Submission from

Grains Research and Development Corporation

to

Inquiry into increasing the value added to Australian raw materials

by

House of Representatives Standing Committee on Industry, Science and Resources

June 2000

1 The scope of value adding in the grains industry

The GRDC notes and endorses the Committee's interpretation of 'value-adding' on pages 3 and 4 of their first report of March 2000. Specifically, the Committee agreed with the Agriculture Fisheries and Forestry Australia (AFFA) submission that 'value adding' is not synonymous with 'processing' or 'downstream industry'. The concept needs to be understood more broadly as activity that adds to or enhances the value of products, in the context of the impact on aggregate national income and living standards.

From this perspective, adding value within the Australian grains industry covers a wide range of activities. These span from biotechnology, to farming systems knowledge and technology, plant breeding, grading and varietal segregation, other agricultural technology such as precision agriculture and farm machinery, through to human resource development and knowledge-based products and services. All will be discussed within this submission.

The Grains Research and Development Corporation (GRDC) is part of two industries – the grains industry and the research & development industry. Moreover, the grains industry is increasingly understood as part of the agrifood industry. Although this submission discusses the grains and agrifood industries, it says as much about the Australian Research and Development (R&D) industry.

The goal of grains R&D is to add value through sustaining and enhancing the environment; strengthening productivity; improving the quality of grain and grain based food, and increasing economic gains to the agricultural industries and the community.

Partners for Profit, the current five-year plan of the Grains Research and Development Corporation, points out that on-farm profits for graingrowers are linked to the final demand for products such as food bread, beer, edible oils, noodles and stockfeed, as well as industrial products like starch, ethanol and lubricants. The plan observes that investment in R&D plays a significant role in adding value along this chain from farmers to consumers.

With 80% of grains produced in Australia being exported, the traditional emphasis (pre-1980s) has been on selling bulk commodities, with Australia's comparative advantage seen as grain cleanliness, dryness and the white colour of its wheat. Market development has made it clear, however, that greater weight must be placed on quality characteristics specifically required by the food industry.

In identifying end-uses for traditional and new grains, the GRDC has had to take into account processing and consumption trends in major domestic and international markets. This information, in turn, has to be communicated to those most involved in producing and enhancing the raw material: Australia's growers, plant breeders, agronomists, farming systems advisers, and researchers in agricultural technology, biotechnology, processing and market presentation.

The GRDC investment focus must, therefore, go well beyond the scientific/technological **research** disciplines and into **development, communication** and **commercialisation** to ensure the regular transfer to users of the research results.

Adequate provision must also be made for the maintenance and replacement of the people and skills needed to keep adding value to Australia's agricultural raw materials.

Scope for value adding arises, then, in diverse areas of the GRDC's activity. The submission, which follows, offers more detailed comments on several of these areas.

The grains industry provides a useful example of the importance of R&D to maintaining Australia's competitiveness in a global market. **Figure 1,** below, indicates the decline in terms of trade for the grains industry over the past two decades, highlighting the offsetting effect of productivity gains.

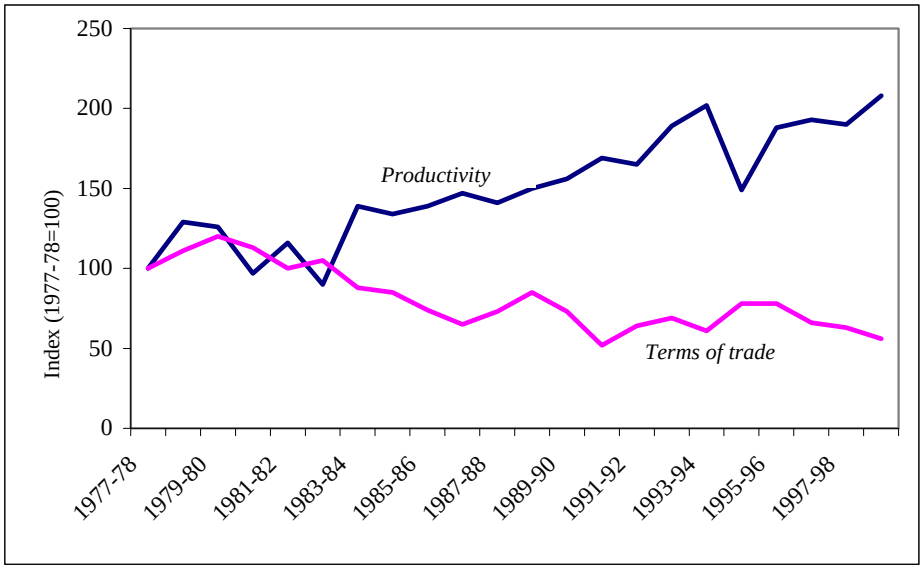

Figure 1: Australian Grains Industry – compound indices of changes in terms of trade and productivity improvements over two decades.

