Representing **the best** of the plant science industry

CropLife AUSTRALIA

SUBMISSION TO FOREIGN AFFAIRS AND AID SUB-COMMITTEE INQUIRY INTO THE ROLE OF DEVELOPMENT PARTNERSHIPS IN AGRICULTURE AND AGRIBUSINESS IN PROMOTING PROSPERITY, REDUCING POVERTY AND ENHANCING STABILITY IN THE INDO-PACIFIC REGION

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CropLife Australia (CropLife) is the peak industry organisation representing the agricultural chemical and biotechnology (plant science) sector in Australia.

CropLife represents the innovators, developers, manufacturers and formulators of chemical crop protection products and agricultural biotechnologies. The plant science industry provides products to protect crops against pests, weeds and diseases, as well as developing crop biotechnologies that are key to agricultural productivity, sustainability and food security. The plant science industry is worth more than $17.6 billion a year to the Australian economy and directly employs thousands of people across the country.

CropLife is a member of CropLife Asia and part of the CropLife International Federation of 91 national associations and which has a global network operation in all 5 major geographical world regions. CropLife is formally represented in the Indo-Pacific region with representation in East African nations, Singapore, Indonesia, Philippines, China, India, Korea and Japan.

CropLife and its members are committed to the proper stewardship of their products throughout their lifecycle and to ensuring that human health, environment and trade issues associated with agricultural chemical and biotechnological use in Australia and around the world are responsibly and sustainably managed. Our member companies are global leaders in their full-lifecycle approach to industry stewardship and contribute more than $13 million a year just in Australia on stewardship activities to ensure the safe and effective use of their products. CropLife ensures the responsible use of these products through its mandatory industry code of conduct and has set a benchmark for industry stewardship through programs such as ***drum****MUSTER*, ChemClear® and Agsafe Accreditation and Training. Our stewardship activities demonstrate our industry's commitment to ethical and responsible practices from discovery and development of crop protection products through to their use and the final disposal of container waste and unwanted chemicals.

The world's population is predicted to increase to 9.7 billion by 2050, requiring an increase in global food production of more than 70 per cent. Providing enough food in the context of production constraints, volatile consumption patterns and a changing climate will be an unprecedented scientific, economic, agronomic and public policy challenge. The situation provides an opportunity for Australian farmers to assist in the global food security effort. By adopting innovative farming practices, such as the sustainable and efficient use of biological and chemical crop protection products and genetically modified (GM) crops, farmers worldwide will be able to sustainably increase productivity to produce more safe, affordable and nutritious food.

Meeting the challenges presented by sustainably increasing food production to meet growing global demand will require science-based policies that support all production systems, including existing and future production tools and technologies. Sustainable production systems will include the conventional systems reliant on the timely, responsible and considered application of crop protection products in ways that maximise yield and manage potential environmental and other risks. A synthesis of international studies estimates crop protection products (including herbicides, insecticides and fungicides) currently increase global food production by between 30 and 50 per cent[1].

For millions of families in the developing world, farming is not just an occupation, it is the sole means of survival. Small-holder farmers grow several crops on small plots of land to support their families and those in their local communities. In 2010, two billion people depended upon 500 million small-holder farmers to meet their food needs. They're the largest farmer group in the world and key drivers of food security in developing countries. The trouble is that it's tough for small-holder farmers to make a good living. The plant science industry is trying to change that with a commitment to provide them with knowledge and access to innovative farming methods and technologies.

In particular, crop protection and biotechnology innovations can assist farmers in producing high yields with fewer natural resources by reducing water consumption, increasing a crop's nutrient uptake and reducing the need for other inputs.

[1] Deloitte Access Economics, 2013, 'Economic activity attributable to crop protection products' CropLife Australia

The plant science industry's biological and chemical crop protection products are critical to maintaining and improving Australia's agricultural productivity to meet global food security challenges in coming decades. Each of these products is rigorously assessed by the Australian Pesticides and Veterinary Medicines Authority to ensure they present no unacceptable risk to users, consumers and the environment. In 1995, it took the assessment of 52,500 compounds to develop one new effective crop protection chemical active. It now requires the assessment of more than 140,000 compounds and expenditure of more than $250 million (US) over a 10 year period to bring just one new successful crop protection product to the market. Without access to these tools, farmers may potentially lose as much as 50 per cent of their annual production to pests, weeds and diseases. According to a Deloitte Access Economics report released in 2013 entitled *Economic activity attributable to crop protection products*, CropLife Australia, it is estimated that up to $17.6 billion of Australian agricultural output (or 68 per cent of the total value of crop production) is attributable to the use of crop protection products.

Crop protection products (CPPs) are crucial to modern integrated pest management techniques and systems used by farmers. Access to fewer crop protection tools would facilitate faster development of resistance among target pests, diminishing the efficacy of remaining chemical options. The economic impact of weeds alone is estimated to be in excess of $4 billion each year, with an impact on the environment that is similar in magnitude[2]. It is imperative that the Australian Government maintain the primacy of science and facts. Australia's former Chief Scientist, Professor Ian Chubb, said in his outgoing statement that the weight and quality of evidence must always trump make-believe. There is a need for a paradigm shift in thinking from regulating the science (as it has been proven safe) to facilitating the growth of the Australian economy by driving the plant science industry (both in the public and private domain) to its full potential.

GM crops, an application of modern agricultural biotechnology, are just another step along the same path of technological innovation that led to Australian agricultural inventions such as the combine harvester and 'Federation' wheat varieties. The utilisation of these innovations has delivered safe and affordable food to the nation and the world. Despite a proven record of safety, every GM crop is subjected to intense global scrutiny. Globally, government regulators have independently reached the same conclusion – that cultivation of GM crops poses no greater risk to human health or the environment than cultivation of conventional (non-GM) varieties. More importantly, they are a necessary and important tool in meeting the global food and nutrition security challenge.

