

The Case for A GM-Free Sustainable World - Executive Summary

Why GM Free?

1. GM crops failed to deliver promised benefits

The consistent finding from independent research and on-farm surveys since 1999 is that GM crops have failed to deliver the promised benefits of significantly increasing yields or reducing herbicide and pesticide use. GM crops have cost the United States an estimated \$12 billion in farm subsidies, lost sales and product recalls due to transgenic contamination. Massive failures in Bt cotton of up to 100% were reported in India.

Biotech corporations have suffered rapid decline since 2000, and investment advisors forecast no future for the agricultural sector. Meanwhile worldwide resistance to GM has reached a climax in 2002 when Zambia refused GM maize in food aid despite the threat of famine.

2. GM crops posing escalating problems on the farm

The instability of transgenic lines has plagued the industry from the beginning, and this may be responsible for a string of major crop failures. A review in 1994 stated, "While there are some examples of plants which show stable expression of a transgene these may prove to be the exceptions to the rule. In an informal survey of over 30 companies involved in the commercialisation of transgenic crop plants....almost all of the respondents indicated that they had observed some level of transgene inactivation. Many respondents indicated that most cases of transgene inactivation never reach the literature."

Triple herbicide-tolerant oilseed rape volunteers that have combined transgenic and non-transgenic traits are now widespread in Canada. Similar multiple herbicide-tolerant volunteers and weeds have emerged in the United States. In the United

States, glyphosate-tolerant weeds are plaguing GM cotton and soya fields, and atrazine, one of the most toxic herbicides, has had to be used with glufosinate-tolerant GM maize.

Bt biopesticide traits are simultaneously threatening to create superweeds and Bt-resistant pests.

3. Extensive transgenic contamination unavoidable

Extensive transgenic contamination has occurred in maize landraces growing in remote regions in Mexico despite an official moratorium that has been in place since 1998. High levels of contamination have since been found in Canada. In a test of 33 certified seed stocks, 32 were found contaminated.

New research shows that transgenic pollen, wind-blown and deposited elsewhere, or fallen directly to the ground, is a major source of transgenic contamination. Contamination is generally acknowledged to be unavoidable, hence there can be no co-existence of transgenic and non-transgenic crops.

4. GM crops not safe

Contrary to the claims of proponents, GM crops have not been proven safe. The regulatory framework was fatally flawed from the start. It was based on an anti-precautionary approach designed to expedite product approval at the expense of safety considerations. The principle of 'substantial equivalence', on which risk assessment is based, is intended to be vague and ill-defined, thereby giving companies complete licence in claiming transgenic products 'substantially equivalent' to non-transgenic products, and hence 'safe'.

5. GM food raises serious safety concerns

There have been very few credible studies on GM food safety. Nevertheless, the available findings already give cause for concern. In the still only systematic investigation on GM food ever carried out in the world, 'growth factor-like' effects were found in the stomach and small intestine of young rats that were not fully accounted for by the transgene product, and were hence attributable to the transgenic process or the transgenic construct, and may hence be general to all GM food. There have been at least two other, more limited, studies that also raised serious safety concerns.

6. Dangerous gene products are incorporated into crops

Bt proteins, incorporated into 25% of all transgenic crops worldwide, have been found harmful to a range of non-target insects. Some of them are also potent immunogens and allergens. A team of scientists have cautioned against releasing Bt crops for human use.

Food crops are increasingly used to produce pharmaceuticals and drugs, including cytokines known to suppress the immune system, induce sickness and central nervous system toxicity; interferon alpha, reported to cause dementia, neurotoxicity and mood and cognitive side effects; vaccines; and viral sequences such as the 'spike' protein gene of the pig coronavirus, in the same family as the SARS virus linked to the current epidemic. The glycoprotein gene gp120 of the AIDS virus HIV-1, incorporated into GM maize as a 'cheap, edible oral vaccine', serves as yet another biological time-bomb, as it can interfere with the immune system and recombine with viruses and bacteria to generate new and unpredictable pathogens.

