ASSET MANAGEMENT

“WHO’S AFRAID OF GM FOOD?”
A MYTH-BUSTER FOR SUSTAINABLE INVESTORS

As an asset manager with a specialism in Sustainable Investing we are sometimes asked what our position is on Genetically Modified or Transgenic organisms. Here, we critically examine the credibility of the arguments and defences for using genetically modified crops as a tool to get more out of less, and in a less harmful way.

The return of the repressed

During the febrile opening years of the 21st century, insults like ‘Frankenfoods’ and ‘Luddites’ were hurled across the pitched battle field of the British newspapers. Then the debate on GM food went quiet and has stayed that way for a decade – until recently. The spectre of permanent food price inflation, climate change and concern about our ability as a planet to feed an extra two billion mouths by 2050 has prompted scientists, in the main, but even some hitherto hostile environmentalists such as Mark Lynas and a founder of Greenpeace to urge a re-appraisal of GM. We need to feed the world somehow while not exacerbating environmental problems like climate change, water availability, fertilizer use and forest loss that, in turn, undermine stable agriculture.

Fig. 1 Global area of biotech crops: million hectares (1996-2013)

[Graph showing the global area of biotech crops from 1996 to 2013 with a note: Developing countries overtake developed in acreage of GM crops grown.]

Source: ISAAA, 2013
A 10,000 year backstory

It was 1996 when the world’s first commercially available genetically modified (GM) food arrived on UK supermarket shelves; rather improbably and without fanfare, a tomato puree made from GM tomatoes. An executive from the company that became synonymous with GM, Monsanto, caught the brewing malaise when he is reported to have said that whatever people thought about using GM to make insulin, “monkeying around with food would be greeted with deep scepticism” (Pringle, 2005). That suspicion has a long lineage. In ‘The Mower against Gardens’, the 17th century English poet Andrew Marvell described genetic modification of flowers by traditional means:

“No plant now knew the stock from which it came;  
He grafts upon the wild the tame...  
And in the cherry he does Nature vex,  
To procreate without a sex.  
‘Tis all enforced...”

It seems we’ve been monkeying around with plants since we first domesticated wild grass into wheat in the breadbasket of civilisation some 10,000 years ago. But modern GM is different. It accomplishes by design that rare fluke in nature: that genes are transferred from one organism to another, unrelated one; conferring it with novel, useful characteristics.

Unequal growth

GM corn, soy and cotton with resistance to broad spectrum herbicides and those that express the naturally occurring pesticide Bacillus Thurengiensis (Bt) have been adopted rapidly by the Americas and a number of other countries. A Credit Suisse report (January 2013) estimated the growth rate of GM traits at 6%-10% per annum. However, GM known also as biotech or ‘transgenics’ has been repeatedly rejected in Europe and Japan. Even in America, the world’s leading producer and consumer of GM crops, scrutiny is resurgent. There is clamour for mandatory labelling, primarily over alleged risks to health, biodiversity and concerns about corporate control of the food chain.

GM joins nuclear power in a duopoly of technologies that bitterly divide people who claim to be committed to sustainability. There are few safer bets for Facebook contagion than a story about an evil seed company’s latest outrage. How can you treat claim and counter-claim with the informed caution you need not to be led astray? The subject of GM is one that has generated an industry of book-writing, documentary making and pamphleteering. RLAM has reviewed most of the temperate ones written by people with credible authority. We consulted leading academics and global

YIELD IN THE FIELD

A 2009 report entitled “Failure to Yield” written by a former US Department of Agriculture scientist examined government data on GM crops in the US on their own terms and found that in almost all cases they failed to deliver increased yield.

Another similar study found that weed resistance to herbicides for GM crops had grown, leading to even higher applications of sprays. However, something must explain the dominance of GM corn and soy in the US. The advantage is not yield here, but lower overall input and labour costs. The weed resistance problem is indeed real, but not unique to GM.

