

Cooperative Research Centres Association
Incorporated

Submission

INQUIRY INTO INCREASING VALUE
ADDING TO AUSTRALIA'S RAW
MATERIALS

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Submission from the Cooperative Research Centres Association into the Inquiry into Increasing
Value-adding to Australia's Raw
Materials by the House of Representatives Standing Committee on Industry, Science and Resources

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1. Scope of the Submission

Australia has a solid base in the export of raw materials; increasingly markets for these raw materials face competition from other providers. Cooperative Research Centres (CRCs) working in those areas providing raw materials, may, through focussed collaborative research, provide outcomes which when taken up, make the difference between keeping a market or losing it.

This submission from the Cooperative Research Centres Association (CRCA) provides a number of examples from Cooperative Research Centres which are illustrative of value-adding to Australia's raw materials whether it be to differentiate the raw material for use in a range of markets (both domestic and export), to make more efficient the use of Australia's natural resources, to develop technology that assesses quality of the raw material, to provide information that maximises the use of the raw material as well as upgrading the raw material per se. These "snap shots" have been drawn from Cooperative Research Centres, in the Agricultural Sector and in Mining & Energy. The contact details are provided for each CRC should it be helpful for the Committee to seek more information directly.

The CRCs represented are:

- CRC for Premium Quality Wool
- Aquaculture CRC Ltd
- CRC for Cattle & Beef Quality
- Quality Wheat CRC Ltd
- CRC for Hardwood Fibre & Paper Science
- The AJ Parker CRC for Hydrometallurgy
- CRC for Black Coal Utilisation.
- CRC for Clean Power from Lignite

2. What is the Cooperative Research Centres Association?

The CRC Association comprises 55 member Cooperative Research Centres of those currently operating. Some are still in the process of joining for the new membership year and the new CRCs successful in the recent application round for funding are not yet operational. The CRCs cover the industry sectors of manufacturing, information & communication technology, mining & energy, agriculture & rural based manufacturing, the environment and medical science & technology.

The CRCA:

represents members' views on issues of generic importance to CRCs and their operation

- allows members to share experience and practices for, given the diversity of CRCs, some one has often "done it before"
- helps to promote awareness of CRCs and the CRC Program.

The CRCA organizes a range of activities, the key one of which is the flagship event, the Annual CRCA Conference. This provides an opportunity to showcase the achievements of CRCs to a wider influential audience and to allow CRCs to share experiences in business, communications and education activities. The most recent Conference in April this year focused on the use and uptake of research and the theme was, appropriately, "Reaping the Rewards of Research". As part of this the Association instigated the Awards for Excellence in Technology Transfer where the key criteria were the:

- demonstration of uptake by research users of the CRC technology transferred to them,
- demonstration that the research outcomes enhanced competitiveness, efficiency and/or profitability for research users
- demonstration of a close relationship between the CRC research team and research-user partner which resulted in the effective application of the technology transferred.

3. What are Cooperative Research Centres (CRCs)?

CRCs are part of the CRC Program which was set up in 1990 to maximise the capture of the benefits of research through the development of enhanced cooperative linkages between researchers and research users in the public and private sectors. It seeks to strengthen collaborative research links between industry, research organisations, educational institutions (eg Universities) and relevant Commonwealth and State government agencies. This is achieved by setting in place formal, strategic, long-term (7 year) agreements between research providers and research users in the public and private sectors. The Program is unique globally.

The Government contributes about a third of the funds through the CRC Program- the participants the remainder. Indeed the Federal Government's commitment to the Program since its inception and running through to 2003 is \$ 1. 1 billion.' over the same period, CRC core participants, comprising government agencies, research organisations and universities have committed about \$2.7 billion to CRC research.

CRCs have established research alliances with more than 900 large and small-to medium sized enterprises. Of these 120 individual large companies and 26 small-to medium sized enterprises work with CRCs as core participants in CRCs.

The focus of CRCs is on technology transfer. this is particularly assisted by the bringing together of first class researchers with research users; this in turn leads to a quicker uptake of the outcomes of the research because the users and researchers have been "shaping the product"/ "developing the new knowledge" together from the start.

CRCs also have a strong training role and are producing more work-place oriented post-graduates. These in turn are important in technology transfer.

4. Examples of Value Adding to Raw Materials from a number of CRCs

4.1 CRC for Premium Quality Wool

The proportion of locally-produced wool processed through to top in Australia is only 15 to 18%, well below the proportions of 60 to 70% experienced in other major apparel wool exporting countries in South America and South Africa. There are a number of historical reasons for this but the outcome has been that the low level of early stage processing in Australia has contributed to the poor vertical integration between the Australian raw wool industry and overseas worsted spinning mills.

