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Monsanto's transgenic potatoes on the loose in Georgia (1996-1998): the need for an international Biosafety Protocol

COLORADO POTATO BEETLE

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Monsanto's transgenic potatoes on the loose in Georgia (1996-1998): the need for an international Biosafety Protocol

This report is a joint collaboration between Greenpeace International and Elkana[1]. It is the result of an investigation in July 1998 by Greenpeace in Georgia which was carried out in cooperation with Elkana.

Executive Summary

Imports and cultivation in Georgia

This report details the import and cultivation of Monsanto's genetically engineered potatoes, "Naturemark" NewLeaf potatoes, in Georgia. These imports were facilitated for Monsanto by a US farmer and Agricultural Co-operative Development International, a US organisation which operates in Georgia to promote US agricultural products and market opportunities for US agribusiness. The deal was financed with credit from the European Union's technical assistance programme to newly independent states (TACIS).

No comprehensive assessments were carried out in Georgia on the environmental, health or indirect agricultural impacts of these transgenic potatoes. Monsanto did not insist on or even recommend that any measures to delay resistance development be taken before the transgenic potato seeds were planted. By contrast, in the US, Monsanto had recommended a number of measures to be taken by farmers planting the same transgenic potato seeds. Georgian farmers were not given any information about the potential negative environmental impacts of these transgenic crops. The Georgian Minister of Agriculture, Minister Gulua, made special efforts to allow these transgenic potatoes to enter Georgia.

Monsanto was able to benefit from the lack of state control on genetic engineering and the lack of knowledge of the risks involved in the deliberate releases of genetically engineered organisms. This resulted in uncontrolled field tests and deliberate releases of their transgenic potato in Georgia without any regard to the environmental and other impacts of these activities on the Georgian environment. No rules were in place to regulate the imports into Georgia of genetically modified seeds.

Environmental threats posed by Monsanto's Bt potato

Monsanto's "Naturemark" NewLeaf potatoes are designed to kill the Colorado Potato Beetle. These genetically engineered potatoes contain a modified gene[2] of the natural toxin, *Bacillus thuringiensis* (Bt) and have been designed to provide a built-in pesticide against the Colorado Beetle. Monsanto's Bt potatoes also contain another foreign gene[3] that induces resistance to the antibiotic, Kanamycin, and has no function other than to be used as a marker.

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[1] Elkana is an non-governmental organisation based in Georgia which aims to promote organic agriculture through training, education and project work. Its members are mostly Georgian farmers. Their goal is to develop sustainable agriculture in Georgia by supporting farmers through project workers, publishing information, holding seminars, carrying out research, providing credit, protecting indigenous varieties and species, certification and marketing of organic products. Elkana alerted the public to this case in August 1997. In old Georgian, "Elkana" means "God bless the harvest".

[2] The cryIIIA gene from Bacillus thuringiensis subsp. tenebrionis (Btt)

[3] The nptII gene (neomycin phosohotransferase type II)

The production of Monsanto's "Naturemark" NewLeaf potatoes failed in Georgia leading to commercial losses and debts for the Georgian farmers who entered into this experiment for Monsanto. Those potatoes which were harvested are known to be circulating in Georgia, Russia and Azerbaijan. Unfortunately, neither Monsanto nor the Georgian Minister of Agriculture chose to assess the negative ecological or health impacts of this transgenic potato on the Georgian environment.

The release and dissemination of Monsanto's transgenic Bt potato in Georgia and its neighbouring region is likely to have serious negative impacts on the environment and environmentally sustainable farming methods[4]**.** Georgian farmers may never have the chance to apply the natural Bt formulation to control the Colorado Beetle in an environmentally sustainable way. Recent scientific studies confirm that transgenic Bt crops, such as Monsanto's potato, may harm non-target species in the food chain and the dissemination of transgenic Bt potatoes may have a potential negative impact on the Georgian ecosystem and disturb precious ecological balance. This would be particularly unfortunate given the unique diversity of Georgian nature and its diverse indigenous agricultural varieties. Further, the controversial use of an antibiotic resistance marker gene in Monsanto's potato may place human and animal health at risk as a result of the possible build up of resistance in disease-causing germs to commonly used antibiotics.

Greenpeace's demands.

Greenpeace would expect the Georgian and US governments and the EU to require Monsanto and ACDI to:

- immediately recall the transgenic potatoes circulating in Georgia, Russia and Azerbaijan
- immediately provide comprehensive and relevant information to all farmers affected in Georgia, and other affected areas on the risks this transgenic potato poses to the environment, and environmentally sustainable agricultural practices
- pay financial compensation to the farmers for any direct or indirect losses they have incurred from these transgenic Bt potatoes
- create a compensation fund to enable the Georgian Environment Ministry to restore any potential damage to the environment.

