“Sciencenotfiction: Timetothinkagain aboutGM”

A EuropaBio initiative

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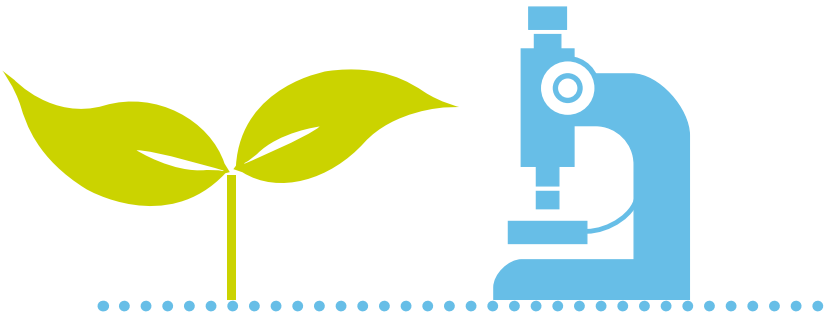
Context

Dispelling the myths about GM



Foreword

Over the past decade, Europe has seen polarised coverage of GM science, overwhelmingly focused on a small number of un-reviewed reports claiming negative effects of the technology. But the use of GM crops has continued to increase in other parts of the world, along with high-profile research into crops engineered to produce medicinal drugs or beneficial vitamins. As a result, Europeans have been left feeling confused and lacking the impartial information needed to come to an informed decision.

Scientists, leaders and farmers from around the world have become increasingly vocal in calling for a rational, fact-based debate on crop technologies using scientific data and years of experience in the field. But highly complex new science can rarely be explained in a soundbite, and this can be frustrating to the public and scientists alike.

I remember all too well the attempts in Scotland to carry out field trials of GM crops and experienced first hand the intimidation and abuse from anti-GM protestors towards farmers who volunteered to proceed to GM cultivation. In reality no rational, evidence-based debate took place. Most of the time, we are facing the politics of fear and ridiculous claims about the possible 'disastrous' effects of growing GM crops, none of which are based on scientific facts.

As the global food challenge increases, Europeans are also looking more closely at the global impact or ‘foodprint’ of their food choices. This includes a choice about what role they would be prepared for biotechnology to play in our farmers’ agricultural ‘toolkit’. European farmers need to be able to compete in the global market; to do so, they need to have access to the same technology that is available in other parts of the world. This technology can be part of the answer that we are looking for to develop a model of agriculture that produces more, but uses less energy, fewer artificial fertilisers and creates fewer CO_2 emissions. While the European Union is a major importer of GM crops, European farmers’ choice to cultivate GM crops is severely restricted. As a result, far less than 1% of global GM production is taking place in the EU. The EU needs to rely on science alone when it comes to decision-making on food production, simply because we value food safety first and foremost. We need to realise that new technologies are showing us the future in building more sustainable food production systems capable of meeting the huge rise in the world food demand.

GM technology is a confusing topic that needs to be explained better. This guide aims to look at the reality of crop science, explode some of the myths around GM and recognise the growing support from high-profile development and sustainability organisations; from the WHO to the Gates Foundation. There is a line between science and fiction, and this will certainly help to better draw that line to avoid further misconceptions of what is only a technology. It is what we do with it which determines how valuable it will be for our society. Let’s put the emotive scaremongering behind us, let’s start to think again about GM.

Mr. George Lyon MEP,
Group of the Alliance of Liberals and Democrats for Europe and Member of the United Kingdom Liberal Democrats Party

1. Agriculture: New solutions for new challenges

By 2025, the global population will reach eight billion people, and over nine billion by 2050[i]. Experts recognise that food production must therefore increase by up to 60% to feed the world[ii]. Already, almost a billion people do not have enough food, and many more are malnourished. Competition for land, water and energy is intensifying – not to mention the effects of climate change and the ongoing need to reduce waste and cut carbon emissions.

Agricultural productivity is back on the political agenda, and there is a pressing need right now for new forms of technology in agriculture to help those at the sharp end of the global food challenge. All of the world's farmers need a wide array of tools and techniques to help address food scarcity by growing more food in a sustainable way.

Alongside conventional plant breeding, biotechnology and plant science innovations such as Genetically Modified crops ('GM' or 'GMOs') are such tools. GM means that existing genes are modified or new genes included to give plant varieties desirable characteristics, such as resistance to certain pests or herbicides. Because only a few genes with known traits are transferred, GM methods are more targeted and faster than traditional breeding.

> "The Food and Agriculture Organization estimates that developing countries will have to boost their yields by half to meet the challenge of global hunger. We simply won't be able to meet that goal without using all the scientific tools at our disposal."
>
> Bill Gates

This can help by reducing inputs like fuel, water and fertiliser, by developing crops that can grow in harsher conditions, and by boosting crops yields on the same amount of land. Higher reliable yields and reduced inputs mean lower food costs for citizens, with better management of agriculture's impact on the environment around them.

Scientists, leaders and farmers from around the world have become increasingly vocal in calling for a rational, fact-based debate on crop technologies using scientific data and years of experience in the field. In Europe we have an opportunity to put emotive

scaremongering behind us, and to think about what role we would be prepared for biotechnology to play in our farmers' agricultural 'toolkit'.

GM crops are one type of biotechnology which have been grown for 16 years by more than 16.7 million farmers in 29 countries. In 2011, they were grown on 160 million hectares of land – an area the size of the UK, Ireland, France, Germany and Belgium combined[iii]. More than two trillion meals containing food produced from these crops have been consumed without any substantiated health issues.

