STUART AGNEW MEP

A PERSONAL INVOLVEMENT WITH GM CROPS (APRIL 2014)

If one had made the statement below to anyone with an education, thirty years ago, the response would probably have been something along the lines of: "that's progress for you, keep up the good work".

"In thirty years' time we will be able to reliably establish crops using 'no-till' techniques drastically reducing the risk of both wind and water erosion and drastically reducing fuel and horsepower requirement.

We will have found a way of avoiding 'fire-brigade' emergency reactive spraying of insecticides resulting in collateral damage to beneficial insects and the risk that the spraying would in any case be too late to prevent the transfer of a debilitating virus disease to the crop.

The difficulties of insecticide storage, transport and safe application in less developed countries would disappear. Initially, this would be achieved by the crop producing its own insecticide, but a few years later the crop would be bred to be unattractive to insects and the serious problem of insects mutating to resistant strains would be overcome.

We will have bred a potato that is tasty to eat, yet has a total, natural resistance to late blight. This, at a stroke, will delete the practice of spraying increasingly expensive fungicides that employ ever more complicated chemistry onto the crop every week for a maximum of 19 permitted applications, and still finding blight at the end of the summer.

We will have made serious strides into the research of creating leguminous maize and wheat, helped by the donations of a very wealthy philanthropist who understood the significance of the world's food supply being so dependent on nitrogen fertiliser produced from fossil fuels.

We will have learnt how to improve human health and indeed save lives by the nutritional enrichment of rice and other grains.

We will have found an alternative way of satisfying our requirement for omega 3 oil, and thus remove the need to depend solely on dwindling fish stocks for this resource.

We will have solved the problem of wheat gluten allergies that affect about ten per cent of our population.

We will have abandoned the practice of irradiating seeds to force unpredictable mutations, which might well result in serious environmental consequences.

We will have bred crops that are far more tolerant to dry or saline conditions along with fewer requirements for phosphate and potash fertilisers, the manufacturers of which were in a position to dictate price to the industry.

We will have successfully put these new ideas through every safety test that has been devised.

We will have witnessed the keenness of farmers to invest their own cash in the seeds that produce these benefits, repeatedly year after year despite the extra costs, with the stabilising effect of healthy competition between the suppliers of those seeds.

The farmers would also have the comfort of knowing that once patents have expired, they can maintain these varieties on their own farms, free of charge without any redress from the breeders.

The technology that achieved this is called: Genetic Modification or Genetic Engineering.

As we now know, the reaction to these developments in many quarters is far from positive. We have witnessed outright hostility that has gone to the extremes of intimidation and rural terrorism. The EU has been influenced by this hostile sentiment to such a degree that it has simply abandoned its own rules on scientific assessment.

How on earth did all this come about?

I believe that it is the result of a pincer movement from two different pressure groups that started in the mid nineties. One of which had a great deal to lose from the widespread adoption of this technology, and the other which was desperate to find something to hate.

If you read the promotional material from the Organic Farming fraternity thirty years ago, it relied heavily on a phrase similar to *"pesticide-drenched food from crops, devouring unsustainable quantities of imported fossil fuels"*, to deride the products of conventional farmers.

The spectre of conventional farmers adopting a technology that could make this dramatic statement redundant was an anathema so great, that any means must be used to discredit the new GM technology.

Meanwhile, the break-up of the Soviet Union and the fall of the Berlin Wall were creating a major headache for the communist sympathisers of Western Europe. The demonstrable failure of communism did nothing to diminish their hatred of capitalism; hatred so entrenched that it was their way of life. So, they looked around for another reason to hate capitalism and the concept of big business destroying the planet gained popularity and the Green Party was born.

With a name like that, they were soon soul mates with the organic farmers, but one strange anomaly in this otherwise perfect marriage was quietly buried. Organic farmers required higher prices for their product, whilst the former communists were traditionally against anyone personally profiting from supplying 'the people' with their food.

A common enemy was required, who could transcend these differences, which could be identified, and loathed.

Enter Monsanto.

As a very young farm manager, fresh from college in 1971, I was in the vanguard of the 'spray it with everything' approach to arable farming. Herbicides, fungicides, insecticides, growth regulators, trace elements. You name it, I was at it, and doing a lot of the work personally in unsocial hours to catch the best conditions. It didn't always work! However, my three employers over that decade backed my spending (they were all at least a generation older, and must have harboured reservations about this) which resulted in a wheat crop in 1979 yielding

four tonnes per acre, one of the very first in Norfolk and at a time when farm managers were bragging about getting three tonnes.

I became familiar with the names of the companies who produced the inputs that I used: ICI, Shell, Ciba-Geigy, Hoecsht, BASF, Bayer, and Dupont etc. There was one product I used called "Ramrod", a herbicide for the few acres of brassicas I grew, which was manufactured by a firm called Monsanto. I used no other product of theirs and wondered how they could possibly survive in the UK market with such a pathetically small share of it. I must confess to even feeling a little sorry for them!

That perception changed virtually overnight with the dramatic arrival on the market of a product with the trade name of "Round-up" and the chemical name Glyphosate.

In those days, the biggest problem weed to arable farmers was the perennial 'couch-grass' or 'twitch'. This weed seemed to thrive on annual ploughing, could easily halve yields and made harvesting the cereal crop difficult as the couch-grass was still green and damp whilst the cereal straw was dry.

Our only method of control was regular stubble cultivation after harvest, but that required the soil to be moist enough initially to allow the roots/rhizomes of the couch-grass to be easily up-rooted, followed by dry weather to desiccate and exhaust the rhizomes. Any rain shortly afterwards could allow the roots to re-establish. In some years, the hard work paid off, in others a lot of fuel, time and wearing parts were wasted.

Some farmers would resort to repeat applications of Paraquat, but this is a most unpleasant and toxic desiccant, that only destroys the green leaf.

The arrival of Round-up in the mid seventies could be regarded as one of arable farming's major steps forward. The material was translocated through the couch grass into the roots which were slowly killed. As long as the weather was dry for a day after application, it could rain all it liked thereafter because the chemical was part of the plant. There were other benefits. Round-up could be applied pre-harvest onto couch-grass that was standing above a nearly ripe cereal crop. This dried out the weed making harvest easier and also making the following stubble burning operation far more effective as well. A good burn was a really useful contribution to the effort involved in controlling slugs and blackgrass.

The safety aspect for those applying Round-up was a huge improvement over Paraquat, and in fact any other herbicide on the market. There was no foul odour and no irritation to the skin. There was an environmental benefit as well. This material broke down immediately on contact with the soil so there was no risk of contamination in water courses. In common with any new introduction to agriculture, farmers were cautious at first. Word however got around very quickly that Round-up was highly effective.

Monsanto of course priced their product to what they thought the market could bear, and it transpired that the market could bear a very great deal! At £17 per acre, a full dose equated to about half of the cost of the farm rent. In those days, combine harvesting could be hired in for £12 per acre. Never before had farmers paid so much for a single application of a weed killer. This was all the more remarkable in the knowledge that further applications of different herbicides would be required during the growing period of the crop.

Despite this they purchased Round-up to use over a higher proportion of their farms each year, learning the circumstances where reduced rates could be effective, or how to enhance low dose rates by the addition of 'wetter's. Other perennial weeds such as docks and thistles were well controlled and the material could also be used very effectively at a light dose to kill emerging weeds on a 'stale seedbed'.

There was one short cut that was not worth making. It was no use going in with the plough once you noticed the weeds starting to die. This disturbance would interrupt the process and the weeds would re-emerge. You had to wait until the weeds were truly dead before any cultivation. Impatience in this respect has personally cost me money over the years.