A meta-analysis (James, 2013) of 14 peer reviewed studies of GM cotton in India since 2002 shows that each study found large double-digit yield growth and profits per hectare in a range of different periods, as well as substantial falls in spray use. Qaim (2013) finds evidence of a modest 5% improvement in mean calorie consumption in adopting households.
agricultural centres. Below we reproduce the most common claims in favour of the technology. We then explain the typical critiques of these claims and end by adding our view of how claim and counter-claim stack up.

**THE ARGUMENTS**

"**We need GM because we’re going to need more food for the 9 billion.**”

**Credibility rating: 6/10**

**Proponents say:**
GM increases crop yields at a point when the benefits of the first Green Revolution have reached their limits. Cultivable land is in very short supply. Demand, driven by population growth and calorific intake, is set to shoot up. This will create what will be the first genuine global food supply crunch.

**Critics respond:**
The evidence for increase in yields that can be achieved through GM crops is disputed, or at least cannot be taken for granted.

**Alternative perspective:**
The Green Revolution, which did increase yields massively, almost passed Africa by entirely, for socio-political reasons. With Africa having the most cultivable land left, much could be done to modernise African agriculture using tried and tested techniques, before ever reaching for complex technologies like GM.

**Our analysis:**
Greatly increased crop yields with GM have happened but are not a given. Certain traits; herbicide resistant crops like maize and soy, which dominate GM acreage have delivered no intrinsic yield benefit (Jeffries Investment Bank, China Agribusiness 2025, published January 2013); while others have produced impressive results (e.g. Bt cotton in India, where the adoption rate is 95%). Cotton, although not edible, is considered here because of its potential to create income that tends to be spent on food by small farmers. There is evidence to believe that GM can deliver productivity beyond where Green Revolution techniques tail off or are not appropriate, but much depends on the environmental and social context of application. GM will be needed for more adaptable and resilient agriculture. It is prudent to assume that its contribution to the ‘global yield gap’ however, will be sizeable, rather than revolutionary.

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"**GM takes harmful additives like pesticides and fertilizers out of the system.**”

**Credibility rating: 8/10**

**Proponents say:**
GM enables fewer and less intense application of insecticides, fungicides, herbicides and fertilizers, reducing costs and pollution. It achieves this through breeding resistance or traits that rely less on inputs. GM reduces or removes the need for tilling. This in turn can supress CO2 in the soil while helping preserve soil nutrients.
Critics say:
In practice, major products like Monsanto’s Round-up seeds and Round-up Ready herbicide have led to increased use of herbicide to kill everything except the seed and crop. This is not about reducing inputs but creating reliance on a tied offering. Like antibiotics, major GM traits like Herbicide Tolerance have been overcome by super-weeds. Most GM crops are not food for human consumption. They are for more profitable uses like energy (e.g. corn for ethanol), industrial production (e.g. potatoes for starch) and animal feed (soy and corn). So far, GM has produced precious little in the way of genuinely pro-poor solutions.

Alternative perspective:
One-crop monoculture dominates Western farming. Instead, a number of techniques can be combined effectively to reduce harmful additives. Polyculture, Integrated Pest Management, and Low External Input (less reliance on agrichemicals) increase resilience, the presence of natural predators and help maintain equilibrium in ecosystems. This also avoids over-reliance on one crop and reduces famine and malnutrition risk.

Fig. 2 Percentage reduction of insecticides on cotton bollworm relative to total insecticides used in cotton in India, 2001 to 2011

Our analysis:
Authoritative studies of the food system agree it’s not an either/or situation. Generally, GM has led to reductions in external inputs but had the opposite effect where human error led to overuse. The problem of resistance is not unique to GM. Over-reliance on any intervention will eventuate in resistance. Local factors such as climate and farmers’ ability to access other technology and affordable credit may sway the result in one direction or the other more than the technology itself. In short, the answer is that GM really can reduce external inputs and emissions, and increase farm income; but only under properly managed conditions, based on knowledge of the locale.
“GM can help us grow food under severe environmental pressure.”