Since its first appearance in the 1990s, those diametrically opposed to the technology have sought to distort evidence on GM, but Europe today is not the same as Europe in the 90s.

We need to recognise that current agricultural policies are not future-proof. This is not a contest between GM and organic agriculture, or between industrial and small-scale farming.

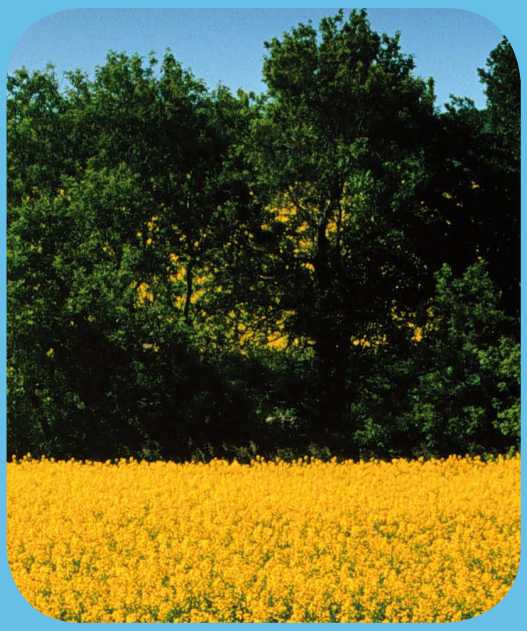
"It is important that we tone down the debate on GMOs to a rational level."
John Dalli, former EU Commissioner for Health and Consumer Policy, 2011

"77% of Europeans agree that the European Union should encourage its farmers to take advantage of biotechnology in agriculture."
Eurobarometer survey of 26,691 Europeans, 2010 [iv]

"GMOs offer the potential of increased productivity, improved nutritional values, that can contribute directly to enhancing human health and development."
World Health Organisation [v]

"Just as my own anti-GM activism began to fade as soon as I began to read up on the science, so surely the demystifying power of information is the best antidote to "anti-science zealotry", whether this is about nuclear power, GM crops, climate change or any other scientific endeavor."

Mark Lynas, Environmental Commentator, July 2011 [vi]



"I understand the Soil Association's concerns around GMOs. The fact is, however, there are a lot of GMOs which are necessary. Many small farmers do not have 15 years to wait in order to breed into their wheat the soil nutrition efficiency they need. GM can speed up that process."

Phil Bloomer, Oxfam Director of Policy and Campaigns, 2012

In reality, countries do not choose one model, and no single system, set of practices or type of technology will provide food security or guarantee Europe's competitiveness in the world market.

Europe's farmers excel at responsible deployment of all farming methods and technologies, managed through stewardship programmes with technology companies. They should be able to use their expertise to choose the best crops to meet the needs of Europe and the world.

It is time to defend independent evidence on the benefits and limitations of crop breeding technologies, and to confront some of the misleading tactics used by anti-GM-science campaign groups. Time to think again about GM and to discuss how Europe can play its part in reducing the immediate and future stresses facing our life support system – the food chain.

2. What led to a lack of trust in regulatory bodies and suspicion of GM?

Recent media coverage of agricultural technology has focused on its potential to help tackle global food security, and European consumers have shown more positive attitudes to GM foods. But where did European scepticism of GM come from? To understand where we are today, it is necessary to look at the circumstances around the launch of the first GM product in Europe in the mid-1990s…

Fertile ground for sowing fear

The late 1990s were a turbulent and changing time in Europe for agriculture, food safety, science and global commerce:

- Consumers' trust in food science and safety was shaken by mismanagement and poor communications around a series of European food crises: salmonella, dioxin-contamination in chicken feed, and BSE or 'mad cow disease'.
- Europeans were angry that regulations designed to protect the safety of their food were not operating properly, and lost trust in the authorities.
- EU citizens were also concerned by a Common Agricultural Policy which had led to an oversupply of some agricultural produce[vii].
- This was also the period which saw the first mass anti-globalisation protests aimed at multinational commerce and trade.

The first GM crops were launched in Europe in 1995 amid this scientific and economic uncertainty, and consumers were not familiar with how the new regulatory system worked. Scientists and politicians assured the public of their safety, yet this did little to assuage concerns. Things were not looking good…

The European public listened to the loudest voice

Like any new technology, consumers had questions about GMOs:

➜ Were they safe?
➜ Were they good for the environment?
➜ Why were private companies involved?
➜ Why were they needed?

Most of our food production relies on technological innovation. But public perception of food and farming is often driven by marketing imagery. This paints an idyllic, traditional, and pastoral picture of hand-ground grain, home-grown vegetables, and hand-milked cows. It is an unrealistic and misleading image of agriculture, yet it resonates with consumers.

One challenge was that most of the first generation of GM crops was developed to enable farmers to overcome plant diseases and pests, increase yields and decrease inputs like pesticides and fuel. Therefore, it was difficult for Europeans to see the personal benefit from GM, rather than the indirect benefits such as lower commodity costs and more targeted use of pesticides.

A further challenge was that the companies producing GM seeds had experienced a much less controversial introduction of GM crops in North America, where they were even more successful than anticipated. There was an assumption that Europe would follow suit, and some of the messages from industry on GM were better suited to business-to-business (B2B) communications, with companies not as prepared to deal directly with the food-buying public.

Anti-science campaign groups were able to exploit these concerns. Through the clever use of media-friendly but unsubstantiated terms like ‘frankenfoods’ and powerful imagery of people in biohazard suits in fields, anti-GM campaigners were able to instil fear and mistrust about products which scientists found to be as safe as – if not safer than – conventional foods.

