

# **Open Letter from World Scientists to All Governments (signed by 441 scientists from 54 countries, see [www.i-sis.org](http://www.i-sis.org))**

## **Summary**

We, the undersigned scientists, call for the immediate suspension of all environmental releases of GM crops and products, both commercially and in open field trials, for at least 5 years; for patents on living processes, organisms, seeds, cell lines and genes to be revoked and banned; and for a comprehensive public enquiry into the future of agriculture and food security for all.

Patents on life-forms and living processes should be banned because they threaten food security, sanction biopiracy of indigenous knowledge and genetic resources, violate basic human rights and dignity, compromise healthcare, impede medical and scientific research and are against the welfare of animals.

GM crops offer no benefits to farmers or consumers. Instead, many problems have been identified, including yield drag, increased herbicide use, erratic performance, and poor economic returns to farmers. GM crops also intensify corporate monopoly on food, which is driving family farmers to destitution, and preventing the essential shift to sustainable agriculture that can guarantee food security and health around the world.

The hazards of GMOs to biodiversity and human and animal health are now acknowledged by sources within the UK and US Governments. Particularly serious consequences are associated with the potential for horizontal gene transfer. These include the spread of antibiotic resistance marker genes that would render infectious diseases untreatable, the generation of new viruses and bacteria that cause diseases, and harmful mutations which may lead to cancer.

In the Cartagena Biosafety Protocol negotiated in Montreal in January 2000, more than 130 governments have pledged to implement the precautionary principle and to ensure that biosafety legislations at the national and international levels take precedence over trade and financial agreements at the World Trade Organization.

Successive studies have documented the productivity and the social and environmental benefits of sustainable, low-input and organic farming in both North and South. They offer the only practical way of restoring agricultural land degraded by conventional agronomic practices, and empower small family farmers to combat poverty and hunger.

We urge the US Congress to reject GM crops as both hazardous and contrary to the interest of family farmers; and to support research and development of sustainable agricultural methods that can truly benefit family farmers all over the world.

We, the undersigned scientists, call for the immediate suspension of all environmental releases of GM crops and products, both commercially and in open field trials, for at least 5 years; for patents on living processes, organisms, seeds, cell lines and genes to be revoked and banned; and for a comprehensive public enquiry into the future of agriculture and food security for all.

1 Patents on life-forms and living processes should be banned because they threaten food security, sanction biopiracy of indigenous knowledge and genetic resources, violate basic human rights and dignity, compromise healthcare, impede medical and scientific research and are against the welfare of animals(1). Life-forms such as organisms, seeds, cell lines and genes are discoveries and hence not patentable. Current GM techniques which exploit living processes are unreliable, uncontrollable and unpredictable, and do not qualify as inventions. Furthermore, those techniques are inherently unsafe, as are many GM organisms and products.

2. It is becoming increasingly clear that current GM crops are neither needed nor beneficial. They are a dangerous diversion preventing the essential shift to sustainable agricultural practices that can provide food security and health around the world.

3. Two simple characteristics account for the nearly 40 million hectares of GM crops planted in 1999(2). The majority (71%) are tolerant to broad-spectrum herbicides, with companies engineering plants to be tolerant to their own brand of herbicide, while most of the rest are engineered with bt-toxins to kill insect pests. A university-based survey of 8200 field trials of the most widely grown GM crops, herbicide-tolerant soya beans – revealed that they yield 6.7% less and required two to five times more herbicides than non-GM varieties(3). This has been confirmed by a more recent study in the University of Nebraska(4). Yet other problems have been identified: erratic performance, disease susceptibility(5), fruit abortion(6) and poor economic returns to farmers(7).

