Sugar Research Australia®

GM SUGARCANE IN AUSTRALIA – WHERE WE ARE

BACKGROUND

Sugar Research Australia (SRA) and its predecessor organisations have a strong history of investing in frontier technologies to make a step change in the Australian sugar industry's productivity, profitability and sustainability.

In recent decades, an example of this investment came via a Joint Venture with DuPont that sought to develop herbicide tolerant cane (HT-cane) using genetic modification (GM) technology.

When this partnership was formed in 2009, with rigorous industry consultation, this technology offered significant potential for the Australian industry, and there was a strong imperative for Australia to maintain its global competitiveness by being the first country to move towards this technology.

THE SCIENCE

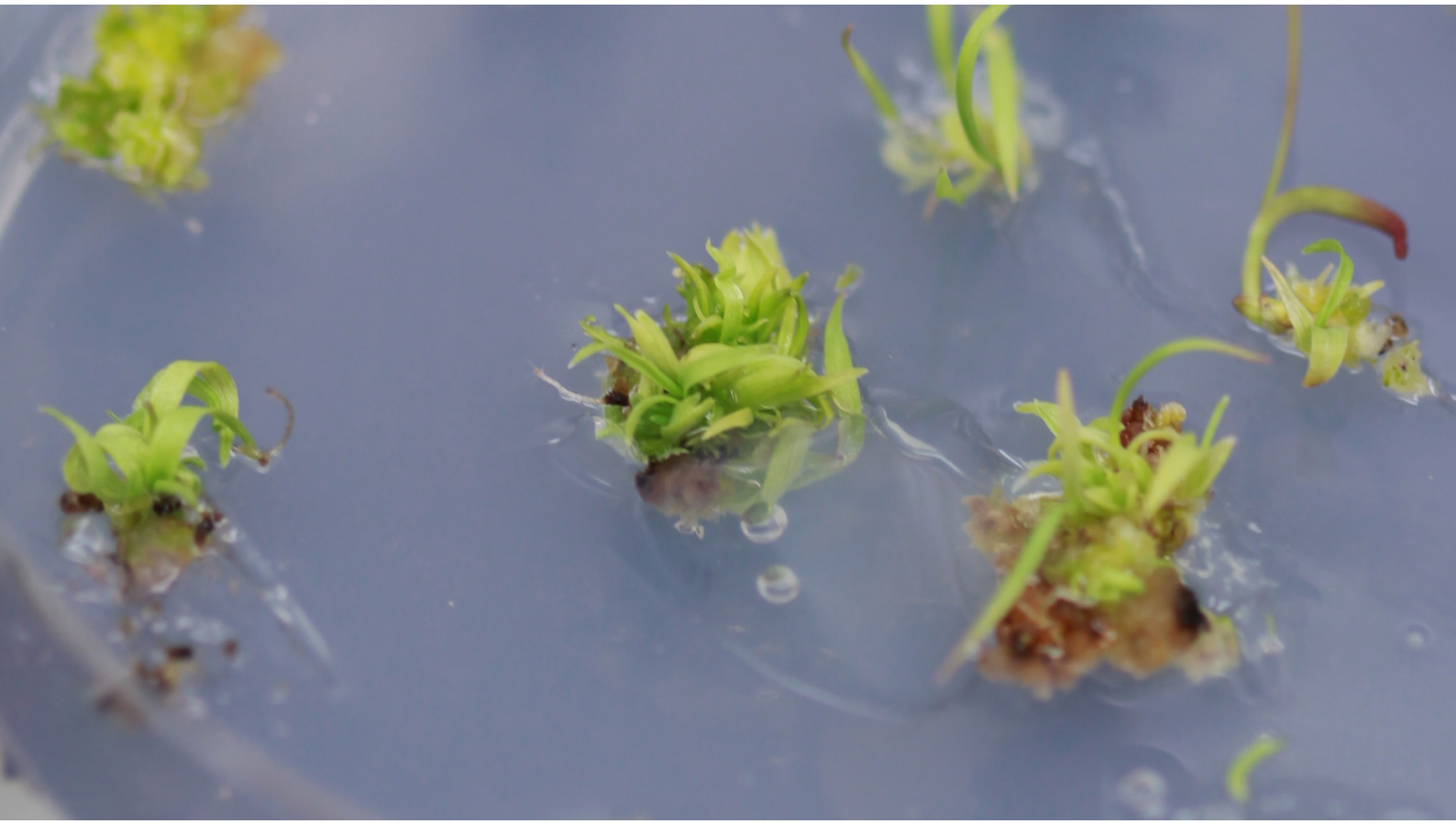
Given the significant resources required to develop and deliver a GM crop, herbicide tolerance was chosen to focus on a single trait. Glyphosate resistant sugarcane would offer an environmentally and socially acceptable solution to modify herbicide practices and lower costs.

