CropLife AUSTRALIA

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

CropLife submission to Queensland Agriculture and Food Research, Development and Extension Roadmap

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1 INTRODUCTION

CropLife Australia (CropLife) is the national peak industry organisation representing the agricultural chemical and biotechnology (plant science) sector in Australia. CropLife represents the innovators, developers, manufacturers and formulators of chemical, biological and organic crop protection products and agricultural biotechnologies. CropLife's membership is made up of both patent holding and generic Australian and international and small and large companies and accordingly, advocates for policy positions that deliver whole of industry benefit.

The plant science industry provides products to protect crops against pests, weeds and diseases, as well as developing crop biotechnologies that are key to the nation's agricultural productivity, sustainability and food security. The plant science industry directly underpins and enables more than $18 billion a year of Australian agricultural production and directly employs thousands of people across the country. CropLife Australia is a member of CropLife Asia and part of the CropLife International Federation of 91 CropLife national associations globally.

What are the key drivers of RD&E and innovation that will impact the Queensland agriculture and food sector in the next 10 years?

The world's population is predicted to increase to 9.8 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, restricted and limited resources and a changing climate will be an unprecedented scientific, agricultural, industrial, economic and public policy challenge. The situation provides an opportunity for Queensland farmers to both assist in the global food security effort and to profit from increased demand for their agricultural products. By adopting innovative farming practices, such as the sustainable and efficient use of crop protection products and genetically modified (GM) crops, the Queensland farming sector will be able to produce more sustainably and with greater productivity.

Crop protection products and crop biotechnologies are crucial to environmentally sustainable, modern, climate-smart farming. A truly productive, competitive and sustainable agricultural industry in Queensland that improves market returns at the farm gate is not achievable in the long-term without ensuring that regulatory systems are efficient, effective and only commensurate with the genuine risks, costs and benefits to the broader community.

It is essential that government works with industry to reduce unnecessary 'red tape' and regulation that is not commensurate with risk. It is crucial to create nationally harmonised regulations and legislation to maintain the ability for Queensland farmers to access the latest innovative plant science tools and products.

Queensland's agriculture and food sector is a world-class producer of high-quality, safe agriculture, food and fibre products. Queensland's field and horticultural crops are a significant part of the economic, social and cultural fabric. The Queensland horticulture industry is worth $4.1 billion each year, while Queensland's cropping, cereal, grain, fibre and sugarcane industries have a combined value of $3.2 billion each year. Queensland's vegetable and fruit industries are the largest and second largest in Australia, respectively. The Queensland cotton industry produces about 40 per cent of the nation's 3.5 million bales (more than 790,000 metric tonnes, averaged over the last 5 years) each year and is estimated to add more than $2 billion in value to the Australian economy. Nearly 100 per cent of the cotton grown in Queensland is genetically modified. GM cotton along with integrated farm management has led to several on-farm benefits and greatly reduced the environmental impact of cotton farming.

By adopting profitable, productive and innovative farming practices, such as the sustainable and efficient use of crop protection products and GM crops, the Queensland farming sector will be able to produce more with less, strengthening both the Australian agriculture industry, the Queensland farming sector and the regional communities that rely on them.

Meeting the challenges presented by sustainably increasing global demand for food will require open, rational and science-based policies that support all production systems, including existing and future production tools. Profitable, productive and innovative 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.

Crop protection products (which include herbicides, insecticides and fungicides, generally referred to as pesticides) are currently relied upon to increase global food production by between 30 per cent and 50 per cent. Supporting industries to develop and introduce newer crop protection products that are better targeted to Queensland pests, climates and crops will help Queensland play its part in addressing global food security.