According to a recent ABARE publication (Knopke, O'Donnell & Shepherd, 2000), grain production has increased by an average of 3% over the past two decades (annual growth in total factor productivity of 3.2% pa over 22 years to 1998-99). During the 1990s Australian grain production underwent a major expansion phase as a result of large increases in the areas sown to grain and improvements in productivity and yields. One of the biggest drivers in the expansion in area sown was the relative lack of productivity growth in the livestock sectors to offset terms of trade effects. During the 1990s average wheat yields were around 30% higher than those achieved in the 1980s. This compares favourably with estimates for agricultural industries in competing countries.

The grains industry unreservedly attributes these productivity gains to R&D, which has been an overriding factor in keeping the Australian grains industry in business. R&D has also enhanced value-adding activities to grain commodities production.

2 R&D Trends in Australia

Figures released by the Australian Bureau of Statistics indicate that Business Expenditure for R&D (BERD) has been falling significantly and successively since financial year 1995/96. Total government R&D expenditure was almost constant, in real terms, between 1994/95 and 1996/97. Forthcoming data from the ABS is expected to indicate a constant trend, or perhaps a real decline. Higher education R&D expenditure increased from 1992/93 to 1996/97 but ABS figures are expected to reveal a leveling off. This is likely to add up to an overall trend of decreasing R&D as a proportion of GDP, with

Australia's position declining relative to other nations on this measure. Most of Australia's trading partners have increasing BERD to GDP ratios.

This does not appear to be a picture consistent with the stated aspirations of any of the major political parties. Specifically, declining BERD is not consistent with a nation aspiring to be good at the business and commercialisation end as well as the science end of R&D and innovation.

At least three policy implications are apparent.

1. Business incentives for R&D need to be reviewed and enhanced. A return to a higher R&D tax deduction incentive or some other equivalent mechanism needs to be considered. With the implementation of a new tax system on July 1, and a lower company tax rate, the incentive value of the 125% concession will be further eroded.
2. It is imperative that public sector R&D be maintained. A decline in both private and public sectors would compound the erosion of Australia's capacity to innovate. Australia holds unique skill and knowledge assets within its public sector institutions which are in danger of being lost or downgraded. Attention will be drawn to several key areas of concern relevant to the GRDC's activities (Refer section 3.2).
3. It is not just the dollar magnitude that counts. This submission touches on issues of improving the effectiveness and efficiency of the management of public sector R&D expenditure, and improving the linkages and synergy between public and private sector R&D expenditure.

In this context, the Corporation submits that there is a strong case to review and enhance business incentives for R&D, and a strong case for maintaining Commonwealth levy matching. The latter provides the R&D business incentive equivalent in agricultural industries where small enterprises predominate and pooling of funds is critical.

3 Australian Issues in R&D

3.1 Public sector and private sector

The GRDC invests in R&D through both public sector and private sector entities in both supplier and venture partner relationships. However, the bulk of these investments is with public sector or government owned entities in some form, including state departments of agriculture, universities, CRCs and the CSIRO.

The GRDC seeks to contract with R&D public sector entities, within a framework of investment and risk management, with a focus on the market and business environment, and a determination to engage with technology adoption and commercialisation. More often than not, however, the GRDC finds itself effectively contracting with the individual scientist who is focused on the science. The difference in mindset can be summarised as seeking 'funding' in contrast to making 'investment'.

The GRDC certainly accepts a major responsibility for building an appropriate management framework around its investment portfolio. The GRDC is focused on major changes in the way it does business to achieve this framework. (Refer Section 8, on plant breeding.) However, this will be achieved more effectively for all involved and across public sector R&D entities, if there is a dominant culture and approach that places the scientist within an industry-focused and business-aware institutional framework. Indeed,

if the public sector is to engage more actively with the private sector, it is imperative that such frameworks become a preoccupation of public sector R&D institutions. Otherwise the $4 billion to $5 billion that is spent on R&D through the public sector (broadly defined) will be prone to disconnection from the commercialisation and value-adding end of the spectrum. Additionally, forays of publicly derived funds into the commercialisation end of R&D may be vulnerable to excessive risk or exploitation of the public purse.

