

uk2020

Rt Hon Owen Paterson MP
The Second Green Revolution

The Biotech Connection, AgriTrend 2015 Farm Forum Event

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Thank you for inviting me to speak today at the AgriTrend Farmers Forum an influential gathering of commercial farmers here in the heart of Canada's key growing areas.

This may seem like a strange place for a British politician to be invited to speak, but I want to set your commercial efforts and technological innovations into their wider context. The subjects you have discussed here in these last few days through keynote addresses, sessions, and in conversation and what you do when you return home to your commercial interests, are all part of a greater global contest, a call to arms in a desperate race against naysayers and doom merchants as we face a growing global population. I want to talk today about a second Green Revolution, the benefits of biotech - and specifically genetically modified organisms - and the threat posed by reactionary forces putting these advances in peril.

But first, I want to talk about one of my heroes, the father of the Green Revolution: Norman Borlaug.

I can remember as a child seeing traumatic news bulletins with images of starving people on the Indian subcontinent in the late 1960s. At that time, prominent American biologist Paul Ehrlich had stated in 1968 that,

"The battle to feed all of humanity is over. In the 1970s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now. At this late date nothing can prevent a substantial increase in the world death rate ..." ¹ Ehrlich was a prophet of doom, seeing catastrophe approach and his solution was to reduce the number of human beings on the planet.

Fortunately, there was one Iowa farmer and agricultural researcher ² who took a different approach. Norman Borlaug took wheat breeds he had engineered for the climate and soils of Mexico and bred them with varieties from Japan. The resulting dwarf wheat had short stems that wouldn't bow under the weight of their increased fruitfulness. He shipped 35 big truckloads of these seeds to the Indian sub-continent just in the nick of time as the monsoons failed and global grain surpluses were wiped out in 1965. ³ Over the next few years the new harvests saved hundreds of millions of lives, Norman Borlaug won the Nobel Peace Prize in 1970, and now India is a major food exporter. ⁴ Norman Borlaug was the father of the Green Revolution which saw modern breeding techniques increase yields, boosting the use and effectiveness of fertilizers, and saving over one billion lives in the developing world.

Most importantly, and this is critical, Borlaug did not give in to Ehrlich's wrong predictions. He found a way to feed a growing population.

Today we stand at the threshold of a Second Green Revolution. Advances in agricultural technology have reduced the use of chemicals, and are producing greater yields, feeding more people as our global population meets 7 billion, and moves rapidly towards 10 billion. We are sitting upon some of the most exciting scientific and technological advances mankind has known – and it is both good for the human race and good for our planet. And will finally end the shame of nearly one billion who still go to bed every night hungry and malnourished.

And yet, here, at the dawn of 2016, 40 years after Ehrlich was proved comprehensively wrong, we are faced by the same voices with predictions of doom at global progress, versus the farmers, agricultural researchers, and private companies - like you in Centennial Hall here today - rising to the challenge of feeding the world. It is your own commercial interests and profit-making agricultural enterprises that will determine the fate of many. The consequences of who wins this contest are colossal. It is why I am hugely grateful to be here this afternoon to encourage you all in your further adoption of biotech. The extended use

of genetically modified organisms will play a key role in the Second Green Revolution.

Advances in genetic science mean that we can be more accurate in the breeding process, enhancing seeds for a variety of pest or extremity in climate. Genetic modification is a huge leap forward from the haphazard and lengthy breeding processes we have been developing since the Stone Age.

As you will all know, breeding was at first simply a matter of taking the strongest stalks of corn, say, the ones with desirable traits, pairing them and hoping that the offspring stalks of corn would be taller and stronger. Weak looking plants were tossed aside. As agricultural understanding advanced, breeding experiments became much more elaborate and systematic. By the 19th century, Gregor Mendel established the scientific principles behind breeding, and his rules still apply.

The plants produced by this traditional process underwent massive genetic change—so much so that they often bear little resemblance to their ancient forefathers. Those wild ancestors were generally much smaller and much less tasty—if they were even edible.

Take teosinte, for instance, the ancestor of corn,⁵ which looks nothing like the robust corncob of today. It's a skinny green stalk with two rows of seeds covered in an unappetizing, dark shell. We think of corn as the bright yellow cob with 8 to 12 rows of exposed kernels. In fact, teosinte and maize are so dissimilar that it wasn't until 1930 that George Beadle, a graduate student at Cornell and future winner of the Nobel Prize, discovered the family relationship.⁶

Think about it. Over 10,000 years of domestication, teosinte was bred and crossbred millions of times, with uncounted traits and genes randomly exchanged. Slowly, the better traits were advanced until we ended up with the crop we enjoy today.