Monsanto, as a consequence of the success of Round-up, were suddenly big players and making good money from their product. This state of affairs would however be limited by the expiry date of their patent on Glyphosate, after which, all and sundry could put their "me too" much cheaper versions on the market.

The spectre of such an event was obviously a stimulus to their next move. Monsanto had learned that a particular bacterium was resistant to Glyphosate and that this bacterium could be inoculated into the seed of a cropping plant. The resultant crop could therefore be sprayed with Glyphosate and survive, whilst ***all*** the surrounding weeds died.

This was a big step forward because of what it implied. It should now be possible to dispense with all the other selective herbicides used on the growing crop and to dispense with the heavy cultivations prior to the planting of the crop. All the weeds could be controlled in one fell swoop later in the season. This in turn would greatly reduce the risk of soil erosion.

Perhaps the most interesting aspect to this breakthrough was the added factor that if seeds were inoculated with the bacteria by a process of gene transfer, the crop would grow to produce seeds that were automatically endowed with a resistance to Glyphosate. It would not be necessary to always inoculate each new generation.

From being a major force in the agrochemical industry, Monsanto suddenly became a major force in the seed industry.

I recall first hearing about this significant development in agriculture at a meeting of the Norfolk branch of the NFU in Norwich. The same question jumped from everybody's lips simultaneously:

"What about the volunteers?" By this we were referring to the seeds shed by such a crop germinating and becoming a nuisance in themselves, because they could not be controlled by Round-up.

We were assured that the seeds of commercial crops would be prevented from germinating as part of the deal. This had another unintended benefit. It meant that 'sprouting on ear' during a wet harvest should not happen with the consequential loss of quality and yield.

The concept of planting crops that could not reproduce themselves was not new to farmers. We were aware that a process known as 'male sterility' took place in the field scale production of hybrid seed, and also that attempts to plant the seeds produced from a hybrid variety could result in a crop that would unpredictably revert to the genetic make-up of any of its four grandparents.

Shortly afterwards, Monsanto announced that they could breed a crop, using their new genetic engineering techniques, that would contain an insecticide in its sap. This had massive implications. It meant that in theory, at least, an end to the insect-transmitted viral diseases of crops. No more charging in with crop sprayers

engaging in what was termed “revenge spraying” or killing the insects *after* the virus had been transmitted.

American farmers, individuals who had never been slow to adopt new methods, made no exceptions here and Monsanto’s sales flourished. Other Agrochemical companies were not far behind. Syngenta had been able to breed crops resistant to their desiccant Gluphosinate Ammonia (sold as ‘Challenge’ in the UK.) This brought in an element of competition to the market.

One sector of agriculture was less enthusiastic. Organic farmers suddenly found it much harder to talk up their own product. In effect their fox had been shot and their hounds had nothing to chase. Monsanto’s crops implied far less use of pesticides. Something needed to be done to discredit this new direction taken by agriculture.

The Green movement in the EU had organised itself as a Pan European Political Party, which automatically qualified it for EU funding and a right to interfere in any EU member State. It only needed organic farmers to complain about the activities of a large corporation, and the fact that GM technology was coming to Europe and the EU Green lobby went into overdrive. Aided by the advent of the internet, and the ease of spreading misinformation through it, they attacked Monsanto and GM technology on a number of fronts, in what became a successful campaign to frighten people.

This was done very cleverly by the posing of questions;

Q: How do you know it’s safe to eat?
A: It has passed all the safety tests used on other new crops, and there have been no negative reports.

Q. But can you prove that no one will be adversely affected?
A: No, but…….

Their first target was the aforementioned fact that the GM crops could not reproduce themselves. Although not a new concept in agriculture, it was presented as the method by which large companies would “own the worlds food supply” by inserting a “terminator gene” into the crop that would oblige farmers to source their seed from the breeder in the same way as the acquisition of hybrid varieties. “Terminator gene” was a very clever phrase quickly taken up by the media. One of

the arguments put forward by the anti-GM lobby was that the terminator gene could transfer itself into other plant species and kill them off. This is the equivalent of a doctor advising an infertile male patient that he should refrain from unprotected sex, in case he passes his infertility on to his sons! One would have thought that this logic would have prevailed in the discussion, but such was the volume of outrage about the very concept of a terminator gene, that logic never got a look in.

In the face of this barrage of predictions of Armageddon, Monsanto agreed to withdraw the "terminator gene". Immediately, of course, the spectre of nuisance 'volunteer' plants came back into the frame and Monsanto would need to use another method for protecting their intellectual property rights.

Plant breeders have a right in this respect that lasts for twenty years. This period also includes the years spent in trials since the date the new variety was registered. Royalties from a successful variety have to cover the costs of research required to develop that variety, but also the costs of other varieties abandoned along the way for different reasons.

Since I became a farm manager in 1971, the one single feature that I have witnessed as the main driver of agricultural progress has been the astonishing achievements of plant breeders. Sugar beet has to be mentioned here. A big drawback of growing the crop in the early days was the cost of 'singling' by hand labour in a short time frame. A sugar beet 'seed' was actually a 'cluster' of 2-4 seeds. A precision drill could plant a cluster every few inches, as the site for the ultimate root, but three plants would emerge from each site, tangling around one another to the extent that instead of one big taproot appearing there would be three very small misshapen roots producing a totally uneconomic yield. Careful hand hoeing was required to select the best looking plant of the cluster, whilst destroying the others. Very large numbers of individuals with hand hoes were required. The plants needed to be large enough so that job was possible, but not so advanced that yield was already suffering. If this window of opportunity was accompanied by wet weather, the task was not only slowed down, but beet plants that had been hoed out could easily re-establish themselves.

Sugar beet is naturally a biennial crop, but is harvested for its root in the first year. Left untouched this root becomes the energy source for a substantial plant growing up to five feet tall in the second year bearing several hundreds of 'clusters' of seeds. The plant breeders noticed that the very occasional cluster contained just a single seed. The cluster needed to be physically broken carefully with a knife (or

similar tool) to establish the number of seeds within it. In some varieties the incidence of ‘singles’ appeared slightly higher than others. The breeders then set about a marathon project of only planting singles in the hope that the resultant crop would only yield ‘singles’. In practice it might yield a higher percentage of singles but not singles exclusively. With relentless selection for singles, eventually a variety emerged that did indeed only produce one seed in each cluster. This was known as a “monobeet” variety.

One could describe the above as an early exercise in Genetic Modification.

There was a problem, however. By selecting relentlessly for the monobeet trait, all other facets were ignored and the yield potential of monobeet was perhaps 15% less than multibeet competitors.

Despite this drawback, and the fact that monobeet seed cost more to buy, farmers increasingly converted to it. The cost of the dreaded singling operation, the difficulties in getting enough hoers to do it effectively and the influence of unfavourable weather were well worth a cash price to avoid. The farmer simply had to plant a few more acres of a much more easily managed crop to fulfil his quota.

From this tiny genetic base of ‘single clusters’, the breeders then had the challenge of increasing yield. For twenty years the yield increases were very small. Sugar beet varieties now regularly yield three times as much as the multibeet varieties of the 1960s. It has been a magnificent achievement.

The only financial reward for the breeder is a time limited royalty on the sale of seed, or a licence fee from a farmer who multiplies up the variety for his own use on his own farm. To me, it is blindingly obvious that the breeders must benefit from their endeavours; otherwise there is no incentive for them to work at all. Many farmers though are uneasy with this concept, and bitterly resent being asked to contribute to a technology that they are well aware that they benefit from. The war cry is: “it is my right to sow my own seed”.

If Monsanto thought that by dispensing with the terminator gene they had got the activists off their backs, they were mistaken.