Such an approach should not undermine support for 'basic' or 'strategic' research. Rather it will ensure that basic and strategic research is identified as such and constitutes an appropriate proportion of each entity's portfolio, depending on the particular organisation's mandate and portfolio structure. The aim is to ensure that the rest of the portfolio, in a sense, underwrites basic and strategic research. Moreover, a framework which maximises general R&D efficiency and effectiveness may well enhance available funding for fundamental research.

Also, such an approach does not negate the critical importance of public benefit delivered through non-commercial mechanisms for the GRDC and like organisations. An important function of the GRDC remains the pooling of grower funds for investment in domains where market failure would otherwise detract from optimal industry outcomes, because the potential for commercial revenue is insufficient This will be relatively endemic to certain areas of investment such as the sustainable management of resources.

However, the GRDC would not be serving its stakeholders by excluding itself from research where commercial drivers impinge either peripherally or centrally – areas such as breeding, biotechnology, grain quality enhancement, other agricultural technology, and information delivery. Therefore, the GRDC is working towards a shift in approach, incorporating much closer links between public and private sector R&D investment within the grains industry.

3.2 Critical intellectual capital

The GRDC works with agricultural R&D organisations throughout Australia and has strong global links and perspectives. It is well placed to provide a strategic perspective on Australia's unique and valuable intellectual capital strengths within the agricultural domain. Several areas are worth highlighting to the Committee.

1. Australian science is very strong across the disciplines of plant physiology and molecular biology. This knowledge spans the chemical, physical and genetic basis of plant function. Australia holds a knowledge platform for an understanding of genetic function that is critical to the effective development of biotechnology in the broad sense.(Refer Section 5.)

   This intellectual capital is proving alluring to the multinational life-science companies. But the GRDC believes it is also a knowledge platform that is in danger of being lost or downgraded, through budget squeezes within State agencies and departments.

2. Farming systems research is another primary strength. This field of research will always be, to some extent, unique because it deals with the geographic and climatic uniqueness of Australian farms within the various agro-ecological zones. Major

industry gains emerging from this R&D include the growth of the Australian canola and lupin industries, and the introduction of long season winter wheats. This field also underpins management of such factors as disease, pests and herbicide resistance. (Refer Section 6.)

3. A third primary strength is within plant breeding research. Plant breeding also needs to address unique geographic and climatic conditions. The best breeding knowledge and quality research is a high value-adding activity. (Refer Section 8.)

Other areas of special intellectual capital could be added to the list, but the above three are central to Australia's value-adding capability within the agrifood industry.

3.3 R&D in food processing

Generally (primarily) publicly funded agricultural R&D and (predominantly) privately funded food processing R&D progress within different systems with relatively little contact or integration. This is one of the factors constraining a fully developed R&D focus on the whole agrifood value chain.

The GRDC is giving a high priority to bridging the boundary between these areas of R&D. However, there remains a perception among grain growers that it is difficult to demonstrate a benefit to the grower of investing grower funds in downstream processes. In this regard, some potential mechanisms and policies for facilitating change are explored within the following section.

Moreover, a study by Instate (2000) found that the food processing sector's R&D expenditure has declined by 38% between 1995/96 and 1997/98 and the number of people employed on R&D has fallen by 21%. The study found that processed foods ranked last amongst manufacturing sectors in the use of modern technology

There are several possible reasons for this, including the possibility of sector ownership by multinational companies that carry out their R&D offshore. There are several possible ways of luring more R&D investment on-shore, including the building of relationships and investment partnerships with other sub-sectors of Australia's agrifood and R&D industries.

4 Agriculture and Food Industry Value Chain

4.1 Overview

As the Australian grains industry has grown and matured, research into production capacity has been maintained as a priority. However, there has been a shift of focus, with an increasing emphasis on aspects further down the value chain.

Growers are aware of the shifting demands of processors and consumers and there has been a growing move towards the development and adoption of on-farm quality assurance (QA) schemes, such as Graincare, developed by the Grains Council of Australia, and Great Grains, developed by Pulse Australia Ltd. Manufacturers have become involved in cooperative research efforts, through organisations such as the CRC for Quality Wheat Products and Processes (QWCRC) and the GRDC.