Credibility rating: 7/10

Proponents argue:
GM can deliver traits designed to meet climate change and resource shortage challenges. These include drought, flood and salinity resistance, and the ability to grow on marginal land. An overview by research company Hardman and Co. (January, 2011) of pipeline techniques include ingenious means of stimulating plants to change their root systems or leaf characteristics, or ‘silence’ genes that hobble a plant under environmental stress. GM can play role in mitigation, too: crops that are herbicide tolerant enable carbon sequestration/suppression and soil nutrient preservation because there is no need to till the soil (Brookes and Barfoot, 2012). GM and Marker-Assisted Selection (non-transgene) techniques can induce changes in the structure and biology of the plant. This could enhance, for example, a plant’s ‘fixing’ of the nitrogen they need to grow, a benign alternative to the extremely wasteful and polluting blanket application of this fertilizer today. Crops being trialled presently include rice with greater Nitrogen Use Efficiency in Asia and maize with greater Water Use Efficiency in Africa.

Critics say:
Few if any commercially licensed GM products are designed to have such traits. The industry is long on ‘talk’ and short on ‘walk’ in bringing such products to market.

Alternative perspective:
The more radical of these solutions, if they materialise, will not fix the underlying problems that lead to resource shortages. Commercialised crops that solve abiotic problems like climate and water stress are in their infancy while crops that produce an increased amount of useful biomass more efficiently are more distant, still. They are not the root cause. We should be looking up the food chain to issues like land and trade reform that increase food system resilience.

SWEET IRONIES

In the 1990s the Hawaii papaya, a major earner for the state, was suffering from near-terminal levels of a native ringspot virus. Universities collaborated to create a GM variety that was resistant. The papaya bounced back and has stayed resistant. It also resulted in less pesticide use. The scientists won an international prize.

In 2013, the council for the main island voted by a large majority to ban further GMOs, buoyed by a national campaign against them on the island, citing general concerns about safety, biodiversity and corporate control. The papaya farmers objected. Papaya and a GM corn already in use there were grandfathered in.

Some say the GM rainbow papaya was a model of how transgenics can be employed in an enlightened way, through public funding. For the bans supporters, it was an expression of the will of the American people.
Our analysis:
GM advocates accept that historically, the biggest causes of malnutrition, hunger and famine have not been sheer supply. Rather, they are political and economic factors such as war, trade, poverty, and logistics. But we cannot wait, for example, for all countries to become incorruptible democracies before acting on the emerging food crisis. We need technical fixes within our grasp, too. It’s not ‘either/or’. Bangladesh has recently approved the growing of disease-resistant eggplant, which was developed in the Philippines. Eggplant or aubergine is a major part of the Bangladeshi diet. Other products in the pipeline are potatoes resistant to the still-prevalent late blight, the cause of the Great Irish Famine of 1845-1847. In China, 75% of all rice is infested with the stem borer pest that can be controlled with Bt rice (James, 2013).

“GM can give us nutritionally advanced foods, even medicines.”

Credibility: 4/10

Proponents say:
GM can be an accurate tool for targeted nutrition delivery by endowing crops with certain traits and ‘pharming’ them. The most well-known of these is ‘Golden Rice’, designed to combat blindness in Asia. Two genes are added that produce Beta-Carotene, which converts to Vitamin A. Other desirable traits include longer shelf life, edible vaccine delivery and flavour enhancement of nutritious but unpopular foodstuffs.

Critics say:
The targeted nutrition argument has been overplayed. It will not work isolated from the wider issue of access to nutrition and poverty. Clapp & Fuchs (2009) argue that the resurgent food security narrative used in support of GM is dominated by the quantity and resilience of food supply, while being “silent on distributional issues”.

Alternative perspective:
The reasons why people suffer from malnutrition (in all forms) are usually complex. As before, Golden Rice is a technical fix for one of a number of symptoms. Throwing resources and years of development only serves to distract from dealing with the fundamental causes; war, corruption, poverty, lack of education and so on.

