry, from October 8, 1999, concerning genetically modified organisms, published October 22 1999.

§1 Scope of the regulation:

1. 1 Requirements for the applications for a permit for the deliberate release of genetically modified organisms into the environment for experimental purposes or for placing on the market a product consisting of or containing genetically modified organisms or parts thereof.
2. 2 Requirements for risk assessment....
3. 3 Requirements for the labelling and packaging of the product placed on the market consisting of or containing genetically modified organisms or parts thereof.

§2.1 The application for a permit for the deliberate release of genetically modified organisms into the environment for experimental purposes, thereafter referred to as “deliberate release“, shall contain:

(...)

1. 2. The detailed description of the information mentioned in 2.1 is given in attachment 1 to this regulation.

§3.1 The application for a permit for placing a product on the market consisting of or containing genetically modified organisms or parts thereof, thereafter referred to as “product“, shall contain:

(...)

1. 2. The detailed description of the information mentioned in 3.1 is given in attachment 2 to this regulation.

§9.1 Subject to paragraph 9.3, on the package of a product consisting of genetically modified organisms or parts thereof shall be written in a colour contrasting to the colour of the package “genetically modified product“.

9.2 Subject to paragraph 9.3, on the package of a product containing ingredients which are genetically modified organisms or parts thereof, close to the name of the ingredient it shall be written in a colour contrasting to the colour of the package “genetically modified“ or the ingredients shall be marked with an asterisk (\*) and the explanation for the asterisk shall be placed on the bottom of the list of ingredients.

1. 3 The label on the package of the product shall contain information about:
  1. The purpose/usage of the product. The date and number of the permission to place the product on the market.
  2. Geographical-natural conditions in which the product can be used, if the product requires that.
  3. Measures to take in case of accidental release or improper use.

§ 10 The regulation enters into force 14 days after its publication, with the exception of § 9 which enters into force 6 months after its publication.

## ***Annex 2: A process based labelling system, proposed by Greenpeace***

The following text is an extract of Greenpeace policy on labelling in the European Union. 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 micrororganisms 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 3: Contacts***

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Phone ++49/40/431 88-001 Fax -002

Main Custom's Office (Ministry of Finances) tel. 022 69455555, Custom's Information ul.  
Swietokrzyska 12 tel: 022 6943194, 6945596, 6943091, 6943587

Dept of Nontariffs Goods tel.022 6529163, Head Ms Renata Wolanin tel 022 6529023

Custom's Office in Szczecin tel 091 4624211

COBORU (Research Centre for Cultivated Plant Varieties), Slupia Wielka k/Poznan, tel:061  
2852341

Mr Szurpicki, Head Prof. Edward Gacek

Dr. Zbigniew Halat, Health Risk Management & Communication Ltd., 00-963 Warszawa 81,  
skryt.60, Tel. & Fax ++48/22/841 31 78, Email: headquarters@halat.com,

Information Office for Genetically Modified Food. Aleja Solidarnosci 105, pok. 308, 00-140  
Warszawa, tel./fax 022/652 13 61, Email info\_gmo@mail.unicom.pl

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Prof Stefan Malepszy, Prof. Katarzyna Niemirowicz-Szczytt, Warsaw Agriculture University,  
Chair of Horticulture, Dept. of Genetics, Breeding and Biotechnology; ul. Nowoursynowska tel:  
022 8439041, 8439061, 8439081

Ministry of Agriculture and Rural Development ul.Wspolna 30 room.396, tel: 022 6232152,  
Antonina Korzeniowska (seed variety registration); Dept of Agricultural Development Mr  
Wieslaw Wawiernia (GMO in seed sector) tel: 022 6232466

Ministry of Environment ul. Wawelska 52/54 pok. 340, Head Zygmunt Krzeminski Tel: 022  
8250001 ext. 673, 022 8256204, Malgorzata Wozniak 022 8257699

Polska Federacja Producentow Zywnosci, Jacek Czarnecki GMO, Gregorz Trochimczuk  
(executive secretary), Nowowiejska 1/3, Warszawa, phone 022/825 39 65 and 825 95 90

Prof. TomaszTwardowski, Institute of Bioorganic Chemistry PAN, ul. Noskowskiego 12  
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tel: 061 8528503 ext. 133, 134, twardows@ibch.poznan.pl

Prof. Ewa Zimnoch-Guzowska, Plant Breeding and Acclimatisation Institute (IHAR), Mlochow,  
05-832 Rozalin, phone 022/729 92 48, fax 729 92 47, e.zimnoch-guzowska@ihar.edu.pl

### ***International organisations active on GMO issues***

There are hundreds of groups around the world campaigning on genetic engineering issues.

While some choose to focus on the genetic engineering of crops, others focus on patenting. Some want complete bans, some the labelling of GE products, some want moratoriums, while others are simply focused on raising public awareness. Listed below are just a few of these groups and organisations.

**ANPED** The Northern Alliance for Sustainability PO Box 59030 1040 KA AMSTERDAM The Netherlands Tel. +31 (0)20 4751742 Fax +31 (0)20 4751742 [www.anped.org](http://www.anped.org)

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

**Campaign for Food Safety**, Minnesota, USA, Tel: +1 218 226 4164, Fax: +1 218 226 4157  
E-mail: [alliance@mr.net](mailto:alliance@mr.net) <http://www.purefood.org/index.htm> (The Campaign for Food Safety is dedicated to healthy, safe and sustainable systems of food production; they act as a global clearinghouse for information on GE and offer 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](mailto:marty@gene-watch.org) <http://www.gene-watch.org> (The CRG

focuses on human genetics issues including genetic discrimination and patenting. They are also active on biosafety and consumer 'right to know' issues and produce and distribute educational materials.

**Genetic Resources Action International (GRAIN)**, Barcelona, Spain, Tel: +34 93 301 1381, Fax: +34 93 301 1627 grain@bcn.servicom.es <http://www.grain.org>

**Greenpeace** International, Berlin, Germany Tel: +49 30 30 889914 Fax: +49 30 30 889930 <http://www.greenpeace.org/~geneng/>

**Pesticide Action Network (PAN)** North American Office, San Francisco, USA Tel: +1 415 981 1771

Fax: +1 415 981 1991 panna@panna.org <http://www.panna.org/> (PAN 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.)

Research Foundation for Science, Technology & Natural Resource Policy, New Delhi, India Tel: +91 11 696 8077 Fax: +91 11 685 6795 twn@uvm.ernet.in <http://www.indiaserver.com/betas/vshiva>

**Rural Advancement Foundation International (RAFI)** Winnipeg, Canada Tel: +1 204 453 5259

Fax: +1 204 925 8034 rafi@rafi.org <http://www.rafi.org> (RAFI is 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 twn@igc.apc.org <http://www.twinside.org.sg/south/bio.htm> (This is a network of organisations and individuals involved in issues relating to development, the Third World and North-South. Their website is useful source of info about biopiracy, patents, the World Trade Organisation (WTO) and GE.)