Genetic Modification: Busting the Myths

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With Teagasc's application to grow genetically modified potatoes in Ireland and the EPA's granting them a licence to do so, there has been an accompanying outbreak of modified myths being trialled on the Irish population. This leaflet seeks to address some of the most dominant and pervasive of these myths in order to support resilience and resistance to this deliberate and potentially lethal contamination of information being supplied to the Irish population.

Myth 1: Genetically Modified Potatoes Could Have Prevented the Irish Famine

The logic behind this claim is based on the falsity that the widespread starvation that occurred in Ireland in the 1840s, known as the Irish Famine, Great Hunger or *An Gorta Mór*, was due simply to the potato crop being wiped out by a fungal infection called blight (*phytophthora infestans*). That blight did indeed attack and cause massive damage to the crop is undisputed. To imply that this was the sole cause of the starvation and that the absence of a blight resistant potato provided the death knell for a million people, is an outrageous modification of historical fact and sets a dangerous precedent for failing to recognise the real causes of world hunger today.

The failure of the potato crop in Ireland in the 1840s proved to be so catastrophic, not because the Irish were bad farmers who weren't prepared for blight. Rather, denied access to land due to Colonial Occupation at the time, the vast majority of the Irish were forced to engage largely in monoculture, i.e. the almost exclusive growing of a single crop that would survive on the poor ground that was left to them. They chose the lumper potato which gave a high yield in poor soil conditions but which had almost no resistance to blight. When blight did come, their crop was wiped out and they starved.

There were blight resistant varieties of potato in existence at that time. Notably, in parts of Kerry, the population had continued to grow a different variety of potato called Butes. The Bute was naturally resistant to blight and so survived to feed the local population.

The Bute exists to this very day thanks to the careful conservation by Kerry growers and the pioneering work of Irish Seed Savers. It retains many of its blight resistant qualities. In addition, Irish Seed Savers have been carefully developing other blight resistant varieties through traditional, natural processes. These varieties include the Sharpo and the Blue Danube.

Thus, there were blight resistant potatoes available in the 1840s. What wasn't available to the vast majority, however, was justice in the form of access to land or the resources with which to buy other foodstuffs. The resultant dependence on monoculture, the dependence on one crop, proved fatal when that crop failed. The very same factors, i.e. denial of access to land, lack of resources with which to obtain food and enforced dependence on monoculture in the form of cash crops, remain central causes of poverty and hunger in the world today. Far from contradicting these factors, the introduction of GM varieties of seeds exacerbates them. How and why are further illustrated below.

Myth 2: We Need Genetically Modified Foodstuffs to Feed the World

The causes of world hunger today are many and complex. With nearly a billion people suffering from starvation across the globe, it is vital that we identify, understand and take responsibility for

the underlying and complex causal factors if we are truly to eradicate widespread hunger in a manner that is both sustainable and just.

There are an estimated 900 million small farmers around the world. In reality it is farms such as these that have the track record and the capacity with which to feed the world's human population. Growing a wide variety of crop species, and very often family owned and community based, they have survived by drawing on knowledge and experience gathered and honed organically/holistically over thousands of years of tradition. Where farms such as these are supported and enabled to continue and develop, the capacity for feeding communities and populations is greatly increased.

GM technology does not favour such farming. Rather it favours industrialised farming involving the large scale growing of a single crop for the world market as opposed to meeting the needs of local communities for access to healthy and nutritious food.

Indeed GM poses a huge threat to such farms. Often these small farmers are driven off the land or have their traditional plants contaminated by exposure to genetically modified varieties. In circumstances where farmers are either forced or persuaded by false promises to opt for GM seeds, it has very often proven to be disastrous. Farmers find themselves locked into a system that requires the buying of patented seed from the multi-national seed company on a yearly basis as the GM variety plants produce no viable seeds; and to the necessity of buying the expensive chemicals that the seeds are engineered to work with. ***In India, an estimated one quarter of a million farmers have committed suicide as a direct result of the repeated failure of the GM crops they were persuaded to grow and the overwhelming debt this left them in as well as the loss of their traditional way of life.***

The global hunger crisis is not caused by lack of access to GM technology. As in the case of *An Gorta Mór* in Ireland, the underlying causes are a complex mixture rooted in conflict, poverty and injustice.

