Submission to the Agicultural Innovation Inquiry

15th March 2016

Many thanks for the opportunity to contribute to this inquiry. This submission is on behalf of Friends of the Earth's Emerging Tech Project and as such will focus on the use of biotechnology and nanotechnology in agriculture.

Agricultural innovation is a much broader topic than the use of genetically modifed crops

To date a large proportion of submissions to the inquiry have been from representatives of the genetically modified (GM) crop industry e.g. Bayer, CropLife and AusBiotech. This is unfortunate, since agricultural innovation is a much broader topic than the use of GM crops. Furthermore, a four-year study by the World Bank and four United Nations agencies concluded that GM crops won't play a major role in solving the world's foot shortages.[1]

The 2008 International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) was conducted by over 400 scientists and experts from 80 countries and endorsed by 58 governments. The IAASTD report pointed out that yields of GM crops are "highly variable" and in some cases GM crops exhibit "yield declines". The authors noted that there are lingering safety concerns associated with GM crops and that the patents attached to them could undermine seed saving and food security in developing countries.[2]

Asked at a press conference if GM crops were the answer to world hunger, IAASTD Director Professor Bob Watson stated "The simple answer is no."[3]

The IAASTD called for a shift to "agroecological" food production systems. Examples of these innovative systems documented in IAASTD and other sources include:

- Low-input, energy-saving practices that preserve and build soil, conserve water, and enhance natural pest resistance and resilience in crops: for example, crop rotation, intercropping, "push-pull" systems to control pests, and use of nitrogen fixing plants to enhance soil fertility;
- The use of thousands of traditional varieties of major food crops which are naturally adapted to stresses such as drought, heat, harsh weather conditions, flooding, salinity, poor soil, and pests and diseases[4];
- Programmes that enable farmers to cooperatively preserve and improve traditional seeds;
- The use of existing crops and their wild relatives in traditional breeding programmes to develop varieties with useful traits;
- The use of marker assisted selection (MAS), to speed up traditional breeding.[5] Unlike GM technology, MAS can produce new varieties of crops with valuable complex traits such as enhanced nutrition and taste, high yield, disease resistance, and tolerance to drought, heat, salinity, and flooding.

According to Olivier De Schutter, the UN special rapporteur on the right to food:

> *"Agroecology mimics nature not industrial processes. It replaces the external inputs like fertilizer with knowledge of how a combination of plants, trees and animals can enhance productivity of the land. Yields went up 214% in 44 projects in 20 countries*

> *in sub-Saharan Africa using agroecological farming techniques over a period of 3 to 10 years… far more than any GM crop has ever done."*[6]
>
> *"To feed 9 billion people in 2050, we urgently need to adopt the most efficient farming techniques available. Today's scientific evidence demonstrates that agroecological methods outperform the use of chemical fertilizers in boosting food production where the hungry live – especially in unfavorable environments. To date, agroecological projects have shown an average crop yield increase of 80% in 57 developing countries, with an average increase of 116% for all African projects. Recent projects conducted in 20 African countries demonstrated a doubling of crop yields over a period of 3–10 years. Conventional farming relies on expensive inputs, fuels climate change and is not resilient to climatic shocks. It simply is not the best choice anymore today. Agriculture should be fundamentally redirected towards modes of production that are more environmentally sustainable and socially just."*[7]

Agricultural innovation doesn't have to be technological. The use of agro-ecological production systems and the localisation of food production systems improve food security, reduce the use of synthetic chemicals and other inputs and improve the viability of farmers. Such measures also reduce the climate footprint of food production, which is a major contributor to the climate emergency we are currently facing.

There is an urgent need for public research funding to be redirected from intensive, chemical dependent farming systems, towards more agroecological approaches.

New GM techniques

In recent years large agrochemical corporations such as Dow, Syngenta, Bayer and Monsanto and other players have been investing in a suite of risky new genetic modification (GM) techniques, which industry refers to collectively as 'New Plant Breeding Techniques'. Industry is arguing that these techniques are much more precise than older genetic engineering techniques - or even that they are not really genetic engineering at all – in order to attempt to circumvent regulation and public resistance to GMOs.

The GM crop industry is currently making a concerted push to have these emergent techniques escape GM laws in the United States, Europe and Australia. Industry is arguing that these techniques – which include oligo-directed mutagenesis (ODM) and site-directed nucleases (SDNs) such as zinc-finger nucleases (ZFN) and CRISPR - only result in small predictable changes to the genome and are therefore much more precise that earlier genetic engineering techniques. Interestingly, this is exactly the same argument they used when GM crops were originally introduced – and is equally untrue for these techniques.

These techniques pose unknown risks and need to be regulated

Austrian government agencies are among the few globally to consider the biosafety risks posed by new GM techniques. Their conclusion, over three separate, high-level reviews of the biosafety risks, is that there is insufficient knowledge regarding the risks posed by these techniques. On this basis, they argue that products derived from new GM techniques should be regulated in the same way as those created using older GM techniques and require a comprehensive case-by-case risk assessment.

The Norwegian Environment and Development Agencies also recently commissioned a review of these techniques. This concluded that further biosafety research needs to be performed before these techniques are commercialised.

We have attached a copy of our 2015 report on these techniques *GM2.0: Australian regulators engineering the truth* which outlines these techniques and the risks associated with them in more detail.

The deregulation of these techniques could have serious trade implications

The Codex Alimentarius guidelines for the safety assessment of foods derived from "modern biotechnology" defines this as:

> *the application of:*
> *i) In vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles; or*
> *ii) fusion of cells beyond the taxonomic family that overcome natural physiological reproductive or recombinant barriers and that are not techniques used in traditional breeding and selection.*[8]

This definition covers the vast majority of these new GM techniques. It means that countries could require safety assessments for these new GM techniques and block exports from countries that don't require them.