Negative Media Coverage – 1990s

GM blunder contaminates Britain with mutant crops
Source: Daily Mail, UK, 16.08.2002

GM giants 'will force the world into famine'
Source: The Guardian, UK, 10.05.1999

GMOs colonise French crops
Source: TF1, France, 25.07.2001

One in Five foods contaminated with GM
Source: La Repubblica, Italy, 11.12.2001

UK Prince leads fight against GM food
Source: BBC, UK, 01.06.1999

Trade in Frankenstein foods unregulated
Source: El Tiempo, Spain, 25.02.1999

EU study: GM ruins organic farming
Source: News.at, Austria, 16.05.2002

Balanced/Positive Media Coverage – 2000s

World can't afford to ban GM crops
Source: The Sun, UK, 26.01.2012

Genetics to prevent hunger
Source: ABC, Spain, 18.07.2012

No risk with GMO food, says EU chief scientific advisor
Source: EurActiv, Belgium, 24.07.2012

Government says that "GM maize is more environmentally friendly than conventional maize"
Source: El Pais, Spain, 25.06.2012

GM crops key to human survival, says top scientist
Source: The Guardian, UK, 23.01.2011

Potato chips from GM potatoes in 2014?
Source: Adevarul, Romania, 08.08.2010

GM crops continue to gain ground
Source: Le Monde, France, 10.02.2012

The scientific community found themselves on the back foot

Those involved in the development of the technology were unprepared for this hostile environment, and were not able to connect with the 'person in the street' in an effective way.

There was a complex combination of concern about food safety, lack of trust in science and policy-makers, scepticism about multi-national companies' intentions and romantic views of food production. The public's concern was addressed in scientific language, which did not connect with the underlying emotions that had been successfully stirred by anti-GM campaigners.

Most of the initial communication focused on the safety of the GM products and how they were the same as existing products. This failed to address the core point of the debate in Europe – a fear of further food scares mixed with a fundamental lack of trust in reassurances offered by politicians, scientists and companies.

As the years passed and the media battle rumbled on, misinformation from campaign groups was reinforced by a number of politicians who were keen to use public mistrust as an electoral tool. Some former and current European politicians still openly attack the safety of GM crops, despite thousands of safety assessments and almost two decades of using biotechnology crops in Europe and around the world.

"Genetic engineering became a widespread and frequent topic shortly after a period during which various issues of public health, food safety, pollution, etc. had arisen. Confidence in institutions and in certain technological advances decreased considerably […] By presenting themselves as defenders of consumers' interests and health, the opposition rallied a substantial proportion of the Western public who saw no advantages in GMOs."

Sylvie Bonny, INRA (National Institute of Agricultural Research), France 2003

By the middle of the 2000s, a significant number of retailers, policy makers and global environment and development NGOs were beginning to see the benefits of GMOs, and scaremongering about GM safety had consistently proved unfounded. Countries which had begun to reap the benefits of GM technology saw its future potential, both in improved agricultural production and in the economic benefits that followed. However, political pressure had already resulted in the malfunctioning of the GMO approval system in Europe, with a de facto moratorium on GM cultivation[viii].

A wider public debate on the consumer benefits of new and potential GM products in Europe therefore became merely theoretical. European citizens became even further removed from the debate as they continued to enjoy plentiful food supplies, and retailers played down the fact that many European farm animals were fed GM feed.

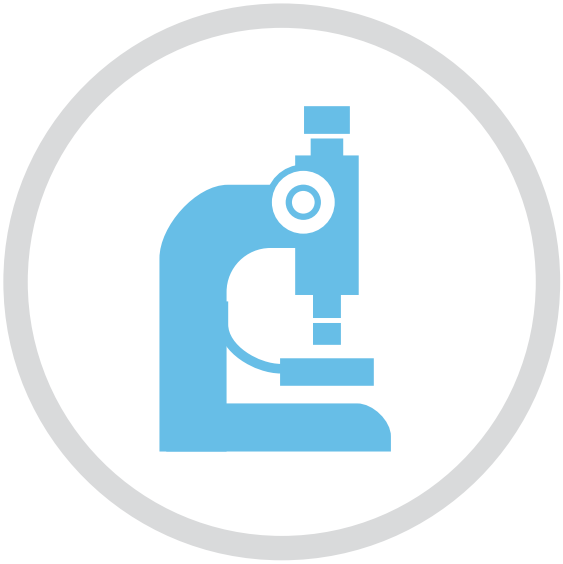
3. Defendingsoundscience

Much of the science being undertaken in Europe is ground-breaking, innovative and highly advanced. This is especially true in areas like genetics. More than ever, research is transparent and open to scrutiny, both by the global scientific community and by media and consumers.

One of science's greatest strengths is that it deals in discovery, which holds an endless fascination for consumers.

But this eagerness to learn about the latest scientific developments also represents a threat to the reputation of balanced and independent academic science.

Before they can release details of their findings, scientists know that they must first test, test, and test again to ensure that their findings are accurate.



A 2011 report from the BBC Trust into the broadcaster's science coverage found instances of scientific reporting where providing an opposite view without consideration of "due weight" could lead to a "false balance". i.e. that opinions provided by climate-change sceptics and GM opponents was given equal weight to peer reviewed science. The report therefore concluded that 'the BBC must take special care to continue efforts to ensure viewers are able to distinguish well-established fact from opinion on scientific issues and to communicate this distinction clearly to the audience'.