The need for international biosafety rules

This case is relevant to the current U.N. negotiations for a Biosafety Protocol under the Convention on Biological Diversity. Greenpeace considers that international rules are needed to control the proliferation of genetically engineered organisms in order to protect biodiversity and human health.

One of the main points arising from this case is that the lack of international rules setting out obligations for comprehensive environmental, human health and agro-socio impact assessments meant that neither Monsanto nor the USA were obliged to provide relevant information to the Georgian authorities to take an informed decision on the imports.

The case also exposes the lack of legal and financial remedies available to the farmers who will incur losses, for example, as a result of not being able to apply their traditional, organic farming methods, and the Georgian state whose biological diversity will be threatened from the potential impacts of the transgenic Bt potato in the food chain.

[4] See Annex I for a summary of the potential negative impacts

Georgia

Georgia is located between Europe and Asia. Its geographical position and topography make it one of the most biologically unique regions of the world, with almost all climatic zones represented.

Georgia is situated between the Caucasus mountains in the north, lesser Caucasus in the south and the Black Sea in the west. The country covers an area of 69,700 sq km and has about 5,5 million inhabitants.

Historically, Georgia is an ancient centre of biodiversity with a highly developed agricultural economy. Its richness in biodiversity resulted from the knowledge, breeding and preservation efforts of indigenous peasants over centuries. This has led to the preservation of numerous varieties of cereal, leguminous plants, fruits and vines specially adapted to local conditions. The country's name Georgia, based on the ancient Greek word for earth**,** expresses the historical and traditional importance of agriculture in this region.

Georgia is a centre of origin for many agricultural crops[5]. There are, for example, 1200 varieties of beans and 500 varieties of 900 species of wine grapes cultivated. In addition, Georgian farmers have developed a special pest and disease-resistant species of wheat using traditional methods.

According to official data, agriculture is Georgia's second largest economic sector after industry. Organic agriculture is considered as an important element of Georgia's economy. Most farmers do not want to depart from their traditional practices and culture, and often cannot afford to buy chemical sprays**.** The small (often organic) farmers with their broad range of production of different crops in their gardens and fields contribute a good quality food supply although the quantity is not yet sufficient to provide enough food for the entire country.

Since 1989 the country has suffered a major economic crisis, due to domestic political conflicts and the breakdown of the former Soviet Union. Frequent wars, the unstable political situation and the agricultural policy of the former Soviet Union have destroyed much of the country's indigenous biodiversity and have led to shortages in food production. This situation formed the background to the imports of genetically manipulated seed potatoes. The lack of any state control or knowledge about genetic engineering and its risks on the part of the Georgian authorities provided an ideal opportunity for Monsanto to exploit the situation to introduce its transgenic Bt potatoes.

How Monsanto's Bt potatoes came to Georgia.

Monsanto's "Naturemark" NewLeaf potatoes are designed to kill the Colorado Potato Beetle. These genetically engineered potatoes contain a modified gene[6] of the natural toxin, *Bacillus thuringiensis* (Bt) and have been designed to provide a built-in pesticide against the Colorado Beetle. Monsanto's Bt potatoes also contain another foreign gene[7] inducing resistance to the antibiotic, Kanamycin, and has no function other than to be used as a marker.

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[5] Confirmed in an interview with Mr. David Nakani, Deputy Minister-Head of the Department of Scientific Support and the Using of Natural Resources in the Georgian Ministry of Agriculture

[6] The cryIIIA gene from Bacillus thuringiensis subsp. tenebrionis (Btt)

[7] The nptII gene (neomycin phosohotransferase type II)

In May 1996 approximately 133-148 tons of Monsanto's genetically engineered (GE) Newleaf potatoes were imported to Georgia.

These GE seed potatoes came from Idaho (80%) and Canada (20%). Three varieties of genetically manipulated Bt potatoes were imported: Atlantic, Superior and Russet Burbank.

The GE seed potatoes were shipped to Izmir, Turkey, and transported from there in six Turkish trucks to Tsalka, where they arrived late in May 1996.

Georgian authorisation procedures. There are no laws in Georgia to specifically regulate activities or imports of genetically engineered organisms.

The seed potato plan. In early 1995, as a result of a shortage of seed potatoes, the Ministry of Agriculture requested the Georgian Agro-biotechnology Institute to prepare a Seed Potato Production Project. In June 1995, this project was adopted by the Academy of Agricultural Science and the Minister of Agriculture. There was no consultation with other Ministries, such as the Ministries of Environment or Health.

The Project provided for the competitive testing of different foreign potato varieties, and among these varieties were Monsanto's genetically engineered Bt potatoes.

The deal. The project was designed to be financed through a Georgian-US joint venture on a credit of US$ 2,000,000. It has not been possible to obtain a description of this joint venture from the Ministry of Agriculture.

