

Is modern farm technology a saviour or a threat?

Dr Elizabeth Finkel, Chief Editor, Cosmos Science Magazine

Crawford Talk: 27th August, 2014, Parliament House, Canberra.

Cosmos magazine explored that question this March on the occasion of the 100th birthday of Norman Borlaug, the man whose Green Revolution set Asia on the path to food security and development. Most of the world have never heard of Borlaug and his Green Revolution. For those who have, many see the Green Revolution as the beginning of modern agriculture's woes.

In our special issue we set ourselves the task of unpacking that paradox.

As a journalist, it behoves us to be a proxy for the public. We are the ones privileged to tour through the knowledge jungle guided by experts. We need to think up the incisive questions and drill down to the bottom of the issues.

And then, it behoves us to come up with some sort of sum-up. Like a judge summing up for the jury after the courtroom's cross-examination of the evidence.

So what are the most important questions to ask about modern agriculture in general and GM specifically?

To me they are: Is it safe for humans? Is it safe for the environment? Does it benefit farmers? Especially do they benefit farmers in poor countries; perhaps an illiterate African woman living at the end of a dirt track. These are the farmers who really need the help both to rise out of poverty and to feed their countries as populations continue to soar in Africa and India.

It's often said, that the world already produces enough food. That may be true but it's hard to see how excess corn grown in the US will solve the problems of food security and poverty alleviation in Africa.

It's also important to explore the opposition, which in certain quarters grows ever more virulent. Europe is generally hostile to GM, particularly France. It's also at odds with its own scientific advice – chiefly that from EFSA and its Chief Scientific Adviser – Ann Glover. In March green groups invaded the offices of EFSA. This July, nine NGOs took the extraordinary step of requesting that the European Commission do away with the position of chief scientific advisor altogether.

Well before I take you through the cross-examination of the evidence, let me do things in reverse and give you my sum-up.

And that is that the attack on modern agriculture does not at all serve the public or the planet or farmers. Though the various opponents fly the kites of sustainability, protecting the environment, and helping poor farmers, their stance seems to put them at odds with those causes.

Farmers are smart and will pick the solutions that suit them. No-one is trying to block them from using organic methods if they so choose. Indeed they work very well for

Sulawesi coco farmers, as La Trobe University's Phil Keane finds, and insects can be used to control pests in China's rice paddies as Geoff Gurr from Charles Sturt University has found. But different methods work better for large scale crops.

So why are activists or NGOs or governments trying to dictate to farmers just how they should farm?

But let me back track and take you through the journalistic cross-examination.

Is it safe? The question is: compared to what? Nothing is 100% safe when it comes to food. The worst toxins are to be found in moulds like those that grow on corn, or the bacteria that can contaminate bean sprouts. Mycotoxins cause acute illness, cancer, and sometimes death. In 2004 in Kenya, 125 people died and nearly 200 others were treated after eating homegrown contaminated maize. In 2011 in Germany, there were 45 deaths and 3,785 illnesses from eating spouts.

So is modern agriculture good or bad for our health? One statistic speaks very loudly. Take a look at studies in the human lifespan. For instance James Vaupel's paper in *Nature* in 2010. He's director of the Max Planck Institute for Demographic Research. There's a telling graph. It charts lifespan in the US, Sweden and Japan since 1860. There's a small rise from 1860 to 1950. Then the slope takes off. Between 1950 to 2000, lifespan went up from 70 to 80. Vaupel says it shows no signs of slowing down – its rate of increase is now 2.5 years per decade. And it's not that people are piling up like junk in the nursing homes. They are reaching old age in better health. As Vaupel put it, "senescence has been delayed by a decade". So it's true, 50 is the new 40.

The real hike in the longevity curve came since 1950, just as modern agriculture was coming online. Of course lots of things contribute to longevity. But clearly those railing against the woes of modern agriculture should take a look at this. If it's so bad for us, please explain?

So is GM safe? If you are guided by what the world major food safety agencies have to say after 25 years of testing, then you'd have to say yes, as safe as anything produced by agriculture. Arguably much, much safer, because it has to run a gauntlet of safety testing.

Most of the two thousands or so studies are indeed done by industry (just as is done for pharmaceuticals). But some 10% of studies are independent and the majority concur.

Occasionally a paper comes along raising alarm over GM maize for instance – often by the same authors. Most recently from Giles Seralini and colleagues from the University of Caen. Their original paper published in Sep 2012 in [Food and Chemical Toxicology](#) was widely ridiculed by statisticians and retracted in November, 2013. Last June 24, it was republished largely unchanged by [Environmental Sciences Europe](#).

If this was a courtroom analysis, you'd have to think the jury would weigh the evidence from the world's regulators and independent scientists as winning the day. Staggeringly the French government seems to be most swayed by the Seralini line.

Is modern farm technology good or bad for the environment?

You'd have to say good. Green Revolution wheat and rice plus fertilizer, chemicals and irrigation produce a greater yield on the same footprint, and that spares land. Since 1960 the world population doubled, but food production tripled while consuming only 12% more land.

Rockefeller University's Jessie Ausubel estimates that without modern farming, the world would have needed to grab the equivalent of two South Americas for farming. Some of that spared land has been given over to conservation. India's forest cover has actually increased since 2005.

Overall when it comes to the overuse of chemicals seen in the 1970s, the trigger that prompted Rachel Carson to ring the alarm bell in her book "Silent Spring", we are seeing a big trend in the right direction. Much of that is due to snazzy technologies that allow the farmer to be much more frugal – so-called precision farming. US farmers for instance reduced their pesticide use 6% each decade between 1980 – 2007. And the energy used to make each bushel of corn declined by 43%.

Gains from GM crops.