GM crops have over a period of 20 years demonstrated their sustainability credentials, including by way of:

- Improving the sustainable use of crop protection products;
- Reducing tillage (facilitating no-till farming);
- Reducing on-farm fuel use;
- Reducing CO_2 emissions from farming operations;
- Increasing soil carbon storage; and
- Increasing water use efficiency.

GM crops currently under research and development will help farmers to combat environmental stresses such as drought, acid soils and salinity, which are being caused by climatic changes and previous non-sustainable farming practices. There is also considerable Australian research into GM traits that will bring health benefits to consumers, such as healthier starches and oils modified to be lower in saturated fats and with improved cooking qualities.

GM crops is the fastest adopted crop technology in recent times with more developing countries adopting biotech crops. Bangladesh planted biotech crops for the first time in 2014 and Indonesia and Vietnam approved biotech crops for 2015 planting. Increasing adoption of GM crops in developing countries highlights the importance of such innovative solutions to small-holder farmers.

[2] Australian Weeds Strategy – A national strategy for weed management in Australia. National Resource Management Ministerial Council (2006), Australian Government Department of the Environment and Water Resources, Canberra, ACT.

Every legitimate scientific and regulatory body that has examined the evidence has arrived at the conclusion that GM crops and the foods they produce are as safe as their conventional counterparts. This includes the World Health Organization, the Australian Academy of Science, the European Commission, the American National Academy of Sciences, the Royal Society of Medicine and many more. GM crops currently grown around the world and the food they produce have been studied extensively and repeatedly declared safe by scientific bodies and regulators globally, and with three trillion meals containing GM food having been consumed with not one single substantiated health claim anywhere, the evidence and science on the safety of GM Crops on the environment and human health is clear.

This submission focuses on the plant science industry's role in supporting agricultural development and inclusive economic growth in the Indo-Pacific region. It highlights the role of plant science in the success of Australia's agricultural industry and the critical importance of innovation in the industry. It submits that agricultural development, empowerment of women in farming, better nutrition and inclusive economic growth in the Indo-Pacific region globally requires access to modern farming technologies, including agricultural biotechnology and biological and chemical crop protection products.

A productive and competitive Australian agriculture sector will continue to contribute to food security in the Indo-Pacific region. Increased involvement in international decision-making bodies will provide opportunities for influencing decision-making thereby enhancing agricultural exports and new market access.

Plant science gives farmers the modern agricultural tools and technologies they need to feed the world, strengthen their communities and care for the planet. Supporting access to these products for farmers in the Indo-Pacific region is crucial.

Supporting agricultural development and inclusive economic growth in the Indo-Pacific region will require innovative science-based policies.

From biotech plants that boost yields and profit, to herbicides that replace strenuous labour, small-holder farmers are looking to plant science innovations to give them more choice to improve their livelihoods. Making agriculture more productive and profitable through plant science will help small-holder farmers move from 'farming to survive' towards 'farming for profit' – creating sustainable livelihoods and stronger communities.

For example, Bt cotton, a GM crop with a built-in pest resistance, is boosting farm incomes and quality of life in many developing countries. In India, Bt cotton farmers are achieving 50 to 110 per cent higher profits. Their families have more maternal health care, higher school enrolment and vaccination rates for their children. Their rural villages also benefit with improved access to telephone systems, drinking water and economic infrastructure.

Crop protection products, known as pesticides, are also an important tool for small-holder farmers. Using pesticides to produce disease-free, high-quality fruit can result in a four-fold income increase for small-scale passion fruit farmers and extra income for avocado farmers. These higher incomes have allowed farmers to improve their health and access to medical care, provide schooling for their children, and oftentimes invest in new business opportunities.

Herbicides, one category of pesticide, that control weeds are a critical tool to reduce strenuous labor and boost yields. To weed just one hectare of corn, a farmer would have travelled a distance of 10 kilometres, all in a stooped position that could result in permanent spinal deformation. Herbicides can reduce back-breaking hand weeding labor by 90 per cent, meaning 24 billion less hand weeding hours and a 40 million tonne increase in crop yield. In addition, the reduction in hand weeding hours would enable women farmers in Africa, for example, to pursue additional educational, business and family opportunities.

Meeting the challenges presented by sustainably increasing food production to meet growing global demand will require innovative science-based policies that support all farming production systems, including existing and future production tools. Competitive and sustainable production systems will include the conventional systems reliant on the timely, responsible and considered application of crop protection products in ways that maximise yield and manage potential risks. GM crops, an application of modern biotechnology, are just another step along the path of plant breeding and the utilisation of these innovations is already delivering safe and affordable food, feed and fibre to the nation and the world.

Access to innovative and emerging technologies in the agricultural sector could promote prosperity, reduce poverty and enhance stability in the Indo-Pacific region and Australia is an example of how this can be achieved.

The plant science industry enhances the contribution of agriculture to economic growth and helps to build a competitive, productive and sustainable agricultural industry

The plant science industry's crop protection products (CPPs) include fungicides, herbicides and insecticides that are critical to maintaining and improving agricultural productivity to meet global food security challenges in coming decades.

All agricultural production systems, whether they be conventional, organic or reliant on biotechnologies employ strategies to control pests, weeds and diseases. Without the responsible use of CPPs, as much as half of the world's food supply could be lost. Ensuring farmers have access to innovative modern technologies to protect their crops will support the ongoing economic, environmental and social sustainability of agriculture.