Our analysis:
It is unrealistic to pin hopes for solving malnutrition on any one thing. The purported benefits of GM traits like nutritionally enhanced foods will be more effective if supported by adequate national governance and legal systems, and development strategy including education and neo-natal care. By some estimates, around one third of raw food commodities never reaches the shelf because of lack of adequate farm machinery, storage and transport infrastructure. This scandal could be tackled comparatively easily through infrastructure development, ‘smart’ IT, and with spin-off development benefits. It is easier to envisage great strides being made relatively quickly in this area than in GM superfoods, but that’s no reason to prevent the latter.
“GM takes established methods and makes interventions faster, better, stronger.”

Credibility rating: 8/10

Proponents say:
The pure science of creating a GM variety can be many times faster than traditional breeding techniques, and much more accurate and specific. This takes much of the guesswork out of the hybridisation Andrew Marvell referred to. The use of industrially designed seeds builds in more predictability of yield compared to traditional techniques. The advantage is that this creates more stability for rich and poor farmers, alike.

Critics say the industry has not delivered. Proponents say industry has been discouraged from doing so. Pro-GM scientists complain that what is holding up GM products getting to market is regulation that is disproportionate, even draconian considering the risks relative to other environmental releases. Indeed, they argue that international treaties like the Cartagena Protocol are not about safely regulating GM. They are a Trojan horse by NGOs for ensuring GM is simply not worth the bother. They point to the lack of empirical evidence of actual novel or additional environmental harm from 20 year-old GM crops compared to conventional crops.

Critics respond:
If GM is so much more efficient and accurate, why do GM products still take on average 15 years to come to market? The failure of some variants and the success of others is a natural process driven by natural selection. Promoting infallible varieties may have unpredictable consequences for other varieties. The latter may die out prematurely, reducing biodiversity and leaving behind a less diverse and therefore resilient genetic pool. The need for farmers to continually go back to large, multi-national seed companies each year in order to obtain these industrially-consistent seeds creates a dependence on organisations whose profit motive may lead them to abuse the dependant relationship.

Alternative perspective:
Marker-Assisted Selection (MAS) is akin to x-raying lots of plants for the tell-tale signs (markers) of useful genetic qualities but doesn’t necessarily involve gene insertion, and moreover not from other species. Instead of inserting transgenes, traditional breeding techniques are used more accurately to match up those varieties with the highest chances of success. This can achieve comparable results without requiring the same regulatory hurdles. The Rothamsted Centre in the UK uses transgene insertion and MAS methods, the latter without crossing genomes between species, to create aphid and fungus-resistant wheat, respectively.

Our analysis:
Our view is that a greatly deregulated approach to GM will do more harm than good. If stakeholders refuse to buy into it, it is doomed. On the issue of excessive influence of multi-nationals on the supply chain, international market-oriented farmers will go with a strategy that works for them. Some farmers are unconcerned if they have to re-purchase seed if increased and reliable yields mean they can gain the critical momentum to obtain credit, invest and grow their business, making them more able to access external markets and personally less susceptible to starvation.
Nevertheless, it is wise to challenge a scenario where a handful of very large corporations wield potentially enormous control through the intellectual property of seeds. They cannot be relied upon to maintain the interests of the poor at heart when they serve shareholders first. The Green Revolution, which massively increased yields in the 1950s and 1960s, was mostly government funded and the outputs freely shared. We need better models of joint public/private research and development. This way, the risks and opportunities are shared in the public and private spheres and the resulting Intellectual Property is not withheld unreasonably or contrarily to the public good.

“Slamming GM while ignoring other clear and present food risks is irrational.”

Credibility: 8/10

Proponents argue:
GM is merely a vastly more efficient tool to achieve the exact same aims as more traditional methods, but still performing the same basic trick as before. Calling GM ‘unnatural’ is naïve and ignorant of history. In fact, GM crops receive more regulation, testing and monitoring than anything else that goes into the human body other than drugs, yet the evidence for serious unintended consequences is so far non-existent. On a relative risk basis GM can be considered safer than alternatives to increasing yield, such as the known negative effects of bringing new land under cultivation or intensifying agricultural inputs like pesticides and herbicides.