The next ploy of the anti GM lobby was to refer to GM technology as a huge step into the unknown that could result in very serious unexpected consequences down the line. What they did not appear to appreciate was the method it replaced;

irradiation of seeds to force mutations. This method of plant breeding was hundreds of times more likely to produce unpleasant surprises. Logically the Greens should have vehemently opposed this. They simply chose not to. The fact that organic farmers were already happily using varieties bred by the use of irradiation may have had something to do with that choice!

However, fear is a powerful tool which produced another catchphrase 'frankenfood' to describe GM crops. Again this was very effective, but it would have seemed a far more fitting description of irradiated seeds.

The Greens now concentrated on environmental damage in the form of lost bio-diversity caused by GM crops. No formal work had been done on this in the USA, so it was agreed by the EU (who have the sole right to allow GM crops in Europe) to organise field trials, where the effect on bio-diversity could be scientifically assessed.

Maize was the first GM crop to be trialled in the UK and volunteers were called for. I do not grow maize and, at that time (circa 1998), only had a passing interest in the new technology.

An NFU colleague of mine, William Brigham, who farmed about 20 miles from me, along with his two brothers had agreed to host a maize trial. He grew maize as part of his rotation (silage for his dairy herd) and therefore could utilise the harvest from the 'Control' area of the crop. The GM and non-GM maize crops were duly planted and managed in different ways for weed control.

Early one summer morning, the family became aware that there was a tractor working in the maize field and hurried over to investigate. What they witnessed astonished them. A tractor with a mower attached was steadily mowing down the crop accompanied by about 25 individuals variously using scythes, sickles and other tools to damage the maize. The gate to the field had been re-secured after the entry of the trespassing tractor to make it difficult for anyone else to gain access.

The brothers' reaction was in my view heroic. Despite being unarmed and heavily outnumbered they challenged these vandals. One of the brothers quickly fetched a telescopic handler, sorted out the gate, drove hard across the field and using the pallet tines, rammed the mower. The damage was sufficient to stop it working.

The stress of the confrontation caused one of William's brothers to suffer an angina attack, and of course the police were called.

As soon as I heard the news, I rang William and offered my full support and sympathy, and at that moment made the decision to get personally involved, if the opportunity presented itself.

I regarded those who invaded William's farm as self-righteous hooligans who were not remotely justified in destroying a fully authorised agricultural crop trial. Amongst their number was a 'peer of the realm' who really should have known better. There was a subsequent court case and to my disgust these so called 'activists' effectively got away with armed invasion of private property.
This result sent out the message that unacceptable behaviour was acceptable, if it was under the banner of "anti-GM".

In 1999, there was a call for volunteers to host three year trials for other GM crops. Syngeta wanted to trial their oilseed rape that was tolerant to the total herbicide Glufosinate Ammonia. Monsanto wanted to trial their sugar beet that was tolerant to Glyphosate.

Volunteers should own their land, or have written consent from their landlord. My situation was as follows: I owned some land in Suffolk but did not live there, whilst my main farming operation was (at the time) purely based on rented land in Norfolk, where I lived. I went through the motions of approaching the landlord of my Norfolk arable farm to grow a trial of GM sugar beet, but I expected and received his polite refusal.

The land in Suffolk was heavy (high clay fraction) and therefore unsuited to sugar beet, but perfect for oilseed rape. At 50 miles distant though, it would be very difficult to defend. However, I put my name forward and made contact with Syngenta.

All the arrangements were put in place. The standard rules were that the GM crop would comprise five acres, with at least the same area alongside farmed conventionally, as a 'control'. The site was posted on the internet as required by the rules. (This of course made it very easy for the activists to locate). I had a supportive contractor lined up to perform all the tractor operations and purchased a caravan that I intended to park in the field and occupy, for as many nights as practicable. This was not going to be easy, as such a commute was time and fuel

consuming and I was already very busy. In particular, I was concerned to leave my wife alone with the children. My father-in-law very helpfully offered to stay overnight with them himself.

One aspect that I needed to really think through was how I, alone and unarmed, would deal with an invading tractor plus an army of yobs. There was not much point in being present, if I took no effective action. I had to avoid delivering serious injury, but at the same time put a stop to this nonsense, whilst staying intact myself. I was able to come up with an idea, part of which could be rehearsed. I can confirm that the rehearsal was successful, but will say no more on this subject!

With a few days to go before planting the crop, I received a telephone call from my brother who lived fairly close to my Suffolk land. He was most aggrieved by my plans as he felt that activists would target his house (assuming it was mine) and that life for himself and his family could be made extremely difficult. There was logic to this argument that I could not deny. With the same surname as me, his family might well be in line for intimidation, and the William Brigham affair was still news.

With a very heavy heart, I explained the situation to Syngenta and informed them that I must withdraw. I felt utterly miserable. All around was news of farmers pulling out of trials because of fear of intimidation and I was going down the 'jelly route' myself. The Syngenta man must have realised how badly affected I was by this, because he called round at our house that evening. I explained that I felt like a batsman at a cricket match who has persuaded the captain to 'put him up the order' and then got out first ball. I will never forget the reply of the Syngenta rep: "Don't forget there is always a second innings".

The number of sites taking part in these nationally organised trials was, in itself, important. It needed to exceed a threshold that was statistically reliable which, from memory, was about 70.

Fortunately there were about 85 when I pulled out at the last minute, so my departure was not critical.

During that summer (2000), a GM debate was held in the Norwich Sports Centre. Speaker after speaker stood up from the floor to say what appalling risks we were taking with GM crops. Many of these people described themselves as 'geneticists' and insisted, to frequent applause, that the trials should be stopped immediately.

There were a lot of students present from the University of East Anglia, who had found something new to hate. There were also present some of those individuals who had invaded Brigham's Farm, and they were lauded as heroes. I have been to meetings before where one side gets going and those who oppose feel isolated and fearful of speaking and this was happening here.

Eventually, the Chairman asked if anyone from the floor was prepared to speak in favour of the trials. The very last thing I wanted to do was stand up in that huge hall and speak to a hostile audience. I reasoned though that here was at least an opportunity to salvage my self-respect which had taken a real battering, when I pulled out of the trial.

I therefore outlined why I thought that this technology could be of great help to food production and was listened to with groans of disapproval until I stated that I had been forced to abandon my own trial, when there was a burst of thunderous applause!

The chairman then announced the debate over, remarking that the house was "almost unanimous" in its verdict. That phrase resulted in a lot of filthy looks in my direction, and only then did I realise how important it was to many of them, to boast a 'unanimous' result.

What was really heartening though was the number of people who came up to me afterwards wanting to shake my hand. In particular, young science students from the UEA. I walked out of there head held very high indeed.

Shortly afterwards, I received a call from someone asking me to confirm if I occupied land on the site of RAF West Raynham. I agreed that I did and he then accused me of hosting a GM crop trial. I explained that the land I occupied was permanent grassland and I was prohibited from ploughing any of it. He was most insistent that the map reference of a GM trial site had been advertised as being on my land and it was no use my denying it. I stoutly denied it, but pointed out that I was happy to be considered one of the 'villains', even if it was not true!

The truth emerged a little later. My neighbours, the Raynham Estate had agreed to host a trial on land immediately adjacent to my holding. I was delighted by the news and offered to keep an eye on it and confront any suspicious looking individuals. Despite this, one morning I noticed areas of the GM sugar beet crop had been flailed down by a strimmer. Fortunately the beet regrew.

Later that year, I attended an NFU council meeting and the GM trials were discussed. It had been tough going for some of the farmers. One from Hertfordshire, Bill Fiddian, had had his buildings broken into and his combine harvester attacked. The tyres were slashed, hydraulic hoses severed, V belts slashed and electrical wiring pulled out. To his great credit, Bill said he would continue with the three year program, provided the police regularly checked his premises.