The plant science industry is worth more than $17.6 billion a year to the Australian economy and directly employs thousands of people across the country. In terms of employment in Australia, the crop protection product sector contributes just over 9,250 in full time equivalent employees, made up of about 2,050 directly in the crop protection product manufacturing sector and 7,200 in the sectors that supply inputs to the crop protection product sector.

CropLife members support all production systems, including organic, by providing CPPs to meet the needs of Australian farmers. Our members' success is intrinsically linked with that of all Australian farmers. Ultimately, a sustainable agricultural system will involve balancing a series of potentially competing issues and making decisions about the most effective, efficient and sustainable way to manage a farm taking into account the type of production system, climate, soil types, pest pressures and economic considerations.

Farmers ultimately have the most detailed and extensive knowledge about their farms. Any sustainable agricultural policy will need to recognise the critical role that farmers play in ensuring the ongoing sustainability of their farms. Giving farmers greater choice and options to manage their land and production systems provides them with the best opportunity to make decisions that promote the ongoing sustainability of agriculture.

Conventional broadacre production systems use crop protection products efficiently and effectively

For conventional production systems, sustainability needs to consider different pressures and factors that have an impact on the sustainability of the farming system. Broadacre farming of cereals and grains is an internationally competitive and trade exposed market. Standards for grain quality and safety can have serious impacts for market access should they be breached. The international trade in grains also presents significant biosecurity risks that must be controlled to prevent the spread of potentially disastrous pests and pathogens. The sustainability of this sector is dependent upon the efficient and responsible use of critical inputs (including CPPs, among others) to remain both economically and environmentally sustainable.

Indeed, modern broadacre production systems adopt approaches that are both economically and environmentally sustainable, while also producing significant social benefits. For example:

- Modern herbicides and insecticides are highly selective. Modern selective insecticides can target harmful pests while leaving beneficial insects untouched, generating both productivity and biodiversity benefits. Selective herbicides can target weeds while leaving a growing crop unharmed. This allows farmers to choose the best crop protection technologies to suit the particular circumstances of their farm, as well as providing for flexibility in the production system.
- The responsible and sustainable use of herbicides enables the use of minimum and no-till production systems. Replacing tillage with the use of herbicides provides improved weed control, increasing yields while also providing ancillary environmental benefits. Reducing the need for tillage reduces carbon emissions, improves soil structure and soil biodiversity, and assists soils retain both water and organic matter.
- Modern farming systems also assist in reducing total pest and weed pressures, for the benefit of other production systems that may choose not to use pesticide tools.

Conventional production systems are responsible for the vast majority of food production. They succeed by producing safe, sustainable and abundant food through minimising production inputs and maximising yield. The efficiencies inherent in these production systems enable farmers to feed more people with less land, water and other resources. This reduces pressure on remaining areas of wilderness to be converted to agricultural production. As one of the key drivers of biodiversity loss globally is loss of habitat for native species, the environmental benefits of producing more food more efficiently is significant.

Conventional horticultural production systems in Australia rely on innovative crop protection products

Horticultural production systems use modern pesticide products to efficiently produce higher quality, safer food. Horticultural systems often operate in locations that can lead to potentially conflicting land uses that can require better farm management practices. Chemical application often needs to be undertaken in ways that prevent any unanticipated impacts upon neighbouring land uses. Careful application and product choice, as well as user training and licensing, can help achieve this aim and allow productive horticultural enterprises to prosper.

Critically, ongoing innovation and product development can support new and emerging horticultural industries. As farmers seek to diversify their production to meet market demands and to build the resilience of their enterprises, new products will be required to address new applications on minor and specialty crops. This not only builds the economic sustainability of farming enterprises generally, but may also result in the development of new products and markets that are better suited to individual farm circumstances.

The Australian example of the use of GM crops highlights the importance of farmer access to this technology in the Indo-Pacific region.

The benefits of agricultural biotechnology, specifically genetically modified (GM) crops, are wide-reaching

The first generation of GM crops, with productivity enhancing input traits such as insect resistance and herbicide tolerance, have been rapidly adopted around the globe providing clear agronomic, economic, environmental and social benefits to those 18 million farmers in 28 countries who have accessed the technology[3].

In Australia, growing GM cotton varieties has seen environmental benefits resulting from improving the sustainable use of insecticides and changes in the type of insecticides and herbicides used. First grown in 1996, almost 100 per cent of Australia's cotton crop is now grown with GM varieties[4]. Cultivation of GM insect resistant cotton varieties has enabled a reduction in the amount of insecticide active ingredient used by up to 85 per cent[5,6]. This, in conjunction with industry stewardship practices, has greatly reduced the potential for chemical runoff into rivers in cotton growing regions of Australia[7].

The types of chemical being used have also changed. Because of the 'in-built' insecticide in GM insect resistant cotton, insect control can be more targeted and specific meaning there is less of an impact on non-target organisms, thereby allowing beneficial (i.e. predatory insects) to remain in the crop. It is worth noting that the insecticidal 'Bt' protein expressed in GM insect resistant cotton is also an approved input in organic agriculture. In-crop fuel use is also reduced as a result of fewer insecticide applications being required.

GM herbicide tolerant cotton has increased the adoption of minimum tillage practices and the replacement of some herbicides with less hazardous alternatives. By facilitating minimum tillage, GM herbicide tolerant cotton has reduced soil erosion, increased retention of soil moisture and increased soil carbon.

Economic and social benefits have also been realised through the adoption of GM crops in Australia. For example, in GM cotton growing regions, the incidence of on-farm workplace incidents has decreased as a result of reduced insecticide spraying and also the reduced need for hand weeding in cotton fields. Community perceptions of the Australian cotton industry have also markedly improved since GM cotton was first grown in 1996[8]. Cultivation of GM cotton varieties has allowed cotton farmers to spend less time on the tractor and more time with their families, an important social implication for rural Australia that should not be overlooked.