The QWCRC has focused on better understanding and measures of wheat quality, application of this knowledge to wheat breeding, milling, and processing, and the

development of new products. The QWCRC represents a $7 million investment by GRDC, over a period of seven years. The Centre's partners, include Arnotts Ltd., the Australian Wheat Board, the Bread Research Institute of Australia, the CSIRO Division of Plant Industry, Defiance Mills Ltd., George Weston Foods Ltd., Goodman Fielder Ltd., NSW Agriculture, the New Zealand Institute of Crop and Food Research, the University of Sydney and the WA Department of Agriculture.

However, despite some successful initiatives, much more remains to be done in improving coordination and integration across the agriculture-food value chain. The Minister for Agriculture, Fisheries and Forestry recently prioritised a 'whole-of-industry-value-chain approach' for Commonwealth RDCs. The development of further initiatives to address this has become a key focus of the GRDC Board and Management.

Industry statistics underline the major potential of the food sector. ABS data and other sources show that the processed foods and beverages industry:

- is the largest manufacturing sector, with over 3500 enterprises and employing one in five of the manufacturing workforce;
- has an annual turnover in the order of A$47 billion and exports valued at around A$12 billion;
- sources more than 90% of ingredients from an efficient Australian agricultural sector, and
- of this A$12 billion in exports, over $1 billion represent the grains based segment of the processed food industry.

Moreover, this is a high growth area. The Senate Committee Report on Value Adding in Agricultural Production, the Woodley Report (1997), cites evidence that trade in processed and branded food products is growing at twice the rate of unprocessed food commodities, and is growing at a greater rate than the market for manufactured products in general.

The size and growth rate of these markets highlights the potential benefits. However, to fully realise these benefits, links between producers, processors and marketers need to be rich and strategic, in terms of business strategy, general management coordination, institutional relationship building, market intelligence, product development and research and development activities.

Case study in product development – pre-mixes

The Woodley Report (1997) noted the suggestion by Agriculture, Fisheries and Forestry – Australia that there is considerable export potential of bread dough, noodles, cake and biscuit pre-mixes for Australia. The GRDC has invested $270,000 over three years with Agrifood Technology (formally the Academy of Grain Technology), to develop high value and nutritious products using blends of wheat flour and dairy proteins or chickpea/field pea flour. It is envisaged that the outputs will be several commercially viable pre-mixes and processing protocols, to be used locally or under license overseas. Markets for the pre-mixes include South East Asia and India.

4.2 Potential policy development issues

The GRDC believes that there is potential to improve the above-mentioned links. The Commonwealth RDCs are one of the important leverage points to achieving this. However, there are several other leverage points and policy areas which are beyond the GRDC's immediate control. Further attention to these areas, through the forum of this Parliamentary Committee and elsewhere, may facilitate the GRDC's efforts to respond to the Government priority of a Whole-of-Chain approach. This will ultimately lead to enhancement of economic value-adding activities within the agriculture and food sector.

The other leverage points and policy-related areas include:

- enhancement of the general R&D environment, including enhancement of taxation incentives, as discussed above;
- further exploration and encouragement of 'new generation' co-operatives or other structural vehicles to bridge the 'silos' within producer/grower and downstream industry segments;
- facilitation of private and public sector equity partnerships, through the latitude accorded to RDCs, but also through whatever range of other vehicles and structures may be available;
- encouraging a focus on the agribusiness chain through the range of other Commonwealth policies and mechanisms designed to stimulate innovation and commercialisation. These include 'R&D Start', the Technology Diffusion Program, the Value Chain Management Program, the Innovation Investment Fund (IIF), the Pooled Development Fund (PDFs), and the Commercialising Emerging Technologies Program (COMET). The terms 'agricultural technology' and 'agribusiness' need to be repositioned in Australia's wider institutions and imagination, to be closely associated with innovation and contemporary technology.
- general attention to building business management frameworks and processes around Australian science excellence through such areas as:
  - the continuous improvement and formal review of the CRC framework, to ensure stringent criteria and monitoring of adoption/commercialisation management within and through CRCs;
  - creating university business schools in networks with science and technology students, and
  - progressing other recommendations of the Innovation Summit Implementation Group, including those pertaining to increasing commercially relevant R&D and business growth.