In April 1996, the Ministry of Agriculture and Agricultural Co-operative Development International (ACDI) signed a letter of guarantee to transfer US$350,000 to Monsanto. The sum was transferred from the Ministry of Finance to ACDI, and then ACDI transferred US$350,000 to Monsanto. As part of its contractual obligations, ACDI has apparently very recently repaid the US$350,000 to the Ministry of Agriculture[8].

Involvement of the EU's TACIS Programme. The sum of $350,000 was given to the Ministry of Agriculture, as credit from the European Union's programme of Technical Assistance to the Commonwealth of Independent States (TACIS) following a request from Minister Gulua, "to buy seed Potatoes". TACIS runs a variety of projects in Georgia, but apparently they were not informed that this particular project with Monsanto would involve genetically engineered seed potatoes.

Mr. Patrick Daubresse , Economic Advisor of the Delegation of the European Commission in Georgia has confirmed that there has been no further involvement of the TACIS programme in this seed potato project.

The key players. The present investigation has revealed that Monsanto Inc., the Agricultural Co-operative Development International (ACDI), the Georgian Minister of Agriculture and the US potato farmer, Bill Loughmiller, were involved in this project.

- Monsanto**,** the US agro-chemical multinational, who had developed and marketed its transgenic Bt potato.

[8] Confirmed by Todd King, ACDI country representative

Monsanto provided the Georgian authorities with a number of documents[9] in order to establish the safety of their transgenic potato. In essence, these documents showed that Canadian, US and Japanese government authorities had approved the growing in their territories of Monsanto's Bt potatoes for human consumption.

Monsanto did not provide the Georgian authorities with an assessment of the likely environmental impacts of the transgenic potato on the Georgian ecosystem and the Georgian authorities did not request such an assessment**.** Contrary to its instructions in the same year to US farmers growing this transgenic crop, Monsanto also did not require or even recommend that a number of measures were undertaken in Georgia in connection with its project to mitigate the risks of build up of insect resistance.

- The Agricultural Co-operative Development International (ACDI/VOCA) is a US organisation operating in Georgia. This organisation facilitated the import of Monsanto's Bt potatoes to Georgia.

ACDI/VOCA describes itself as a "private, non-profit international development organisation providing high-quality expertise at the request of agribusinesses, co-operatives, and private and government agencies abroad."[10] ACDI has members from a variety of corporate and financial backgrounds, including US agricultural banks and US seed companies. It also receives financial support by the United States Agency for International Development (USAID). ACDI combines the profits of US agribusiness and banks with a political agenda and aid.

- Georgian Minister of Agriculture, Minister Gulua, who authorised the imports.

Greenpeace has discovered that the relevant Monsanto and other US representatives were in direct contact with the Georgian Minister of Agriculture, Mr**.** Gulua. Minister Gulua authorised the deal, apparently without considering the need to consult with the Ministries of Environment or Health on this new type of crop for Georgia.

Mr. Gulua agreed to the sowing and testing of Monsanto's transgenic potatoes. There was no transparent authorisation process involved, no pre-conditions for environment and health safety assessments to be carried out and no obligations to keep records of the results and consequences of the project.

The main records detailing the involvement of the Minister of Agriculture come from a report[11] of Mr Murvanidze who at the time worked for the Georgian Agro-Biotechnology Institute. In July 1995, Mr. Murvanidze had been sent to the US to negotiate the potato deal with Monsanto on behalf of the Georgian Ministry of Agriculture. It should be noted that Mr Murvanidze was also working at the same time as a consultant to ACDI/VOCA, where he continues to work today.

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[9] - letters of approval as food by the Canadian Health Protection Branch.
- A letter from the Canadian Food Inspection Directorate regarding the approval for field release of these potatoes.
- letters of approval as food by the Japanese Ministry of Health and Welfare.
- A letter from the US Department of Agriculture regarding the determination of non-regulated status. Copies attached in Annex III, including Georgian translations of these letters.
NB most, but not all, GE crops require clearance from the USDA, EPA and also FDA,

[10] ACDI also operates in other countries such as Bolivia, Mexico, Philippines, Russia, Albania, Macedonia, Moldova. For more information see ACDI's website at http://www.acdivoca.org.

[11] Translation attached as Annex IV; Original available on request

According to Mr Murvanidze's report, in a letter (dated 11 August 1995) sent by Minister Gulua to the vice-president of Monsanto, Mr. J. Keiss, the Minister of Agriculture said:

'The Georgian Government is supporting the introduction of Monsanto's Newleaf potatoes.'