The adoption of GM herbicide tolerant canola varieties in Australia has also resulted in environmental benefits and increased environmental sustainability. For example, just as for those farmers growing GM herbicide tolerant cotton, cultivation of GM herbicide tolerant canola has allowed farmers in New South Wales, Victoria and Western Australia to use selective, targeted and lower hazard CPPs.

Herbicide tolerant canola provides farmers with more effective weed control, particularly for those broad leaf weeds that are closely related to canola. Varieties of non-GM herbicide tolerant canola have been grown in Australia since 1993 (triazine tolerant) and 2000 (imidazolinone tolerant). The introduction of glyphosate tolerant GM canola merely adds another weed management option to farmers' weed control toolbox. Both non-GM and GM herbicide tolerant canola technologies have led the shift to no-till or conservation tillage systems with associated environmental benefits such as reduced soil erosion and increased soil water and carbon retention.

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3 James, Clive 2015. 'Global Status of Commercialized Biotech/GM Crops: 2014'. *ISAAA Brief No. 47*. ISAAA: Ithaca, NY.

4 Cotton Australia Cotton Fact File: Biotechnology http://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-biotechnology accessed 4 April 2014.

5 Hattersley P, Johnson H, Glover J, Foster M, Wesley V and Mewett O, 2009. 'Plant Gene Technology: Improving the Productivity of Australian Agriculture'. Australian Government Bureau of Rural Sciences, Canberra.

6 Holtzapffel R, Mewett O, Wesley V and Hattersley P 2008. 'Genetically modified crops: tools for insect pest and weed control in cotton and canola'. Australian Government Bureau of Rural Sciences, Canberra.

7 *Ibid.*

8 *Ibid*

The agronomic benefits of GM (when compared to non-GM) herbicide tolerant canola include increasing the options for in-crop weed control, allowing herbicide rotations that address the risk of herbicide resistant weeds developing and increasing the yield in subsequent cereal crops, which could be adversely affected by herbicide carry over from the herbicides used in non-GM herbicide tolerant crops.

The control of insect pests and weeds is a significant cost for Australian farmers. Crop biotechnology provides Australian farmers with new tools that can be used as part of Integrated Weed and Pest Management programs to maintain the sustainability and longevity of pest and weed control options in Australia.

The global socio-economic and environmental impact of GM crops

The most recent annual report on the global socio-economic and environmental impact of GM crops from the British consultancy firm PG Economics indicated continued considerable economic and environmental benefits to the farmers and general public in countries where GM crops are grown[9]. The report indicated that the net benefit at the farm level in 2013 from growing GM crops was US$20.5 billion. For the 17 year period (1996-2013) covered by the report, the global farm income gain has been US$133.5 billion. Australian GM cotton and canola farmers have realised a benefit of more than US$885 million in the period 1996-2013[10].

The PG Economics report also notes that GM crops have contributed significantly to reducing the release of greenhouse gas emissions from agricultural practices. This resulted from less fuel use and additional soil carbon storage from reduced and no-tillage farming systems associated with GM crops. In 2013, the permanent CO_2 savings from reduced fuel use were the equivalent of removing 940,000 cars from the road and the additional probable soil carbon sequestration gains in 2013 were equivalent to removing 11,520,000 cars from the road[11]. This is equal to 71 per cent of all motor vehicles registered in Australia.

The report notes that crop biotechnology has contributed to a significant reduction in the environmental impact associated with herbicide and insecticide use on the areas devoted to GM crops. From 1996-2013, the use of pesticides on the global GM crop area was reduced by 550 million kg of active ingredient (8.6 per cent total reduction) and the environmental impact associated with herbicide and insecticide use on GM crops, as measured by the Environmental Impact Quotient indicator, fell by 19 per cent[12].

If GM crops had not been available to the 18 million farmers growing them in 2013, an additional 18 million hectares of conventional crops would have been required to produce the same tonnage produced by GM crops for 2013 alone[13].

A recent study reported in the science journal *Nature*[14], found that in China over the past 16 years, vast plantings of GM insect resistant crops have helped to control several major insect pests and reduced the need for additional insecticide applications by promoting the bio-control services offered by beneficial predatory insects. On conventional crops, these beneficial insects were killed by the broad-spectrum insecticides used to control the major target pests, e.g. cotton bollworm. This study found a marked increase in the abundance of three arthropod predators (ladybirds, lacewings and spiders) and a decreased abundance of aphid pests associated with the widespread adoption of GM insect resistant cotton and reduced insecticide sprays in this crop[15].

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9 Brookes G and Barfoot P 2015. 'GM crops: global socio-economic and environmental impacts 1996-2013'. *PG Economics*, Dorchester, May.

10 Australian GM cotton farm income benefit US$2844.3 million 1996-20122013; GM canola farm income benefit US$341 million 2008-20122013.

11 Brookes G and Barfoot P, *Op. cit*

12 Brookes G and Barfoot P, *Op. cit*

13 James, Clive, *Op. cit*

14 Lu Y, Wu K, Jiang Y, Guo Y and Desneux N 2012. 'Widespread adoption of Bt cotton and insecticide decrease promotes bio control services'. *Nature* doi: 10. 1038/nature11153 published online 13 June 2012.