7. Terminator crops spread male sterility

Crops engineered with 'suicide' genes for male sterility have been

promoted as a means of 'containing', i.e., preventing, the spread of transgenes. In reality, the hybrid crops sold to farmers spread both male sterile suicide genes as well herbicide tolerance genes via pollen.

8. Broad-spectrum herbicides highly toxic to humans and other species

Glufosinate ammonium and glyphosate are used with the herbicide-tolerant transgenic crops that currently account for 75% of all transgenic crops worldwide. Both are systemic metabolic poisons expected to have a wide range of harmful effects, and these have been confirmed.

Glufosinate ammonium is linked to neurological, respiratory, gastrointestinal and haematological toxicities, and birth defects in humans and mammals. It is toxic to butterflies and a number of beneficial insects, also to the larvae of clams and oysters, Daphnia and some freshwater fish, especially the rainbow trout. It inhibits beneficial soil bacteria and fungi, especially those that fix nitrogen.

Glyphosate is the most frequent cause of complaints and poisoning in the UK. Disturbances of many body functions have been reported after exposures at normal use levels.

Glyphosate exposure nearly doubled the risk of late spontaneous abortion, and children born to users of glyphosate had elevated neurobehavioral defects. Glyphosate caused retarded development of the foetal skeleton in laboratory rats. Glyphosate inhibits the synthesis of steroids, and is genotoxic in mammals, fish and frogs. Field dose exposure of earthworms caused at least 50 percent mortality and significant intestinal damage among surviving worms. Roundup caused cell division dysfunction that may be linked to human cancers.

The known effects of both glufosinate and glyphosate are

sufficiently serious for all further uses of the herbicides to be halted.

9. Genetic engineering creates super-viruses

By far the most insidious dangers of genetic engineering are inherent to the process itself, which greatly enhances the scope and probability of horizontal gene transfer and recombination, the main route to creating viruses and bacteria that cause disease epidemics. This was highlighted, in 2001, by the 'accidental' creation of a killer mouse virus in the course of an apparently innocent genetic engineering experiment.

Newer techniques, such as DNA shuffling are allowing geneticists to create in a matter of minutes in the laboratory millions of recombinant viruses that have never existed in billions of years of evolution. Disease-causing viruses and bacteria and their genetic material are the predominant materials and tools for genetic engineering, as much as for the intentional creation of bio-weapons.

10. Transgenic DNA in food taken up by bacteria in human gut

There is already experimental evidence that transgenic DNA from plants has been taken up by bacteria in the soil and in the gut of human volunteers. Antibiotic resistance marker genes can spread from transgenic food to pathogenic bacteria, making infections very difficult to treat.

11. Transgenic DNA and cancer

Transgenic DNA is known to survive digestion in the gut and to jump into the genome of mammalian cells, raising the possibility for triggering cancer.

The possibility cannot be excluded that feeding GM products such as maize to animals also carries risks, not just for the animals but also for human beings consuming the animal products.

12. CaMV 35S promoter increases horizontal gene transfer

Evidence suggests that transgenic constructs with the CaMV 35S promoter might be especially unstable and prone to horizontal gene transfer and recombination, with all the attendant hazards: gene mutations due to random insertion, cancer, reactivation of dormant viruses and generation of new viruses. This promoter is present in most GM crops being grown commercially today.

13. A history of misrepresentation and suppression of scientific evidence

There has been a history of misrepresentation and suppression of scientific evidence, especially on horizontal gene transfer. Key experiments failed to be performed, or were performed badly and then misrepresented. Many experiments were not followed up, including investigations on whether the CaMV 35S promoter is responsible for the 'growth-factor-like' effects observed in young rats fed GM potatoes.

In conclusion, GM crops have failed to deliver the promised benefits and are posing escalating problems on the farm. Transgenic contamination is now widely acknowledged to be unavoidable, and hence there can be no co-existence of GM and non-GM agriculture. Most important of all, GM crops have not been proven safe. On the contrary, sufficient evidence has emerged to raise serious safety concerns, that if ignored could result in irreversible damage to health and the environment. GM crops should be firmly rejected now.

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