DEPARTMENT OF PRIMARY INDUSTRIES, PARKS, WATER AND ENVIRONMENT

Review of the Moratorium on Genetically Modified Organisms (GMOs) in Tasmania (2019)

Public Submissions Response Form

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Overview:

The Tasmanian Institute of Agriculture (TIA) does not recommend a specific policy position to maintain, remove or alter the existing GMO moratorium. In doing so, TIA acknowledges the complexity associated with the adoption of gene technologies including

- Rapid developments in plant and animal breeding techniques
- Increasing difficulty of distinguishing between regulated and unregulated breeding techniques
- Consumer preferences strongly influenced by perceptions of 'naturalness'
- The difficulty of quantifying economic benefits and costs of policy and regulation
- Perceived negative environmental and human health implications of gene technologies
- Perceived negative implications of the concentrated ownership of gene technologies
- Real and potential economic and environmental benefits that gene technologies can provide

This submission consequently highlights findings from recent research that has implications for Tasmanian policy.

Policy flexibility: Recent developments in breeding techniques, including those not classified as genetic modification under the *Gene Technology Regulations 2001,* are enabling increasingly rapid changes to plant and animal genomes which are throwing up challenges for the law, enforcement of regulations, and marketing. Breeding techniques such as CRISPR-Cas9 and related gene editing methods have developed rapidly since the last moratorium review, reducing the cost and increasing the feasibility of many breeding options ranging from minor gene-editing within a genome to transgenic modification. The rapid evolution of technology has also led to confusion about what constitutes a GMO and differences in national regulations with significant implications for market

access and certification. These changes increase the likelihood of relatively rapid shifts in policy, markets and research environments in the near future making DPIPWE's comprehensive annual scans increasingly important.

Industry regulation and certification: The recent decision by the Office of the Gene Technology Regulator that single gene editing (SDN-1) will not be classed as genetic modification in Australia and therefore not require regulation adds to the complexity of administering the current Tasmanian moratorium. In the absence of a separate Tasmanian regulatory regime, responsibility for regulation and certification is likely to fall to individual industries.

Social and economic research: Wariness of GMOs by consumers and demand for regulation of the products of gene technology has constrained investment in applied gene technology research, development and commercialisation. Recent research in the US suggests that wariness on the part of consumers is largely driven by perceptions of 'naturalness', and also found that objections to GMOs extend beyond the technology itself to include concerns about corporate control of food chains, distrust of scientific assessments of human and environmental safety, and belief that the food industry is the intended beneficiary rather than consumers or farmers. Research into these broader aspects of GMOs in Tasmania would be useful as a guide to future shifts in policy. For example, as more potentially useful GMOs become available, Tasmania may need to develop legitimate processes of evaluating these on a case-by-case basis. Fostering comprehensive and inclusive public debate well ahead of any future change could assist assessment and evaluation processes.

a. The potential market advantages and disadvantages of allowing or not allowing the use of gene technology in Tasmanian primary industries, including food and non-food sectors

A variety of interacting market issues are evident in examining market advantage or disadvantage, many of which have been well articulated in previous environmental scans conducted by DPIPWE. In addressing this issue we focus on current literature about changing consumer preferences and their associations with brand at scales relevant to Tasmania, as well as intelligence on specific areas of Tasmanian agriculture in which benefits and risks are apparent. Many benefits of the moratorium relate to collective and relatively intangible goods, such as Tasmania's 'clean & green' image, its association with being GMO free, and the potential for these brands to be developed or eroded through maintenance or change in Tasmania's GM-free status. Because these goods are shared and intangible benefits they are difficult to put dollar values on, their evaluation is largely based on the sense among people producing niche products that Tasmania's GM free status affords access to premium markets or contributes (along with other qualities) to the premium gained. Current approaches to measuring the benefits and costs are more applicable to crops for which there is a known GM alternative, enabling direct comparison of costs, returns market opportunities. Crops such as canola, for which such cost-benefit calculus can be accomplished, are not currently a major component of Tasmania's agricultural economy. However, this could change as technologies develop and market conditions as well as the climate continues to change.