The poster child here is Bt cotton. I think it's fine to use a poster child if you are putting an entire technology on trial. Because if you can show a great benefit from one then surely this argues that a death sentence for the entire technology is unwarranted. It's not a *carte blanche* for everything but GM is not asking for that. It is painstakingly regulated on a case by case basis.

Cotton is the world's biggest consumer of pesticide, 16% of the world's pesticides are used here – and some of them are nasty like endosulfan, an organochlorine. It's banned in 80 countries including Australia, US, EU, Canada. But not yet in India where cotton is grown by small scale farmers. Bt cotton was introduced here in 2002 and took off – some 93% of farmers use it.

As a result the use of chemical pesticides dropped by 50% in India; in particular, the use of the most toxic types of chemical like endosulfan was reduced by 70% reduction.

That's had a huge health benefit: a 2011 study found some 2.4 million farmers are not getting poisoned each year

Bt has also cut pesticide use by 50% in China, and by 80% in Australia.

Does it help farmers?

Clearly it helps farmers, particularly small famers; the great thing about seeds is that **they are scale neutral as US political scientist Robert Paarlberg put it.**

It's estimated that 90% of the 17M farmers growing GM crops are poor.

So back to the poster child. In India, farmers are spending less on pesticides so they make a bigger net profit. (And 2.3 million each year are not getting poisoned). Bt Cotton farmers incomes have increased by nearly 4-fold, according to a 2012 study in India: On an all-India level, the cultivation of hybrid Bt cotton seeds has seen the average income of farmers more than double! Take a look at this extract from the Hindu, dated August 29th, 2013

Union Agriculture Minister Sharad Pawar ..said that the Indian farmer was more-wise than him. They understood what crops should be taken. "When 93 per cent of cotton growers are using this seed [Bt.cotton], .. they are the sensible people."

Because of the use of Bt.cotton seed, cotton production had gone up from 137 lakh bales to 352 lakh bales. The use of pesticides had dropped from 46 per cent to 21 per cent as the seed was disease-resistant. ...On farmers' income, Mr. Pawar said prior to Bt., in 2001, the total income per hectare was Rs.7,558 in the rain-fed area. After the introduction of Bt., the income had gone up ..Rs.16,000 and in the irrigated area, it touched Rs. 25,000 per hectare. "So, Bt. has established all the benefits and advantages to the farmers and to the nation," he claimed.

*Meanwhile, **Neha Saigal of Greenpeace India**, has charged that Mr. Pawar's "continued flawed pitch for promoting GM crops and denial of scientific evidence on the adverse impact of this technology is a huge threat to farming livelihoods and food security."*

So let's talk about the opposition to modern agriculture and particularly most vehemently to GM.

What's it all about? What is Greenpeace, that champion of all good things alluding to?

Scan through the literature and it seems to come down to the following:

1. Lack of safety and bad effects on environment. On the weight of evidence, I think the courtroom can dismiss this one
2. They don't work. DISMISS: if they didn't work why do 93% of farmers use it?
- 3.They harm farmers economically because they have to keep buying seed. DISMISS: farmers are doubling their profit with GM cotton.

4. Corporate takeover , especially against Monsanto.

On this last one, hmmm...It's been dubbed "Monsanto derangement syndrome". I can't really say that it makes any sense to me. All big companies merit suspicion.

The bottom line is that GM has been tarred by association – yet many not-for-profits are developing GM, like IRRRI or CIMMYT or CSIRO. I think the courtroom just has to say: we reject the argument of "guilty by association".

Most of this courtroom (attendees of the Crawford Conference) probably agree with my ruling. That wasn't the case with the correspondence we got after the Cosmos Food Wars issue. We were accused of being corporate mouthpieces, and told that our tone was insulting. Our evidence, based on rigorous science and the views of expert agencies was rejected in preference to other views. As the "judge", we tried to advise readers how to weigh different kinds of evidence. That coming from a French scientist whose paper has been rejected should not be given superior weight to the views of the world's expert bodies. Clearly for many readers it made no difference.

So what is to be done?

You might say - not really my job to worry. I've done my journalistic cross examination and sum-up. And maybe trying to change peoples' opinions is futile. There are plenty of studies showing that evidence is not all that important when it comes to peoples' views. Dan Kahan of Yale calls this "cultural cognition". People are most influenced by the view of the group they identify with – their tribe. Kahan has staggering data on climate science that shows scientific education is almost irrelevant to peoples' views. Instead its tracks with whether they see themselves as liberal Democrats or conservative Republicans. Kahan saw a much smaller link with attitudes to GM; liberal Democrats rate it riskier than do conservative Republicans. In Australia, a 2012 government study also found peoples' values predict their position though 30-80% thought it acceptable at some level. In general public opinion seems to be softening. Another 2012 survey suggested 50% accept GM, compared to zero a decade ago.

So as a journalist should I care? I do very much. My job is to chaperone scientific evidence as it makes its way into the public arena. I am still appalled by the wanton attempts to mutilate it.

When I see Greenpeace spread the story of India farmer suicide as a result of GM crops, I wonder what's going on. <http://www.tonu.org/2013/04/20/a-talk-with-rajesh-krishnan-of-greenpeace-india/>

It's a big organization with clever people. Can they really believe that? Suicide is an endemic and longstanding problem caused by going into debt. You can go into debt for borrowing money for chemicals, fertilizer, hybrid seed, your daughter's wedding or GM seed. Your crops can fail for lack of rain or floods. But they pin all the blame on Bt cotton, where the evidence of its benefits to farmers speaks for itself.

So journalists must keep putting out the evidence. Calmly, without hyperbole, lest they trigger tribal responses.

Evidence may not always win but without it we are back in the dark ages.