There is, in fact, very little in our diet today that hasn't been transformed by this process.⁷ As author and authority Henry Miller points out, "with the exception of wild berries, wild game, wild mushrooms, and fish and shellfish, virtually everything in North American and European diets has been genetically improved in some way."⁸

More recent breeding techniques have included using "wide cross" hybridization to move genes from one species to another, for the last 50 years.⁹ The process was used, for example, to combine the best attributes

of wheat and rye to create triticale, a grain that's high in protein and fibre, packed with vitamins, and low in sodium.¹⁰ It's used in flour to make bread, and even found in cereals bearing an organic seal of approval.¹¹

And induced mutation breeding, which began in the 1950s, uses ionizing radiation—the stuff emitted from exploding nuclear weapons—or caustic chemicals to trigger random mutation.

There's nothing wrong with these mid-twentieth century methods. But why rely on chance to come up with the right traits, when you can control and specify the process?

In the 1980s, biotech scientists perfected a technique for adding desirable traits that harnessed a process found in nature to precisely transfer genes in a controlled lab environment, and then, to select the useful transformants and discard the rest, just as seed breeders have weeded out the undesirable crosses for hundreds of years. The “Genetically Modified Organism”, the GMO, was born.

Using this advanced process, scientists know exactly what they are doing. They can transfer a single gene, or several specific genes from one plant into another. There's no guesswork. There's no chance. Only the desired

genes are transferred. Scientists know what they are doing at every step of the process.

Thus, a GMO is nothing more than a plant that has had its genetic makeup adjusted in a highly precise and scientific way.

The potential for this technology is vast. GM crops can fortify food with vitamins and antioxidants, so that the food we eat will make us healthier and stronger. For example, new biotech soya beans can produce higher oleic acid. When heated, they don't transform into the trans fats that elevate cholesterol levels.¹² Similarly, a biotech tomato is in development that mimics good cholesterol,¹³ which would help fight heart disease, which kills one out of every six men in the UK¹⁴ and ends 611,000 lives in the United States every year.¹⁵

GM crops also have the potential to eliminate allergens. Biotech peanuts, to give one example, may one day be enjoyed by anyone without fear of a severe reaction. Gluten-free GM wheat may soon offer bread that won't be harmful to those who suffer from coeliac disease.¹⁶ This product is now undergoing human trials, and as soon as it passes the extensive regulatory review, it will be available to consumers.

There are also GMO plants expressing traits that, for example, shield against contamination from mycotoxins—a severe threat to both human and animal health and which are responsible for perhaps one billion tons of food spoilage every year. The United Nations estimates that up to half of some food crops are affected,¹⁷ exposing not millions but billions of people in the developing world to these naturally occurring toxins that suppress the immune system, retard growth and cause cancer and liver disease in both livestock and humans.¹⁸

And it is those in developing countries that have the most to gain from GM. We have been growing biotech crops commercially for two decades now. Eighteen million farmers, of which 90 per cent were small and resource poor, planted a record 181 million hectares of biotech crops in 28 countries in 2014. Biotech continues to be the most rapidly adopted agricultural technology in history. Since their introduction, we have seen a more than 100-fold increase in the area of GMO crops planted, which today covers a landmass one and a half times the area of China.¹⁹ For the third year in a row, developing countries planted more biotech hectares than the entire developed world.

Farmers use these crops because they need them to withstand drought and a plague of destructive insects. They need the income it provides, which spurs development.

I would like to draw your attention to the dramatic example of insect resistant Bt cotton in Burkina Faso, where farmers are rapidly and overwhelmingly embracing the efficiencies and improved yields represented by the GMO variety.²⁰

By 2013, in fact, almost 70 per cent of all cotton grown in Burkina Faso was Bt, which increased farmers' yields on average 20 per cent over non-GMO cotton. It has also dramatically decreased pesticide applications – which in Africa are often done by hand, a 40 to 80 pound backpack filled with older pesticides strapped to one's back. Bt-cotton has cut those applications from 6 to 2 or fewer and delivers a solution that is eminently more effective.²¹

Within one season, Bt can transform the life of smallholder farmers, turning their farms into profit-making enterprises that allow them to send their children to school rather than out into the fields, and to buy their families enough to eat – and of course with better nutrition comes better health.