At current levels of production, the potential exists to add several hundred million dollars to the export value of Australia's wool clip by processing most of the combing wool through to top.

However, the immediate prospect for an increase in combing capacity in Australia is not good because of excess global capacity and low returns on investment. Nevertheless this needs to be addressed as a key goal for the industry (over the next 5 years). The Wool CRC has been undertaking research which helps to establish a more direct relationship between raw wool producers and down stream processing and manufacturing performance. Such developments are likely to lead to closer integration between raw wool

suppliers in Australia and overseas textile manufacturers leading to increased opportunities for domestic processing within Australia.

A current project provides a good illustration of how cooperative research is contributing to an improved climate for adding value to Australian wool prior to export. The Wool CRC is conducting an international study to demonstrate to worsted spinners the considerable advantages to be gained from using longer top when spinning finer types of wool. The project, involving collaboration between CSIRO (Textile and Fibre Technology) and Agriculture WA, has brought together growers (Australian Merino Society), a trader (Lempriere Australia), a local processor (AusTop) and spinners in five countries (Italy, Mexico, Italy, Japan and Australia). The results of the spinning trials will be used to encourage all spinners to be more flexible in specifying their top requirements and will enhance opportunities for local processors to exercise flexibility in compiling combing consignments.

The CRC for Premium Quality Wool is an unincorporated joint venture established initially under the Federal Government's CRC Program in July 1993 for seven years. The core industry participant is the Australian Wool Research and Promotion Organisation. University core participants are drawn from The University of New England, The University of Western Australia, the University of New South Wales and The University of Adelaide. CSIRO (Animal Production and Wool Technology) is the Commonwealth core participant while Agriculture Western Australia is a State core participant.

Reference: Extracted from the independent letter to the Inquiry Committee with the permission of the Director

Contact: Dr Lionel Ward, Director, CRC for Premium Quality Wool:
Phone: 03 9416 5180

4.2 Aquaculture CRC Ltd

Aquaculture is an industry in its infancy in Australia but has the potential to grow enormously to meet increasing global demands for seafood; indeed, the demand for seafood in the 21 st century can only be met from aquaculture which provides the means to bridge the gap between the demand for seafood and that available from wild fisheries. It is predicted to be Australia's quickest growing rural industry in the 21 st century.

Aquaculture offers special opportunities for value-adding to seafood, because it can deliver product to specification, consistently and at the time of peak market demand, and because appropriate feeding and handling can ensure product with the most desirable characteristics. In the longer term, domestication and genetic selection can improve the characteristics of culture stocks to meet consumer preference.

Aquaculture in Australia benefits from the innovative traditions of Australian farming and the high level of research and development skills in the community. The Aquaculture CRC brings together many of those skills in a coordinated campaign to provide new technology for the industry.

The CRC is developing key technologies to bring new species into Australian aquaculture (such as snapper and striped trumpeter) or to facilitate the sustainable expansion of existing sectors (such as prawn and barramundi). These developments will increase Australia's capacity to deliver seafood products to the market.

Some prawn farmers grow a high value species (Kuruma prawns) specifically for export live to Japan. To achieve the high prices available for this product, prawns must arrive in excellent health, so prawns in

perfect condition must be selected for transport. Accurate methods of measuring prawn condition have recently been provided to industry by the CRC.

Farming of tuna allows the fish to be fattened and supplied at the best time to the Japanese market for sashimi. Quality, including colour, texture and flavour, is paramount, and is strongly influenced by the type and amount of feed given to the fish and the methods of harvesting and handling them. The CRC works closely with the industry in making fast progress on these methodologies.

Related projects with the salmon industry have introduced new tools and methods to ensure the high standards of this product are readily attained. Feeding and harvesting techniques can be used to extend shelf life and minimise flesh defects.

The CRC, with close industry support, has developed rapid genetic selection procedures for pacific oysters, including gene maps and genetic markers. These will deliver long term and cumulative improvements, not only enhancing industry productivity but also increasing meat to shell ratio and providing consistent shape and appearance of the product. Increasingly, these methodologies will be applied to other aquaculture species in the future.

Aquaculture CRC is an incorporated organisation established under the Federal Government's CRC Program in October 1993. Its core participants are the University of Tasmania, the University of Technology Sydney and James Cook University in Far North Queensland. Other core participants in the Commonwealth sector are CSIRO (Divisions of Marine Research, Tropical Agriculture and Animal Health) and the Australian Institute of Marine Science. State institutions which are core participants are the Queensland Department of Primary Industries, the Department-of Primary Industry and Fisheries in Tasmania, NSW Fisheries and the South Australian Research & Development Institute. These all provide cash and in-kind contributions and these are supplemented by the Commonwealth until September 2000.