[ix]

They must ask others to double-check their research and ensure that their work is open to question and challenge forever. This is undertaken through a well-established process known as peer review (see page 13). They are also professionally obliged to include important caveats in their work highlight where its findings might not be applicable and whether it has any implications which require further investigation.

The scientific field of agricultural biotechnology has suffered more than most from the lack of peer review in the ‘evidence’ used by campaign groups. The level of coverage generated by GM science over the past 10 years has overwhelmingly focused on a small number of un-reviewed reports claiming negative effects of the technology.

Campaign groups then refer back to these un-reviewed reports repeatedly, knowing that the correction of disproved claims rarely receives the same attention. This repetition and reinforcement creates a perception that the opinion is equally as valid as peer reviewed science, undermining independent scientific evidence, and gradually eroding consumer confidence in what they hear or read about a new technology.

Most people just want to fast-forward through the boring bits and hear about the exciting new discovery. Highly complex new science can rarely be explained in a soundbite, and this can be frustrating to the public and scientists alike.

It’s time to reassess this scare-mongering, help consumers to judge truly independent scientific opinions, and start to explode some of the common myths about GM.

Scientists and the European Commission agree GMOs are no riskier than conventional crops and foods

In 2011, the European Commission released a compendium of 50 research projects on the safety of GMOs.
The Commission...

... funded research from...

130 research projects

... involving...

500 independant research groups

... over...

25 years

... concluding that...

"There is, as of today, no scientific evidence associating GMOs with higher risks for the environment or for food and feed safety than conventional plants and organisms." [x]

In addition to the research funded by the European Commission, numerous other peer reviewed reports have assessed the safety of GM foods around the world. A recent analysis found that more than 95% of peer reviewed studies found GM foods to be just as safe as conventional varieties. [xi]

However, some campaign groups have realised how the public hunger for new, exciting information can be turned to their advantage.
They promote research which has initially shocking findings but which has yet to be reviewed and verified. These untested results are presented to the public on the same level as science which has been through months or years of review.

But as more and more independent research has been published across the world, the profile of these studies has diminished. In 2012, the Swiss National Research Program found that there were no specific health or environmental risks associated with agricultural biotechnology. It also found that over 80 per cent of Swiss consumers supported the right to choose between food products with and without GM. [xii]

In January 2011 a group of 71 scientists from 25 European countries presented EC Commissioner Dalli with a letter of support following his declaration of a preference for "science-based information and advice" when dealing with the GM issue science which has been through months or years of review. [xiii]

What is peer review?

Scientific review, also known as peer review, is the process whereby other scientific experts in the same field check research for its validity, significance and originality. Once research has been reviewed by a number of experts, it will be considered for publication by a reputable scientific journal. [xiv]

> "Just as a washing machine has a quality kite-mark, so peer review is a kind of quality mark for science. It tells you that the research has been conducted and presented to a standard that other scientists accept."
> Sense about Science, "I don't know what to believe; Making sense of Science stories"

Not everything that has not been peer reviewed is bad science, but it does mean that it hasn't yet been cross-checked. You should therefore treat it like another scientist would, with healthy scepticism, and seek out a range of opinions from other experts in the field.

One of the great benefits of peer review in science means that findings cannot be influenced by whoever funds the research. Peer review generally means that good science is good science, regardless of how it was paid for.

Ironically, many anti-GM groups recognise the primacy of peer reviewed evidence in the field of climate-change science or palm-oil production, but not in the field of agricultural biotechnology.

Scientific peer review is a first filter but not a guarantee; low quality science is occasionally published, however the review process continues after publication.

"It is time to reopen the debate about GM crops in the UK but this time based on scientific facts and analysis. We need to consider what the science has to say about risks and benefits, uncoloured by commercial interests and ideological opinion. It is not acceptable if we deny the world's poorest access to ways that could help their food security, if that denial is based on fashion and ill-informed opinion rather than good science."

Sir Paul Nurse, Royal Society – Richard Dimbleby Lecture, February 2012

4. Time to think again?

It is clear that there is no single solution to the food challenge facing the world, but it is also clear that this challenge is not going to disappear. There will be an extra billion mouths to feed within the next 13 years, pressure on fragile habitats will increase, and climate change may drive down productivity in the developing world by 10-25% over the coming century[xv].

We are no longer in the same food-secure situation which prevailed in the late 90s. There is a growing recognition amongst consumers, NGOs and policymakers that we need to rethink the impact of European agricultural and food choices on the global food system, reduce our carbon emissions and minimise its environmental impacts:

- Progressive NGOs are now working with scientists to address food security. They are accepting that initial concerns in Europe about GM crops may have been understandable in the late 1990s, but they are now harming the agricultural prospects of those who need our help most.

- Government reviews like the UK's Foresight Report are highlighting that, without access to all available agricultural technologies, Europe is becoming less and less self-sufficient in food production. Europe's food imports already require a cultivation area the size of Germany outside its borders. Europe therefore relies on Africa, Asia and America to meet its food needs, as well as draws on scarce local resources like fuel and water[xvi].

- Governments in the developing world are putting in place their own biotechnology authorisation frameworks, keen to investigate biotech crops which could address their local needs. Yet Europe's restriction of the technology continues to discourage some, for fear of jeopardizing one of their biggest export markets.