Brian Locke from Dorset had been 'visited'. He felt very isolated in his part of the world where there were no other trial sites. As a gentleman, in both senses of the word he did not seek confrontation, he felt he had done his bit, but was not prepared to continue.

The most sinister report was from the Raymond family in Pembrokeshire, (Meurig Raymond is now the President of the NFU). They had agreed to host a trial. Shortly before the planting of the crop, the telephone rang in the home of one of the tractor drivers. The man's wife unsuspectingly lifted the receiver to be met with: "if your husband's boss doesn't pull out of this trial, we know where your children go to school". She was traumatised by this experience and the trial was abandoned.

These stories re-motivated me to get involved. This was rural terrorism, pure and simple and I had seen enough of that in my days living in Rhodesia. It was absolutely crucial not to buckle to this sort behaviour. However, the problem remained; where to find the land?

We lived close to the site of RAF West Raynham and, in fact, I rented the grassland between the runways for grazing. The camp was, at that time, being wound down. No one was living on site, but military exercises were regularly held on the runways. Although I was prohibited by my grazing agreement from ploughing any land, (this could have made military exercises difficult) I noticed that opposite the Officers Mess there was a sports field that was now redundant.

I roughly measured it from the map and it came out at about twelve acres. This was good news indeed as the minimum plot size for the trials was ten acres (five for the GM and five for the control).

I contacted the Ministry of Defence and asked if I could plough this land up for a GM trial crop and pointed out that the Government were keen for these trials to be undertaken. To my great astonishment they agreed, and I was IN!

It was more appropriate for me to grow sugar beet on this land rather than oilseed rape. Monsanto were the firm involved in Sugar beet and so I offered the land to them as a trial site. They came and had a look, were happy with me and the land, and I was registered as a trial site.

We had a bit of trouble ploughing the field as the concrete circles used for discus throwing and shot putting were overgrown and invisible. The high jump and long jump pits were pure sand so that on these small spots nothing would grow. The submerged coconut matting on the site of the old cricket nets also caused some ripe language from the ploughman.

However, overall it was perfectly viable and in April 2001 I planted my first GM crop. This had to be done at the same time as the control plot. Monsanto's representatives personally supervised the filling of the drill with their seed and, I noticed, went to great trouble to make sure that they collected all unused seed.

As the weeks went by, we regularly sprayed the control crop with the usual mix of herbicides every ten days. The GM crop germinated and so did thousands of weeds which threatened to overwhelm it. I beseeched Monsanto to allow me to spray it with Glyphosate but they responded that that they were monitoring the crop and would let me know the time to spray.

During this phase, we experienced a 'Norfolk Blow', a strong wind with enough velocity to pick up grains of sandy soil and blast them against the young sugar beet plants, causing severe defoliation. However, this only occurred on the non-GM side of the field. The GM site was so heavily populated with weeds that they formed a stabilising mat over the ground and the wind was unable to pick up sand particles.

At last the order came to spray the Glyphosate and, as I drove the sprayer through the crop, it was difficult to see the beet as they were smothered by grass and nettles up to a foot high.

Within a few days, all this material was turning orange as it died and the only survivors were the rows of green beet looking more and more obvious, as time went by. I noticed over the next few weeks that the decaying vegetation of the dead weeds was forming mulch on the ground and created a good habitat for birdlife.

Right from the day of drilling, scientists in white coats would come at regular intervals and assess the flora and fauna on both sides of the field. Small metal jars were sunk into the ground to catch insects which would be counted.

I wondered what efforts would be made to intimidate me. These came in the form of silent telephone calls at night and a 'black fax'. This is where the sender of a fax feeds in several sheets of black paper. The recipient fax machine would be held up for hours, days even, trying to blacken a white sheet of paper. We had no email in those days, so the fax was relatively busy. It was inconvenient to have it out of action, but I felt I had got away lightly.

The financial arrangements with Monsanto were as follows. They provided the seed FOC along with the Glyphosate. This I had expected, but was pleasantly surprised when they offered to pick up the bill for all contract work on the GM plot and the fertiliser cost. I was not allowed to send the harvested roots to the beet factory (despite the fact that it was a superb crop), they had to go to landfill, which seemed an appalling waste to me, but those were the rules. Monsanto purchased the crop from me for £600 per acre which is about what it would have yielded, had it been sold to British Sugar.

I witnessed the harvesting of the crop and went back home to tell my wife that all had gone well. She was, however, far more interested in the TV where there were images of two high rise buildings on fire in New York. 9/11, of course.

During the autumn, I went to a gathering of 'GM croppers' in London. I was most disgusted to hear that a farm had been invaded by 'activists' who set about trashing the crop and the police who arrived promptly, just stood there and watched.

It meant that if we were to protect our crops from such vandalism, we would have to act on our own. We all swapped telephone numbers and agreed that if there was trouble we would give one another moral support, at the very least and go in person, if that was feasible. The problem of course was that we were scattered about the country and it would just take too long to get to a stricken farm.

There were three of us in Norfolk though, where mutual assistance was a viable proposition.

I had another problem of my own. I needed another field, as I could not grow beet on the same land in successive years.

Out of the blue, the field beside our house came up for sale. The Long Field it was called and it consisted of 37 acres. Beet had not been grown on it for three years, meaning that it could be cropped with beet in 2002. My bid was successful and we were in business for another GM trial crop.

Monsanto were hugely relived at this news. More farmers had dropped out as a consequence of intimidation and we were now down to the bare minimum for the number of trials to be statistically sound.

Meanwhile, Greenpeace and Friends of the Earth, etc, were crowing on the airwaves "look, the farmers are voting with their feet. They have seen sense and are abandoning these trials!" That really made me angry and more determined than ever to give absolutely no quarter, if it came to a physical confrontation.

I recall that, at about that time, there was a GM debate advertised in my local town of Fakenham. The main speaker was Lord Peter Melchett, one of those who had invaded William Brigham's farm. Lord Melchett had inherited an estate in North West Norfolk, where he grew organic crops.

The debate was actually no such thing. It was a series of speakers who took turns decrying GM crops to a fairly full hall. I asked the chairman when the other side would be speaking and he said that there wasn't another side. I offered my services which were accepted, and with far more confidence than I had felt at the Norwich meeting, proceeded to counter some of the nonsense to which I had been listening.

Again, at the end of the meeting, it was heartening to be approached by several people individually saying, "thank God you turned up" or similar phrases.

My newly acquired field, the Long Field, was a very good subject for a GM trial. The previous owner had lost the battle to control wild beet/weed beet, and here was an ideal opportunity to demonstrate the benefits of GM technology. Wild beet, as the name implies, is botanically very similar to sugar beet, to the extent that any herbicides sprayed on to the beet crop will not harm the wild beet. This means that an expensive combination of mechanisation and hand labour (in particular) are the only methods of control.

There is a critical difference though, sugar beet is biennial with the roots being harvested in the first year. The crop, if left un-harvested, would then flower and seed in the second year.

Wild beet, on the other hand, is an annual plant. They grow very rapidly, benefiting from the weed control measures applied to the sugar beet alongside them. Each individual plant can reach 4ft tall, with a number of branches that shade out the sugar beet and bear thousands of seeds that can remain viable in the ground for at least 15 years.

Therefore, it only needs lack of attention to detail in one year, for a farmer to incubate a serious problem, which needs real determination to get rid of. Mechanisation can reduce the competiveness of wild beet in a sugar beet crop but will leave enough wild beet plants to ensure that the problem is even worse, next time around.

