Australian Academy of Science

Submission to the
Inquiry into Primary Producer Access to Gene Technology

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The Academy's response addresses common issues that will soon apply to the production of novel or enhanced attributes in livestock as well as plants even though the terms of reference seem more appropriately directed towards the use of new plant varieties. Our comments are confined to three of the terms of reference.

Further information is available from the Academy's National Science and Industry Forum Report of April 1999 *Gene technology and food* (attached), the Academy's NOVA site (www.science.org.au/nova/) which provides factual information on a range of topics including gene technology and is targeted at secondary schools and the general public.

In addition, the Royal Society's (United Kingdom) statement on *Genetically Modified (GM) Plants for Food Use* (September 1998), its response to the House of Lords Select Inquiry into *Non-Food Crops* and statement on *GMOs and the environment* address matters of concern to the general public and regulatory authorities. (These are all available on its website, www.royalsoc.ac.uk).

The future value and importance of genetically modified varieties

Genetic modification of plant varieties and animals through human selection in the course of breeding has been the mainstay of progress in agriculture, horticulture, and forestry. The future production in these primary industries will be dominated by genetically manipulated organisms (GMOs). It is virtually impossible to decide what is "natural" and what is not after some 10,000 years of plant and animal improvement by humans. Boundaries between traditional breeding and GM technologies will become blurred in the future. An important difference may be that the speed at which specific changes can be made in the genes of an organism may be quick compared to the traditional selection process. This may have important biological and economic consequences, some of which may require international agreement. The opportunity to exact unusually high profits will be limited, given the competitive nature of production of all commodities. Yet, considerable profits and costs in the realm of GMOs are associated with the development and ownership of the intellectual property (IP) vested in the enabling technologies.

We can see the growing importance of gene technology to plant improvement in the fact that, worldwide, the area sown to transgenic crops in 1998 (28m ha.) exceeded the total area of land cropped in Australia (less than 25m ha.). Most GMOs in use to date are ones with agronomic advantages (herbicide tolerance, pest and pathogen

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resistance). Plant products with novel colours or enhanced flavour are also already available. Others with enhanced nutritive value ("nutraceuticals"), with specific health attributes (eg. vaccines delivered in potatoes, bananas or lettuce), or plants engineered to produce a range of new chemicals and raw materials for chemical industry (eg modified starches, biodegradable polymers) will take longer to develop, but illustrate the potential of the technology.

It should be noted that over time it will become more difficult for producers to escape the use of GM material at some point in the production chain. For example, many vaccines and other products are already produced by GMO technology, and as use of these becomes widespread, they will be difficult to avoid. If it were to be required that all poultry required immunisation against a particular pathogen, and the most effective vaccine was GMO-derived, most poultry would then be produced by a GMO-influenced route.

Widespread use of antibiotics in agriculture has already raised problems of new strains of antibiotic tolerant species. For many GM crops there will be ecological questions needing study or regulation. This requires a national capacity for environmental assessment to minimise risk.

The issue is not whether there will be this technology, rather, when and how well will Australia be placed to capitalise on it, to position ourselves competitively in the global market.

The ability for producers to compete using traditionally available varieties

Producers will be unable to compete as freely as they have in the past if they do not have access to GMOs. However, the problem is time-, context- and product-dependent. In the near-term, export of major food crops may be determined by legislation against GMOs in some markets (eg Europe), in which case traditional, non-GM varieties could give an entrée into these markets. In the longer-term, it seems likely that most agriculturally important organisms will be genetically manipulated in some sense or another, just as they have been manipulated in conventional breeding systems.

Consumer concerns will be a major factor in drawing up a legislative response to the universal use of genetically manipulated crops and later animals. Both the grower and consumer can be expected, eventually, to adopt attitudes influenced principally by price, although safety aspects will be an important consideration.

In the U.S. it seems that restrictive legislation may be already overtaken by the complexity of modern food processing. On the other hand, changing legislation in the European Community is becoming increasingly complex and restrictive so as potentially to deny European primary producers access to GM plant varieties, or at least to discourage their planting.

It is not in the best interests of Australian primary producers that overly restrictive legislation be developed here. GM products require a case by case evaluation of risks and benefits rather than a generic response.

Legitimate concerns about biodiversity, facilitated pathogen evolution, antigenicity and toxicity in GM food, for example, need to be treated in the same way as existing problems of quarantine or of food quality.

Introduction of animal GMOs awaits an effective regulatory pathway to market. Because of the pyramidal breeding structure of most extensive livestock industries, and the vertical integration of the intensive industries, commercialisation and marketing of GMO improvements should be relatively straightforward once these are covered by a satisfactory regulatory mechanism. Producers of GM enhanced livestock, whether at the research and development stage like CSIRO or at the commercial stage like enterprises that can be expected to come into existence once regulation is clear, will licence the genetically enhanced animals to major breeders, who will spread them out to commercial producers and multipliers.

There may well be niche markets for agricultural products produced without the use of GMOs as there are now niche markets for "organic" produce. As GMO technology improves, however it can be expected to result in decreased use of chemicals at least in the short-term.

GMO technologies are very much driven by the chemical industry which has developed herbicide resistance genes in order to protect crops against the herbicide they produce for weed control. Many enabling technologies such as certain transformation technologies (e.g. for soybean) and almost all resistance genes and selection markers (e.g. for herbicide resistance genes) are owned by the chemical industry.

A major issue for access to primary producers to new varieties produced by GMO technology is the control of intellectual property (IP). A few large multinational corporations will soon control the use of most existing GM crops. Even when primary producers obtain access to GM crops, the technology owners are likely to determine how and where the crops are grown and may dictate the produce will be marketed.

Another issue is the production of pest and pathogen-resistant lines of animals by genetic modification. Also, if current control chemicals are withdrawn then there may be no technological alternative to GM-resistant lines.

For many of the crops grown in Australia, it seems likely that the development and exploration of varieties produced by gene technology will require the formation of strategic alliances with overseas companies. An exception could be a major cereal

crop such as wheat where sufficient resources might be marshalled by the public and private sectors to develop and protect new IP and produce new GM varieties.

Opportunities to educate the community of the benefits of gene technology

The Academy's National Science and Industry Forum on Gene Technology and Food brought together scientific, industry and consumer perspectives on gene technology. Gene technology promises increase yields and reduced dependence on pesticides. However, as well as benefits there are also potential risks.

Community concerns about the potential environmental impact of GM crops through the transfer of the introduced genes to wild plants and non GM crops, and the indirect effects of the GM crops themselves on the local environment, were covered in a Royal Society report which is available on the Internet. The widespread use of the Internet has changed the way in which information is made available to the community. Sectors of the general public are now in a much better position to be fully informed.

The Academy of Science has also taken a lead role in the public discussion of cloning by nuclear transfer, a technology of great potential benefit to livestock transgenics. CSIRO has taken a key role in heightening public awareness and understanding of GMOs and has also undertaken a survey on consumer attitudes to gene technology (see Science and Industry Forum report).

References:

Gene technology and food, National Science and Industry Forum Report. Australian Academy of Science, April 1999.

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