“Is the process of adding genes to our food by genetic engineering any more risk than adding genes by conventional breeding? The US National Academy of Science answered this commonly posed question in 2004. The answer is no. Virtually everything we eat has been genetically modified in some way, and virtually every food we eat poses some kind of risk, albeit, a very, very small risk. The NAS committee determined that both the process of genetic engineering and conventional breeding pose similar risks of unintended consequences.” (Ronald, Adamcheck, 2008)

Critics respond:
There is a novel side to what is being done, not just how it is being done. The transfer of genetic material from one species to another, unrelated one is something that would probably never hybridise in nature left to their own devices. Therefore, consequences cannot be easily predicted as there are few precedents. Once these mutations are in the wild, there is no chance of undoing it. GM’s impact on populations has never been studied. Proponents point to the U.S.A and cite the apparent absence of harm – but this was the opposite of a controlled experiment. It only shows that no mechanisms were put in place to detect any possible ill-effects. One would not release a drug without clinical testing, not discovering possible side-effects and then point out that there had been no evidence of traceable effects.
“Except for committed opponents, experts agree that there is nothing inherently unsafe about genetically modified foods. However, there are possible hazards. Most scientists admit that transferring genes between species is an unpredictable operation that could cause new allergies for future consumers unless proper precautions are taken. Ecologists have argued persuasively about the dangers of spreading laboratory-altered genes into the environment.” (Pringle, 2005)

Alternative perspective:
Marker-Assisted Selection (MAS) allows us to analyse plant physiology and genetic structure much more completely, faster and cheaper due to technology and computing advances. We still get more targeted, efficient traditional breeding while avoiding the objections around transgene insertion.

Our analysis:
It is valid to point out the fallacy that until GM came along agriculture did not manipulate genetics or that the risks of unintended gene flow are entirely novel. You can’t prove a negative; objections based on ‘not proven safe’ can be used indefinitely by those with an unshakeable ideological opposition. In our view, the analogy with drugs is invalid because drugs are designed to have often radical effects on the human body, whereas the body breaks down all ingested genetic material in the same way with the same outcome. Any harm would not come from genetic difference, per se. Furthermore, foods with known risks are introduced into the food system all the time (e.g. kiwis and nuts cause allergenicity). It is not practical or proportionate to subject everything to laboratory-type experiments first, as is the case for drugs.

There will always be risks in doing something new. One has to consider the consequences of inaction or favouring other approaches instead. In a strictly rational world, society would work through the questions of who bears the costs and derives the benefits. It would weigh whether any side-effects are tolerable and manageable compared to realistic alternatives. In this rational world, the decision whether or not to back GM would be influenced almost entirely by the host environment, not any (probably spurious) universal advantages. In the more complex world we live in, however, consumers have the right to vote with their wallets, whatever their reasons. That is the world in which GM and all other choices must learn to live.

“Well-fed Europeans can indulge misguided caution. The poor should not be forced to.”

Credibility rating: 5/10

Proponents argue:
The freezing out of GM in Europe while the Americas and Asia use it apparently without catastrophe is a consequence not of rational debate about risk and opportunities involving all stakeholders. It is the fallout of an emotional, knee-jerk reaction based on misinformation fuelled by media hype, questionable corporate and NGO tactics and botched communication by well-meaning scientists. Europeans who object on unproven health grounds are denying the opportunity for captive markets that supply them to use GM to their economic and environmental benefit e.g. some African countries will not permit planting of GM as the resulting exports would be banned in Europe.
Critics respond:
This argument is disingenuous as it suggests that poor African countries are crying out for GM while proponents only have poor farmers’ interests at heart – neither of which stands up to scrutiny.

On safety, moderate critics usually accept the quality of debate has been poor. But they defend the right of the consumer to reject that which it considers a possibly unsafe and inadequately tested technology foisted, they say, on consumers by stealth in other countries.

Alternative perspective:
Because the organic industry is dependent on certification, organic is threatened by adulteration from GM material. There is a view (see Ronald, Adamcheck, 2008) that GM and organic should never have been so falsely distinguished from one another; that they are, in fact, complementary methods as they both aim at removing harmful additives and channelling nature’s endowment to our advantage.