15 *Ibid.*

A new study by the International Food Policy Research Institute (IFPRI) measures the impacts of agricultural innovation on farm productivity, prices, hunger and trade flows to 2050 and identifies practices that could significantly benefit developing nations. The study reinforces that no single agricultural technology or farming practice will provide sufficient food for the world in 2050[16]. This highlights the need for a combination of agricultural technologies and practices such as heat-tolerant crops and no-till farming. Australian farmers must be able to adopt the latest safe and proven agricultural technologies and innovations to combat the threat of food insecurity, the impacts of climate change and increasing costs, while remaining internationally competitive.

Nutritional benefits of genetically modified crops are in research and development

Agricultural biotechnology, specifically genetic modification, is being used to develop nutrient-dense varieties of staple crops that could be grown for a fraction of the recurrent estimated annual costs of supplementation programs in developing countries and could reach far more people. The nutritional quality of staple foods can be substantially improved using transgenic methods compared to what can be accomplished using traditional breeding.

For example, Golden Rice (with elevated levels of pro-Vitamin A) is expected to be available in the coming years in the Philippines and probably followed by Bangladesh, Indonesia and Vietnam.

Access to Golden Rice is crucial for the Indo-Pacific region as it addresses a major nutritional crisis. In developing countries, 200-300 million children of preschool age are at risk of Vitamin A deficiency, which is the single most important cause of childhood blindness in developing countries. Every year, about half a million children go blind as a result of Vitamin A deficiency and 70 per cent of those die within a year of losing their sight.

Golden Rice could have been available and saving children's lives for many years were it not for the ongoing activism of anti-humanitarian organisations, who first claimed the elevated levels of pro-Vitamin A in the modified rice were toxic. When this was shown to be patently untrue, these activist organisations changed tack and claimed the level of pro-Vitamin A in the rice was in fact too ***low*** to have any meaningful biologic effect.

Agricultural biotechnology is also being used to produce vegetable oils with low saturated fats and properly balanced essential fatty acids, which are associated with reducing the risk of heart disease and stroke, important for brain function and essential for growth and development of infants.

A new GM wheat variety currently going through field trials will help combat one of the most serious health issues for developed countries – the rise of diet related conditions such as Type 2 diabetes, obesity, cardiovascular disease and colo-rectal cancers. Wheat high in resistant starch has the potential to improve health across the entire Australian population[17].

In comparison, a recent Stanford University meta-analysis[18] of 240 existing studies comparing organic and conventionally produced foods did not find evidence that organic foods are healthier or carry fewer health risks than conventional alternatives. No consistent differences were seen in the vitamin content of organic products and only one nutrient, phosphorous, was significantly higher in organic versus conventionally grown produce (the researchers note that because exceptionally few people have a phosphorous deficiency, this is of little clinical significance). The researchers also stressed that consumers need to be aware that organic foods are not 100 per cent free of pesticides. These researchers concluded that their study showed there is a lot of variation between farming practices and there are many different factors that go beyond method of production, which are important in predicting nutritional quality and harms.

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16 Rosegrant Mark W. et al. 2014 'Food Security in a World of Natural Resource Scarcity: The Role of Agricultural Technologies' *International Food Policy Research Institute (IFPRI)*

17 CSIRO, http://www.csiro.au/Outcomes/Food-and-Agriculture/New-wheat-with-a-healthy-future.aspx, accessed March 2014

18 Smith-Spangler, C, Brandeau, M L, Hunter, G E, Bavinger, J C, Pearson, M, Eschbach, P J, Sundaram, V, Liu, H, Schirmer, P, Stave, C, Olkin, I & Bravata, D M, 2012, 'Are Organic Foods Safer or Healthier Than Conventional Alternatives?' *Ann Intern Med*, *157*, 348-366.

There are numerous environmental benefits of adopting agricultural biotechnology – true sustainability must recognise coexistence of farming

True sustainability must recognise that the variety in farming systems, environments and crops means that a 'one-size-fits-all' approach is neither logical nor effective. Measures that are environmentally sustainable in market gardening in peri-urban areas around Australia may not be economically sustainable in a broadacre cropping/grazing system. Any approach the Australian Government takes to improving agricultural sustainability must recognise this reality.

Coexistence is the practice of growing crops with different quality characteristics or intended for different markets in the same vicinity without becoming comingled and thereby possibly compromising the economic value of both. Coexistence is based on the premise that all famers should be free to cultivate the crops of their choice using the production system they prefer, be it using crop biotech, conventional or organic methods.

Coexistence of various production methods is not a new concept to the agricultural community. Famers have practiced coexistence for generations in order to meet customer demands for different types of products. Breeders and farmers are accustomed to breeding and producing different crops such as bread and noodle wheat, feed and malting barley, and high- and zero-erucic acid canola alongside each other. They are also accustomed to producing certified seed to meet defined purity standards. This experience demonstrates that coexistence of a wide range of production methods is not a problem, provided technical and procedural guidelines are carefully followed and cooperation between neighbouring farms is encouraged. This applies equally to the use of modern crop protection and crop biotechnology products in farming systems.

Coexistence is not about environmental or health risks because it refers only to the use of crop biotechnologies or CPPs that have been approved as safe for the environment and human health by Australian Government regulators.

CropLife's position is that all agricultural production systems should have an equal opportunity to contribute to the agri-food production system under free market conditions. Preference for one production system over another should not be the result of artificial, discriminatory and impractical public policy decisions made by state governments as is currently the case in South Australia and Tasmania with the ban on crop biotechnology products.

High cost of development of a new biotechnology is met by the plant science industry

Bringing a new GM trait to market is a significant investment made by the plant science industry. To determine the relative cost and duration of the process, CropLife International commissioned consultancy firm Phillips McDougall to survey the plant science industry's largest developers. The survey found that it takes 13 years research and development (R&D) plus US$136 million to develop each new GM crop trait[19].