GM crops, an application of modern 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 is as safe as their conventional counterparts. 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:

- reducing overall pesticide use and encouraging the substitution of older pesticides with pesticides that are better targeted, more efficient and have a reduced environmental impact;
- reducing tillage (facilitating no-till farming);
- reducing on-farm fuel use;
- reducing CO_2 emissions from farming operations;
- reducing pesticide runoff into waterways;
- reducing the need for further land use to maintain current global food production;
- increasing soil carbon storage; and
- increasing water use efficiency.

GM crops currently under research and development in Australia will help Australian 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 omega-3 enhanced canola and wheat and barley with healthier starches. Standout Queensland-led research into bananas genetically modified to accumulate high levels of β-carotene (a precursor of vitamin A), could assist in vastly improving the lives of children in African countries, such as Uganda.

2 AGRICULTURAL CHEMICAL PRODUCTS SUPPORTING FOOD AND AGRICULTURE RD&E

All agricultural production systems, whether they be conventional, organic or reliant on biotechnologies employ strategies to control pests, weeds and diseases. According to a Deloitte Access Economics report released in November 2013, 68 per cent of the total value of Australian crop production can be attributed to and directly enabled by the use of crop protection products[1]. Without the responsible use of crop protection products, as much as half of the world's food supply could be lost.

Queensland's $4.1 billion horticulture industry is significantly dependent on crop protection products. Ensuring that Queensland's farmers have access to modern technologies to protect their crops through increased research and development outputs will support the ongoing productivity, profitability, development and innovation of more sustainable agriculture and food industries in Queensland.

CropLife members support all production systems (conventional, organic and modern) by providing crop production products to meet the needs of Queensland farmers. Our members' success is intrinsically linked with that of all Australian farmers. Ultimately, a productive, profitable and innovative agricultural system for Queensland will involve balancing a series of potentially competing issues and making decisions about the most effective, efficient and sustainable way to manage a farm considering the type of production system, climate, soil types, pest pressures and economic considerations.

Any agricultural RD&E action plan will need to recognise the critical role that the plant science industry plays in identifying and developing new and innovative crop protection products that ensure the ongoing sustainability of Queensland's farms. Providing farmers with greater choice and options to manage their land and production systems provides them with the best opportunity to make decisions that promote the ongoing productivity, profitability and innovation of Queensland agriculture and food.

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

Regulatory Environment

Efficient and effective regulation is essential to support an innovative, productive and sustainable agricultural industry in Australia.

Australia is fortunate to have a comprehensive, although somewhat expensive and inefficient regulatory environment to ensure the safety, efficacy and sustainability of agricultural chemical products used in Australia. The Australian Pesticides and Veterinary Medicines Authority (APVMA) conducts a pre-market risk assessment of all new pesticide products before they are registered and sold. The APVMA's assessment manages the sustainability of pesticide products by ensuring that products, when used in accordance with the directions specified on the label, present no unacceptable risks to users, consumers, the environment or trade.

There is, however, a well-recognised problem in a number of smaller and specialty products where the market size does not justify the necessary investment in research and development to generate data and registration costs by a registrant. The Australian Government's mandatory regulatory system for pesticides creates a market failure. This failure comes from the fact that the small volume of sales of products for specialty and minor uses does not offset the high costs associated with registering those products or generating crop- or pest-specific data required to extend labels to include new uses for existing products.

Off-label use reduces the incentive for manufacturers to put minor uses onto labels and potentially raises problems of liability if misuse of the product causes harm.

Label directions for pesticide use are the result of extensive and expensive scientific research by the manufacturer, and rigorous evaluation by the APVMA to ensure safe and effective use. Allowing users to disregard parts of the label in some situations devalues the label and risks encouraging a culture of negligence towards directions. Users are likely to be confused about which label statements are mandatory in each situation and jurisdiction. Users and registrants may ultimately lose confidence in the National Registration Scheme for Agricultural and Veterinary Chemicals. For these reasons, CropLife does not support off-label use of agricultural chemical products.