Measurable costs and benefits:

- **Direct economic loss**: There are well established economic methods for evaluating the costs and benefits of adoption of different crop varieties in commodity markets. For example, an independent review of South Australia's moratorium estimated that the cumulative cost of that moratorium on canola growers totalled $11-33million form 2004-2018 (Anderson 2019). For South Australia the farmgate value of canola for the same period was approximately $154

million. According to figures from DPIPWE the 2016-17 gross value of canola to Tasmania was S1.7 million, up from $0.7 million in 2009-10.

- **Prospective economic advantage and loss**: In coming years, with the development of diverse new varieties through contemporary approaches to biotechnology, it appears highly likely that more accurate cost benefit calculus will be able to be conducted for new varieties. For example, Dairy Australia has developed a new variety of GM rye grass through a series of gene deletions targeting reduced lignification (and therefore increased digestibility), increased yield, decreased toxicity and decreased allergic potential. Modelling based on glasshouse trials has suggested 30% productivity gains (ADIC 2016). While these are preliminary data, productivity benefits of this order if realised in the field would translate to benefits to Tasmanian diary producers of $1,400/ha/yr through increased digestibility and $600/ha/yr through increased yield (Richard Rawnsley pers comm). These changes are likely to preferentially benefit Tasmanian dairy farmers over those in other parts of Australia given their greater reliance on pasture as a source of feed, giving them a potential market advantage through increased productivity. Conversely where GM crops conferring productivity advantages are developed and adopted earlier on the Australian mainland or elsewhere, Tasmanian growers and whole industries may be placed in a position of disadvantage.
- **Regulatory costs**: As more GM crops are introduced to Australia and globally, the regulatory cost of maintaining a GM free status of Tasmania are likely to increase. Depending on how gene editing techniques are legally defined, it may become impossible or very difficult to distinguish genetic material produced through editing or intra-genics (insertion of genes from the same genome, e.g. using SDN-2) from conventionally bred varieties or those developed using unregulated techniques such as physical mutagenesis or SDN-1.

Qualitative indicators of market changes

It is unlikely that it will ever be possible to credibly quantify the costs or benefits of the state's GM-free status to its 'brand' taken broadly. Many claims about market advantage and access are based on qualitative understanding of specific markets and consumer preferences within them, often through relationships, and qualitative understandings of the attributes which confer premium value or market access. While Tasmania's GMO-free status is frequently seen as being among these elements, it is very difficult and may be meaningless to try to separate these elements and attribute a value of GM freedom to the brand as a whole. These appear to vary depending on market and market segment (e.g. commodity, niche) and product. More formal evidence of potential drivers of this brand and market value are scarce, but the following should inform development and evaluation of policy options, including:

- **Markets driven by emotions and morality**: There is clear evidence that consumer choices associated with food are substantially influenced by emotive and moral factors, in particular the desire for 'naturalness' (Scott et al. 2018). Consumer sentiment and latent consumer desires can be mobilised quickly to avoid things that are perceived as 'unnatural'. Proponents of gene-technology have not yet managed to extensively mobilise the virtues of GM products in OECD markets through unequivocal evidence of their environmental, social and economic benefits.
- **Survey research** from the USA indicates that only about 25% of people believe that they have ever eaten foods containing GMOs, yet they occur in 80% of processed food (Hallman 2018). A Pew poll found that about half of American thought food with GM ingredients are worse for one's health than non-GMO ingredients. Research commissioned by the Australian Office of the Gene Technology Regulator found that there is much stronger support for GMOs in

medical and industrial applications than in food and crops, and less concern about modifications that are less radical (Cormick and Mercer 2017).