The cost and duration of new GM trait development, particularly navigating the regulatory process, highlights the need for a transparent and workable regulatory system based on sound science and harmonised risk assessment. Improvements to state and territory participation in the national gene technology regulatory framework will help remove unnecessary barriers to innovation and trade for Australia, assisting the nation in achieving a clean, green and sustainable agricultural sector.

The high level of private sector investment in agricultural R&D in Australia demonstrates the plant science industry's commitment to supporting sustainable agriculture and the extent necessary to bring technological innovation to the market. Ongoing investment by industry and government promises to continue to improve the sustainability of Australia's agricultural industries.

[19] Phillips McDougall, 2011, 'The cost and time involved in the discovery, development and authorisation of a new plant biotechnology derived trait'. A consultancy study for CropLife International, September 2011.

Empowering women farmers could feed an additional 150 million people. The Indo-Pacific region would significantly benefit from empowering women farmers.

In developing countries, women make up almost half the agricultural labour force[20]. But that's where the gender balance ends. When it comes to education, access to crop inputs and crop productivity, there's a significant gap between men and women. Yet the Indo-Pacific region stands to gain so much if the focus is on closing the gender gap and empowering women in agriculture. The UN Food and Agriculture Organization (FAO) says that if women had the same access as men have to resources such as land, financing and technology, among other things, they could increase agricultural yields by 20-30 per cent, enough to lift between 100 and 150 million people out of hunger[21].

FAST FACTS

- From **1996 to 2014**, farmers in **28 countries** worldwide planted more than **450 billion acres** of biotech crops.
- Of the **18 million farmers** growing biotech crops in 2014, **16.5 million** were **smallholder farmers** in **developing countries**.

A 2011 Columbian study on gender and biotech cotton found that female farmers are open to plant technologies and may be better managers of them than their male counterparts. Women are eager to dispense with less efficient ways of doing things and reduce manual labour.

The study[22] by the International Food Policy Research Institute (IFPRI) looked at gender differences in cotton cultivation and the perceptions and experiences of women versus men with biotech varieties. The research was conducted in the main cotton producing regions of Colombia where biotech cotton had been in the market for six years.

Findings revealed that female farmers prefer insect-resistant biotech cotton varieties over conventional ones because they reduce labour costs and manual weeding. Biotech seed decreases the need for CPPs and therefore, the number of male labourers required to spray them – a task solely performed by men. Similarly, technologies that reduce manual weeding, which is often done by women and children, are embraced by women.

The study also found that female farmers appear to have more difficulty accessing or sharing information due to time restrictions as they often juggle domestic responsibilities along with those on the farm. Yet, when they do get information, they seem to pay more attention to it than male farmers. This may translate into women being better managers of technology.

While biotech cotton varieties appear to be positive for both genders through generating additional income, the ways in which men and women spend new money differs. According to the study, male farmers tend to spend money on leisure activities, whereas female farmers invest in their family's health and education.

This study highlights the potential of female farmers as managers of crops and new technologies. Growing evidence shows that empowering women can lead to improved agricultural productivity, food security and nutrition.

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20 FAO, 'International Women's Day 2015: Women farmers key to fighting hunger', http://www.fao.org/news/story/en/item/279496/icode/, sourced 8 January 2016

21 FAO, 'FAO AT WORK 2010-2011:Women – key to food security', http://www.fao.org/docrep/014/am719e/am719e00.pdf, sourced 8 January 2016

22 International Food Policy Research Institute, Women cotton farmers: Their perceptions and experiences with transgenic varieties – Discussion Paper, http://www.ifpri.org/publication/women-cotton-farmers-their-perceptions-and-experiences-transgenic-varieties, sourced 7 January 2016

Tackling food security in the Indo-Pacific region takes more than quantity – it takes quality too.

According to the United Nations, malnutrition and hunger related diseases cause 60 per cent of the 10.9 million children under five that die in developing countries each year[23]. At least half of the 10.9 million child deaths each year could be prevented through better nutrition. Here are five foods that are using plant science to improve their vitamin and mineral content.

Biofortified Sorghum

Due to its ability to withstand periods of drought or heavy rain, sorghum is the only viable food grain for many of the world's most food insecure people. The Africa Biofortified Sorghum Project has developed a new biotech variety to improve nutrition, especially for growing children. It has higher levels of Vitamin A and helps improve the body's absorption of iron and zinc. When brought to market, this product could improve the health of over 300 million people.

Golden Rice

Over 90 per cent of the world's rice is produced and consumed in the Asia-Pacific region – a part of the world fraught with Vitamin A deficiency. But thanks to The Golden Rice Project, a biotech rice variety rich in Vitamin A has been developed. Studies have shown that one bowl of cooked Golden Rice provides 60 per cent of the recommended intake of Vitamin A for children. The rice contains beta-carotene, giving it a sunny yellow colour. Although not yet commercially available, Golden Rice has been bred into local varieties in India, the Philippines, Vietnam and Bangladesh, with field trials currently underway in the Philippines.

Orange Sweet Potato

Approximately 250 million children worldwide suffer from Vitamin A deficiency – the leading cause of preventable childhood blindness. HarvestPlus and its partners have successfully bred a new variety of sweet potato to Mozambique and Uganda that is rich in Vitamin A. The project leaders are hoping other countries will also make the orange sweet potato a staple on their dinner tables.

Iron-Rich Beans

Iron deficiency is a widespread problem in sub Saharan Africa, leading to weakened immune function and anemia. Since 2012, farmers in Rwanda, Uganda and the Democratic Republic of the Congo have been growing a high-iron variety of beans, bred by partners at HarvestPlus, that provides 45 per cent of your body's daily iron needs. The next goal: a variety that provides 60 per cent!