In a second letter to Monsanto, in January 1996, the Minister of Agriculture wrote:

'Georgia agrees to sow genetically improved potatoes for seed production *and will not create any obstacles, not only to using them as seed material, but also as food.'*(emphasis added)

In a further letter (dated 14th March 1996), Minister Gulua wrote to a Mr. M. Kraus of Monsanto:

'The above mentioned potatoes will be free from quarantine rules"

- Bill Loughmiller, a potato farmer from Twin Falls (Idaho, USA), was a driving force to bring Monsanto's NewLeaf potatoes from the US to Georgia under the Seed Potato Project.

Mr. Loughmiller runs his own company called AGPRO International, Inc[12].

The relationship between Mr. Loughmiller and Monsanto remains unclear. According to Greenpeace's and Elkana's inquiries, Georgian Farmer T. (who has asked for his name not to be made available for reasons of security) who met Bill Loughmiller in Idaho for the first time in 1995**,** believed that Mr. Loughmiller is a shareholder and representative of Monsanto. The local ACDI representative in Tblissi told an investigative reporter that he thought however that Mr. Loughmiller was a US businessman who claimed to have the exclusive rights to market Monsanto's patented Naturemark Newleaf potatoes in the Caucasian states.

In August 1995, Mr. Loughmiller visited Georgia to assess the possibilities of seed potato production there. He met a number of key officials including Mr. Gulua, who at this time was Vice-Premier Minister of Georgia, and later became Minister of Agriculture. Loughmiller also met the Director of the Agro-biotechnology Institute, Mr. A.Tserodze.

The first releases into the environment.

In 1996, six or seven local farmers, including Farmer T., planted the seed potatoes partly on their own private properties, and partly on land which belongs to the State Breeding Station. The transgenic potatoes were planted in the regions of Tsalka, Aspindza and Tetritskaro.

Payment but no contract. There was no written contract in 1996 between the farmers and ACDI. However, ACDI paid US$1000 to each farmer[13] who planted the transgenic potatoes, and it was understood that the harvest from these transgenic potatoes would belong to ACDI so that they could sell the seeds for the next year's harvest.

Rotten harvest. The 1996 harvest was extremely low, and this was said to be partly due to the sowing being done very late and the potatoes not being adapted to local conditions. Instead of the estimated harvest of approximately 18 - 22 tons per hectare, the 1996 harvest was only approximately 8 tons per hectare. The potatoes were also attacked by phytophthora, the funghi

[12] http://magiclink.com/bcards/agpro.htm
[13] For information, an urban employee in Georgia earns a monthly salary of $150-250.

which caused the Irish potato blight in the 1840s.

The total harvest in 1996 was only approximately. 600 tons, which was about one half-to-one third of the estimate harvest. In any event, half of this harvest was destroyed due to poor storage conditions.

Extra pesticides had to be used. According to Peter Naskhidashvili, the **C**hairman of the Georgian State Commission of Testing and Protecting Selectional Achievement and the Ministry of Agriculture, ACDI provided fertilizers and pesticides to the potato farmers, in particular to fight the phytoptora funghi.

A number of sources mentioned that different products were provided, including Aminsalt fertilizer which is produced domestically and the imported pesticides RIDOMIL, 2,4,D, Sencor and Bulldog.

No assessment of environmental impacts. The farmers were visited regularly by Mr. Murvanidze, who was acting as a consultant to ACDI, and one other person from the US, called "Brent". The identity of Brent is not known. These two people recorded details about the plots and harvest. No monitoring took place regarding the environmental impacts of the transgenic potato or the development of beetle resistance to the Bt toxin.

No resistance mitigation plans. Contrary to Monsanto's policy and the requirements of the US Environmental Protection Agency, no integrated resistance management took place for Monsanto's Bt potatoes in Georgia. In the same year in the US, Monsanto had required farmers using its transgenic Bt potato to carry out, among other things, the following measures in order to mitigate the development of resistance by Colorado Beetles:

- keep 20% of their potato fields free of the transgenic potato
- rotate potato production annually
- plant transgenic potatoes as far as possible from the previous year's field
- notify Monsanto immediately of any surviving beetle larvae.

The aim of these measures was to maintain the efficacy of the crop for some years rather than to assure any on-going use of the natural Bt spray**.** There were no strategies or plans to mitigate or delay Colorado beetle resistance to the Bt in Newleaf potatoes in Georgia. No refuge blocks were foreseen. Nor were there any formal rules or procedures for supervision of the crops, or warnings given to Georgian farmers.

The second releases into the environment

In 1997, approximately 300 tons of seed potatoes were planted across 144 - 400 hectares. No detailed or precise figures are available because some farmers cut the seed potatoes in half, and sometimes in half again**,** to get more seed material for planting. This showed a clear lack of control of the project.