By working in partnership with stakeholders such as CropLife and its members, the Queensland Government has an opportunity to invest in more comprehensive extension strategies to improve awareness of the issues associated with off-label use of agricultural chemicals, as well as state- or regional-specific label directions to improve confidence in the regulatory environment.

Continued Support of Progress Towards National Harmonisation of Control of Use of Crop Protection Products in Agriculture is Imperative

CropLife promotes improved harmonisation of state control of use regulations in Australia to remove duplication and inconsistencies and to reduce unnecessary costs to industry. CropLife members find it difficult, confusing and costly to meet the multiple regulatory requirements of all the jurisdictions in Australia. This situation minimises the incentive for members to invest in research and development aimed at minor and specialty crops.

The consequences are, however, not limited to minor crops. Major commodities such as wheat and barley can still be susceptible to minor pests and diseases that are not significant enough to justify investment by registrants to extend labels or develop new control technologies. Pests may not always be a problem for a crop, or unusual and unexpected weather conditions in a season may lead to new pest and disease pressures.

The AgChem Access Priorities Forum, formerly the AgVet Collaborative Forum, has improved collaboration between agricultural chemical registrants and the grower industry regarding agricultural chemical minor use priorities. The Forum, initially funded through an Australian Government $8 million commitment in the 2014 Federal Budget, seeks to establish systems that will enable the ongoing registration of chemical products for use on minor and specialty crops, thereby reducing the need for off-label uses and providing a platform by which national harmonisation could occur. Leadership by the Queensland Government is necessary to deliver national harmonisation of state control of use regulations in Australia. Leveraging Forum outcomes will be key to this.

The Australian Government's initial $8 million commitment is a profitable investment in Australia's agricultural sector. Similar programs in the United States were established over 30 years ago and have demonstrated that every dollar invested in a minor use program generates a net return to the US economy of US$550. Targeted investments would also leverage complementary and collaborative investments from users and registrants. CropLife estimates that total funding of $45 million (including the initial $8 million allocation) spread over four or five years would be the likely requirement for the program to deliver the full and genuine economic benefits to Australia.

A lack of available pest and weed protection products provides a significant barrier to the development of new agricultural industries. New crops are less likely to be commercially cultivated for domestic and export markets if there are no options for pest control. Horticultural crops face challenges as the smaller areas under production often make it uneconomic for registration of new chemical products.

The small size of Australia's crop protection product market on a global comparison means the implementation of harmonisation of state control of use regulations is vital so that Australian agriculture is assured access to the latest innovations from the plant science industry and their full range of uses. This would lead to improvements in yields, profitability and access to markets, in turn boosting the competitiveness of Queensland's horticultural and cropping industries both nationally and internationally.

World-leading whole of lifecycle product stewardship

CropLife Members recognise they have an ongoing responsibility to ensure the sustainability of their products. For this reason, CropLife internationally has developed and supported the *International Code of Conduct on the Distribution and Use of Pesticides.* This Code specifies obligations about the stewardship of agricultural chemicals throughout their lifecycle, from innovation, discovery and development through to ultimate disposal of packaging waste. In addition, CropLife Australia members must also abide by the *CropLife Australia Code of Conduct,* and the *Agsafe Code of Conduct.* These stewardship schemes specify the obligations of CropLife Australia members, including requiring participation in the ***drum****MUSTER* and ChemClear® industry stewardship schemes.

Additionally, many CropLife members engage in significant supplementary stewardship of their products, which ensures the products sold by a company are being used in accordance with all the conditions and precautions necessary for that product.

Collectively, these controls help maintain the sustainability of Queensland agriculture by responsibly and efficiently managing farm inputs. The ***drum****MUSTER* and ChemClear® industry stewardship schemes also address environmental and health and safety concerns by disposing and recycling farm chemical waste. To date, ***these programs*** have disposed of more than 5.6 million chemical containers in Queensland, nearly 30 million chemical containers nationally, and 34,880 tonnes of materials have been recycled into re-usable products. It is important to recognise that these programs are undertaken voluntarily by industry, not through any regulation, again reinforcing how the issues of sustainability are culturally entrenched both in Australia and internationally.