Food Sovereignty *is about reliable and sustainable access to nutritious food. It encompasses the need to produce food in a manner that respects the earth, the producer, their communities and the consumers. It is a holistic, efficient and sustainable approach.*

By its very nature GM technology is totally at odds with the philosophy of Food Sovereignty. It is about profits for the companies not food for the hungry. Far from being a viable and/or honest attempt to feed the world's hungry, it is rather a concerted and sinister effort to control world food production and thus prevent communities from feeding themselves and others using generationally honed and sustainable farming practices.

The authors of the report on the biggest international assessment of agriculture ever undertaken to date, which involved over 400 scientists, writing in the journal 'Science', stated that: "***No conclusive evidence was found that GM crops have so far offered solutions to the broader socio-economic dilemmas faced by developing countries." In their report, they confirmed that GM foods fail to address the real causes of poverty and hunger.***

Myth 3: Genetically Modified Seeds and Crops are Good for the Consumer

One of the most basic needs we have as human beings is access to an adequate supply of safe, nutritious food. Genetic Modification very seriously compromises this basic right.

It was in the US in the early 1990s that GM foods were first allowed onto the world markets by the Food and Drug Adminstration (FDA). In doing this the FDA were in fact ignoring their own scientists' warnings that genetic engineering is different from conventional breeding and poses serious risks including the production of new toxins and/or allergens. The FDA went on to form a policy for GM foods that did not require any safety tests or labelling. This policy was overseen by Michael Taylor, FDA's deputy commissioner of policy and a former attorney for GM giant Monsanto.

The process of assessing the safety or otherwise of GM crops is based on the concept of 'Substantial Equivalence'. Basically, this is the assumption that a GMO contains similar amounts of a few basic components such as protein, carbohydrates or fat as its non-GMO counterpart. An analogy that has been made by those critical of the Substantial Equivalence assumption is that of comparing a BSE infected cow and a non BSE infected cow. Biologically there will obviously be similarities, they are both cows. This does not however either eliminate or decrease the risks associated with the infected animal.

When claims of Substantial Equivalence have been independently investigated, they have been shown to be untrue. GM crops have been scientifically proven to have a different composition to their non-GM counterparts. Comparative studies on rice e.g. showed disturbing nutritional deficiencies in the GM variety as compared to non-GM variety grown at the same time in the same conditions.

In Europe, the agency responsible for assessing the safety of GMOs is the European Food Safety Authority. The EFSA refers to the concept of 'Comparative Safety Assessment' in their policy and approach to assessing GMOs. The term Comparative Safety Assessment is synonymous with the US term of Substantial Equivalence and has been similarly discredited by independent investigation.

The EFSA, in common with the US FDA, do not carry out their own tests on GMOs. Rather they leave it to the industry to carry out the testing and then make decisions regarding the safety of GMOs based on these in-house studies. The GM industry has of course a vested interest in 'proving' the safety of GMOs. Certainly, the dangers of bias in favour of GMOs is obvious with such a scenario.

The following three quotes summarise the inadequacy of the assessment system succinctly:

- "It is not foreseen that EFSA (European Food Safety Authority) carry out such [safety] studies as the onus is on the [GM industry] applicant to demonstrate the safety of the GM product in question." (European Food Safety Authority).

- "Ultimately, it is the food producer who is responsible for assuring safety." (US Food and Drug Adminstration (FDA).

- "Monsanto should not have to vouchsafe the safety of biotech food. Our interest is in selling as much of it as possible. Assuring its safety is the FDA's job." (Monsanto).

Another point worth noting when considering the consequences for the consumer of GM foodstuffs is that in transferring the genetic material from one species to another, or even from one variety of a species to another variety of the same species, as with cisgenics, a virus or bacteria is often the vehicle for this transference. Therefore, as well as the dangers posed to the consumer by the manipulation of the genetic make-up of a crop species, there is the added threat of a virus or bacteria in the food with unknown consequences for the consumer.

Considering the nature of investigations for the safety of GMOs, the principles on which these investigations are carried out, and the bodies who are mainly carrying out the studies, any evidence accumulated through these means for the safety of GMOs has to be held with considerable suspicion and doubt by consumers. Further, the release of GM foodstuffs is a very recent event. Thus there is an absence of evidence of long term affects on biodiversity and human and animal health.