Farmers' contract with ACDI. In 1997, those farmers testing the transgenic crops received a contract from ACDI which contained the following main points[14]:

- The Farmer would receive from ACDI a negotiated sum for the planting, growing and harvesting of these potatoes.
- ACDI would pay partly in cash, and partly in materials. What type of materials is not defined, but the farmers assumed this would include, for example, pesticides.
- The farmers would not have to pay for ACDI's consultants who would observe the planting, growing and harvesting of the transgenic Bt potatoes.
- The harvest would belong to ACDI.
- ACDI would try to sell the harvest for the best prices; ACDI would sell to the farmers for replanting and to exporters for sale in neighbouring countries.
-- ACDI would take from the farmers not more than $500,000 to cover ACDI's own expenses.

According to Farmer T.**,** ACDI offered the following options to farmers for the 1997 harvest: Either they would have to pay back a certain amount of cash to ACDI directly after the harvest, or they would have to give back the harvest in part or in full. Some farmers chose the first option, and others the second option.

No segregation in planting. The seed potatoes, delivered from ACDI were planted together with other non-indigenous potato varieties from Germany, Netherlands, Scotland and Russia. None of these varieties were genetically engineered. However, the sowing and the harvest of these varieties took place at the same time and in the same regions.

Widespread deliberate releases. The official 1997 figures record that 142 hectares of Bt potatoes were planted in Tsalka for testing. In addition, 3 plots, each of 0,5 hectares, of the State Breeding Station were planted for competitive testing with other foreign varieties in Akhaltsikhe, Tetritskaro and Tsalka. According to unofficial sources, more than 100 hectares of transgenic potato were grown near the Armenian border in the Aspindza region, one of georgia's traditional potato growing areas. One farmer is reported to be selling transgenic potatoes this summer from this area.

Widespread dissemination of the Bt potato in Georgia. It has been impossible to track down where all of these transgenic potatoes went to as no official records exist. Each of the seven farmers involved negotiated their own deal with ACDI, and there is little doubt that other farmers obtained seed material from the farmers. In 1997 Elkana workers discovered the transgenic potatoes in many small farms - even on organic farms, which is where Greenpeace's sample comes from.

[14] original and translation attached (Annex V)

It is possible to confirm that:
* Part of the 1997 Bt potato harvest has been disseminated in Georgia as seed potatoes. It is thought that the potatoes are still being planted in different regions of Georgia. Greenpeace and Elkana's investigation found the Bt potato on an organic farm about 50 km from Tblissi[15].
* Part of the 1997 Bt potato harvest has been exported to Azerbaijan mixed together with normal (i.e. non genetically engineered) German potatoes. The total export of 120 tons of potatoes was designated for human consumption. Greenpeace with the support of Elkana interviewed the farmer who sold these potatoes.
* Part of the 1997 Bt potato harvest has been exported to Russia. This was confirmed to Greenpeace and Elkana by Mr Machavariani, Head of Biodiversity Department of the Ministry of Environment with reference to his discussions with colleagues in Russia.
* Part of the 1997 Bt potato harvest has been sold at Tblissi Market for human consumption.

According to different sources the Atlantic and Superior varieties turned out to have an extremely ugly appearance and these varieties have not been sown again - at least not in a large amount. The variety that has spread the most is the Russet Burbank.

The official position of the Ministry of Agriculture is that the entire 1997 harvest is kept in storage in Tsalka, and that only the State Breeding Stations are testing the Bt potatoes. The documentary evidence made available to Greenpeace and Elkana points to the inaccuracy of this official position.

Position of the Georgian government

The Ministry of Agriculture was the government authority which was responsible for authorising the imports and growing of these genetically engineered crops. In this case, it would appear that Minister Gulua, the Minister of Agriculture took a strong interest in and prinicipal responsibility for the imports.

Georgia's Parliament became aware of the case[16] and its Parliamentary Committee on Environment and Agriculture recommended in April 1996 a ban on "the import and cultivation of GE products in Georgia, until proper legislation is in place". However, Monsanto's Bt potatoes were sown again in 1997 but this was presented as part of a testing programme and under the control of the State authorities. In August 1996, the Committee, requested that the case be under the joint control of the Georgian State Commission of Testing and Protection of Selectional Achievement and the Ministry of Agriculture. However, Greenpeace's investigation in July 1998 has revealed that there is still little control and monitoring of the Bt potatoes.

Mr.Simon Usunaschwili, Vice Minister for Agriculture, deputy to Minister Gulua, has described to Greenpeace the "official" version of this case. Mr. Usunaschwili stated in July 1998 that the import of genetically engineered potatoes took place under the responsibility of ACDI. He confirms that the Georgian State transferred $350,000 through ACDI to Monsanto in order to establish a joint venture Potato Seed Production Project. He states that the joint venture as a whole failed because the US side "didn't pay their part".