GM crops could be one of the green solutions which helps Europe to meet its responsibility to produce more food for the rest of the world. This is not just a prediction based on exciting GM crop innovations currently in the research pipeline:

- If GM crops were grown in Europe today, the increase in production could be equal to the output from land the size of Belgium every year, and GM crops are already reducing carbon emissions by 19 billion kg of CO_2 every year (the equivalent of removing 9 million cars from the road).[xvii]

- By increasing yields on existing farmland, GM crops also help to ease pressure on natural habitats; an estimated 2.64 million hectares of land would probably be brought into grain and oilseed production if GM traits were no longer used.[xviii]

- Agriculture accounts for 71% of global water withdrawal today – one irrigated acre of cotton requires about 30% less water than two decades ago.[xix]

Europe is already at the forefront of international development and environmental protection, and citizens are fully aware of the global impact of things like their travel and clothing choices. It is to the credit of European citizens that they also take an active interest in the origins of their food. As the global food challenge increases, Europeans are looking more closely at the global impact, or 'foodprint', of their food choices.

Climate change:

10-25%

Loss of agricultural productivity in developing countries this century

They recognise that Europe's support for agricultural technology could help countries to develop local crop traits which maintain yields in the face of this uncertainty. 16.7 million farmers were already growing biotech crops in 2011, with over 90% – or 15 million – being small resource-poor farmers in developing countries, with the resulting higher yields netting them benefits worth more than €1 billion globally[xx].

But retailers and policy makers are not keeping pace with developments and European citizens' opinions, and are not actively helping consumers to make informed and responsible food choices.

No-one believes that GM is a silver bullet, but it could be part of the solution. Europeans must be given the information and choice to be able to decide for themselves what role they would like GM to play in their personal foodprint.

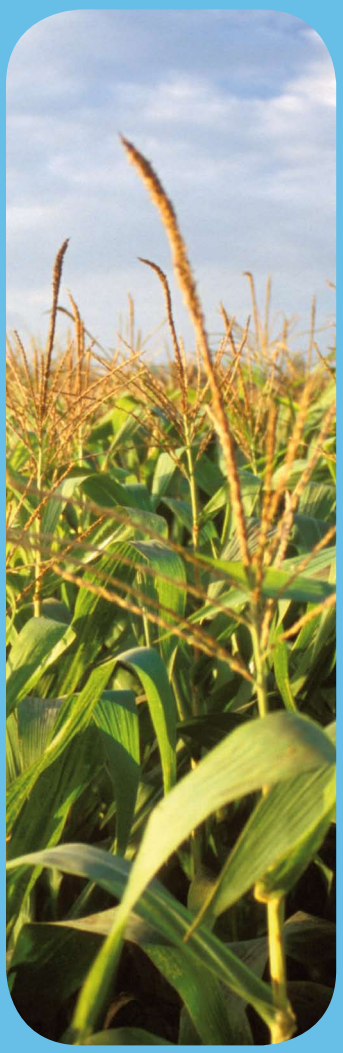
George Bernard Shaw said that 'Progress is impossible without change, and those who cannot change their minds... cannot change anything'.

Given the full scientific facts about biotechnology and a proper choice about the appropriate use of GM in Europe, Europeans can decide if they are ready to change their minds and ready to make progress in the global food challenge.

It'stimetothinkagain

"All [agricultural technology] researchers are now abroad. This is an intolerable situation that does not allow us to prepare for the future […] some say we have to wait for second-generation GMOs. But when you miss the first step, you miss the second, and you have far less chances to be in the following ones."
Guy Vasseur, Chairman of the French Chambers of Agriculture (APCA)

"The affluent west has the luxury of choice in the type of technology they use to grow food crops, yet their influence and sensitivities are denying many in the developing world access to such technologies which could lead to a more plentiful supply of food. This kind of hypocrisy and arrogance comes with the luxury of a full stomach."
Dr. Felix M'mboyi,
African Biotechnology Stakeholders Forum



"Developments in the life sciences may provide another possibility to deal with the challenges ahead. Astonishing breakthroughs have been made in biotechnology. There has been a massive growth, mainly in South America, China and India, in the use of genetically engineered crops."
Tom Arnold,
CEO of Concern Worldwide, Dublin-based International humanitarian organisation

Most technological advances which have helped us to progress have faced opposition initially; from farmers in the 19th century who thought that trains would stop their cows from giving milk, to 20th century scepticism about the safety of microwaves.

[xxi]

5. GM-bashing: Acynicaland profitableexercise

There are many falsehoods, myths and misconceptions about GM food and crops. Many of these myths were knowingly created and perpetuated by groups who campaign against GM. These groups often point to the economic and political stake which research institutes and companies have in a balanced GM policy. But the truth is that these groups and individuals also benefit from the continued misperceptions and fears which they spread about GM, and will do almost anything to damage the credibility of the technology:

- In some cases, this is because their membership funds or sponsorship are dependent on maintaining an anti-GM stance.

- In other cases, it would be reputationally difficult for them to back down from the incorrect claims which they have publicised for many years.

- In a few cases there is a genuine ideological opposition to the 'interference' of science in the natural world, which should be respected and separated from cynical opposition on the basis of pseudo-science.

Over the past 15 years, the number of reputable scientists prepared to support these views has diminished. These groups have therefore turned to increasingly outlandish and unscientific claims, which have almost all been disproved through peer review. But mud sticks, and anti-GM activists know that they can continue to use these 'studies' to generate media coverage even after they have been discredited:

Some tactics used to prioritise communications and PR over scientific rigour, include:

- Promoting scare-stories based on poor science that has not been peer reviewed, often commissioned from scientists who have a clearly negative view of GM crops and who conduct research with the pre-determined intention of revealing highly improbable negative effects of GM.