There is only one solution. Every year the wild beet must be pulled by hand before they produce viable seed. My family and I are no strangers to this task!

As a consequence of this problem, many farmers have either stopped growing sugar beet on certain fields or given up growing the crop altogether.

Although, of course, I had no idea that one day I would own the Long Field, I drove past it most days and watched with professional interest the attempts of the owner to control wild beet there. He was losing the battle slowly over most of the field but had completely lost control along the southern side.

It would be very helpful to me, therefore, if I could target my five acres of GM beet on the part of the field where the wild beet were worst. I put this to Monsanto, who said that the siting of the trial was not their decision or mine. It was left to the monitoring scientists, who would want to choose a part of the field where bio-diversity was likely to be relatively high. Fortunately, there was a strip of trees along the south side of the field and indeed the scientists asked me to grow the GM beet in the south west corner.

Due to the anticipated wild beet problem, we delayed the sowing of the field to create a ‘false seedbed’ and kill the earlier emerging wild beet, before the sowing of the beet crop. This appeared to work with a good flush of emerging wild beet killed off. We then drilled the crop, both GM and non-GM (mid-May) and were

horrified to see another mass of wild beet emerging a month later. On the GM crop, Monsanto recommended any early Glyphosate spray at a low dose. This worked perfectly, killing all visible wild beet and leaving the green rows of GM beet.

I awoke early one June morning, it sounded as though there was a tractor working in the Long Field. I pulled the bedclothes over my head and couldn't hear the tractor, so it wasn't there! A couple of seconds later, my wife nudged me and said; "it sounds like a tractor in your GM crop". With the coward's option no longer available, I leapt out of bed, dressed, and jumped into the Land Rover. The few items I needed for this eventuality had been stored, ready for action, on the middle seat for some weeks.

I had rehearsed this moment in my mind, at least a thousand times, all though "they" had the initial surprise, I could still surprise "them". A big factor was the extent of damage already done, the purpose was to save the trial, not take revenge. The big question dominating my thoughts though was "how many of them are in the field?"

I could see the top of a tractor cab over the hedge, the good news was I could only see one, and furthermore it was working in the non-GM part of the crop.

I rounded the corner and stopped in the gateway, getting a full view of the field for the first time. There was one tractor at work with an implement on the front; it seemed too wide for a mower and also the crop immediately behind the tractor appeared un-damaged.

I was immensely relieved to see that this was no attack. It was my contractor, William Fake, using his initiative to tractor-hoe the latest flush of wild beet. We had agreed some weeks before that he would keep an eye on the crop and jump in with the tractor-hoe, when he deemed fit. I had no idea he was planning on 05.00 hour starts!

The wild beet was so bad on the non-GM side of the field, that a great expense was incurred with hand labour, the only option left. I abandoned three acres altogether because the problem was too great even for hand labour, spraying them off with Glyphosate to prevent the wild beet from seeding.

The GM beet was harvested early, as in the previous year. This time I asked DEFRA if I could feed them to my sheep, rather than incurring the waste and expense of going to landfill. There was some logic in my request, as my sheep would later in the year be fed nuts or rolls whose protein content was GM soya. My request was turned down.

The trials were now over. A few months later, the zoologists and biologists confirmed that there was slightly less bio-diversity in the GM plots. This was no surprise to us growers, it simply meant there were less weeds, which was the purpose of growing the crops in the first place.

Over the next few years I kept up with GM developments by attending the annual 'Cereals' event, calling in on the Monsanto and Syngenta stands. Each year, a few more countries were growing GM crops and, each year, the scope of the crops themselves had increased.

In 2009, I was elected as an MEP, which gave me the privilege of being able to contact two of our plant breeding research centres in East Anglia and to invite myself for a conducted tour. They both readily agreed.

The first I visited was the John Innes Research Centre (JIC) near Norwich. Here I was shown a trial plot of GM blight resistant potatoes. These had been randomly planted amongst conventional potatoes. It was now September, and all that could be seen of the non-GM potatoes were blackened and rotting stems. Blight had simply annihilated them. The GM potatoes were senescent, naturally, but no blight was visible.

I enquired whether blight spores had been deliberately introduced, but was assured that the non-GM potatoes had simply picked up the blight spores from the atmosphere. This had been a summer where blight was particularly bad (prolonged periods of certain temperatures and relative humidity levels had prevailed). A large-scale potato grower friend of mine had sprayed his crop 19 times, which is the permitted maximum and still the disease was not fully controlled. His 20 acres of organic potatoes were completely wiped out by potato blight, as this method of farming has no effective solutions to a serious blight challenge.

The researchers had identified a plant in South America, that whilst technically was a potato, looked like and tasted like a marble. It was however resistant to blight (or

Late Blight, which is the full name). It had not been difficult to isolate the desired gene and insert it into a conventional table potato.

It was disappointing to observe the expense and effort that JIC were obliged to expend on security fencing to protect the trial from activists.

JIC had also embarked on an ambitious project to transfer the leguminous properties of peas and beans into cereal crops, using GM techniques.

The gases in our atmosphere are dominated by Nitrogen. Peas, beans and clovers etc are capable of removing Nitrogen from the atmosphere and using it as a plant food. There is no need to apply Nitrogen fertilisers to such crops. Cereals and other crops require significant quantities of Nitrogen to be applied, in order to realise their yield potential. This can either be applied in the form of a synthetic material that is based on fossil fuels or farmyard manure, if this is available. Neither form of Nitrogen binds properly to soil particles and is, therefore, vulnerable to descending into the groundwater or being washed by high rainfall events into ditches, streams and, ultimately, rivers. Apart from the financial loss incurred, excessive quantities of Nitrogen in drinking water can cause health problems and, in rivers, can upset the ecosystem. However, careful management will very significantly reduce such risks.

Another feature of Ammonium Nitrate fertiliser, as purchased by famers in a granular form, is that it can be easily turned into an explosive device, if it gets into the wrong hands.

Bill Gates, the Microsoft philanthropist, has been suitably impressed by the work that JIC are doing, to the extent that he has gifted them £6 million to ensure that the research on this project is adequately financed.

In January 2012, I invited myself to the Rothamsted Plant breeding Research Centre at Harpenden in Hertfordshire. GM techniques were being used in a novel way to counter a most serious challenge that threatens crop production, the world over.

This is the ability of insects, and aphids in particular, to mutate into resistant strains that are not killed by insecticides. Mutation is the natural defence of species against annihilation and the rate of mutation worldwide now slightly outpaces the ability of scientists to produce new insecticides.

The physical damage to a plant caused by a feeding aphid is the minor element of the attack. Aphids carry and transmit viruses that can have a devastating effect on the yield of a crop. Furthermore, there is no cure for a crop suffering from a virus.

We need to stand back and consider a new approach and this is exactly what Rothamsted have done. It is well known that the peppermint plant repels aphids that settle on it. (In a similar context, grass will not grow under a beech tree, but thrives under an oak tree).

Rothamsted have been able to isolate the appropriate gene in the peppermint plant and transfer it into a wheat variety. I was present at the wrong time of year for aphid activity but I can confirm that the wheat was not mint flavoured. The tests had proved successful in the labs and this was the first year of a proper outdoor crop.

The directors however were desperately worried by a noisily advertised action day for the last Sunday in May where several thousand anti-GM activists were expected to come and destroy the trial plots. Police presence had been assured but both I and the directors were mindful of the pathetic behaviour of the police in Lincolnshire, some years earlier.

The directors asked me if I would be prepared to come and show some solidarity with them on the dreaded day and I was happy to oblige.