According to Mr Usunaschwili, Georgia will in future not import any genetically engineered

[15] Interview with Farmer T .
[16] In the Georgian Parliament in April 1997, Mr. Gachechiladze, a Member of the Georgian Parliament, accused the Minister of Agriculture, Mr. Gulua, that the whole case of the introduction of transgenic Bt potatoes from the US to Georgia "smells like corruption" (see minutes parliamentary session of 27 April 1997).

crops and there will be no production of genetically engineered seed potatoes in Georgia.

The Georgian Minister of Environment, Ms Nino Chkhobadze, comments: "The Georgian Ministry of the Environment demonstrates its negative attitude to the imports of transgenic potatoes and their cultivation. We're not convinced that it's safe. The negative attitude was announced many times. Unfortunately, currently such type of questions are under the Ministry of Agriculture's jurisidiction. There are no national agreements nor agreements between states, contracts regulating the mechanism of treating genetically modified organisms and their impacts on the environment. The question of the imports and tests with such organisms should be considered in every country as a problem of national safety. The permission to conduct such operations should be given by the special authorities, by the Ministry of Environment and by the State Security Service (Georgia KGB). Nowadays the law on genetic engineering in Georgia is being prepared according to the Convention on Biodiversity".

Key biosafety problems relevant to this case

No information from exporting country or exporter on potential adverse impacts of transgenic Bt crop to importing country. Neither USA nor Monsanto considered it necessary to inform the Georgian government of the potential adverse impacts of transgenic Bt crops, such as Monsanto's potato. For example, there was no information to warn that the use of these transgenic Bt potatoes would sooner or later result in the development of Bt-resistant beetles. This is particularly shocking since clear instructions were given to US farmers planting the same Bt potato seeds setting out measures that needed to be taken so as to delay the development of insect resistance to the Bt toxin. It would also appear that the Georgian Ministry of Agriculture did not request any information from Monsanto about possible risks from their product.

No environmental impact assessment on Georgian ecosystem. Neither the US officials, Monsanto nor the Georgian Ministry of Agriculture carried out an assessment of the effects and interactions of the Bt potato on the Georgian ecosystem. There do not appear to be any official Government records of the results and impacts of the deliberate releases of Monsanto's transgenic potatoes.

It is useful to note that in both the US and the EU, the companies applying for deliberate releases of genetically modified organisms are obliged to provide data and environmental impact assessments to the relevant authorities before the releases are authorised. In this case, however, neither Monsanto nor the US authorities provided such data. The Georgian government did not ask for it either. Given the political instability of a newly independent state, there is a strong case for all parties to take responsibility to ensure that a comprehensive environmental impact assessment is carried out before releases can be authorised.

No agronomic or indirect biodiversity-related impact assessment in Georgia. In spite of the large proportion of organic farming carried out traditionally in Georgia, there was no assessment of the impacts that the Bt potato would have on traditional farming methods practised by Georgian farmers. There was also no consideration of alternative agricultural methods which could have been applied to address the potato shortage.

No segregation of Bt potatoes from normal potatoes. For both the 1996 and 1997 harvests, there were no requirements to keep separate Monsanto's transgenic Bt potatoes from non-transgenic potatoes during planting and after harvesting. This has led to the situation where it is not possible to track the dissemination of the transgenic potatoes nor to provide warnings or information to other farmers and consumers in the region.

Unclear liability and compensation. Not only did the Bt potato crop fail, but there are also likely to be ecological and health impacts in Georgia and the neighbouring region. Someone needs to take responsibility for this commercial and environmental damage. It is interesting to note that in the USA, the State of Mississippi's Seed Arbitration Council recommended on 12th June 1998 that Monsanto should pay 3 farmers "nearly $2 million" after Monsanto's Roundup Ready cotton failed to perform as it was advertised. If Monsanto does not agree to this recommendation, the farmers can sue Monsanto before the courts.

The farmers who took part in the project say they still have debts with ACDI as a result of the poor harvest. Farmers now risk losing the use of the natural Bt toxin as an environmentally sustainable pest control tool and will need to invest in other forms of pest control. Farmers who sell their produce under an organic label will be deprived of this revenue. It is unlikely that any of the key players in this transgenic potato story will voluntarily take responsibility for these commercial losses, let alone any harm to the Georgian environment. It is also unlikely that Georgian law will cover the possibility for Georgian farmers to be compensated for these losses as a result of Monsanto's Bt potatoes.

No clear national biosafety rules to regulate imports of genetically modified seeds and crops. The lack of clear rules in Georgia specifically dealing with genetically modified organisms and the type of issues mentioned above no doubt contributed to the uncontrolled, widespread dissemination of Monsanto's Bt potatoes. The Georgian Environment Ministry is apparently drafting national biosafety rules and it is hoped that these will address the above issues, as well as others raised under the Biosafety Protocol negotiations, including the need for criminal sanctions for illegal imports.