By working in partnership with CropLife and our members, the Queensland Government has an opportunity to promote industry-led extension initiatives focussed on the stewardship of agricultural chemicals and the sustainability of the industry, which will generate economic, environmental and human health benefits for Queensland.

Organic Production Systems

Organic production systems often face unique challenges to remain productive and compliant with the standards required by inconsistent and non-science based organic marketing rules. Plant pests and diseases are just as attracted to organic products as conventionally grown produce. Plant protection tools are therefore critical to support organic production systems.

CropLife Australia members provide agricultural non-synthetic chemical and biological based crop protection products to organic farmers across Australia, including organic insecticides and fungicides. Provided that farmers use these products in accordance with the directions specified on the label, farmers can be assured that any environmental, human health or trade impacts can be managed and avoided.

Organic production in Australia continues to experience high growth rates. While there is an inherent productivity barrier to organic production, should this trend continue in the short-term, it will increase the demand for organic crop protection products, as well as newer products to meet specific needs. The economic sustainability of these emerging industries will be reliant on the innovation, development and availability of adequate crop protection tools. Increased investment in RD&E to encourage the generation of data that supports the development of new organic crop protection products, or the addition of new uses for specific crops, is imperative for the Queensland organic industry to continue to grow and be competitive in the Australian market.

Many organic farms currently have limited crop protection options due to the current small size of the industry. The scientific data required to develop and register new products for organic producers can exceed the likely size of the market. The 'minor use' problem, where the economic return to a registrant from a new product use is exceeded by the cost of regulatory requirements for approving a new use, occurs across all broadacre cropping and horticultural systems in Australia.

Conventional Broadacre Production Systems

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 pest species. The sustainability of this sector is dependent upon the efficient and responsible use of, and development of new critical inputs (including pesticides, among others) to remain both economically and environmentally sustainable.

Previous investments in RD&E have produced modern broadacre production systems 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 only weeds while leaving a growing crop unharmed. This allows farmers to choose the best crop protection technologies to suit the 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.

To ensure that future RD&E continues to improve productivity and profitability, increase yields and improve access to important markets, it is imperative that innovation and development in crop protection products is well supported.

Conventional production systems are responsible for the clear 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. As such, targeted, efficient RD&E investments in crop protection products is essential for the continued improvement in food production and ultimately, Queensland's environment, societal health and economy.

Conventional Horticultural Production Systems

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 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 also may result in the development of new products and markets that are better suited to individual farm circumstances.

Resistance Management

CropLife promotes the responsible use of a range of pest management methods to ensure sustainable agricultural outcomes. Our members are committed to the pursuit of technologies that provide economically viable solutions to pest control.

By working in partnership with CropLife and our members, the Queensland Government has an opportunity to promote industry-led extension initiatives focussed on the management of resistance to agricultural chemicals and the sustainability of the industry, which will generate significant economic and environmental benefits for Queensland.

Crop protection products are an important tool in an integrated approach to pest management. It is recognised that resistance management is a vital aspect of maintaining the crop protection option for integrated crop management. In line with good farming practice, a comprehensive program of alternative management strategies is employed to minimise the development of resistance, whilst contributing towards the quality of the environment.

CropLife's Resistance Management Strategies provide a guide for crop protection product rotation through product groups[2]. The strategies are useful tools that support Australian farmers' adoption of resistance management. Managing the emergence of resistance to crop protection products is an essential part of enhance sustainable agricultural practices in Australia.

[2] The CropLife Fungicide, Herbicide and Insecticide Resistance Management Strategies can be downloaded from the CropLife Australia website: www.croplife.org.au

3 USING GM CROPS AS A TOOL FOR ENHANCING AGRICULTURE AND FOOD RD&E

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 26 countries who have accessed the technology[3].