The laxity and confusion that exists across the globe in terms of labelling further complicates the issue. If either animals or human beings begin to show health problems and/or mutations, the lack of transparency regarding labelling ensures a veil of protection for GM products and a lack of traceability which prohibits the identification of problems and/or the accumulation of evidence.

From the points made here there is sufficient cause for concern regarding consumer safety. Enough doubt to justify the call for an adherence to the Precautionary Principle... if you can't prove it is safe, then don't do it.

Myth 4: GM Crops Are Good For the Environment

GM crops are often presented by their proponents as an environmentally friendly option, even as a solution to pollution. If we look at even a few of the environmental claims made for GM technology however, it very quickly becomes apparent that this is far from accurate.

GM technology involves the production of Roundup Ready crops. Such crops have a genetically engineered resistance to Roundup pesticide. The main ingredient of Roundup is glyphosate. As the farmer sprays the field with the herbicide only the weeds are killed off. In time, however, the weeds develop a powerful resistance to Roundup. This creation of so called ‘super weeds’ has led to a massive increase in the use of not just Roundup, but also to the use of even more toxic chemical such as 2,4 D which is an ingredient in the defoliant Agent Orange.

Claims by the GM industry of reduced pesticide use deny the reality:

- GM crops have insecticides engineered into them, and that very often GM seeds are treated before planting;
- in a short time initial reduction in herbicide use is surpassed by increased use due to the development of herbicide-resistant weeds;
- GM crops with insecticide engineered into them express the toxin in every cell for their entire lifetime. This means that pests feeding off the crops are constantly exposed to the insecticide. This long term and constant exposure to the insecticide, leads quickly to the emergence of insecticide-resistant pests. This in turn leads to ever more potent development by the GM seed companies of insecticidal crops.

The scenario described here of pesticide use, the development of pesticide resistant organisms, the production of more potent pesticides and so on and on, only benefits the GM companies making money from each new revolution of the chemical treadmill. It is of no benefit to the environment, the producer or the consumer.

GM seed companies claim that GM crops with their built-in insecticides, only affect the target pests. Studies show however that this is untrue. For example, mycorrhizal fungi in the roots of plants (which help with the uptake of nutrients for the plan and help them resist disease and cope with drought), have been found to be adversely affected by GM crops.

Other non-target organisms negatively affected by GM crops include butterflies, ladybirds, lacewings and bees. GM crops have also been shown to have a detrimental impact on aquatic environments and their species. A study in Indiana revealed that insecticides released from GM maize was polluting 25% of streams tested. The water flea, often used as an indicator of environmental toxicity, showed toxic affects such as reduced fitness, higher mortality and impaired reproduction, after being fed GM maize.

Glyphosate, the main ingredient in Roundup and its breakdown product AMPA, has been found to contaminate air and water. Glyphosate is toxic to earthworms and to amphibians and has been shown to decrease the nutrient level of plants and delays the fixation of nitrogen, giving rise to reduced growth of roots and sprouts resulting in yield decline, especially in drought conditions where it can be reduced by up to 25%. This is of particular concern for the Global South. Glyphosate stimulates the growth of certain fungi, notable Fusarium. This is alarming as Fusarium not only adversely affects the plant, but also produces toxins that can enter the food chain and harm animals and humans.

About 80% of GM crops have been engineered to be resistant to herbicide, usually Roundup manufactured by Monsanto. The main ingredient in Roundup is Glyphosate. Independent Studies on human cells and on animals have shown that glyphosate in its raw form, and as formulation in Roundup, has very serous toxic affects, often at low levels such as could be found in the environment or as residues in food or feed.

In the early 2000s, the UK government ran three year scale farm tests to examine the affects on farmland biodiversity of GM crops. The conclusion to these tests was that the cultivation of herbicide resistant crops reduces wildlife populations and damages biodiversity.

Myth 5: GM Crops Cause Pose No Threat to Human Health

Roundup/glyphosate exposure and serious health problems, including:

- DNA damage;
- Premature births and miscarriages;
- Birth defects including neural tube defects and anencephaly (absence of a large part of the brain and skull);
- Multiple myeloma, a type of cancer;
- Non-Hodgkin's lymphoma, a type of cancer;
- Disruption of neurobehavioral development in children – in particular, attention-deficit

disorder (ADD) and attention-deficit hyperactivity disorder (ADHD).