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Conclusions

The case of the imports of Monsanto's Bt potato in Georgia is a sorry story for Georgian farmers and for biological diversity. More beneficial impacts on Georgia's biodiversity and agricultural activities could have occurred if investment had been made to encourage local seed-producing laboratories to work on Georgia's potato shortage by producing different potato varieties, which would have been well adapted to local conditions**.**

Legal and financial responsibility need to be taken for the environmental and commercial harm which has resulted from these imports. Greenpeace would expect the Georgian and US governments and the EU to require Monsanto and ACDI to:

- immediately recall the transgenic potatoes circulating in Georgia, Russia and Azerbaijan
- immediately provide comprehensive and relevant information to all farmers affected in Georgia, and other affected areas on the risks this transgenic potato poses to the environment, and environmentally sustainable agricultural practices
- pay financial compensation to the farmers for any direct or indirect losses they have incurred from these transgenic Bt potatoes
- create a compensation fund for the Georgian Environment Ministry to restore any potential damage to the environment.

The case does however point to the need for clear, legally binding international rules to control all aspects of the movements and dissemination of genetically modified organisms into the environment. Governments from around the world are in the process of negotiating an international Biosafety Protocol to the Convention on Biological Diversity. Greenpeace believes that the type of problems raised in the Georgian Bt potato case need to be addressed by all governments through rules which protect biodiversity and human health from the risks of releasing genetically engineered organisms into the environment.

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Annex I: Potential Negative Impacts of Deliberate Releases of the Bt Potato in Georgia

a) Environmental threats from Bt crops

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 Monsanto's potatoes, 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.

Studies have shown that the *Bt* toxin can bind with soil particles and clay particles in particular (Tapp & Stotzky, 1995 a), persist in soils for between 5-20 days (Palm et al, 1994) and retain toxicity to the larvae of species such as the tobacco hornworm (*Maduca sexta*) and the Colorado potato beetle (*Lepinotarsa decemlineata*) (Tapp & Stotzky 1995 b). At times insecticidal activity of *Bt* was increased by adsorbtion and binding to clays and the potential for accumulation in soils exists (Tapp & Stotzky 1995 b). 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 (EPA MRID NO 434635).

A recently published study (Hilbeck et al., 1998) shows that transgenic *Bt* maize may poison beneficial predatory species reared on transgenic maize-fed herbivores such as the European corn borer and a bollworm. With both herbivores - even the bollworm larvae which did not die from the transgenic *Bt* maize - there was an increased mortality of the predatory larvae from the green lacewing. During their entire immature development, 62 percent of the lacewing larvae died when raised on transgenic *Bt* maize-fed prey, whereas only 37 percent of the lacewing larvae died that were fed with *Bt*-free prey.

This also raises major concerns about the impacts of transgenic *Bt* crops on non-target species. One major concern of the negative effects of *Bt* toxin on non-target species is the potential for species further up the food chain, such as birds, to have 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 lady bird are the most important beneficial predatory species to control pest insects.

b) Insect resistance to Bt threatens organic farming

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 (see Whalon and Ferro, 1998).

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 (Cannon, 1996, p564). 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.

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.

In a 1992 lab study, eight species were analysed for resistance to *Bt* toxins. At least one of the tested species, the diamondback moth (*Plutella xylostella*), developed a high level of resistance in the field as a result of *Bt* use (McGaughey and Whalon, 1992).

A laboratory study showed that Bt-resistant European corn borers (ECBs) can be easily found, and that the resistance in a population of ECB increases rapidly with exposure to *Bt* - up to 35-fold increases in only 3 generations (Huang et al., 1997).

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 (Whalon et al. 1993). This selected CPB strain could survive for two generations on the transgenic *Bt* plants (see Whalon and Ferro, 1998).

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 (McGaughey and Whalon, 1992). There is also a high risk that the Colorado potato beetle would develop cross-resistance against other *Bt* toxins (Whalon and Norris, 1997).

c) build up of antibiotic resistance poses threats to human and animal health

Several GE crops such as Monsanto's GE *Bt* potato or cotton contain antibiotic resistance genes. Monsanto's GE *Bt* potato contains a marker gene which will confer resistance to the antibiotic Kanamycin. The concern is that antibiotic resistance genes may be transferred to disease-causing germs which would lead to resistance to life-saving antibiotics, and harmful disease-causing germs could no longer be controlled through the use of common antibiotics.

Clinical antibiotic therapy has become increasingly difficult because of a surge in the number of pathogens now carrying resistance genes. Such resistance includes resistance to kanamycin (Weltman et al. 1994, Gomez et al. 1991, Haglund et al. 1991, Dabernat 1987). Public health is approaching a major crisis in both developed and developing countries with the appearance of at least 30 new infectious diseases, together with the re-emergence of diseases already considered eradicated in the past 25 years (WHO 1996). Any activities which may encourage the increase in the spread of resistance to antibiotics must clearly be halted.