The weeks passed quickly as they do these days and, on the day before D-Day, I asked my sons if they would like to accompany me. Two were available and were absolutely up for it, without any hesitation; a very proud moment for me. The third would have come but was otherwise committed. I made it quite clear to them that if the police did a “Lincolnshire” I was not going to stand idly by. I was realistic enough to grasp that I did not have a hope in hell against 4,000 people armed with hooks, sickles, scythes and strimmers. However, if I dressed up in my protective gear and simply charged at them, the police would be forced to act. I might or might not be charged with disturbing the peace. I was prepared to live with that. (Incidentally this was *not* my tactic for defending my own trial a few years earlier).

It was absolutely crucial to me to prevent these activists from claiming they were unopposed.

The town of Harpenden is separated from the research station by a public park and the police had sealed off all entrances to the trail plots and were diverting the activists into the public park. Parking was at a premium in the town. I asked some local pedestrians where the parking was for the demonstration. To my surprise one of them asked whose side I was on. I replied I wanted to make a token defence of the trials. To my astonishment he broke into a smile and guided me to a convenient little slot in a back street. That small incident was a huge morale booster.

We walked into the park, past a couple of coaches, the first I presumed of many that would be shortly arriving. A group of policeman were present, asking individuals which side they were on as we streamed in. Similar, of course, to the separation of fans at a football match. Anti-GM activists to the west, supporters of Rothamsted to the east. Inevitably, the great majority were westbound.

The scene was reminiscent of a medieval battlefield. The opposing sides separated by a shallow valley with a few decorated gazebos on the activists' side. We were each handed a placard reading "I support science" (or similar wording) and then, as they say in the army, 'we hurried up and waited'.

I gave a couple of interviews to the local press, and we were all impressed by the scale of the police turnout. The access from the public park to the research station is via a gated lane. Mounted police were concentrated here and it was quite apparent that it would take a very determined effort to break through. For the first time in the months that I had been thinking about this day, I dared believe the trial might survive.

Looking across to the other camp, I became aware that, although there seemed to be a lot of people moving towards it, most of them were moving away, after a brief look. The permanent numbers around the gazebos were only slowly growing and time was moving on. The activists were merely providing an interesting spectacle for the locals enjoying a Sunday stroll.

We could hear music playing and some desultory singing, but no way was this an invading army.

I told my sons I wanted to see the whites of the eyes of these activists, and holding the placard firmly in front of me walked across the 'valley'. We agreed that if we all went it might attract the attention of the police.

There were some discarded leaflets lying on the ground in my path. They proclaimed that an organisation called “Take the Flour Back” was spearheading the protest. Indeed, stacked on a trestle under a gazebo were piles of buns and crusts. They appeared stale without the delicious smell of really fresh bread. The predominant smell was from a weed, but not the sort of weed to be found in a wheat crop.

Beyond the gazebos were microphones and individuals, with their backs to me, were addressing the activists. A fair haired man in a white shirt appeared to have the chairman’s role. He would give an anti-capitalist rant, and then invite another speaker to give another anti-capitalist rant. White-shirt would then give it another go before introducing someone else. His ‘guest speakers’ were quite obviously from other Continents.

I was standing with my placard, just behind them and to their left. My presence was proving a slight distraction, and a young man came forward towards me from the crowd. He asked in poor English why I was holding the “wrong” placard. We got engaged in a slow conversation (he could understand me very easily), which was perfectly amicable. He had come especially from Italy for the day. He suddenly declared he was wrong to be talking to me and merged back with his crowd.

I started trying to count them. They realised what I was up to and started shifting about. I put it at about 150.

White-shirt then announced they were going to sing a song and they started singing …….in French!

White-shirt then urged them all to link arms in preparation for a symbolic charge at the police. This was a most comical spectacle, with several of them seemingly reluctant to walk, let alone charge. They shambled down to the gate and stopped. White-shirt then stood on the fence holding an adjacent tree for support with one hand and a megaphone in the other.

Another anti-capitalist rant was forthcoming, but then he went on to say that they had very nearly managed to stop the GM trials ten years ago. At that point, I just couldn’t resist booming out: “I was one of those trial farmers and I am very proud of it.”

A number of people started towards me and for a second I thought that I had a fight on my hands. However, they were all brandishing notepads, journalists desperate to report some sort of a confrontation! As far as they were concerned, the day had been a complete anti-climax and I had provided the only excitement. I did a few interviews giving my name (but not rank and number). One of them must have done a bit of digging because the article in a national newspaper the following day 'outed' me as a UKIP MEP.

I later learned that several UKIP members were apparently deeply upset at my activities.

I have this to say to these individuals: "You have a choice. You can either support British scientists in British institutions successfully finding solutions to problems on British farms, or you can support the EU position on this technology. The EU position is to place emotion above science and to use your money to fund Green activists to destroy and decry British enterprise." (Friends of the Earth receive about £1 million per year from the EU). There was a subsequent isolated solo attempt to trash the trial, which was unsuccessful.

Up until very recently there has been a complete logjam on this subject amongst UK political parties. However, Owen Paterson the Conservative Secretary of State for Agriculture has started to take the lead in supporting the work our scientists are doing and, critically, wants British farmers to put it into practice. He is frustrated that the EU prevents him from doing this. I am frustrated because a significant element of UKIP wants to follow the EU.

UKIP's position on GM Crops is as follows:

"UKIP supports research into GM Crops, and will take the decision on commercial growing dependent upon the quantity of imported GM based food being consumed at the time."

At present, the following food items (non-organic) contain ingredients of GM origin, in varying degrees of likelihood, and varying degrees of proportion.

Poultry meat: chicken, turkey, duck
Eggs and egg products: quiche, cakes, mayonnaise
Milk and egg products: cheese, cream, butter, yoghurt, chocolate
Beef: stews, soups, mince

Pork: bacon, sausages, ham, gammon
Lamb, mainly early season
Farmed salmon
Margarine
Cooking oil
Rice, very small chance
Sugar, very small chance

Several medicinal products have been synthesised using GM technology. Insulin for diabetics is a commonly used example.

Cotton, and cotton wool, as applied to open wounds and natural bleeding, will be of GM origin.

After the 'Non- Battle of Rothamsted' another GM related issue started to affect my farming business.

As a producer of free range eggs, I am obliged to ensure that my feed is GM free. The ration consists of two main elements, wheat for energy and soya as the protein provider. All wheat is non-GM so that isn't a problem. Soya is imported from South America, where both GM and non-GM are grown. For many years the non-GM was easily available, but at an increasing price, as farmers wanted a premium for growing a less profitable product.

At the behest of the green lobby, the EU decreed that cargoes of non-GM soya must not contain any accidental GM material, whatsoever. "*Zero tolerance*" was the phrase. This was a classic example of emotion over-riding common sense. A cargo vessel of 60,000 tonnes is impossible to clean out to the last ounce. Soya meal from a GM cargo can cling to the side in humid conditions, and then fall away to mix with the new non-GM cargo in drier conditions. Mixing can occur in lorries and rail wagons in Brazil, and, of course, there could easily be admixture within permitted limits in the growing crop itself.

Checking for the presence of GM material in a non-GM cargo with the correct equipment is simplicity itself. The GM material standing out like different coloured Smarties in the tube.

Inevitably, a trace of GM material was found in a non-GM consignment and the ship was not permitted to unload. When this happens it precipitates a major crisis.

Queues of lorries waiting to take the material to feed mills where little stock is carried, return empty with the haulage bill passed to the customer. The farmer customers of the mills are obliged to find another supplier who will unsurprisingly take advantage of the situation. The ship itself, instead of collecting, say, a load of wheat for export is obliged to return across the Atlantic, through the Panama Canal, across the North East Pacific and unload in China, as a 'distressed cargo'.