4.3 New Generation Co-operatives

The Woodley Report (1997) recommended that legislation be reviewed and amended to remove any legislative constraints to the ability of cooperatives to compete internationally. Subsequently, the Standing Committee of Attorneys General has progressed an agenda of standardising and improving relevant legislation across states, making it easier for cooperatives to merge, expand their operations and raise capital.

Despite some exceptions, there remains relatively little on the Australian business landscape to compare with the so called 'new generation' or 'third wave' co-operatives of North America. The major focus of these co-operatives is on 'value-added' rather than 'commodities' per se.

Two North American examples follow.

- The North Dakota Growers Pasta Company. This co-operative of 1200 grower members produces, packages, labels and markets pasta.
- The Saskatchewan Wheat Pool. This co-operative of 60,000 members, with affiliated companies, is involved in businesses including livestock services, oilseed processing, malt production, flour milling, manufacture of icings and fillings, donut retailing, ethanol production and fertiliser manufacture and distribution

It may well be possible and desirable to introduce further regulatory enhancement or other incentives to accelerate this kind of development within existing Australian marketing arrangements. This could enhance grower links to market signals, with stronger incentives to innovate and link up with other parts of the value chain.

In such an environment, GRDC would expect the emergence of new agricultural R&D partnerships, agendas, and adoption/commercialisation channels.

5 Biotechnology

The biotechnological processes involved in traditional plant breeding are well established and not the subject of current controversy. While conventional breeding is still the main avenue for providing new varieties, Australian industries see modern biotechnology involving genetic manipulation as an important additional source of opportunity for increasing significantly the value which can be added to the nation's agricultural raw materials.

It is important to recognise that there is more to the genetic end of biotechnology than the more controversial element of gene transfer. Research into an understanding of the function of plant genes, into 'molecular marker technology', and into 'double haploid technology', already enables acceleration of conventional breeding techniques.

In enabling opportunities of this kind to be taken, one of the most important current initiatives to be put before the Parliament is the draft legislation for the regulation of gene technology.

The first draft of the Gene Technology Bill gives industry and the research community cause for concern, beginning with the Objects of the Act. These are expressed in negative terms which mainly highlight risks of genetically modified organisms (GMOs). The Explanatory Guide to the draft reinforces the view that gene technology is seen in the light of a threat to people and environment. This differs in tone to the original announcement and Policy Principles paper, where the objective of the Australian regulatory legislation was to be to allow the benefits of gene technology to accrue to the Australian community while providing protection for human health and environment.

It is interesting to note the recent statement of a scientific research committee in the parliament of the country with the longest experience of adding value through gene technology – the USA:

> *"The weight of the scientific evidence leads to the conclusion that there is nothing to substantiate scientifically the view that the products of agricultural biotechnology are inherently different or more risky than similar products of conventional breeding…. The Food & Drug Administration has adopted a risk-based regulatory approach consistent with… the long history of safe use of genetically modified plants and the foods derived from them. Its policies on voluntary consultation and labeling are consistent with the scientific consensus and provide essential public health protection."*
>
> *(Report to Congress Committee on Science from the Sub-committee on Basic Research, Washington D.C., 13 April 2000, p.3).*

The GRDC does recognise the level of public apprehension in Australia and, therefore, welcomes the provision of a statutory basis for regulating the use of GMOs in agricultural R&D. The establishment of an independent regulator with power to enforce decisions should ensure the protection of health and the environment and, importantly, the community's confidence that the protection is being provided.

However, it is important to recognise potential benefits as well as risks for Australia in transgenic enhancement of crops. These include reduced chemical use, elimination of natural toxins, and new grains that add health and nutrition value for consumers. Through its support of Agrifood Awareness Australia the GRDC, with other industry peak bodies, is promoting these positive aspects.

With respect to risks, one of the greatest for the grains industry might be the consequences of excessive constraints on genetic technology. Should this technology be widely adopted and accepted elsewhere but relatively stalled in Australia, the result could be a rapid erosion of Australia's quality advantages in premium markets and the consequent decimation of Australia's grain exports. This risk needs to be juxtaposed with the risk of losing access to markets because of a sustained consumer aversion to GMO products. Both of these risks must be managed – not just the latter risk.

In adding value to its agricultural, medical and other industries, Australia cannot afford to ignore the current and potential benefits offered by biotechnology in general, and gene technology in particular. There is potential for events to lead to excessive regulatory impediments to development of value-adding industry.