Yet even where farmers have voted overwhelmingly for a choice of GM technology and the benefits have been tested and demonstrated in numerous studies, the naysayers have been tireless in myth making and misinformation. Take the allegations of Indian farmer suicides. Anti-GM green groups stated that the introduction of GM crops had brought about an increase of suicides among India's farmers.

Professor Ian Plewis from the University of Manchester clarifies that farmer suicide rates in India are similar to the best estimates of the rates in Scotland and France, around 30 per 100,000 farmers. While these rates are still tragic, they existed at the same level prior to the introduction of GM cotton to India. He states, "In fact, the available data does not support the view that farmer suicides have increased following the introduction of Bt cotton. Taking all states together, there is evidence to support the hypothesis that the reverse is true."²²

And in the global context, over 80 per cent of the world's cotton crop has been GM for several years. The success of insect protected GM cotton has given Burkina Faso, one of the poorest countries in the world, a new tool to boost their main economic activity: cotton production. Farmers

have seen at least 66 per cent less pesticide applied, 20 per cent increase in yield, and at least \$87 per hectare increase in their profit.²³

Modern agriculture lets developing nations maximize the use of their resources. It's good for these nations, and it's good for the planet.

According to a recent study by researchers at Stanford University in the United States, without the advances in agricultural technology since 1960, we would need more than twice as much land to grow all the food we produce today.²⁴ That's almost two billion more hectares of ploughed land than today, more than the entire landmass of Russia, the largest nation on the globe spreading over nine time zones. Two billion hectares is more than twice the entire area of the contiguous United States. The equivalent of three Amazon rain forests.²⁵

So with more land available for conservation and wildlife, with increased yields, with less pesticides used, with poor smallholder farmers earning more, with more mouths fed, with less food waste, who could stand against such optimistic, forward thinking gains won through advanced technology?

The answer is that the army of naysayers and doom mongers resisting this second Green Revolution are vast. They are non governmental

organisations, environmental lobby groups, much of the ‘organic’ food industry giants, and a vast misinformed public in the developed world who are marketed into niche food fetishes based on emotion and anti-science. What is worse, is that Europe’s vast undemocratic and unelected government – the European Union – is being cajoled by environmental NGOs, like Greenpeace and Friends of the Earth, into abandoning science and resisting the adoption of genetically modified foods, thereby turning Europe into the museum of world farming and a vast exporter of superstition and anti-science to the developing world.

When I was the Environment Secretary for the British Government, I was shocked to see how embedded this resistance to progress was across the public sector, charities, and in government itself.

I had hoped that European countries would be excited about using their cutting edge science for innovative new products to sell to each other and to foreign markets. However, advances after rigorous scientific analysis were consistently blocked politically by different countries within the European Union. So much so, I worked with a number of countries, some of whom were anti-GM like Austria, in order to produce an ‘opt-out’ proposal. This would allow countries like the UK and Spain, who were keen to let private industry develop GM products to do so, while allowing

biotech industries to offer an opt out to member states who did not want to adopt GM. This opt out mechanism, allowed some companies to trade with other countries in third markets without incurring any legal challenge. The opt out proposal has since passed but, I am sad to say, that it has been greatly abused. A number of countries have simply taken the opportunity to ban the growing of any GM products, despite Europe importing vast amounts of GM product as animal feed.

This may seem utterly foreign to you here sat in Canada. But in Europe, science and innovation has given way to what is called the ‘precautionary principle’: the idea that if something could possibly cause harm, ban it.

The precautionary principle is so broad it effectively gives regulators the cover to restrict or ban anything at whim or according to whomever is exerting the most pressure. In other words, it replaces science-based regulation with politics. So that we end up with a limit on the amount of pesticides allowed in tap water, set at 0.1 parts per billion - the equivalent of one Tylenol tablet in an Olympic-sized swimming pool.²⁶

The EU finds itself in the ridiculous position that, according to its own pesticide regulations, it would have to ban coffee – and beer, and a

thousand other consumer items – if they were sprayed on fields rather than sold in grocery stores.²⁷