Through the Joint Venture, HT-cane was successfully developed and the technology was introduced into Q208$^{\Phi}$ and Q240$^{\Phi}$. SRA developed more than 2000 independent (sugarcane transformation) lines, and conducted field trials and other related activities over five locations.

In the early stages of the Joint Venture, work also occurred to develop 'synthetic seed' planting technology, but this technology faced local technical and cost challenges so SRA did not make a subsequent investment in this project.

SKILLS AND CAPACITY DEVELOPMENT

The investment in this research through the partnership has enhanced the technological capabilities of SRA research scientists and brought a range of innovative technology to our investments. These new skills and capabilities continue to underpin the delivery of outcomes via our investment in yellow canopy syndrome (YCS), tissue culture, and the breeding program in general. SRA has developed capabilities in sugarcane genetic transformation, GM product technology regulation and stewardship.



CHANGE IN GLOBAL AGTECH TOWARDS SUGARCANE

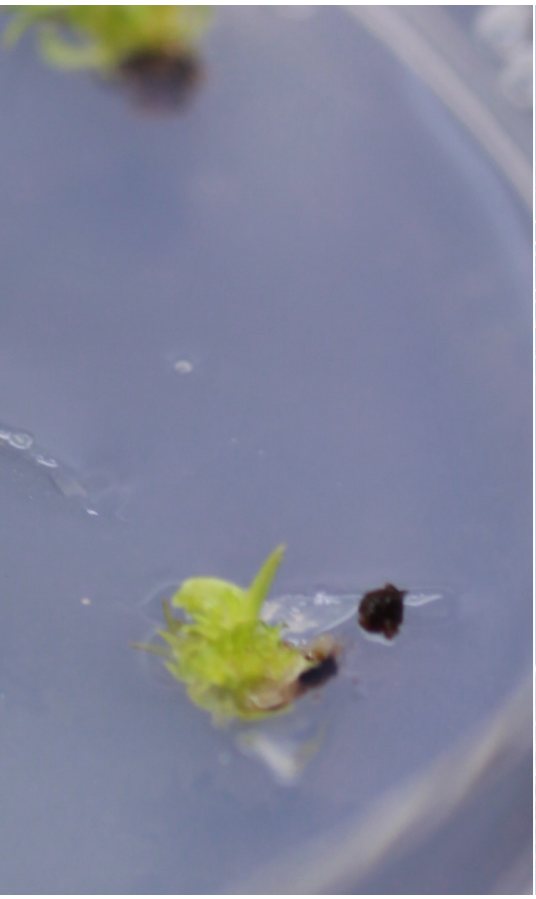
In the early 2000s, there was global enthusiasm for the potential that GM technology offered the agriculture sector, as well as sugarcane's potential as a source of biofuel and high-value products. This created a flurry of investment from major companies around the world. However, market sentiment shifted as the anticipated returns on investment did not arise beyond maize, soybeans, cotton and canola, while consumers and regulators did not embrace the technology as anticipated. Monsanto (now merged with Bayer), Syngenta and DuPont (now merged with Dow Agrosciences and called Corteva) all made significant investments but subsequently stopped or notably reduced their focus on sugarcane.