Vitamin A Enriched Banana

Ugandans eat more bananas than any other country in the world – more than half a kilogram per day. By trading basic bananas with a new vitamin-enriched biotech variety, millions of Ugandans and other East Africans can improve their health and wellbeing. The super banana's bright orange flesh is rich in beta-carotene – a natural source of Vitamin A – and is expected to reach market in 2020.

[23] Progress for Children: A report card on nutrition (no. 4), 2006, http://www.unicef.org/publications/index_33685.html, sourced 20 January 2016

Through the partnership of the public and private sectors, organisations are able to work together for mutual growth and benefit in the Indo-Pacific region.

From feeding a population expected to reach 9.7 billion by 2050, to protecting soil, water and natural habitats, the world's farmers are faced with many challenges. As a result, farmers need innovative solutions more than ever before. Through the partnership of the public and private sectors, innovative collaborations are providing farmers with access to plant science technologies, as well as new practices and knowledge, to help farmers meet these challenges.

These collaborations enable goals, resources, expertise and risk to be shared, ensuring scientific innovations become valuable tools for farmers. Successful public-private partnerships:

- Improve the efficiency of developing locally adapted innovation.
- Enable technology to be distributed more effectively to local farmers.
- Help farmers continuously improve and make the most of sustainable agricultural practices.
- Promote the effective and responsible application of new technologies.
- Provide social and economic value to farmers and communities.

To ensure a sustainable, secure global food supply we need to continuously improve the tools and techniques available to farmers working in diverse ways and environments around the world. This involves not only developing new technologies, but also adapting and applying these innovations to local needs and conditions. It also involves ensuring they can be used effectively by skilled and well-informed farmers. Neither the private nor the public sector can achieve these aims on its own. But together they can combine and maximise the impact of their individual experiences and resources where it matters most – at the local level with our farmers around the world.

There is already a number of public-private partnership projects involving CropLife's members. The projects vary but they all share the same core objectives to improve food security, share knowledge and enable farmers to gain greater access to resources.

Research partnerships can lead to food security solutions.

Such partnerships can improve local agricultural practices and develop staple crops that are more nutritious, better adapted to local growing conditions or resistant to pests.

- A multinational team of private and public sector scientists is currently developing biotech bananas in Uganda with increased Vitamin A, Vitamin E and iron content. Banana is a major food crop in Uganda, so successful research could dramatically improve the diets of millions of people.
- In Bangladesh and the Philippines, biotech brinjal (eggplant) technology was donated directly to local researchers to give farmers quicker access to improved varieties that are resistant to local pests.
- By sharing agricultural knowledge with the International Maize and Wheat Improvement Centre, the private sector has developed new commercially-available maize varieties that adapt to local conditions, and wheat varieties protected against devastating diseases such as wheat stem rust.

Sharing knowledge is a crucial component of public-private partnerships.

Collaborative projects that share practical agricultural information and best practices between the public and private sector and farmer organisations can help improve farming around the world.

- Private companies have been involved in the South African Developing Agriculture Project, which works with local farmer organisations to increase and safeguard crop yields by changing agricultural management practices for the better.
- Several partnerships between non-governmental organisations (NGOs) have focused on integrated pest management training and the responsible use of plant science products in Latin America, Southeast Asia and Africa. Other projects have included educating academia, public and private researchers and government agencies on how to comply with guidelines for regulated field trials, import permits, incident management, product launch and Excellence Through Stewardship® practices.

- Co-convened by the International Centre for Tropical Agriculture (CIAT) and the International Food Policy Research Institute (IFPRI), the HarvestPlus Challenge Program works with more than 200 agricultural and nutrition scientists around the world, including private sector developers. CIAT is currently biofortifying the seven key staple crops that will have the greatest impact in alleviating micronutrient malnutrition in Asia and Africa – beans, cassava, maize, pearl millet, rice, sweet potato and wheat. This partnership directly combines expertise across borders, resulting in economies of scale and faster adaptation.
- In Japan, private companies are cooperating with local government, agricultural associations and universities to improve the productivity and profitability of vegetable farms through new technologies. The project includes establishing the crop varieties and crop protection tools ideal for year-round cultivation of leafy vegetables.
- The Tissue Culture Banana Project brought together Africa Harvest and the private sector to introduce tissue culture banana production methods to farmers in Kenya. Farmers were also given extensive training on agronomy and best practices for small farm-based businesses. The introduction of both technology and training has reduced plant diseases and increased productivity in bananas, an important food security crop in Kenya.
- In Bangladesh, farmers' wives influence the purchase of agricultural products and farming decisions. A community project has focused on placing female crop advisors ("farmers' sisters") in contact with farmers' wives. These advisors support farming meetings, meet with retailers and recommend farming solutions to other women in the community. Programs like these support the women in the farming community, provide agricultural education and knowledge, and help increase farm productivity and profitability.

Gaining greater access to resources is one of the many benefits of public-private partnerships.

Shared projects between government agencies and the private sector can help farmers gain greater access to fundamental resources so they can manage their production process more reliably, at less cost and with greater certainty.