We also saw the precautionary principle in action with startling clarity in the battle over neonicotinoids, or neonics, which activists accused of causing a “bee-pocalypse,” an imminent extinction of bees. Large-scale field studies and massive real-world science do not back up this claim.²⁸ The EU’s own science didn’t back it up. Even at its most basic level, it was faulty: bee populations aren’t falling at a rapid rate. They’re not falling at all. For the last two decades that neonics have been on the market, bee populations have been rising, both in the EU and around the world.²⁹

I insisted that my government department based policy on science - and the science did not support a ban. This wasn’t a popular position. But the opponents were fierce on this one. I personally received 85,000 emails from environmental activists; very few of them were complimentary. Nor was my stance a winning position. The European Commission, as is its habit, caved in to the activists. They overrode their own scientists and banned neonics starting at the end of 2013.³⁰

The result was predictable. I say that because it was indeed predicted by farmers and others who said the ban would remove their best defence against insect pests and force them to use older, less effective pesticides that are worse for bees. Which is precisely what has happened: despite multiple sprayings with pyrethroid, England's oil seed rape crop has diminished.³¹

Oilseed rape plantings in Britain this year were down over 100 thousand hectares - or more than 13 percent - from 2012, the year before the ban,³² and the Association in Independent Crop Consultants project a 14% decline in harvests next year in 2016.³³

Europe as a whole is looking at a 15 per cent reduction in rapeseed this year as a result of the ban.³⁴ Another example of the precautionary principle creating realised risks.

Something needs to happen in Europe's sclerotic government where the precautionary principle is the main tool for doom mongers to jump on and kill any progress in Europe.

So in November last year, a group of European industrialists wrote a letter to Jean-Claude Juncker the president of the European Commission.

They suggested policy be measured not by the precautionary principle, but instead by “the innovation principle”.

They defined it as follows:

"The Innovation Principle represents a new and positive policy contribution and, we believe, can provide a vehicle for achieving your vision for European economic recovery. The principle requires that whenever policy or regulatory decisions are under consideration, the impact on innovation should be fully assessed and addressed. This new approach will boost confidence and thereby contribute to a genuine resurgence of innovative activity, job creation and economic growth in Europe."³⁵

So instead of weighing the risks of a new technology against nothing — perhaps against some perfect theoretical world — European governments would have to weigh both the risks and benefits of any proposed new technology against the risks and harms of existing technology: neo-nics against pyrethroids; electronic cigarettes against cigarettes; Bt corn against chemical pesticide treatment of corn.

It would force European policy makers to face up to the potential benefits of any innovation rather than just strike them down. And the innovation principle would have to assess whether any regulation was likely to stifle innovation.

In short, it would recognise that innovation is generally far more beneficial than a lack of innovation – for the obvious reason that we can select beneficial innovations and reject harmful ones.

It would compel bureaucracies and governments to champion innovation. As a politician in a country presently locked into the European Union, I can only hope that the unelected policy makers in Brussels will adopt the “innovation principle” and let forth an explosion in innovation that benefits our citizens and the world. It is why I am in politics.

But environmental groups are not content to just hoodwink policy makers at the European Union and government level. They also act with criminal intent to stop the science and force these advances from being realized.

Nowhere is that seen in starker relief than in Greenpeace’s war on Golden Rice. Developed 15 years ago by Professors Ingo Potrykus and Peter

Beyer, Golden Rice is a miracle grain enhanced with vitamin A-producing beta-carotene. In 2001, the professors donated their invention to the world in the hopes that it would be used to end the scourge of vitamin A deficiency.

Absence of a source of vitamin A in the diet, vitamin A deficiency, is the principal cause of childhood blindness globally, affecting 500,000 children annually. Of those half a million children, about 50% die within a year or two. Vitamin A deficiency is also a nutritionally acquired immune deficiency syndrome, so common diseases which should be survivable are lethal. Two million young children die as a result every year.³⁶

So let's be clear. Although these deaths are preventable, 6,000 children who were alive this morning will be dead tomorrow.

Had Golden Rice been a part of their diet—this crop could have been introduced years ago—millions of young eyes and millions of young lives, primarily in Africa and South Asia, would have been rescued. Although there have been legitimate delays in development, Golden Rice hasn't happened because organizations like Greenpeace, with a war chest estimated at US\$500 million, have rallied the forces of doom in a global

campaign to frighten the public about GMOs and to pressure governments into keeping Golden Rice off the market.

Greenpeace originally claimed Golden Rice wouldn't work, but once its effectiveness had been proved beyond a shadow of a doubt, the group switched to saying that the poor should simply buy vitamin supplements and eat fresh vegetables instead³⁷.