Case Study - 'Grain*gene*' joint venture

In 1999 the GRDC entered into a strategic alliance, Grain*gene*, with the AWB Limited and CSIRO Plant Industry to generate innovative intellectual property (IP) and new generation plant biotechnology capability for the Australian grains industry. The alliance seeks to promote the use of gene technology in plant breeding and improve grain production and quality. The Grain*gene* partnership represents a framework for research and industry groups to work together to bring discoveries successfully to fruition. This will place Australian researchers in a strong position from which to develop IP, and engage in the trade of IP with multinational companies, giving the Australian grains industry access to new technologies. In developing these technologies, not only is there considerable potential to value-add within the grains industry, through the development of novel plant varieties, but also to develop a new Australian industry in biotechnology.

6 Farming Systems

The development of farming systems and a diversity of alternative crops to improve profitability and sustainability are areas of major investment by the GRDC. Nutrition, disease, weeds, environmental and seasonal conditions influence crop production, and introduce a degree of risk into production. The challenge to grain producers is making these alternative crops profitable so that the risk is spread over a number of enterprises on the farm, so all parts of the cropping cycle are profitable. A challenge to plant breeders lies in developing varieties with traits better-adapted to the environment, with enhanced disease resistance, increased yield, and quality better suited to the market.

Canola and the new long-season winter wheats provide two excellent examples of benefit from applied farming system research.

A long-term investment in the development of a focused breeding program has led to the development of a profitable canola crop, suited to market requirements. It provides the added advantage of giving subsequent cereal crops a considerable yield advantage by providing an effective disease break. ABARE (2000) estimates a 256% increase in the area sown to canola in the three years from 1997-98 to 1999-2000 and a 275% increase in production. Canola is now the third largest crop (in terms of both production and value) in Australia , with an area of 1.5 million hectares forecast to be planted to the crop in 2000-01.

Winter wheats are developing a new ‘industry’ for the southern and coastal higher rainfall regions, servicing an expanding feed-grains market. These provide an advantage to producers, traditionally reliant on grazing, by providing them with a cropping option. The inclusion of winter wheat crops in traditional grazing systems has the potential to lift and stabilize farm income. Development of these crops will help to generate the income required for diversification and restructuring of the grazing industry in these areas. The new wheats have been bred to take advantage of a dual role, allowing them to be grazed in the coldest winter months, and then allowed to mature to produce a crop.

7 Grading and segregating for end use

Through its Wheat Quality for Processing program, the GRDC makes a substantial investment in adding value through the marketing chain. Processing of noodles—a major market for Australian wheat in South East Asia—has been intensively studied. Australia already markets more wheat quality classes and special segregations than any other supplier to the world market. Approximately 35 per cent of exports now go to discriminating markets and premiums are paid for specific quality. The introduction of the Australian Premium White (APW) class and segregation of noodle quality varieties, and the industry’s subsequent movement from the bulk commodity market to specified product, are examples of significant value-adding to primary produce. Segregating for discriminating end use has been fundamental to the development of Australia’s grain markets.

A case study in noodles

In 1990 the (then) Australian Wheat Board and an Australian food company decided against producing and exporting noodles to Japan when it was discovered that the noodles would not be competitive with noodles manufactured in Japan.

From 1996-1999 the GRDC invested some $550,000 in the Asian Noodle Products Market Analysis Program, which developed an Asian noodle market research strategy and set the national direction for noodle quality research.

Hakubaku Australia is now an example of a successful noodle exporting company. In 1998 the Japanese firm established a factory in Ballarat, producing traditional Japanese dried noodles. The finance, machinery and skills for the factory were imported from Japan. However, the majority of the raw ingredients are grown in the surrounding districts of northwestern Victoria and southern New South Wales. Buckwheat for one type of noodle produced by Hakubaku is milled in Japan for use in the Ballarat factory. The firm exports five types of noodles under different brand names to Japan.

Since 1993 the GRDC has invested in the Wheat Quality Objectives Group (WQOG), which includes representatives from AWB Ltd., the domestic milling industry and researchers. In defining quality objectives, the Group has adopted a 'product' focus and has identified 28 major end-uses for Australian wheat. WQOG analysis has formed the platform for much of Australia's breeding and quality development strategies. For example, AWB Ltd. used WQOG analysis to support its decision to introduce APW class, subsequently to become Australia's dominant multi-purpose milling wheat. Premium White flour is suitable for Asian noodles (including Hokkien, instant and fresh noodles) and for the production of Middle Eastern and Indian style breads and Chinese steamed bread.