4. According to the UN food programme, there is enough food to feed the world one and a half times over. While world population has grown 90% in the past 40 years, the amount of food per capita has increased by 25%, yet one billion are hungry(8). A new FAO report confirms that there will be enough or more than enough food to meet global demands without taking into account any yield improvements that might result from GM crops well into 2030 (9). It is on account of increasing corporate monopoly operating under the globalised economy that the poor are getting poorer and hungrier(10). Family farmers around the world have been driven to destitution and suicide, and for the same reasons. Between 1993 and 1997 the number of mid-sized farms in the US dropped by 74,440(11), and farmers are now receiving below the average cost of production for their produce(12). The farming population in France and Germany fell by 50% since 1978(13). In the UK, 20 000 farming jobs were lost in the past year alone, and the Prime Minister has announced a £200m aid package(14). Four corporations control 85% of the world trade in cereals at the end of 1999(15). Mergers and acquisitions are continuing.

5. The new patents on seeds intensify corporate monopoly by preventing farmers from saving and replanting seeds, which is what most farmers still do in the Third World. In order to protect their patents, corporations are continuing to develop terminator technologies that genetic engineer harvested seeds not to germinate, despite worldwide opposition from farmers and civil society at large(16).

6. Christian Aid, a major charity working with the Third World, concluded that GM crops will cause unemployment, exacerbate Third World debt, threaten sustainable farming systems and damage the environment. It predicts famine for the poorest countries(17). African Governments condemned Monsanto's claim that GMOs are needed to feed the hungry of the world: "We..strongly object that the image of the

poor and hungry from our countries is being used by giant multinational corporations to push a technology that is neither safe, environmentally friendly, nor economically beneficial to us... we believe it will destroy the diversity, the local knowledge and the sustainable agricultural systems that our farmers have developed for millennia and ...undermine our capacity to feed ourselves.(18)" A message from the Peasant movement of the Philippines to the Organization for Economic Cooperation and Development (OECD) of the industrialized countries stated, "The entry of GMOs will certainly intensify landlessness, hunger and injustice.(19)"

7. A coalition of family farming groups in the US have issued a comprehensive list of demands, including ban on ownership of all life-forms; suspension of sales, environmental releases and further approvals of all GM crops and products pending an independent, comprehensive assessment of the social, environmental, health and economic impacts; and for corporations to be made liable for all damages arising from GM crops and products to livestock, human beings and the environment(20). They also demand a moratorium on all corporate mergers and acquisitions, on farm closures, and an end to policies that serve big agribusiness interests at the expense of family farmers, taxpayers and the environment(21). They have mounted a lawsuit against Monsanto and nine other corporations for monopolistic practices and for foisting GM crops on farmers without adequate safety and environmental impact assessments(22).

8. Some of the hazards of GM crops are openly acknowledged by the UK and US Governments. UK Ministry of Agriculture, Fisheries and Food (MAFF) has admitted that the transfer of GM crops and pollen beyond the planted fields is unavoidable(23), and this has already resulted in herbicide-tolerant weeds(24). An interim report on UK Government-sponsored field trials confirmed hybridisation between adjacent plots of different herbicide tolerant GM oilseed rape varieties, which gave rise to hybrids tolerant to multiple herbicides. In addition, GM oilseed rape and their hybrids were found as volunteers in subsequent wheat and barley crops, which had to be controlled by standard herbicides(25). Bt-resistant insect pests have evolved in response to the continuous presence of the toxins in GM plants throughout the growing season, and the US Environment Protection Agency is recommending farmers to plant up to 40% non-GM crops in order to create refugia for non-resistant insect pests(26).

9. The threats to biodiversity from major GM crops already commercialized are becoming increasingly clear. The broad-spectrum herbicides used with herbicide-tolerant GM crops decimate wild plant species indiscriminately, they are also toxic to animals. Glufosinate causes birth defects in mammals(27), and glyphosate is linked to non-Hodgkin lymphoma(28). GM crops with bt-toxins kill beneficial insects such as bees(29) and lacewings(30), and pollen from bt-corn is found to be lethal to monarch butterflies(31) as well as swallowtails(32). Bt-toxin is exuded from roots of bt-plants in the rhizosphere, where it rapidly binds to soil particles and become protected from degradation. As the toxin is present in an activated, non-selective form, both target and non-target species in the soil will be affected(33), with knock on effects on species above ground.