Greenpeace have in effect said that those living on less than \$2 a day cannot even have the choice to benefit from technological innovation.

In 2013, an organization in the Philippines that lists Greenpeace amongst its partners, violently attacked and destroyed the agricultural research facilities they oppose.³⁸ The group—known as MASIPAG—bused in a mob of anti-GMO thugs from the city who trampled their way onto the field so they could rip the young plants out of the ground.³⁹ A Greenpeace Southeast Asia spokesperson condoned the attacks.⁴⁰

In 2011 Greenpeace attacked GM wheat in Australia, which was the first field trial in Australia of a crop designed to enhance the health benefits of this food staple.

In January, I visited the CSIRO Experimental Station at Ginninderra in Canberra where the attacks took place. They told me how they were broken into and research plants were cut down.⁴¹ The GM crop trial plots were destroyed. In one of the few occasions in which Greenpeace has been called to account for its criminal and immoral behavior, two Greenpeace activists were prosecuted and received suspended sentences. Greenpeace admitted liability and paid a fine of \$282,560.⁴²

Patrick Moore, one of the early leaders of Greenpeace in the 1970s, has broken with his old organization for just this reason. He now works to expose Greenpeace's actions in the developing world and has joined with Golden Rice inventor Ingo Potrykus in calling for the organization to be tried for crimes against humanity.⁴³ It is why I was thrilled that Prime Minister Modi is working to suspend Greenpeace from activity in India.

Those who oppose this Second Green Revolution share exactly the same fatalistic pessimism as Ehrlich 40 years ago who stood by as millions died of starvation. They share a basic loathing for human beings, seeing our species as a pestilence, the main part of the problem. Much of the environmental movement equates technological advance with damage to the environment and are hell bent on a return to some sort of pre-Industrial, subsistence living utopia.

But this mindset has disastrous consequences for those who still live at subsistence levels— those rural farmers in the developing world attempting to move up from subsistence farming, and whole countries that are trying to build thriving modern economies around increased agricultural production.

The Kenyan-born Calestous Juma, Professor of the Practice of International Development at Harvard Kennedy School, is a former executive secretary of the UN Convention on Biological Diversity, who has repeatedly slammed the EU for strong-arming African nations not to grow GM crops and threatening to cut off imports and aid if they dare to assert their independence.⁴⁴

In a recent essay he said, “It is estimated that Africa imports nearly 83 per cent of its food. African leaders are seeking ways to feed their peoples and become players in the global economy.”⁴⁵

He told us at UK 2020, my think tank in London, that European opposition to GM means that locally researched innovations for regional diets cannot be developed fully. While Africa can provide organic products for a niche market, it is unable to develop GM products for the

European market or itself. Along with the debilitating effects of having aid made conditional on not adopting GM, Africa will not be able to develop a rigorous, full blooded agricultural economy, and all that would spring up around it - such as infrastructure and other jobs, technologies and markets.

I was at Cornell University earlier this year, and spoke to a scientist from Uganda, where cassava is a critical and staple part of their diet. A GM disease resistant variety is being developed. She told me, “Europeans don’t understand what it is like to see neighbours in your village dying of poisoning from rotten cassavas.” She simply couldn’t understand European hostility to GM.

Put in its simplest form, an Africa able to feed itself, is more likely to have stable governments and prosperous societies, and with it a hope and a future that reduces the push factors of migration and drivers of poverty and hostility in which terrorism is able to take foot. Not only that, but it will in time create plentiful markets for many of your companies to trade with.

But it is worse than that. Not only is Africa not able to feed itself, not only is it importing 83 per cent of its food, in part because of European

policy, but Europe, which sits on some of the most fertile land on the planet, imports food from the rest of the world which requires the equivalent of 35m hectares of someone else's farmland to produce.

One small example illustrates why. US maize yields have overtaken those of France in the last 20 years.⁴⁶ This is not just because France doesn't use GM crops, but is part of a broader failure to embrace better seed breeding or the rapid adoption of data driven support tools. As a result, France is missing out on 0.9 tons per hectare of maize yield across their whole production area of 1.5 million hectares. If French yields had kept pace with those in the USA they could be growing the same total maize harvest on 150,000 less hectares, land that could be spared for nature, recreation or forestry. Or, by more efficiently farming the same area, they would have an extra 1.4 million tons of maize. This "missed yield" is worth \$150 per hectare to each farmer and could be worth \$225M to French agriculture.