Similarly, the GRDC has invested in the Barley Quality Objectives Group (BQOG), an industry-wide group whose mission is to ensure that future quality needs of key malting-barley markets will be met by the research effort.

Alternative products for Australian grains currently being explored through GRDC research include: further work on Middle Eastern flat breads (including blends with dairy and pulse products), sponge and dough bread, frozen dough products, Chinese dumplings, Chinese steam bread and buns and further development of noodle quality. In order to continue developing value-added products, industry needs to be forward looking, and take opportunities to explore and develop non-traditional products.

8 Plant Breeding

Plant breeding is a powerful, value-adding agricultural industry. It provides the basic material to achieve yield and quality enhancement, the development of specific quality parameters for particular end use markets (e.g. noodles, pasta, bread, flat bread), and is also a major factor in management of diseases, pests, climate and soil stresses.

Wheat breeding in Australia is estimated by Brennan (1989) to result in around a 1% increase in yield per annum and a 0.5% increase in quality per annum (as estimated by a

compound ‘quality index’). A proportion of breeding research also fulfills a function of ‘maintenance research’ – keeping pace with the various stresses on plant growth, to ensure that yield or quality does not decline.

The Centre for International Economics (2000) estimates that for each 1% increase in wheat yield, around $37 million dollars is added to annual income, spread across farmers, processors and consumers. Similarly, for each 1% increase in wheat quality, around $56 million is added to national income. The research indicated strong benefit-cost ratios for R&D in wheat breeding and R&D in downstream processing of wheat.

These areas of research are critical to the welfare of Australian growers. They are also critical to Australia’s capacity to ‘value-add’ through developing specific quality parameters, and through segregating those grains for very specific end-use market demands. It is within this domain of wheat breeding that the GRDC is pioneering a new approach. The GRDC is using its purchasing power and influence to facilitate the emergence of new wheat breeding entities and consortia, with the aims of:

- improving investment program outcome focus;
- maintaining contestability and extracting further efficiencies;
- further enhancing and embedding more commercial contracting and program management practices;
- facilitating access to and commercial management of intellectual property, and
- achieving world’s best practice in wheat breeding, in the service of maximum community benefit.

R&D by its very nature needs to push beyond the comfort zone, in terms of challenging both existing knowledge orthodoxies and the existing ways of doing business. This kind of structural change heralds a trend in institutional change within R&D.

9 Agricultural Technology and Commercialisation

Apart from the technologies and domains of knowledge referred to above, there are numerous other areas of agricultural technology that the GRDC portfolio either directly covers or becomes involved in at the periphery. Many of these potential technologies are positioned right at the commercial end of the spectrum. When the GRDC owns or co-owns the intellectual property it has a responsibility to contract or partner with private capital and commercial entities to ensure that the knowledge does not remain ‘on the shelf’, while ensuring that arrangements protect considerations of public benefit and long term stakeholder interests.

Examples include but are not limited to technology for assessing grain quality, ‘precision agriculture’ technology (e.g. IT and satellite technology in the service of crop production decisions), new developments in farm machinery, biotechnology, and knowledge based products and services.

The appropriate business structures need to be developed for GRDC to link into the commercialisation end without exposing funds to unacceptable risk or liability. The rewards of achieving this include:

- ensuring Australian grain grower access to the latest technology, and minimising the risk of being locked out by multinational life-science companies or other institutions where other stakeholder interests will prevail, and
- optimising the value-adding activity that takes place within Australia on the platform of Australian science and intellectual capital.

The GRDC has been proactive in developing such business structures. However, existing policy guidelines for other public entity participation can create and has created difficulties leading to sub-optimal outcomes in terms of risk management. Many of the public entities potentially participating with the GRDC and the private sector are State based, and some are Commonwealth based. It follows that if the national R&D environment is to facilitate public/private sector interaction, and if Australia is to become better at the market end as well as the science end of innovation, then there will need to be considerable work done by the Commonwealth and States working together on these issues.

10 Grains Industry Skills Base

In 1999-2000 the GRDC invested $3.7 million directly in education and training through its Developing the Skill Base program. The program aims to contribute to maintaining the quality of the research base and to enhancing growers' skills. It offers a range of scholarships, fellowships, training programs, conference travel and other incentives to students, scientists, growers, processors and others to tackle grains industry problems along the whole industry chain.