Our analysis:
On the perennial food fight over whether GM is safe, there are studies a plenty but no sustained, peer reviewed evidence from mainstream academia for any systemic harm resulting from the ‘GM-ness’ of GM. But that does not mean GM is benign. The most credible risk is the potential of GM to erode valuable existing biodiversity and reduce resilience. Although there is no compelling evidence of this having happened in practice, most scientists accept it is a real risk, if GM seeds and existing seed banks are not stewarded properly. There are protocols that countries can adopt to regulate the use of GMs but these are onerous. Only relatively sophisticated systems can handle them, which is why they tend not to be a priority for developing countries. The focus of philanthropic and aid programmes in agriculture should focus on increasing local resilience and reducing wasted inputs and spoilage: GM may play a role, but it is not a given, much less a silver bullet.

Heat and light
Earnest scientists despair at what passes for debate about GM (Shurman, 2010, Falker 2009). It is a widely held view that Monsanto in particular scored some spectacular own goals as a result of an aggressive and arrogant approach, something a former CEO Bob Shapiro conceded in a mea culpa at a Greenpeace AGM. Others simply see the ongoing food fight as an example of a healthy pluralist society at work. No one group; companies, NGOs, scientists, farmers has been able to get it all their own way. As one staunch defender of a free market approach to GM concedes, “Neither science nor public opinion is by itself sufficient justification for the creation, adoption, or implementation of a public policy.” (Cooley, in Kolb, 2007).

Playing it safe?
There is also more than a seed of truth to the critique that so far, the GM lobby has been long on sustainability ‘talk’ but short on ‘walk’. Companies like Monsanto have preferred to focus on less commercially risky products that deliver benefits to large farmers. We believe this is changing. The profit motive is already aligning with the production of more food and the creation of socially and environmentally useful traits (e.g. to combat the predations of climate change).
Fig. 3 Seed companies: who’s working on what?

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<thead>
<tr>
<th></th>
<th>Maize</th>
<th>Soybean</th>
<th>Cotton</th>
<th>Canola</th>
<th>Others</th>
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<td>BASF</td>
<td>Higher Yielding*</td>
<td>Higher yielding*</td>
<td>Drought tolerance*</td>
<td>Higher yielding*</td>
<td>Higher yielding sugarcane</td>
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<td>Drought Tolerance*</td>
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<td>Higher yield wheat*</td>
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<td>Stress tolerant wheat*</td>
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<td>Plant-made pharmaceuticals</td>
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<td>Healthy oils</td>
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<td>Added nutrition</td>
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<td>DuPont</td>
<td>Seed production technology (yield)</td>
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<td>Higher yielding</td>
<td>Higher yielding</td>
<td>Higher yielding wheat*</td>
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<td></td>
<td>Improved feed</td>
<td>No transfat, low sat. fat oil</td>
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<td>Improved processing</td>
<td>Increased oils</td>
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<td>Monsanto</td>
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<td></td>
<td>Improved Nitrogen</td>
<td>Low transfat oil</td>
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<td>Syngenta</td>
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<td>Carb Yield</td>
<td></td>
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<td>Higher yielding wheat*</td>
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Source: PhillipsMcDougall, October 2012. *In collaboration

The structural shift to high food prices and awareness of climate change is re-orienting seed company priorities to products that have economically valuable sustainability characteristics. Monsanto and Du Pont are trialling drought-resistant wheat, for instance (both companies have had corn versions approved). Many smaller companies have clever techniques in the pipeline for coaxing plants to deal with pest, weed, water and climate stress.