Insurance companies pick up the majority of the tab but retaliate by wanting massively enhanced premiums for non-GM cargoes, plus 'excesses'.

Shippers effectively went on strike and the EU changed to a tolerance of 0.9% of GM presence. Some shippers felt this was unrealistic and looked for other cargoes; others raised their haulage charges to cover insurance costs.

On my farm this resulted in a steadily increasing cost for non-GM soya.

My eggs were dedicated by my packer to Sainsbury and McDonald's, both of whom, at the time, were taking a harder line on GM than other outlets, who were dropping their insistence on non-GM in the face of greatly diminished supply.

The crunch point was reached in August 2013, when three more shippers (comprising most of the remaining non-GM capacity) declared they would no longer carry non-GM.

The only overland source of non-GM soya was from the former Soviet Muslim republics. At a quoted price of £680 per tonne for this material, I phoned my egg buyer/packer declared *force majeure*. Either I should be allowed to use GM soya, or I would be forced to kill my 35,000 birds, because I could no longer afford to feed them.

A very tense 24 hours ensued, and then the welcome call came through that I could use GM soya.

The change to GM soya has resulted in no adverse customer reaction whatsoever.

In January of this year, Dr Patrick Moore visited Brussels and gave a presentation at an event about GM crops, which I attended. Patrick Moore is a co-founder of Greenpeace and led the organisation in the early years. He subsequently left them as he felt their agenda was becoming increasingly unrealistic and inappropriate.

One example was the Greenpeace attitude to GM crops, in particular:

'Golden Rice' - In South-East Asia, a couple of hundred years ago, rice would have been off-white or beige in colour. Occasional grains were, however, pure white and looked far more attractive. For this reason alone, the farmers and growers started to selectively plant seed that was white in colour and, ultimately, they achieved what was effectively a new uniform variety. They were unaware that they had bred out the carotene constituent of the seed. Carotene contains vitamin A.

Where vitamin A can be obtained from other food in the daily diet, its absence in rice will not matter. However, where rice is the predominant food, the shortage of vitamin A has serious consequences. Pregnant women will give birth to blind babies, babies who become blind and children who die young.

GM technology has been used to enrich rice with vitamin A, by inserting the appropriate gene from other plants. The real difficulty has been achieving the right quantity of vitamin A, in a grain of rice.

Early work did not incorporate enough, but subsequent work proved successful. Greenpeace has vigorously opposed this work from the outset and successfully trashed field trials of what is termed 'Golden Rice' (because of its colour, as changed by the presence of carotene).

Full details of this can be found by viewing Dr Moore's website: The Golden Rice Project.

The following day, I accompanied him to demonstrate against Greenpeace, outside their Brussels office. This was a very strange experience for them as, usually, they are the demonstrators. It was also a very strange experience for me.

It does seem utterly incomprehensible to me that the green lobby has reached such a state of righteousness that so few people are prepared to condemn them, for such utterly callous behaviour.

Since being elected I receive many letters from individuals attempting to convince me of the horrors and terrors of GM crops. It is a good example of the "Frankfurt School and Critical Theory". Someone puts a story on to the internet and

everybody forwards it on to everybody else. It is repeated so often "it must be true."

For the record:

The Monarch butterfly is thriving.

People becoming ill in rural Paraguay are suffering from exposure to toxic insecticides sprayed on to non-GM crops.

Dr Seralini's experiments on GM maize-fed rats have been rubbished by over 30 separate independent research institutions, in as many countries.

Suicides in India have been the subject of a marathon research project. There is no obvious link between suicides and GM crops. Suicides in certain parts of India have traditionally been above average.

Livestock deformities on certain farms

The GM rations on those farms are no different to the GM rations fed on farms clear of these problems. Virtually all farms in Europe and North and South America are feeding GM based rations.

Superweeds

In warmer latitudes, there are some weed species that have always been resistant to Glyphosate. In the absence of competition from other weeds, they are proliferating. I understand that, in most cases, the addition of the 1960s herbicide 'Dicamba' to the Glyphosate controls these rogue weeds (as it always used to). The acid test is farmer reaction. They will not invest in this technology, if they do not get results.

HOWEVER: There IS a super-weed in the UK cereal crops now; herbicide-resistant blackgrass. Starting in Oxfordshire a few years ago, it is steadily spreading and forces farmers to either fallow a proportion of their land, or significantly change their cropping. This weed is susceptible to Glyphosate and GM technology could easily breed wheat to tolerate Glyphosate.

On my own farm, I have been using Glyphosate since 1977. I can put my hand on my heart and say that I have no resistant weeds. Some (creeping thistle, wild chrysanthemum) need the maximum dose and plenty of time before ploughing.

Contaminating Organic Farms

People who live in glass houses should not throw stones. Organic farms are far more likely to play host to ergot, stinking bunt, loose smut, creeping thistle and potato blight than conventional farms. Natural agents can easily spread these problems considerable distances.

I believe there should be accurate labelling of food products with GM derivatives. The market must decide in the end and not the EU-funded green lobby.

The present attitude to this technology is akin to the way suspected witchcraft was dealt with in medieval times, with superstition and bigotry. If this is maintained, we will lose our scientists to other countries, which will, in turn, export GM food to us and our own farmers will not be able to compete.

Unnecessary soil erosion putting silt into rivers and unnecessary consumption of fossil fuel are the two certainties of remaining a non-GM crop country.

Many are convinced that GM crops are a huge step into the unknown. GM crops are, in fact, far closer to organic farming than they are to the use of synthetic materials on crops.

Both organic and GM recognise that nature may have a solution to any problem created by nature; they merely adapt the solutions they find in different ways.

UPDATE – JANUARY 2015

FBN-UK NEWS

Global GM crop plantings increase by 6 million hectares in 2014

The International Service for the Acquisition of Agri-Biotech Applications (ISAAA) has today released its annual report on the status of global GM crop plantings, showing a further increase of 6 million hectares in 2014 to a record 181.5 million hectares, grown by 18 million farmers in 28 countries. It marks the 19th

consecutive year of increased global GM crop adoption since the first commercial plantings in 1996.

Clive James, ISAAA founder and report author said: "The accumulated hectarage of biotech crops grown in 1996 to 2014 equals, roughly, 80 percent more than the total land mass of China. Global hectarage has increased more than 100-fold since the first plantings of biotech crops."

Key developments highlighted in the ISAAA report include:

- The United States continues to lead production at 73.1 million hectares, up 3 million hectares – a growth rate of 4 percent – from 2013.

- Brazil ranked second for the sixth consecutive year, increasing its hectarage by 1.9 million hectares from 2013 to 42.2 million hectares.

- Argentina retained third place with 24.3 million hectares.

- India and Canada both recorded 11.6 million hectares. India had an adoption rate of 95 percent for biotech cotton. Canola and soybean hectares increased significantly in Canada.

- Farmers in Bangladesh grew GM Bt brinjal for the first time in 2014.

- South Africa ranks as the leading developing country to grow biotech crops in Africa, recording 2.7 million hectares in 2014.

- Several African countries including Cameroon, Egypt, Ghana, Kenya, Malawi, Nigeria and Uganda conducted field trials on GM food crops including rice, maize, wheat, sorghum, bananas, cassava and sweet potato.

Further details below.

Biotech Crops Show Continued Growth, Benefits in 2014, Global Plantings Increase by 6 Million Hectares - ISAAA, 28 January 2015

In 2014, a record 181.5 million hectares of biotech crops were grown globally, an increase of more than six million hectares from 2013, according to a report released today by the International Service for the Acquisition of Agri-Biotech Applications

(ISAAA). With the addition of Bangladesh, a total of 28 countries grew biotech crops during the year. The 20 developing and eight industrial countries where biotech crops are produced represent more than 60 percent of the world's population.