There is strong resistance to genetically modified crops in our key export markets such as Europe. Even if GM crops are approved in these jurisdictions this doesn't mean that markets will accept them. The ability of states to impose moratoria on GM crops on marketing grounds is therefore vital to ensure that these markets are protected.

Friends of the Earth is calling for:

- These new GM techniques and the products derived from them to be subject to a comprehensive case-by-case risk assessment, including full molecular characterisation and independent safety testing to minimise any potential risks to human health and the environment;
- All products derived from new GM techniques to be labelled to protect choice for farmers, producers and consumers;
- The precautionary principle to be enshrined in both the Gene Technology Act and the Food Standards Australia New Zealand Act, given the experimental nature of these technologies and the risks associated with them;
- The Government to impose strict liability on all dealings with GMOs licensed by the OGTR, so that liability for GM contamination and the resultant losses and costs rests fully on the licensees and the owners of GM patents;
- A moratorium on the commercialisation of these new GM techniques until our regulatory system for GMOs is adapted to deal with the potential risks posed by them.
- The redirection of research funding from intensive, chemical dependent farming systems, towards more agroecological approaches.

Nanomaterials and agriculture

Nanomaterials are objects with one or more dimensions, or surface structures, on the nano-scale. The nano-scale ranges from approximately 1-100 nanometres - with one nanometre being one billionth of a metre. The properties of matter change at the nano-scale and nanomaterials can therefore behave quite differently to bulk particles of the same substance. They also have a greater surface area relative to volume. This makes them much more chemically reactive – and potentially toxic - than larger particles.

Nanotechnology is being used in products across the agricultural supply chain, including in chemicals, feed and supplements for farm animals, machinery and storage facilities.

Agrochemicals

Nanotechnology is introducing a new array of potentially more toxic pesticides, plant growth regulators and chemical fertilisers, further entrenching the current system of industrial and chemically intensive agriculture.

All the leading producers of agricultural chemicals, including BASF, Monsanto and Syngenta are actively researching nanotechnology for use in agriculture and pesticides with nanoscale ingredients are already on the market.[9]

In the last ten years, over 3000 patents have been filed for pesticides with nanoscale ingredients.[10] These are mostly nanoscale versions of existing pesticides.[11] The Internet platform nano-technologien.com claims that "Bayer AG has been producing pesticides in this format size on a large scale".[12]

There are good reasons for assuming that nanomaterials in agricultural chemicals are already in use here and that our regulator, the Australian Pest and Veterinary Medicines Authority (APVMA), has failed us. These nano based agricultural chemicals have not been assessed for safety. Their effects on water, soil, plants and food are largely unknown.

We are seeing ‘innovation’ that benefits one sector – the agricultural chemical industry – and puts farmers and the public at risk. This is not the kind of innovation that Australia should be supporting.

This kind of commercially driven innovation is not only dangerous but means as a country we don’t discuss or agree on the innovations that are needed to make agriculture viable and sustainable.

Friends of the Earth is calling for:

- a mandatory register of nanomaterials to help protect agricultural workers and allow regulators to conduct risk assessments.
- regulations that ensure nanomaterials are not used in agriculture until they have undergone an independent safety assessment and that all nanomaterials in agrochemicals and animal feed are labelled.

[1] International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). Agriculture at a crossroads: Synthesis report of the International Assessment of Agricultural Knowledge, Science and Technology for Development: A Synthesis of the Global and Sub-Global IAASTD Reports. Washington, DC, USA: Island Press; 2009. Available at: http://www.unep.org/dewa/agassessment/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Synthesis%20Report%20%28English%29.pdf

[2] *Ibid.*

[3] Lean G. (2008) Exposed: The great GM crops myth. *The Independent*, Published April 20, 2008, http://www.independent.co.uk/environment/green-living/exposed-the-great-gm-crops-myth-812179.html

[4] National Research Council (1996) *Lost Crops of Africa. Volume I: Grains*. Washington DC; 1996. Available at: http://www.nap.edu/catalog.php?record_id=2305

[5] Collard BC, Mackill DJ. (2008) Marker-assisted selection: An approach for precision plant breeding in the twenty-first century. *Philos Trans R Soc Lond B Biol Sci.* **363**:557-72. doi:10.1098/rstb.2007.2170

[6] Leahy S. (2011) Africa: Save climate and double food production with eco-farming. *IPS News*, Published March 8, 2011, http://allafrica.com/stories/201103090055.html

[7] United Nations Human Rights Council (2011) Eco-farming can double food production in 10 years, says new UN report [press release], Published March 8, 2011, http://www.srfood.org/images/stories/pdf/press_releases/20110308_agroecology-report-pr_en.pdf

[8] Codex Alimentarius (2009) *Foods derived from modern biotechnology: Second edition,* ftp://ftp.fao.org/docrep/fao/011/a1554e/a1554e00.pdf

[9] Hofmann, T. & Kah. M. (2012) Department für Umweltgeowissenschaften an der Universität Wien. Nano-pesticides in Agriculture: Opportunity or Risk? http://medienportal.univie.ac.at/presse/aktuelle-pressemeldungen/detailansicht/artikel/nano-pestizide-in-der-landwirtschaft-chance-oder-risiko/ (accessed 10 March 2014)
Kah, M. *et al.*(2013) Nanopesticides: State of Knowledge, Environmental Fate, and Exposure Modeling, *Critical Reviews in Environmental Science and Technology*, **43**:16, 1823-1867.

[11] *Ibid.*

[12] Nano-technologien.com (2012) Nano in Agriculture, http://www.nano-technologien.com/nano-in-landwirtschaft (accessed 10 March 2014)