There is evidence that DNA can survive in animal guts and can even be traced in somatic cells (Schubbert et. al., 1997, Schubbert et al., 1994). Scientific findings by Hoffman et al. (1994) show that the fungus Aspergillus niger incorporated the antibiotic resistance gene in all co-culture experiments with transgenic plants carrying an antibiotic resistance gene. Recent

scientific assessments highlight the major risk of the transfer of antibiotic resistance gene from transgenic plants to potentially harmful soil bacteria or bacteria in the digestive tract (Courvalin, 1998). The transfer of DNA to soil bacteria through the decomposition of the plant is facilitated by the stability of DNA in soil, and the ability of some bacteria to spontaneously and efficiently incorporate DNA. These micro-organisms, Acinetobacter, are among those that are responsible for infections in immuno - compromised people whose numbers are increasing. In practical terms, this affects people with AIDS, leukaemia, elderly people, people who have had transplants, and those who have been treated with chemotherapy for cancer (Courvalin, 1998).

Kanamycin is a member of the aminoglycide antibiotics family. These include Neomycin, Streptomycin, Gentamycin, Tobramycin and Amikacin. Kanamycin can be used for the treatment of infections in various parts of the body when penicillin or other less toxic drugs cannot be used because of resistant infectious agents. For example, bone, respiratory tract, skin, soft-tissue and abdominal infections and urinary tract infections can be treated with Kanamycin (Lokhvitskii et al. 1992, Aleksandrova et al. 1991, Pfau 1991, Tsukamura et al. 1988, Edson et al. 1987, Yelon et al. 1996, Hernandez et al. 1996, Kutushev et al. 1995, Tsubokawa et al. 1994, Riley 1997). It is also used to sterilise or destroy the bacteria in the bowel before intestinal surgery.

In addition, there is the risk of developing cross resistance (Onaolapo 1994). Only one mutation in the resistance gene may cause resistance to some or all members of the antibiotics family, making them useless for therapy. For instance it was found that *B. subtilis*, marked by a Kanamycin resistance gene, showed cross resistance to the aminoglycoside antibiotics Amikacin and Tobramycin, which belong to the new generation of aminogycoside antibiotics (Smirnov et al. 1994).

References to potential negative impacts of deliberate releases of the Bt potato in Georgia

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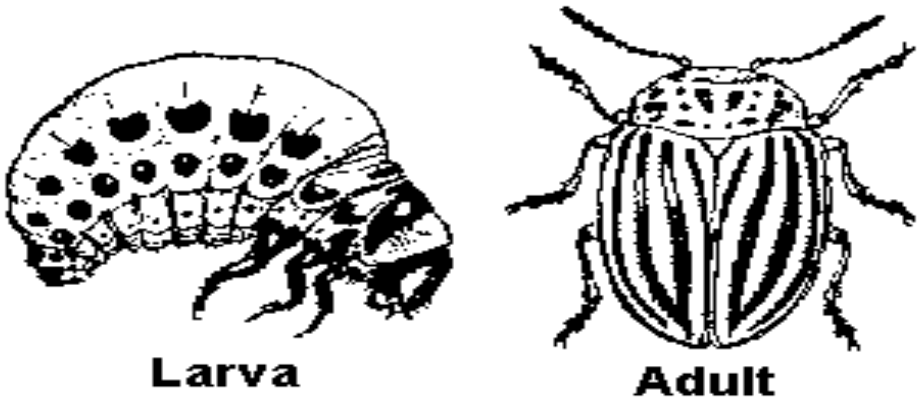
509-514.

Annex II: Pictures of the Colorado Potato Beetle



COLORADO POTATO BEETLE

Annex III: Letters of approval provided by Monsanto

Annex IV: Mr Murvanidze's report

NB Original available upon request to Elkana or Greenpeace.

Annex V: ACDI contract with Georgian farmers

Annex VI: Statistics from FAO database (United Nations Food and Agriculture Organisation)

"Product"	"Element"	"1994"	"1995"	"1996"	"1997"
"POTATOES"	"AREA HARV (HA)"	"24,100"	"23,200"	"27,000"	"28,000"
"POTATOES"	"YIELD (HG/HA)"	"123,237"	"152,155"	"133,333"	"135,714"
"POTATOES"	"PRODUCTION (MT)"	"297,000"	"353,000"	"360,000"	"380,000"
"POTATOES"	"SEED (MT)"	"30,000"	"40,000"	"42,000"	"45,000"

POTATOES IN MT (metric tons)

	1992"	"1993"	"1994"	"1995"	"1996",
IMPORTS	5,000",	"2,395",	"2,650",	"4,500",	"1,500"
EXPORTS	"0",	"18",	"0",	"0",	"0"