10. Products resulting from genetically modified organisms can also be hazardous. For example, a batch of tryptophan produced by GM microorganisms was associated with at least 37 deaths and 1500 serious illnesses(34). Genetically modified Bovine Growth Hormone, injected into cows in order to increase milk yield, not only causes

excessive suffering and illnesses for the cows but increases IGF-1 in the milk, which is linked to breast and prostate cancers in humans(35). It is vital for the public to be protected from all GM products, and not only those containing transgenic DNA or protein. That is because the process of genetic modification itself, at least in the form currently practised, is inherently unsafe.

11. Secret memoranda of US Food and Drug Administration revealed that it ignored the warnings of its own scientists that genetic engineering is a new departure and introduces new risks. Furthermore, the first GM crop to be commercialized – the Flavr Savr tomato – did not pass the required toxicological tests(36). Since then, no comprehensive scientific safety testing had been done until Dr. Arpad Pusztai and his collaborators in the UK raised serious concerns over the safety of the GM potatoes they were testing. They conclude that a significant part of the toxic effect may be due to the "[gene] construct or the genetic transformation (or both)" used in making the GM plants(37).

12. The safety of GM foods was openly disputed by Professor Bevan Moseley, molecular geneticist and current Chair of the Working Group on Novel Foods in the European Union's Scientific Committee on Food(38). He drew attention to unforeseen effects inherent to the technology, emphasizing that the next generation of GM foods – the so-called 'nutraceuticals' or 'functional foods', such as vitamin A 'enriched' rice – will pose even greater health risks because of the increased complexity of the gene constructs.

13. Genetic engineering introduces new genes and new combinations of genetic material constructed in the laboratory into crops, livestock and microorganisms(39). The artificial constructs are derived from the genetic material of pathogenic viruses and other genetic parasites, as well as bacteria and other organisms, and include genes coding for antibiotic resistance. The constructs are designed to break down species barriers and to overcome mechanisms that prevent foreign genetic material from inserting into genomes. Most of them have never existed in nature in the course of billions of years of evolution.

14. These constructs are introduced into cells by invasive methods that lead to random insertion of the foreign genes into the genomes (the totality of all the genetic material of a cell or organism). This gives rise to unpredictable, random effects, including gross abnormalities in animals and unexpected toxins and allergens in food crops.

15. One construct common to practically all GM crops already commercialized or undergoing field trials involves a gene-switch (promoter) from the cauliflower mosaic virus (CaMV) spliced next to the foreign gene (transgene) to make it over-express continuously(40). This CaMV promoter is active in all plants, in yeast, algae and E. coli. We recently discovered that it is even active in amphibian egg(41) and human cell extract(42). It has a modular structure, and is interchangeable, in part, or in whole with promoters of other viruses to give infectious viruses. It also has a 'recombination hotspot' where it is prone to break and join up with other genetic material(43).

16. For these and other reasons, transgenic DNA – the totality of artificial constructs transferred into the GMO – may be more unstable and prone to transfer again to unrelated species; potentially to all species interacting with the GMO(44).

17. The instability of transgenic DNA in GM plants is well-known(45). GM genes are often silenced, but loss of part or all of the transgenic DNA also occurs, even during later generations of propagation(46). We are aware of no published evidence for the long term stability of GM inserts in terms of structure or location in the plant genome in any of the GM lines already commercialized or undergoing field trials.

18. The potential hazards of horizontal transfer of GM genes include the spread of antibiotic resistance genes to pathogens, the generation of new viruses and bacteria that cause disease and mutations due to the random insertion of foreign DNA, some of which may lead to cancer in mammalian cells(47). The ability of the CaMV promoter to function in all species including human beings is particularly relevant to the potential hazards of horizontal gene transfer.