In Europe there is an abandonment of science, and governments are turning their backs on technology that would both boost domestic production, help world trade, invigorating development and growing stability in Africa. But here in North America, and across Asia,

commercial and government interests are on the right side of the Second Green Revolution.

We must continue to reject the fear mongering of environmental lobbyists for the sake of feeding the planet, creating a better environment, and boosting geo-political stability.

The UN just dramatically increased its estimates of world population growth, which they expect to soar by over 1 billion in the next 15 years and reach 9.7 billion by 2050—well within many of our lifetimes.⁴⁷ How are we going to feed them if those NGOs who bully governments into ignoring innovation and science, and destroy publicly funded scientific trials attempting to establish life saving advances in GMOs such as Golden Rice?

Should we listen to those environmental groups working in the tradition of Paul Ehrlich? For As Norman Borlaug said ten years ago, “There are 6.6 billion people on the planet today, with organic farming we could only feed 4 billion of them. Which two billion would volunteer to die?”⁴⁸

But the answer is, of course, none.

Those of us in this room, biotech industrialists, businesses, farmers, and politicians, we stand against those who have no message of hope, we press on with the adoption of innovation, science, and technological progress for the sake of a global population, where every life is valuable.

Thank you very much.

REFERENCES

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- ¹ Ehrlich, Paul R. (1968). *The Population Bomb*. Ballantine Books.
 - ² http://www.eco-imperialism.com/PDFs/Playing_Games_With_Starving_People_-_Chapter_Excerpts.pdf
 - ³ Conway, G, *One Billion Hungry Can we feed the world?*, Cornell University Press, 2012, pp. 42-46
 - ⁴ <https://www.agra-net.net/agra/public-ledger/features/analysis-indian-food-export-boom-targets-african-markets-457337.htm>
 - ⁵ <http://maize.uga.edu/index.php?loc=ancestors>
 - ⁶ http://www.nytimes.com/2010/05/25/science/25creature.html?_r=0
 - ⁷ <http://www.project-syndicate.org/commentary/henry-i--miller-on-the-meaningless-distinction-between-genetically-modified-organisms-and-their-conventional-counterparts>
 - ⁸ <http://www.project-syndicate.org/commentary/henry-i--miller-on-the-meaningless-distinction-between-genetically-modified-organisms-and-their-conventional-counterparts>
 - ⁹ <http://www.project-syndicate.org/commentary/henry-i--miller-on-the-meaningless-distinction-between-genetically-modified-organisms-and-their-conventional-counterparts>
 - ¹⁰ <https://www.organicfacts.net/health-benefits/cereal/triticale.html>
 - ¹¹ <http://m.wholefoodsmarket.com/blog/heres-whats-new-september>
 - ¹² http://www.gmo-compass.org/eng/news/519.usa_new_gm_soybean_higher_oleic_acid_content_approved.html
 - ¹³ <http://phys.org/news/2013-03-tomatoes-mimic-actions-good-cholesterol.html>
 - ¹⁴ <http://www.nhs.uk/Conditions/Coronary-heart-disease/Pages/Introduction.aspx>
 - ¹⁵ <http://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>
 - ¹⁶ <http://acsh.org/2015/09/gm-bread-making-promising-strides-against-celiac-disease/>
 - ¹⁷ <http://www.fao.org/docrep/U3550t/u3550t0e.htm>
 - ¹⁸ http://www.ifpri.org/sites/default/files/publications/aflacontrol_wp04.pdf
 - ¹⁹ <http://www.isaaa.org/resources/publications/briefs/46/pressrelease/default.asp>

²⁰http://www.isaaa.org/resources/publications/biotech_country_facts_and_trends/download/Facts%20and%20Trends%20-%20Burkina%20Faso.pdf

²¹ See for instance, Krishna VV, Qaim M (2012) Bt Cotton and sustainability of pesticide reductions in India, *Agricultural Systems*, Volume 107, pp 47–55, <http://www.sciencedirect.com/science/article/pii/S0308521X11001764>. For a general overview, see:

[isaaa.org/resources/publications/biotech_country_facts_and_trends/download/Facts%20and%20Trends%20-%20Burkina%20Faso.pdf](http://www.isaaa.org/resources/publications/biotech_country_facts_and_trends/download/Facts%20and%20Trends%20-%20Burkina%20Faso.pdf);