GM crops in Australia: a snapshot of GM cotton and GM canola Benefits to Sustainable Agriculture and Food RD&E

In Australia, growing GM cotton varieties has seen environmental benefits resulting from decreased insecticide use 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 insects (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 because 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. Reducing the use of some residual herbicides, together with good industry stewardship, has decreased the potential for herbicide runoff into waterways[8].

3 ISAAA 2016. 'Global Status of Commercialized Biotech/GM Crops: 2016'. *ISAAA Brief No. 52*. ISAAA: Ithaca, NY
4 Cotton Australia Cotton Fact File: Biotechnology http://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-biotechnology accessed 18 July 2017.
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 Hattersley *et al.*, Op. cit.

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 have decreased because of reduced insecticide spraying and 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[9]. 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 crop protection products.

Herbicide tolerant canola provides farmers with more effective weed control, particularly for those broad leaf weeds, such as wild radish, 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 retention.

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 global socio-economic and environmental impacts of GM crops

The most recent annual report on the global socio-economic and environmental impacts of GM crops from the independent British consultancy firm PG Economics indicated continued considerable economic and environmental benefits to the farmers and public in countries where GM crops are grown[10]. The report indicated that the net global benefit at the farm level in 2015 from growing GM crops was US$15.4 billion. For the 20-year period (1996-2015) covered by the report, the global farm income gain has been US$167.8billion. Australian GM cotton and canola farmers have realised a benefit of over US$1.02 billion in the period 1996-2015[11].

[9] Holtzapffel *et al.*, Op. cit.

[10] Brookes G and Barfoot P 2017. 'GM crops: global socio-economic and environmental impacts 1996-2015'. *PG Economics*, Dorchester, June.

[11] Australian GM cotton farm income benefit US$949 million 1996-2015; GM canola farm income benefit US$74 million 2008-2015.

If crop biotechnology had not been available to the more than 18 million farmers using the technology in 2015, maintaining global production at the 2015 levels would have required additional plantings equivalent to 40 per cent of the arable land in Australia. That's more than 19 million hectares of forest and natural habitat not used for agricultural purposes in 2015 alone.

The PG Economics report notes that GM crops have contributed significantly to reducing the release of greenhouse gas emissions from agricultural practices. This results from less fuel use and additional soil carbon storage from reduced tillage associated with GM crops. In 2015, this was equivalent to removing 26.7 billion kg of carbon dioxide from the atmosphere, or equal to removing more than 12 million cars (72 per cent of cars registered in Australia) from the road for one year[12].

The report also notes that agricultural biotechnology has contributed to a significant reduction in the environmental impact associated with insecticide and herbicide use on the areas devoted to GM crops. From 1996-2015, the use of pesticides on the global GM crop area was reduced by 620 million kg of active ingredient (8.1 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[13].

A 2012 study reported in the science journal *Nature*, found that in China over a period of 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[14]. On conventional crops, these beneficial insects were killed by the broad-spectrum insecticides used to control the major target pests, for example, 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].

A 2014 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.

Queensland 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.

12 Brookes G and Barfoot P 2017, *Op. Cit.*.
13 *Ibid.*
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.*
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)*

Health, Safety and Nutritional Impact of Agricultural Biotechnology

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.

Commercial production of GM crops is only permitted when environmental and consumer safety has been thoroughly demonstrated. In Australia, the Gene Technology Regulator is responsible for licensing any dealings with live and viable genetically modified organisms (GMOs). Food Standards Australia New Zealand (FSANZ) is required to approve any GM food ingredient and APVMA regulates those GM crops with inbuilt pest protection. The GM canola and GM cotton crops that are grown in Australia have passed these regulatory assessments.