  - A study by Prof Giles-Eric Seralini on the effects of GM maize on rats in 2007 was promoted by a number of environmental groups as evidence of the 'toxic effects' of eating GM. This study was later totally discredited as the experimental protocols and conduct were flawed and the results were attributable to normal biological variation.[xxii]

  - In 2008, Greenpeace seized on an Austrian study of mice fed on GM maize, claiming that it showed 'serious health threats of genetically engineered crops'. But the research had not been peer reviewed and its author, Prof. J. Zentek, himself recognised the inconclusive results and refuted Greenpeace's conclusions. Greenpeace quietly changed its conclusions, but made no attempt to publicly correct the error.[xxiii]

- Anti-science campaign groups regularly use directional questions and leading language to misrepresent both the facts about biotech crops and consumer opinions:
  - For example, a Swiss referendum led by GMO opponents in 1998 asked citizens whether they wanted to “protect life and the environment against genetic manipulation”.

- Using the destruction of field-trials as a high-profile media tool:
  - Destroying scientific experiments and threatening researchers is totally unacceptable in a modern society, but is valued by anti-GM campaigners for its shock media value. The groups responsible make little attempt to distinguish between conventional and GMO trials, and frequently wear unnecessary biohazard suits to ensure press coverage.
  - There have been around 80 attacks on academic or governmental crop research institutes in Europe in recent years, all of which have targeted on experiments which operate within the strict safety guidelines laid down by regulatory authorities. Yet, anti-GM groups routinely complain that they would like more scientific evidence for GMO safety.
- Attacking individuals in an attempt to discredit or discourage sound science:
  - In addition to threats of violence against scientists involved in GM research, increasingly desperate campaign groups have also sought to discredit high-profile figures who have spoken in defence of GM evidence. These include Harry Kuiper (the Chair of EFSA’s Scientific Panel on GMOs), Bill Gates (for his foundation’s funding of GM crops for the developing world) and former European Commissioner John Dalli.

Campaign groups’ claims about GMOs must therefore always be checked. Their sources are not only frequently inaccurate, but often begin by determining their conclusions before seeking out the evidence to prove them, no matter how flawed. It is also worth noting the many well-respected organisations who have judged the science on the safety of GMOs to be reliable: UN, Food and Agriculture Organisation (FAO), World Health Organisation, and European Commission.

"If we look at evidence from [more than] 15 years of growing and consuming GMO foods globally, then there is no substantiated case of any adverse impact on human health, animal health or environmental health, so that's pretty robust evidence, and I would be confident in saying that there is no more risk in eating GMO food than eating conventionally farmed food."

Anne Glover, Chief Scientific Adviser, European Commission, 2012

"Many green campaigns, like those against nuclear power and GM crops, are not actually scientifically defensible."

Charles Secrett, Former Executive Director of Friends of the Earth, 2011

"None of the predictions about negative health effects have materialised. This is why many [campaign groups] have now changed their strategy and are now more careful with allegations about alleged adverse health effects. They have switched instead to occasional anecdotal evidence as well as raising doubts about "long term effects."

Prof Klaus Ammann, European Federation of Biotechnology, 2011

[xxiv]

6. GM claims versus GM reality

There are hundreds of myths about GM food and crops. These were created and continue to be spread by groups who actively campaign against GM for ideological, political or economic reasons. These myths are emotive and designed to scaremonger, creating news headlines that attempt to undermine the case for GM in Europe. However, they are not based on fact and they do not represent the latest state-of-the-art science or the pile of evidence on the potential of the technology to help increase agricultural production sustainably.

Claim: *GM crops 'contaminate' organic and conventional crops growing near to them.*

Reality: All agriculture is about managing co-existence. In simple terms, this means growing different crops and processing different products without mixing them up. Co-existence guidelines are already in place to prevent GM crops cross-pollinating with conventional or organic crops.

Anti-GM campaign groups use the word 'contamination' to imply this is a safety issue, but the crops themselves have already been approved as safe to grow. This is rather an economic and market-related issue about allowing farmers to maintain segregation of different types of crops[xxv]. Co-existence is not a new concept and farmers use it every day to separate crops used for human food, animal feed, and industrial purposes.

In Europe, Spain is already growing more than 95,000 hectare of GM maize alongside conventional crops without any evidence over the past eight years that co-existence does not work[xxvi]. In the US, the organic sector thrives alongside GM crops, and more than 18% of US farmers grow both GM and organic crops on the same farm[xxvii]. Co-existence provides farmers and citizens with a genuine choice.

Claim: *GM food is not safe to eat – we do not know enough about the long term effects on human health.*

Reality: There is broad scientific consensus that GM crops and food are safe to eat and they are subject to some of the most rigorous scientific safety assessments of any products in the food chain.

An estimated 2 trillion meals containing GM ingredients have been eaten around the world over the last 13 years without a single substantiated case of ill-health. The World Health Organisation has said that: *'No effects on human health have been shown as a result of the consumption of such foods by the general population in the countries where they have been approved'*[xxviii]. In 2011, the European Commission concluded: *'there is, as of today, no scientific evidence associating GMOs with higher risks for the environment or for food and feed safety than conventional plants and organisms'*[xxix].

Claim: *European consumers do not want GM food.*

Reality: A number of studies have concluded that most Europeans do not actively avoid GM food, and that the way Europeans respond to prompting via a questionnaire does not bear much relation to how they shop in a grocery store.

A good example is the tomato paste made from GM 'Flavr Savr' tomatoes, which was sold in the UK from 1996 to 1999. The cans were clearly labelled as being derived from genetically modified tomatoes. Because of lower production costs, the sale price of Flavr Savr tomato paste was lower and outsold conventional tomato paste at many locations. However, following media hype about potential problems linked to GM (later proved to be false), sales of the paste declined dramatically. Supermarkets subsequently announced they would no longer use GM ingredients as a result of customer concerns.