<http://www.idrc.ca/EN/Resources/Publications/Pages/ArticleDetails.aspx?PublicationID=666>

²² <http://theconversation.com/hard-evidence-does-gm-cotton-lead-to-farmer-suicide-in-india-24045>

²³ <http://www.asa3.org/ASA/meetings/belmont2013/papers/ASA2013Greenplate.pdf>

²⁴ <http://www.pnas.org/content/107/26/12052.full.pdf+html>

²⁵ <http://greenstate.tv/resources/detail/saving-natural-habitat-and-preserving-species-the-story-of-modern-agriculture>

²⁶ Anderson (Report), The effect of The Loss of Plant Protection Products on UK Agriculture and Horticulture and the Wider Economy, <http://www.nfuonline.com/andersons-final-report/>

²⁷ http://www.realclearmarkets.com/articles/2013/06/11/less_risk_more_bodily_harm_100392.html

²⁸ <http://www.forbes.com/sites/jontentine/2013/04/11/science-collapse-disorder-the-real-story-behind-neonics-and-mass-bee-deaths/2/>, and

<http://www.forbes.com/sites/jontentine/2014/02/05/bee-deaths-reversal-as-evidence-points-away-from-neonics-as-driver-pressure-builds-to-rethink-ban/>

²⁹ <http://www.agprofessional.com/news/bee-population-rising-around-world>

³⁰ <http://www.eureferendum.com/blogview.aspx?blogno=84472>

³¹ <http://www.thetimes.co.uk/tto/opinion/article4227789.ece>

<http://www.rationaloptimist.com/blog/bees-and-pesticides.aspx>

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/469400/structure-june-ukcerealoilseed-statsnotice-20oct15.pdf

-
- ³³ <https://www.fginsight.com/news/oilseeds-to-see-significant-shrinking-as-restrictions-and-low-prices-bite-7913>
- ³⁴ <http://www.bloomberg.com/news/2015-01-08/bugs-invade-europe-as-save-bees-cry-spurs-pesticide-ban.html>
- ³⁵
http://www.riskforum.eu/uploads/2/5/7/1/25710097/innovation_principle_letter_4_no_v.pdf
- ³⁶ WEST, K. P., Jr, KLEMM, R. D. W., SOMMER, A., Vitamin A saves lives. Sound science, sound policy, *Journal of the World Public Health Nutrition Association*, Oct 2010, Vol. 1, Number 5;
- YOU, D., JONES., G., WARDLAW, T., Levels & Trends in Child Mortality Report 2010, United Nations Inter-agency Group for Child Mortality Estimation, United Nations Children's Fund, p. 1
- ³⁷ <http://www.allowgoldenricenow.org/the-crime-against-humanity>
- ³⁸ <http://news.smh.com.au/breaking-news-national/greenpeace-attacks-canberra-gm-wheat-crop-20110714-1hflf.html>;
- <http://www.independent.co.uk/environment/greenpeace-gm-crop-attack-declared-legal-698440.html>
- ³⁹http://www.slate.com/blogs/future_tense/2013/08/26/golden_rice_attack_in_philippines_anti_gmo_activists_lie_about_protest_and.html?original_referrer=http%253A%252F%252Ft.co%252FXWJCWmVTCF
- ⁴⁰ <https://www.newscientist.com/article/dn24021-militant-filipino-farmers-destroy-golden-rice-gm-crop#.UhjDkWT08Vk>
- ⁴¹ <http://www.abc.net.au/news/2011-07-14/20110714-greenpeace-gm-protest/2794272>
- ⁴² <http://www.abc.net.au/news/2011-07-15/scientists-condemn-greenpeace-gm-cull/2795482>
- ⁴³ <http://www.allowgoldenricenow.org/the-crime-against-humanity>
- ⁴⁴ *Independent*, 3 June 2013, Europe's GM stance denies Africa the right to feed itself, warns leading academic; <http://www.independent.co.uk/news/science/europes-gm-stance-denies-africa-the-right-to-feed-itself-warns-leading-academic-8641327.html>
- ⁴⁵ <http://www.capx.co/how-the-eu-starves-africa-into-submission/>
- ⁴⁶ <http://faostat3.fao.org/browse/Q/QC/E>
- ⁴⁷ <http://www.un.org/en/development/desa/news/population/2015-report.html>

⁴⁸ www.normanborlaug.org/knatvig/FOREWORD_Kendall.doc

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