- **Consumers avoiding GMO products**: Current labelling laws in the USA do not make it mandatory to label products containing GM products as they are considered 'substantially equivalent'. Where mandatory GMO branding has been implemented there have been premiums associated with non-GMO options. For example, in Vermont, USA, mandatory branding of GM products led food manufacturers to preferentially use sugar from sugar cane rather than from sugar beet, leading to a small premium for the former and decrease in value for the latter (Carter and Schaefer 2019).
- **The rise of non-GMO branding**: According to Cargill, the world's largest producer of processed food components, non-GMO is one of the fastest growing segments in the food industry. They make this claim in the context of their partnership with the non-GMO Project to produce GM-free options for food production. There are some concerns within the US organics industry that the non-GMO brand is starting to take market share from USDA Organic certified products which are (less obviously) free of GM products (or at least below the 0.9% GMO threshold) (Bunge and Gasparro 2015; Hallman 2018).
- **Opportunity costs and path dependencies:** It is widely recognised that lifting the moratorium and 'opening the door' to GM crops would be an irreversible decision. Once Tasmania loses its GM free status it cannot be brought back. However, there may also be a risk that maintaining the moratorium creates its own path dependency. If mobilised as a marketing advantage by multiple Tasmanian brands, and explicitly associated with Brand Tasmania, realising any advantages from the introduction of specific GM products could be made difficult because of general accession to GM-free status. Such strengthening of brand associations could make it harder to change the status of the moratorium in the future, potentially leading to disadvantages in specific sectors.
- **Spread of GM traits or genes**: The last two decades have seen rapid growth in the land area on which GM crops are grown, both in developed and developing countries. Increasing prevalence of GM crops is likely to lead to increased genetic drift where GMO and non-GM crops of the same species occur in a single area. Currently Bass Strait provides a significant barrier by which this sort of genetic drift can be contained. However, it is likely that in some crop thresholds, rather than zero-tolerance, will need to be defined and monitored and these may need to align with thresholds set in key export markets.

b. Domestic and international gene technology policy relevant to primary industries

1. Examples of innovative GMO policy and regulation from other jurisdictions that Tasmania could adopt or learn from?

As gene technology advances and becomes more widespread and diverse, it is likely that more of Tasmania's agricultural sectors will look to varieties developed through new breeding technologies to offer greater productivity, efficiency, and/or to reduce environmental impacts and other costs. This may happen over years or decades but considering the speed of advances in plant breeding technologies over the last 5 years, the normalisation of genome editing and other techniques appears very likely, making the adoption of GMOs in some sectors of Tasmanian agriculture desirable in the foreseeable future. This is likely to be a question of when rather than if.

If this is the case, it will be useful to develop well-ordered ways of assessing varieties of the basis of their potential to impact Tasmanian markets.

Tasmania's unique position as a high-wage economy with a strong reliance on agricultural production, distant markets, a small population and an island status appear to have created distinct and somewhat separate pathways for agricultural and rural development in the state (Leith et al. in press). Firstly, farmers must adopt and adapt efficient and effective processes, techniques and technologies in order to be able to compete in high value commodity markets. Secondly, Tasmanian businesses create very high value products for discerning customers in niche markets. These two distinct export market segments appear to have a somewhat different relationship to Tasmania's brand and GM free status.

Especially in Europe, policy innovations around complex socio-technical issues with potentially substantial market implications have led to the development of a variety of variably inclusive means for dealing with highly contested issues. These processes, while still quite experimental, suggest ways of doing socio-economic assessments that move beyond expert assessment alone and provide greater public legitimacy and more thorough bases for decision-making (Binimelis and Myhr 2016). By including diverse people and perspectives, allowing time for deliberation, and enabling community leadership on complex issues, processes such as those listed below can inform more inclusive and complete community debate.

- Citizen Juries
- Real-time technology assessment
- Participatory technology assessment
- Responsible innovation

In the case for GM varieties coming into the state, it is likely that such approaches could be very useful in developing assessment criteria. For example, if GM food crops were to ever be allowed, how could it be demonstrated that they align with Tasmania's clean, green brand, or that they do not undermine this brand? Addressing such questions could clearly be informed by existing work of Brand Tasmania and other organisations who articulate the values and interests associated with this brand and its market value. It may also be possible that scientific assessments could by undertaken of environmental, social and economic implications of new varieties.