Further examples of shoppers' behaviour and acceptance of GM foods in Europe can be found on the EuropaBio website[xxx].

"On the basis of the research evidence, phrases like "overwhelming opposition" and "massive consumer rejection", which have been used in the media and by some politicians in relation to public attitudes to GM foods, present a misleading impression of what the research is actually saying."
'GM Foods: What Europeans Really Think', Hutton, 2006

Claim: *GM crops harm the environment and reduce biodiversity.*

Reality: All types of agriculture have a significant impact on the environment, whether subsistence or large-scale, organic or conventional. GM is one tool which farmers can use to manage this impact and to increase sustainability.

By increasing the yields of crops like soy, GM crops can help to reduce the amount of land needed to produce the same amount of food, our 'foodprint'. In turn, this reduces the pressure from agriculture on fragile natural habitats like rainforests, which also helps prevent land degradation[xxxi].

Even in fields where GM crops are grown, there is peer reviewed evidence that the reduced application of pesticide and less tillage can increase biodiversity[xxxii]. Mounting evidence also shows that GM crops have no significant adverse effects on non-target organisms[xxxiii]. Overall, the effects of farming on biodiversity depend mainly on agricultural practices rather than on the technology used for plant breeding.

The International Union for Conservation of Nature originally called for a moratorium on GM crops, but by 2007 had resolved that there was "no conclusive evidence of direct negative impacts on biodiversity of GMOs that have been commercially released"[xxxiv].

Claim: *The EU approvals process for GMOs is unaccountable.*

Reality: The safety assessment and approvals process is rigorous and prescribed by law. Any GM foods and feeds intended for sale or cultivation in the European Union are subject to a safety assessment which is undertaken by independent scientists from the European Food Safety Authority (EFSA). However, the final decision for authorisation still rests with EU Member States, which vote on European Commission proposals.

Claim: *Biotechnology companies control farmers and agriculture through strict patents.*

Reality: Pioneering work on GM is carried out in the public and private sector, often in collaboration, which requires investment of millions of euros in research and development. Companies are ideally placed to raise the finance in order for these advances to be turned into marketable products; similar to the way in which new pharmaceutical products are made available to patients, or communications companies invest in new smartphone technology.

Every year, the industry's top 10 companies re-invest $2.25 billion, or 7.5% of sales, into R&D for new products[xxxv]. A fair intellectual property framework is needed to protect this investment for a limited period, and ensure the plant science industry maintains its strong innovative base. Therefore, almost all high-performing seeds are patented and cannot be saved for use in the next planting season; this includes conventional (non-GM), GM and organic hybrid seeds.

"The large concentration of firms in large multinational groups exists in many sectors, as does the commodifying of new activities; patents have existed for a long time for many goods that are sometimes vital."

Sylvie Bonny, INRA (National Institute of Agricultural Research), France 2003

Claim: *GM crops are only suitable for industrial-scale farmers in the West.*

Reality: More than 90% of farmers growing biotech crops are resource-poor farmers in developing countries growing crops on small plots, often less than 10 hectares. In 2010, 55% of the farm income gains from GM crops went to farmers in developing countries. Growth rates of biotech crops indeveloping countries were twice as fast as developed countries in 2011, and eight out of the top ten countries growing biotech crops were in the developing world[xxxvi]:

- ➜ Indian farmers planted 10.6 million hectares of biotech cotton during 2011. The use of GM cotton has reduced farmers' exposure to pesticides, as well as increasing the income of farmers by up to US$250 per hectare[xxxvii].
- ➜ Africa planted 2.5 million hectares in 2011 of biotech crops, and is making advances with field trials in the regulatory process for additional biotech crop countries and crops[xxxviii].

Claim: *GM crops do not deliver the benefits promised by the biotech companies.*

Reality: GM crops are not the silver bullet to solve all our problems, but farmers choose GM crops because they offer a better return on investment.

The net economic benefit of GM crops at the farm level in 2010 was $14 billion, equal to an average increase in income of $100 per hectare.

[xxxix]

Insect resistant (Bt) and herbicide (HT) traits were first commercialised twenty years ago, and are therefore a fairly basic and unsophisticated use of GM technology. Current advances include developing crops that should deliver consumer health benefits such as biofortification with nutrients such as zinc, additional protein or omega 3 and tolerance to drought.

7. Where to find further information

- The EuropaBio website at www.europabio.org
- European Commission Food and Feed Safety: Information on the latest legislative and policy developments relating to crop biotechnology – http://ec.europa.eu/food/food/biotechnology/index_en.htm
- European Food Safety Authority (EFSA): Provides independent scientific advice and clear communication on existing and emerging risks in relation to food – http://www.efsa.europa.eu/
- Sense About Science – charitable organisation that works to improve the debate around science by http://www.senseaboutscience.org/
- CropLife International – provides a database of benefits of GM and latest developments http://www.croplife.org/public/benefits_of_plant_biotechnology
- ISAAA – the 'Global Knowledge Center on Crop Biotechnology' provides the latest statistics on GM cultivation around the world http://www.isaaa.org/kc/
- GMO Compass – A website set up by the EU, including information on all aspects of GM safety, regulation and co-existence http://www.gmo-compass.org
- Public Research and Regulation Initiative – The PRRI is a world wide initiative of public sector scientists involved in research in modern biotechnology for the public good, including the European Farmer Scientist Network http://www.prri.net and http://greenbiotech.eu