Moreover, GRDC's investment in the communications element of the portfolio is critical to building and maintaining intellectual capital, skills and knowledge, particularly within the community of grain growers. During 1999-2000 this entailed investment of $4.6 million in industry communications, delivery networks and conference support. The application of knowledge from grains R&D is transferred, disseminated and exchanged through local grower networks via the successful ‘TOPCROP’ program and the more recent ‘Shared Solutions’ program.

The management of Australia’s intellectual capital within the grains industry also requires effective management of intellectual property. This is an increasingly critical and complex arena with the advent of biotechnology and multinational life-science companies. Consequently, the GRDC has allocated investment of $3.4 million over five years to establishing the Australian Centre for Intellectual Property in Agriculture within the Australian National University’s Faculty of Law, with support also from the Commonwealth Government through Biotechnology Australia (via Agriculture, Fisheries and Forestry Australia). The Centre aims to provide a national facility for education/training, research and policy development in IP issues applying to agricultural biotechnology and the grains industry. This will contribute to preventing the loss of Australian innovation to international competition, by setting the legal protocols for the protection of work. In addition to offering training in these areas, the centre will act as a resource, compiling information, conducting research and providing strategic advice on policy and policy reform.

All of the above GRDC investments make an important contribution to maintaining the intellectual capital base required to sustain and improve Australia's grain quality advantages, and to continue to build advantages in adding value to grain commodities. However, there are further important policy areas that might be fruitfully explored by the present Committee and which the GRDC investments will not comprehensively address.

Firstly, there is the issue of linking skills of innovation management and business management to science and technology skills. Some starting points are suggested under Section 4.2 of this submission. The CRC framework, university faculty and course structures, and Innovation Summit Implementation Group agendas all provide potential leverage points. There is more to this than training and courses and PhDs. The right incentives and drivers need to be in place. For example, the funding and accountability criteria for CRCs and universities need to be appropriate. Further, there is scope to encourage research institutes to increase researcher incentives through such mechanisms as equity options, as suggested by the Innovation Summit.

Secondly, there is the issue of addressing the low R&D profile of the agrifood industry, as indicated by the Instate (2000) study. Again, there is undoubtedly more to this issue than the provision of scholarships and training programs. As already indicated, the GRDC is prioritising new initiatives within this arena, but the GRDC alone cannot fully address the issues.

11 Conclusion

This submission has reviewed what can be achieved through well targeted and well managed R&D, in terms of value-adding within an industry. It has also provided comments on where Australia might strengthen R&D institutions and policies if R&D is to provide maximum leverage to value-adding industry development.

There are several mechanisms through which governments can facilitate value-adding industry, which do not inherently distort economic activity or result in sub-optimal whole-of-economy outcomes. Facilitation and funding of research and development is pre-eminent among such mechanisms.

Moreover, within the grains industry the effectiveness of the Research and Development Corporation model is beyond dispute. Within this model, levy funding from growers rectifies R&D market failure due to the relatively small scale of grain farm operations, and rectifies the potential 'free-loader' problem in an industry with many small players. Government matching funds provide an economically sound means of stimulating innovation and improved productivity within the agricultural sector, through a mechanism that does not compromise Australia's free trading credentials. Moreover, Commonwealth matching provides a legitimate platform to:

- fund research where there is a major public good element of the outcome, and the economically 'external' nature of the benefits will not provide sufficient potential commercial revenue or sufficient grower incentive to dedicate levy funding (e.g. aspects of sustainability, regional development agendas); and

- progress research where the grower stakeholder may not inherently hold the same priorities as a broader stakeholder view, such as with respect to downstream industry domain.

With respect to ‘public good’ benefit flows, the above-mentioned and recent economic modeling work by the CIE on the GRDC's wheat research investments exemplifies the sound rationale for government matching of levies. The study quantified significant benefit flows through to consumers and downstream industry (not just to wheat growers) as a result of wheat related R&D.

This submission has illustrated that the grains industry, despite the commodity nature of its basic products, is central to Australia’s value-adding capabilities, in both the narrow and broad senses discussed at the outset. Moreover, the submission demonstrates how essential R&D is to the economic value generated by the industry. And through the GRDC, Commonwealth investment in grains R&D will continue to be assured of delivering net economic benefit, as well as encouraging value-adding Australian industry.

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