These are policy processes rather than policies themselves. They require time and investment and can be set-up in many ways. In Tasmania's case the fixed moratorium period and the annual environmental scans carried out by DPIWE offer an opportunity to trial and develop appropriate policy processes such as those outlined above. TIA, the University of Tasmania and our international networks of research collaborators would be well placed to contribute to such development to fit-for-purpose policy processes in his contested area.

c. Research and development relevant to the use of gene technology in primary industries

1. Are there new gene technologies that would provide positive benefits to your business or the State as whole? What are they and what would the benefits be?

2. What impact has the moratorium had on the research and development of new products or markets?

While there are increasing numbers of GM varieties that may create economic and or environmental advantages, the lack of strong demand for GM technologies in most of Tasmanian or Australian markets is likely to have strongly curtailed investment in gene technology research and plant breeding, not only in Tasmania, but around the world. Despite rapid advances in scientific techniques, the

processes involved in developing new varieties with desirable traits remain very drawn-out and costly. However, the science of genetic modification is advancing rapidly, as are its applications.

A key driver of future research investment and interest in Australian research and development in this area is likely to be use of SDN-1 processes. Assuming the recent OGTR ruling passes both houses of Australia's Parliament, crops developed using SDN-1 approaches will not be regulated or registered, but rather considered as the products of conventional breeding. They will not be considered genetically modified under Australia's *Gene Technology Regulations 2001*. This could foreseeably lead to a rapid increase in activity and development of varieties and a key focus of research.

Other gene editing approaches that rely on intra-genic modification (changes within a species' genome) or transgenic (introducing DNA from other species) are likely to remain curtailed by lack of demand GMO products, regulatory controls and the moratorium itself if it remains. However most of the scientists doing cis- and trans-genic research in TIA and the University of Tasmania did not see these issues as constraining their own research work. An exception was related to field trials which are done in other jurisdictions. This was seen as a problem for one scientist because it was viewed as necessarily giving over attribution of findings (for instance, first authorship on research papers) to international or mainland collaborators. Most researchers consulted did not see their own research as being substantially constrained by the moratorium.

In terms of university teaching and research training, introduction to the range of genetic modification techniques currently available is standard practice in plant and animal genetics but has limited attraction due to the lack of demand and the regulatory regime. Lack of industry demand for research in this area to address a wide variety of challenges is constrained by the lack of strong demand among consumers for GM products.

d. Any other relevant matters raised during the review

Access to markets and potential price premiums that Tasmania's agriculture and food sectors purportedly earn due to its GM-free status are effects of larger societal perceptions that may change gradually over time. To fully benefit from the substantial potential of GM products while managing their risks will require less reactionary and more intentionally managed public debate about GM issues at local, national and international scales. Tasmania's GM-free status aligns with emerging trends such as the growth in US non-GMO labelling and European consumer preference to avoid products containing GMOs.

Many consumer concerns about GMOs do not relate directly to the technologies themselves but to associated issues such as corporate control of food chains, distrust of scientific assessments (for instance of safety) and misgivings that genetic modification is not in the interests of consumers or farmers. Decreasing costs of developing GM varieties may lead to new generation crops being developed by farming groups or through public funding to address specific issues. However high costs of regulatory compliance for GMOs are likely to create incentives for investment in varieties that will lead to an economic return.

Most studies comparing the advantages and disadvantages of GMOs in agriculture have concentrated on economic analyses (Catacora-Vargas et al 2018). Yet it appears likely that consumer concern will need to be addressed through assessment of the full range of social, cultural, economic, political and ethical concerns as suggested in several recent studies (e.g. Scott et al 2018; Hallman 2018). Even when this difficult assessment is undertaken it is plausible (and probably likely) that a strong anti-GM sentiment will remain among consumers of food who seek 'naturalness' for the foreseeable future.

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