Epidemiological studies cannot prove a cause-and-effect relationship between exposure to a suspect substance and a health effect. However, in the case of glyphosate/Roundup, toxicological studies carried out under controlled laboratory conditions confirm the causal relationship with health problems.

In an article for The Institute of Science in Society, Dr. Mae-Wan Ho related the following scientific evidence in relation to GM food:

Pregnant female rats fed GM soya gave birth to severely stunted progeny and others in the litters that died within three weeks (see main article);

GM-soya affected cells in the pancreas, liver and testes of young mice (see main article);

Rats fed a Monsanto GM maize developed serious kidney and blood abnormalities [13]

Villagers in the south of the Philippines suffered mysterious illnesses when a Monsanto GM maize hybrid came into flower; antibodies to the Bt protein in the GM maize were found in the villagers, and there have been five unexplained deaths.

A dozen cows died after eating a Syngenta GM maize and more in the herd had to be slaughtered due to mysterious illnesses.

Dr Arpad Pusztai and colleagues found young rats fed GM potatoes damaged in every organ system including an increase in thickness of the stomach lining to twice that in controls.

Scientists in Egypt found similar effects in mice fed another GM potato.

The US Food and Drug Administration had data dating back to early 1990s showing that rats fed GM tomatoes had developed small holes in their stomach.

Chickens fed Aventis' glufosinate-tolerant GM maize were twice as likely to die compared with controls.

New research demonstrated that a harmless protein in bean when transferred to pea caused inflammation in the lungs of mice and provoked reactions to other proteins in the diet ("Transgenic pea that made mice ill", this series).

Commenting on some of the evidence presented here, Dr. Michael Antoniou, Reader in Medical and Molecular Genetics at King's College London, had this to say:

> *If the kind of detrimental effects seen in animals fed GM food were observed in a clinical setting, the use of the product would have been halted and further research instigated to determine the cause and find possible solutions. However, what we find repeatedly in the case of GM food is that both governments and industry plough on ahead with the development, endorsement and marketing [of] GM foods despite the warnings of potential ill health from animal feeding studies, as if nothing has happened.*

Myth 6: GM Crops are Good for the Producer/Farmer

"It would be too generous even to call GM crops a solution in search of a problem. These crops have failed to provide significant solutions, and their use is creating problems - agronomic, environmental, economic, social and (potentially) human health problems." (National Farmers'

Union of Canada).

Inherent in the sections above are several arguments as to why GM crops are not good for the farmer/producer e.g.

- the need for increased use of pesticides;
- the favouring of large scale industrialised farming over smaller family owned and traditional farms;
- increased financial cost due both to the need for purchasing new seeds from the GM seed company each year, as GM crops don't produce viable seeds, and to the increased expenditure on herbicides.

Often a claim made by proponents of GM crops is for increased yield. However the data does not support this claim. 'Failure to Yield' is considered to be the definitive study to date on GM crops. It was produced by Dr. Doug Gurian-Sherman, senior scientist at the Union of Concerned Scientists and former biotech advisor to the US Environmental Protection Agency. The study found that GM technology has not raised the intrinsic yield of any crop.

"The promise was that you could use less chemicals and produce a greater yield. But let me tell you, none of this is true."(Bill Christison, President of the US National Family Farm Coalition).

> *What kind of legacy do we want to leave our children and grandchildren? A legacy of land, food, water and air full of poisons? No, we want to leave a legacy of land, food, air and water full of health and vitality. I have a message especially to the younger generation. Your rights and your freedoms can be lost overnight. Your choice to eat healthily can be taken away. The law in Canada has enabled corporations to deny the rights of farmers to grow and save their own uncontaminated seeds. We are determined to spend the rest of our lives, if necessary, protecting our human rights.* (Percy Schmeiser, Canadian farmer whose crops were contaminated by Monsanto's Roundup Ready Granola).

References: In addition to named references in body of document:

- GMO Myths and Truths: an evidence-based examination of the claims made for the safety and efficacy of genetically modified crops. Michael Antoniou, Claire Robinson, John Fagin 2012. MASIPAG Biodiversity Centre, The Phillipines.