- The not-for-profit African Agricultural Technology Fund (AATF) facilitates and promotes public-private partnerships that enable resource-poor small-holder farmers in sub-Saharan African to access proprietary agricultural technologies. The AATF leads the Water Efficient Maize for Africa (WEMA) project – a public-private partnership to develop royalty-free drought tolerant African maize using conventional breeding, marker-assisted breeding and biotechnology.
- In India, private companies have worked with local leaders and banks supported by the National Bank for Agriculture and Rural Development (NABARD) to help farmers gain financial independence with the help of a low-cost credit system. Thanks to the development of this transparent, reliable credit and distribution system, farmers have access to affordable, high yielding maize hybrids, farm inputs and specialist knowledge.
- The Frijol Nica project in Nicaragua provides integrated product bundles of agricultural inputs to farmers with four to five months of credit, backed by a cooperative and financed by a local distributor. With improved access to inputs, farmers can increase the amount and quality of crops they grow and, in turn, their incomes.
- The International Potato Centre has developed a long-term strategy to work with the U.S. Agency for International Development (USAID) and the private sector to increase business investments throughout the seed potato value chain. This can help increase the availability of high-quality seed potatoes, promote improved seed management and improve potato productivity in Ethiopia, Kenya, Rwanda, Tanzania and Uganda.
- The Qori Chacra program in Peru has trained farmers so they can meet the rigorous quality protocols for local restaurants and businesses. By creating a continuous local market for their products, farmers have been able to improve their standard of living as well as adopt new farming methods, build greenhouses and field trial new crop varieties.
- Over the next decade, the International Potato Centre's Sweet potato Action for Security and Health in Africa (SASHA) project could improve the lives of 10 million sub-Saharan households. It is focusing on improving the quality and range of available sweet potato varieties, including a weevil-resistant variety, as well as developing sustainable seed systems. The project connects research and development to make it easier to access and distribute better varieties of this important crop for the region.

- Knowledge sharing and lifelong learning in public institutions is important all over the world, including developed countries such as Australia. It is being supported through private collaborations, for example through funding endowed chairs at universities and sharing private expertise and plant breeding excellence to develop new plant varieties suited to local and global markets.
- Public research institutes in Australia, China, Israel and Japan are working with private industry on rapid gene sequencing models and modern breeding techniques to make important agricultural tools available to farmers sooner.

The lack of regional regulatory harmonisation acts as a barrier to access innovation

CropLife advocates for a regulatory system that is efficient and effective. The system for registering products must be transparent and predictable to provide applicants with certainty about how their application will be assessed. Australia's agricultural chemical and gene technology regulatory systems, although far from perfect in terms of efficiency and cost effectiveness, are renowned for world's best-practice, evidence-based risk assessments.

Regulatory assessments of CPPs and genetically modified organisms often differ significantly from country to country. The lack or harmonisation in methodology, risk assessments and risk management decisions often acts as a barrier to innovation.

It has to be realised that even with more harmonised methodology, risk assessments and risk management decisions remain the sovereign right of individual countries. Individual country needs and expectations of what constitutes acceptable risk will vary based on their particular socio-economic situation, their tolerance for risk and their understanding of the benefits derived from a crop protection/genetic modification technology.

Harmonisation in this area can, however, reduce complexity in trade; enhance farmers' access to quality, legitimate technologies; increase research investment and build more shared regulatory capacity. Regulatory harmonisation in the Indo-Pacific region unleashes the potential of the agricultural sector through reducing redundancy, leveraging the regulatory competency among Indo-Pacific nations, minimising waste of critical resources and expediting the testing and review processes for new products.

More efficient registration of new products helps reduce the costs to the region's governments - and ultimately mitigates barriers to trade. This is made possible by leveraging competence among member states through the mutual acceptance of data for product registration and providing incentives that encourage investments in research and development for crop protection within the Indo-Pacific region.

International engagement to open discussions with Indo-Pacific region nations on best-practice regulatory processes and risk management would go some way in breaking down these barriers to innovation.

Conclusion

The plant science industry provides products to protect crops against pests, weeds and diseases, as well as developing crop biotechnologies that are key to agricultural productivity, sustainability and food security.

The world's population is predicted to increase to 9.7 billion by 2050, requiring an increase in global food production of 70 per cent. Providing enough food in the context of production constraints, volatile consumption patterns and a changing climate will be an unprecedented scientific, economic and public policy challenge.

Meeting the challenges presented by sustainably increasing food production to meet growing global demand will require science-based policies that support all production systems, including existing and future production tools and technologies.

For millions of families in the developing world, farming is not just an occupation it is the sole means of survival. They're the largest farmer group in the world and key drivers of food security in developing countries. However, it's tough for small-holder farmers to make a good living. The plant science industry is trying to change that with a commitment to provide them with knowledge and access to innovative farming methods and technologies. In particular, access to crop protection and biotechnology solutions can assist farmers in producing high yields with fewer natural resources by reducing water consumption, increasing a crop's nutrient uptake and reducing the need for other inputs.

In developing countries, women make up almost half the agricultural labour force[24]. But that's where the gender balance ends. Empowering women farmers could feed an additional 150 million people. The Indo-Pacific region would significantly benefit from empowering women farmers. Recent studies highlight the potential of female farmers as manager of crops and new technologies. Growing evidence shows that empowering women and providing them with access to the plant science technologies can lead to improved agricultural productivity, food security and nutrition.

Plant science is also contributing to addressing nutritional needs. Vitamin A enriched banana, iron-rich beans and golden rice are just a few examples of how the plant science industry is seeking to improve nutrition for many of the world's most food-insecure people.

International engagement in the Indo-Pacific region on best-practice agricultural chemical and agricultural biotechnology regulatory processes and assessments will go some way to Australia helping to eradicate extreme poverty and hunger and reduce child mortality while promoting gender equality and empowering women; all United Nations Millennium Development Goals[25].

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24 FAO, 'International Women's Day 2015: Women farmers key to fighting hunger', http://www.fao.org/news/story/en/item/279496/icode/, sourced 8 January 2016

25 United Nations website, http://www.un.org/millenniumgoals/, sourced 22 January 2016