The safety of agricultural biotechnology products has been continually reaffirmed over time

A significant number of peer-reviewed scientific research papers have been published that describe the results of biosafety research on biotech crops. The GENetic Engineering Risk Atlas (GENERA) is a long-term project to catalogue, examine and communicate the findings of all peer-reviewed scientific publications that can be used to analyse the relative risks of genetically engineered plants. Currently listing 600 peer-reviewed papers, the overwhelming weight of scientific consensus in these papers confirms that approved genetically modified crops are as safe for human health and the environment as their conventional counterparts[17].

Biotech crops have been grown and consumed for more than 20 years and people around the world have eaten billions of meals containing biotech-derived foods or ingredients. There are no substantiated scientific reports of any food safety issues related to the consumption of biotech crops.

Nutritional benefits of GM crops

Agricultural biotechnology 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.

Golden Rice

For example, Golden Rice (with elevated levels of pro-Vitamin A) is expected to soon be available in developing countries where 200-300 million children of preschool age are at risk of Vitamin A deficiency. Every year, about half a million children go blind because of Vitamin A deficiency, which is the single most important cause of childhood blindness in developing countries, and 70 per cent of those die within a year of losing their sight.

[17] The GENERA list of peer reviewed studies in to the safety of GM crops can be accessed here: http://www.biofortified.org/genera/studies-for-genera/

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.

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.

High Omega-3 Canola

Canola crops that have been modified to produce high levels of long-chain omega-3 oils, like those found in fish oil, have clear health benefits and are a joint venture between the CSIRO, the Grains Research and Development Corporation and Nuseed, a CropLife Australia member. The health benefits of long-chain omega-3 oils are well documented with adequate intake having an overall positive impact on brain, eye and heart health, and inflammation management. Omega-3 oils also play an important role in child and infant development.

Pending regulatory approvals, the high omega-3 canola will relieve pressure on wild fish stocks and maintain adequate supply of this important nutrient via a proven land-based, sustainable source. One hectare of this canola has the potential to provide the omega-3 oil yield from 10,000 kilograms of fish.

Productive, Profitable and Innovative Agriculture and Food RD&E Must Recognise Coexistence

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 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 agricultural biotechnology products in farming systems.

Coexistence is not about environmental or health risks because it refers only to the use of crop biotechnologies or crop protection products 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 governments at any level.

4 CONCLUSION

Maintaining a productive, profitable and innovative agriculture and food RD&E system for Queensland will not be achieved by limiting the options for farmers to manage their businesses. Each individual farm faces specific challenges in terms of climate, soil type, farming system, demography and economy. These circumstances all have an impact upon the choices available to farmers to manage their farms. For example, the challenges faced by a sugarcane grower in Proserpine will be different to a GM cotton farmer in the Darling Downs.

Because of the wide variety of farming systems and circumstances throughout Queensland, growth in agriculture and food RD&E will only be delivered by enabling farmers to make management choices and decisions that best suit their individual circumstances. For some farmers, this may mean adopting organic production systems to leverage high-value specialty markets. For other farmers, this may mean adopting innovative new agricultural chemical products or genetically modified crops for agronomic purposes.

Any decisions made by farmers in consideration of their circumstances can support the ongoing innovation in agriculture and food RD&E. Ultimately, it is farmers that best understand the pressures faced by a farm enterprise. Regulatory settings in Australia that support agriculture and food RD&E must continue to allow farmers to make decisions in the best interests of their own business. This means continuing to allow farmers to adopt any of a range of farming systems, or a combination of them.

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

True innovation in agriculture and food RD&E must recognise 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 surrounding Brisbane may not be economically sustainable in a cropping/grazing/horticulture system. Any Roadmap to improving agriculture and food RD&E in Queensland must recognise this reality.

CropLife and its members are committed to supporting all farming systems in Queensland by providing farmers with the innovation, technologies, tools and products that they need to ensure productive, profitable and innovative farming practices. Providing for access to reliable, safe, effective and efficient new technology crops and crop protection products will build both sustainability and resilience into all Queensland agricultural systems.