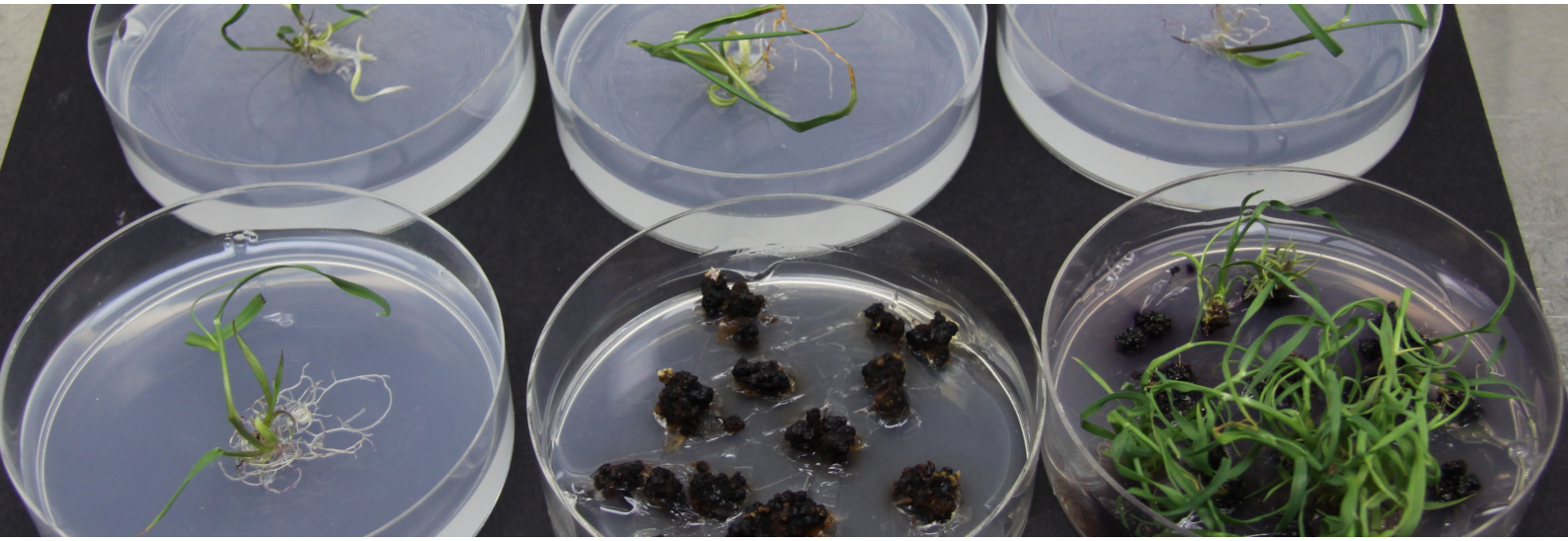
Sugarcane also faced additional hurdles compared to other crops when it came to commercialisation of the technology, due to the crop cycle and planting method.

A big challenge was around how the economic benefit of GM technology would be shared among all stakeholders, including growers.

Even though refined white sugar crystals do not contain any genes (DNA), there has been an increase in anti-GM sentiment, which has also created concern around key Australian markets if Australia were to adopt this technology. There has been an increase in the marketing tactic of labelling sugar crystals as "GMO free".

In that context, DuPont approached SRA indicating that they were reducing their investment in sugarcane and to terminate the alliance with SRA. As part of the termination agreement, DuPont required SRA to destroy all GM material held by SRA and developed under the Joint Venture. This has now occurred and the termination agreement between DuPont and SRA was completed in early 2019.





REGULATION

The technology faces major regulatory challenges, most notably:

- Approvals required in Australia and our export markets are not assured;
- Individual grower implementation isn't a practical pathway, thus requiring whole regions and their mills to participate in the operational and financial aspects of commercialisation; and
- The immediate financial cost of retaining commercial rights appears unlikely to generate a return on investment for the overall industry.

The commercialisation process involves an overlapping sequence of approvals by multiple governments and agencies in Australia and overseas.

The approval process typically takes five to seven years with an estimated cost of $15m – $25m, with additional technology licensing fees likely to add tens of millions of dollars of cost over the life of the GM HT cane being available for use to Australian growers.

As well as the formal technical regulatory approvals, commercialisation also requires agreements with herbicide suppliers for the new label recommendations; with growers and mills for potential royalty collections; and with mills and marketers for potential segregation of processing, shipping and marketing.

THE FUTURE

In light of these challenges, SRA has consulted with the Australian Sugar Industry Alliance (ASA) about the future of this technology for our industry. At this time, we have deemed that it is neither affordable nor efficient to further pursue the technology to commercialisation. The research side of much of this work has been successful, and it has added significant capability and technology that will contribute to our industry's research endeavours in the future. However, success in research does not always align with the rapidly-changing opinions of regulators and the public, particularly regarding technology such as GM, where misinformation and fear carry significant public sway.

SRA is also reviewing the global status of gene editing technology to identify new pathways to input and output traits that could deliver value to the Australian sugarcane industry. Examples could include alternative herbicide resistance or value added traits such as higher sucrose production or production of other industrial products in sugarcane, such as novel carbohydrates or plant oils.

While the current regulatory requirements of gene editing technology appear less onerous than GM, this technology is still expected to face challenges. For example, the Court of Justice of the European Union recently ruled that gene edited crops should be subject to "the same stringent regulations as conventional genetically modified organisms". Given these risks, SRA is taking a cautious approach to investment in this technology.

SRA is also monitoring new technologies in the synthetic seed space and investigating whether these technologies are suitable for Australia.

SRA remains committed to delivering valued solutions for the Australian sugar industry through its targeted research, development and adoption (RD&A) programs.

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