"The accumulated hectarage of biotech crops grown in 1996 to 2014 equals, roughly, 80 percent more than the total land mass of China," said Clive James, ISAAA Founder and report author. "Global hectarage has increased more than 100-fold since the first plantings of biotech crops."

Since 1996, more than 10 food and fiber biotech crops have been approved and commercialized around the world. These range from major commodities such as maize, soybean and cotton, to fruits and vegetables like papaya, eggplant and, most recently, potato. The traits of these crops address common issues affecting crop benefits to the consumer and production rates for farmers, including drought tolerance, insect and disease resistance, herbicide tolerance and increased nutrition and food quality. Biotech crops contribute to more sustainable crop production systems and provide resilient responses to the challenges of climate change.

According to the report, the United States continues to lead production at 73.1 million hectares. Up 3 million hectares – a growth rate of 4 percent – from 2013, the United States recorded the highest year-over-year increase, surpassing Brazil, which has recorded the highest annual increase for the past five years.

The report also highlighted key benefits of biotechnology, including alleviation of poverty and hunger by boosting the income of risk-averse small, resource-poor farmers around the world. Latest global provisional information for the period 1996 to 2013 shows that biotech crops increased production valued at US$133 billion; in the period 1996 to 2012 pesticide use decreased significantly saving approximately 500 million kg of active ingredient. In 2013 alone, crop plantings lowered carbon dioxide emissions equivalent to removing 12.4 million cars from the road for one year.

These findings are consistent with a rigorous meta-analysis, conducted by German economists, Klumper and Qaim (2014), which concluded that GM technology has, on average, reduced chemical pesticide use 37 percent, increased crop yields 22 percent, and increased farmer profits 68 percent during the 20 year period of 1995 to 2014.

Bangladesh: a model for success

One of the smallest and poverty-stricken countries in the world, Bangladesh approved Bt brinjal/eggplant in October 2013. Less than 100 days post-approval commercialization began in January 2014 when 120 farmers planted 12 hectares of the crop throughout the year. Bt brinjal/eggplant not only brings financial opportunity to poor farmers in the country, but also drastically decreases farmer exposure to pesticides on the food crop by 70 to 90 percent.

"The timely approval and commercialization of Bt brinjal in Bangladesh speaks to the power of political will and support from the government," said James. "This lays the foundation as a model of success for other small, poor countries to quickly introduce the benefits of biotech crops."

The case of Bangladesh in 2014 reconfirms the value and success of public-private partnerships. The Bt biotech trait for brinjal – one of the most nutritious and important vegetables in Bangladesh – was donated by Mahyco, an Indian company.

"Public-private partnerships continue to increase the probability of timely delivery of approved biotech crops at the farm level," James said. "They will remain essential in the years to come."

The Water Efficient Maize for Africa (WEMA) Project is another example of a public-private partnership at work. Beginning in 2017, select African countries are scheduled to receive the first biotech drought tolerant maize, a food staple depended on by more than 300 million poor Africans. The donated biotechnology trait is the same as the DroughtGard™ variety used in the United States, which increased 5.5-fold in planted hectares from 2013 to 2014. This demonstrates strong farmer acceptance of the biotech drought tolerant maize.

New approvals address consumer concerns

In the United States, approval of the Innate™ potato was granted in November 2014. The Innate potato decreases production of acrylamide, a potential carcinogen, when potatoes are cooked at high temperatures. Furthermore, it increases consumer satisfaction while precluding up to 40 percent yield loss as the potato will not discolor when peeled and has fewer bruising spots. These attributes will have meaningful impact on food security as food waste continues as an important factor

in the discussion of feeding 9.6 billion people in 2050 and approximately 11 billion in 2100.

Potatoes represent the fourth most important food staple in the world. As such, a continuous effort is being made to improve the potato and combat losses due to diseases, insects and weeds, and other constraints.

Biotech-based control of the fungal disease late-blight, the most important disease of potatoes in the world, is already being field-tested in Bangladesh, India and Indonesia. Late-blight caused the 1845 Irish famine, which resulted in 1 million deaths. Biotech control of virus diseases and the Colorado beetle, the most important insect pest, are already available, but not deployed.

Status of biotech crops in Asia

In Asia, China and India continue to lead developing countries growing biotech crops at 3.9 million hectares and 11.6 million hectares planted in 2014, respectively.

The adoption rate of biotech cotton in China increased from 90 to 93 percent in 2014, while virus resistant papaya plantings increased approximately 50 percent. More than 7 million small farmers in the country continue to benefit from biotech crops and the latest economic data available indicates farmers in the country have gained US$16.2 billion since the introduction of biotech in 1996.

According to the report, India cultivated a record 11.6 million hectares of Bt cotton with an adoption rate of 95 percent. British economists Brookes and Barfoot estimate that India enhanced farm income from Bt cotton by US$ 2.1 billion in 2013 alone.

Developing countries Vietnam and Indonesia granted approval for commercialization of biotech crops to begin in 2015. This includes several hybrids of biotech maize for importing and planting in Vietnam and drought tolerant sugarcane for planting as a food crop in Indonesia.

Growth continues in Africa and Latin America

Having cultivated 2.7 million hectares in 2014, South Africa ranks as the leading developing country to grow biotech crops in Africa. Sudan increased Bt cotton

hectarage by approximately 50 percent in 2014 and several African countries including Cameroon, Egypt, Ghana, Kenya, Malawi, Nigeria and Uganda conducted field trials on several pro-poor crops including the food crops rice, maize, wheat, sorghum, bananas, cassava and sweet potato.

These crops can contribute to resilience and sustainability in the face of new climate change challenges.

In Latin America, Brazil ranked second, behind only the United States, for biotech crops planted in 2014. At 42.2 million hectares, this represents an increase of 5 percent from 2013.

Biotech crops impact food security, sustainability and the environment

From 1996 to 2013, biotech crops have increased crop production valued provisionally at $US133 billion; helped alleviate poverty for more than 16.5 million small farmers and their families – more than 65 million people, collectively – some of the poorest people in the world; and decreased the environmental impact of food and fiber production by reducing pesticide use, increasing land savings and reducing CO2 emissions.

According to Brooks and Barfoot, had the additional 441 million tons of food, feed and fiber produced by biotech crops from 1996 to 2013 not been produced, an additional 132 million hectares of conventional crops would have been required to produce the same tonnage. This required increase in hectares could have negative implications for biodiversity and the environment due to an increased need for cultivated acres.

By the numbers

- United States continued as the lead country with 73.1 million hectares, a year-to-year increase of 4 percent, equal to 3 million hectares.

- Brazil ranked second for the sixth consecutive year, increasing its hectarage by 1.9 million hectares from 2013.

- Argentina retained third place with 24.3 million hectares.

- India and Canada both recorded 11.6 million hectares. India had an adoption rate of 95 percent for biotech cotton. Canola and soybean hectares increased significantly in Canada.

For more information or the executive summary, visit www.isaaa.org.

About ISAAA:

The International Service for the Acquisition of Agri-biotech Applications (ISAAA) is a not-for-profit organization with an international network of centers designed to contribute to the alleviation of hunger and poverty by sharing knowledge and crop biotechnology applications. Clive James, Emeritus Chairman and Founder of ISAAA, has lived and/or worked for the past 30 years in the developing countries of Asia, Latin America and Africa, devoting his efforts to agricultural research and development issues with a focus on crop biotechnology and global food security.

http://www.isaaa.org/resources/publications/briefs/49/pressrelease/default.asp