End notes

i World Population Prospects: The 2010 Revision, UN Dept of Social and Economic Affairs http://esa.un.org/unpd/wpp/

ii Addressing Issues such as western over-consumption and the distribution of agricultural resources are vital, but the UN Food and Agriculture organisation also recognises that 'Agricultural production needs to increase by 60% over the next 40 years to meet the rising demand for food' and that as the scope for area expansion is limited 'additional production will need to come from increased productivity in the same way as it has for the past 50 years'. OECD-FAO Agricultural Outlook 2012-2021, 2012

iii Global status of commercialised GM crops, ISAAA, 2011 www.isaaa.org

iv Special Eurobarometer 354 – Food-related risks, EFSA, Nov 2010 http://www.efsa.europa.eu/en/factsheet/docs/reporten.pdf

v Modern food biotechnology, human health and development: an evidence-based study, WHO, 2005 – http://www.who.int/foodsafety/publications/biotech/biotech_en.pdf

vi http://www.marklynas.org/2011/07/greenpeace-and-gm-wheat-time-to-stand-up-for-science/

vii Perceptions which were stoked by the tabloid media portrayals of European 'butter mountains' and 'wine lakes'

viii http://ec.europa.eu/food/food/biotechnology/gmo_ban_cultivation_en.htm

ix 'BBC Trust review of impartiality and accuracy of the BBC's coverage of science', BBC Trust, July 2011

x A decade of EU-funded GMO research (2001-2010), European Commission http://europa.eu/rapid/press-release_IP-10-1688_en.htm

xi Peer Reviewed Publications on the Safety of GM Foods, Dr. Christopher Preston, University of Adelaide http://www.agbioworld.org/biotech-info/articles/biotech-art/peer-reviewed-pubs.html

xii 'Green genetic engineering in Switzerland: low risk, high unused potential' Swiss National Science Foundation http://www.snf.ch

xiii http://www.cropgen.org/article_366.html

xiv http://www.senseaboutscience.org/

xv *'Global Warming and Agriculture: Impact Estimates by Country'*, William Cline, Peterson Institute for International Economics, 2007

xvi Ecological Footprint of European countries, European Environment Agency http://www.eea.europa.eu

xvii Global status of commercialised GM crops, ISAAA, 2011 http://www.isaaa.org/resources/publications/briefs/43/executivesummary/default.asp

xviii Brookes G, Yu TH, Tokgoz S, Elobeid A. The Production and Price Impact of Biotech Corn, Canola, and Soybean Crops. AgBioForum 13:25-52, 2010

xix Facts and figures – The status of global agriculture, Croplife International 2010 www.croplife.org

xx Global status of commercialised GM crops, ISAAA, 2011 http://www.isaaa.org/resources/publications/briefs/43/executivesummary/default.asp

xxi http://www.europabio.org/europes-foodprint

xxii *The Science of Things That Aren't So*, Prof Bruce M. Chassy, Forbes http://www.forbes.com/sites/henrymiller/2012/02/22/the-science-of-things-that-arent-so/2/

xxiii The Austrian experiment with mice fed with a hybrid GM maize from Monsanto, Prof Klaus Ammann, 2010 http://tinyurl.com/austrianmice

xxiv European Federation of Biotechnology http://www.efb-central.org

xxv Supply Chain Initiative on Modified Agricultural Crops (SCIMAC) http://www.scimac.org.uk

xxvi Global status of commercialised GM crops, ISAAA, 2011 http://www.isaaa.org/resources/publications/briefs/43/executivesummary/default.asp

xxvii 'Are Organic Farmers Really Better Off Than Conventional Farmers?', H Uematsu & A. K. Mishra, Louisiana State University http://purl.umn.edu/103862

xxviii 20 questions on genetically modified foods, World Health Organisation http://www.who.int/foodsafety/publications/biotech/20questions/en/

xxix A decade of EU-funded GMO research (2001-2010), European Commission http://europa.eu/rapid/press-release_IP-10-1688_en.htm

xxx http://www.europabio.org/what-do-europeans-think-about-gm

xxxi http://www.europabio.org/do-gm-crops-have-effect-soil

xxxii Impact of GM crops on biodiversity, Janet E Carpenter, 2011 www.landesbioscience.com/journals/gmcrops/CarpenterGMC2-1.pdf – Tillage means disturbing the topsoil in a field by ploughing, sowing, harvesting etc. In conservation tillage systems, old crop stalks, weeds and surface topsoil can be left in place for as long as possible. This prevents soil erosion, maintains moisture, and provides a better habitat for small invertebrates. Low-till systems are much easier to maintain with GM crops.

xxxiii When used with other forms of crop management techniques. Impact of GM crops on biodiversity, Janet E Carpenter, 2011 www.landesbioscience.com/journals/gmcrops/CarpenterGMC2-1.pdf

xxxiv https://cmsdata.iucn.org/downloads/ip_gmo_09_2007_1_.pdf

xxxv http://www.europabio.org/why-do-seeds-have-patents-are-gm-seeds-only-patented-seeds

xxxvi Global status of commercialised GM crops ISAAA, 2011 www.isaaa.org

xxxvii Global status of commercialised GM crops ISAAA, 2011 www.isaaa.org

xxxviii Global status of commercialised GM crops ISAAA, 2011 www.isaaa.org

xxxix Brookes, G., Barfoot, P. (2011), GM crops: global socio-economic and environmental impacts 1996-2010 http://www.pgeconomics.co.uk/pdf/2012globalimpactstudyfinal.pdf

GM crops: It'stimetothinkagain

www.seedfeedfood.eu