19. The possibility for naked or free DNA to be taken up by mammalian cells is explicitly mentioned in the US Food and Drug Administration (FDA) draft guidance to industry on antibiotic resistance marker genes(48). In commenting on the FDA's document, the UK MAFF pointed out that transgenic DNA may be transferred not just by ingestion, but by contact with plant dust and air-borne pollen during farm work and food processing(49). This warning is all the more significant with the recent report from Jena University in Germany that field experiments indicated GM genes may have transferred via GM pollen to the bacteria and yeasts in the gut of bee larvae(50).

20. Plant DNA is not readily degraded during most commercial food processing(51). Procedures such as grinding and milling left grain DNA largely intact, as did heat-treatment at 90deg.C. Plants placed in silage showed little degradation of DNA, and a special UK MAFF report advises against using GM plants or plant waste in animal feed.

21. The human mouth contains bacteria that have been shown to take up and express naked DNA containing antibiotic resistance genes, and similar transformable bacteria are present in the respiratory tracts(52).

22. Antibiotic resistance marker genes from GM plants have been found to transfer horizontally to soil bacteria and fungi in the laboratory(53). Field monitoring revealed that GM sugar beet DNA persisted in the soil for up to two years after the GM crop was planted. And there is evidence suggesting that parts of the transgenic DNA have transferred horizontally to bacteria in the soil(54).

23. Recent research in gene therapy and nucleic acid (both DNA and RNA) vaccines leaves little doubt that naked/free nucleic acids can be taken up, and in some cases, incorporated into the genome of all mammalian cells including those of human beings. Adverse effects already observed include acute toxic shock, delayed immunological reactions and autoimmune reactions(55).

24. The British Medical Association, in their interim report (published May, 1999), called for an indefinite moratorium on the releases of GMOs pending further research on new allergies, the spread of antibiotic resistance genes and the effects of transgenic DNA.

25. In the Cartagena Biosafety Protocol successfully negotiated in Montreal in January, 2000, more than 130 governments have agreed to implement the

precautionary principle, and to ensure that biosafety legislations at the national and international levels take precedence over trade and financial agreements at the WTO. Similarly, delegates to the Codex Alimentarius Commission Conference in Chiba Japan, March 2000, have agreed to prepare stringent regulatory procedures for GM foods that include pre-market evaluation, long-term monitoring for health impacts, tests for genetic stability, toxins, allergens and other unintended effects(56). The Cartagena Biosafety Protocol has now been signed by 68 Governments in Nairobi in May, 2000.

26. We urge all Governments to take proper account of the now substantial scientific evidence of actual and suspected hazards arising from GM technology and many of its products, and to impose an immediate moratorium on further environmental releases, including open field trials, in accordance with the precautionary principle as well as sound science.

27. Successive studies have documented the productivity and sustainability of family farming in the Third World as well as in the North(57). Evidence from both North and South indicates that small farms are more productive, more efficient and contribute more to economic development than large farms. Small farmers also tend to make better stewards of natural resources, conserving biodiversity and safeguarding the sustainability of agricultural production(58). Cuba responded to the economic crisis precipitated by the break up of the Soviet Bloc in 1989 by converting from conventional large scale, high input monoculture to small organic and semi-organic farming, thereby doubling food production with half the previous input(59).

28. Agroecological approaches hold great promise for sustainable agriculture in developing countries, in combining local farming knowledge and techniques adjusted to local conditions with contemporary western scientific knowledge(60). The yields have doubled and tripled and are still increasing. An estimated 12.5 million hectares worldwide are already successfully farmed in this way(61). It is environmentally sound and affordable for small farmers. It recovers farming land marginalized by conventional intensive agriculture. It offers the only practical way of restoring agricultural land degraded by conventional agronomic practices. Most of all, it empowers small family farmers to combat poverty and hunger.

29. We urge all Governments to reject GM crops on grounds that they are both hazardous and contrary to ecologically sustainable use of resources. Instead they should support research and development of sustainable agricultural methods that can truly benefit family farmers the world over.

Signed by 441 scientists from 54 countries