GM has potential to be socially useful so long as the conditions are right. Just as it is a mistake to ignore GM, it should not be a substitute for more plodding, unglamorous but utterly necessary reforms of how the world farms, stores, transports and consumes food. Consider just two examples; reversing the neglect in agricultural investment in developing countries (see pie chart and table below) and greater attention to applied soil science would be ways in which we could help deliver more from less.
**Rhetoric and delivery**

Whither the companies in all this? Despite the sustainability bluster, industrialised farming has never been interested in the crops that mean life and death to the time-rich, resource-poor small-holders. One wry commentator (Klass, in Kolb, 2007) noted the red herring that NGOs cannot simultaneously dismiss GM technology as callously ignoring the poor small farmer while also maintaining it is threatening to lock them into servitude. But it works both ways: companies cannot perpetuate the argument that they are the much-maligned good guys with sustainability at heart, without bringing forward socially valuable products. Else, they should facilitate the rest of the world getting on with it (Fukuda-Parr, 2007) by opening their patent vaults. Philanthropic development of biotech crops is stymied by the infamous ‘patent thicket’ of privately held Intellectual Property, entangling and compromising scientific knowledge of public interest. The following graph shows how plant science dominates the number of patents issued by the European and US patent offices. ‘Cultivar’ refers to plant-based patents. Of these, “Multinationals such as Monsanto, DuPont, Syngenta and Bayer are famous for acquiring large numbers of patents with more than 70% of the patents in agricultural biotechnology in between 2002 and 2009.”(Adenle et. al. 2012)

**Fig.4 Annual trends in patents of crop biotechnology between 2002 and 2009**

![Annual trends in patents of crop biotechnology between 2002 and 2009](source)

Source: (Frisio et al., 2010 in Adenle et. al, 2012)
Fig. 5 Global public spending on agricultural R&D by major country or region and by income status, 2008

Agri-spending is higher per capita in rich countries, but China is reversing decades of neglect

Source: International Food Policy Research Institute, 2012

Fig. 6 Estimated crop biotechnology research expenditures (Million $)

<table>
<thead>
<tr>
<th></th>
<th>Biotech R &amp; D Million $/Year</th>
<th>% Share in Total Expenditure</th>
<th>Biotech as Share of Sector R &amp; D</th>
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<td>1,900 - 2,500</td>
<td>90.91 - 92.01</td>
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<td>Private Sector*</td>
<td>1,000 - 1,500</td>
<td>48.43 - 54.55</td>
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<tr>
<td>Public Sector</td>
<td>900 - 1,000</td>
<td>36.36 - 43.58</td>
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<td>7.99 - 9.09</td>
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<tr>
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<td>Public (foreign aid)</td>
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<td>CGIAR centres</td>
<td>25 - 50</td>
<td>1.21 - 1.82</td>
<td>8</td>
</tr>
<tr>
<td>Private sector</td>
<td>N/A</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>World total</td>
<td>2,065 - 2,750</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Includes an undisclosed amount of R & D for developing countries.

Rich countries and the private sector still dominate biotech R&D
A way forward

Taken together, the response required is obvious. Governments, multi-lateral development organisations, NGOs and social entrepreneurs will have to reprise a variation on the command-and-control approach used in the ‘50s and ‘60s. This was driven by a mission to disseminate innovation in agriculture for those who most need it. Innovation is by no means restricted to GM but it can play a part. The Indonesian government’s scientific body, for example, developed a GM variety of sugar cane resistant to water stress, which was approved in 2011.

The private sector, alone, will not deliver. But it can be prodded by moral pressure and a sense of vision into bringing its innovation to the table. On June 12th, 2014 Tesla Motor’s CEO Elon Musk announced that Tesla motors will allow competitors like BMW and Nissan to use its electric vehicle patents so long as they help jumpstart the industry. Tesla’s share price drifted up slightly. Monsanto and others are taking a leaf out of the pharmaceutical companies’ crisis-management handbook by allowing sub-Saharan countries to use its drought resistant crops royalty-free. Will a Monsanto or Du Pont go further, and follow Musk’s example by unconditionally opening its vaults to all pro bono projects?

Niall O’Shea
Head of Responsible Investment
Royal London Asset Management
August 2014
Public disclosures cited:


The Organic Centre, Impacts of Genetically Engineered Crops on Pesticide Use in the United States: the first 13 years, 2009


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