**Contact: Dr Peter Montague, Director, Aquaculture CRC Ltd:
Phone 02 9514 1385**

4.3 CRC for Cattle and Beef Quality

Australia is the world's largest beef trader. We have only 2.5% of world cattle numbers, but we supply 23% of world beef trade. Beef exports are worth \$3 billion annually. Domestic beef trade is worth a further \$3 billion annually. More than 95% of Australian beef undergoes primary-stage processing in Australia.

Australia exports beef to 48 countries. These countries all have market specifications for beef products that differ from each other, and from the Australian domestic market.

Value-adding in the beef trade began in the late 1980s with the realization that Australia must cease treating beef exports as an undifferentiated commodity. This led to the need to describe and differentiate our beef for each market.

The central focus of the Cattle and Beef CRC, formulated in 1991, was to identify the genetic and non-genetic factors influencing beef eating quality. This recognized the fact that the key value-adding was to guarantee eating quality of Australian beef to consumers in domestic and export markets.

In 1993, the Cattle and Beef CRC put in place the largest integrated study of genetics, nutrition and meat science in Australian beef research history. It required the support of the Commonwealth, the cooperation of scientists from four institutions across three states and the unqualified support and participation of

commercial beef herds: the result is a 14,000-head progeny test for beef quality traits from across Australian beef breeds and environments.

The results of the CRC initiative now provide Australia with the information to value add to beef exports by guaranteeing that the cattle genotypes and production systems are best suited to the export target.

In the domestic market, CRC results have provided the scientific evidence to underpin the world's first Meat Standards Australia grading scheme based on eating quality. This scheme, now adopted nationally, is the ultimate value-adding tool to guarantee and achieve premiums for beef of known eating quality.

Value-adding can only be quantified by assessing increased revenue for beef products on the one hand and retention of market share, against intense global competition, on the other. In the case of the domestic market, CRC outcomes in respect of value-adding in beef retail yield and beef tenderness are estimated to have generated a net present value of \$400 million over 20 years, based on modest adoption rates.

The CRC for Cattle & Beef Quality is an unincorporated organisation established initially under the Federal Government's CRC Program in July 1993. It has just won funding in the recent sixth selection round for a further seven years from July 1999. In this new Centre the core participants are the University of New England, the CSIRO and NSW Agriculture and the Queensland Department of Primary Industries.

**Contact: Professor Bernie Bindon, Chief Executive Officer,
CRC for Cattle & Beef Quality: Phone 02 6773 3501**

4.4 Quality Wheat CRC Ltd

Southern wheatbelt, *Prime Hard* quality grain, has been successfully exported from Wollongong's Port Kembla for South East Asian markets.

The grain, grown last season in central and southern New South Wales, is destined for blending with North American grain for bread and noodle manufacture.

For a long time, it had been held that *Prime Hard* Quality Wheat could only be grown in the North of state until this research showed otherwise. The research is now being extended to develop and evaluate a suite of new varieties with the necessary quality and agronomic characteristics for central and southern areas.

The project is part of the Quality Wheat CRC's program portfolio; this project has been funded by the Grains Research & Development Corporation and is managed by Mr Bob Cracknell, who is also the Senior Wheat Quality Advisor with the Australian Wheat Board.

Mr Murray Rogers (1998) Chief Executive of the Australian Wheat Board says that "*Prime Hard* is one of the world's most readily saleable wheats and oversupply of this grade is a problem we would welcome." The Australian Wheat Board are looking to provide more delivery points for receipt of the *Prime Hard* wheat from southern/central growers with a view to increasing the tonnage acquired; this will help secure supply of this valuable wheat for premium markets. *Prime Hard* is essentially an export grade of wheat and generally not attractive to domestic millers.

Mr Rogers notes that "Providing wheat with specific qualities wanted by buyers is a high priority for the Australian Wheat Board. To help us achieve this, we have an active role in the Quality Wheat C11C". "The Australian Wheat Board stands to benefit from the Quality Wheat CRC's aim to apply quality science to wheat industry needs. The Quality Wheat CRC is developing new technologies which add value to the raw commodity. Our understanding of these gives us an edge in marketing Australia's wheat to buyers with

specialized requirements. Whether the buyer wants milling wheats for noodles, steamed buns, loaves, flat bread, cakes, pastries or snack foods, the Australian Wheat Board knows it can supply a quality product that is appropriate for the end-use"

Quality Wheat CRC is an incorporated, non-profit organisation established under the Federal Government's CRC program in July 1995. It is funded by six commercial participants viz Australian Wheat Board, Arnotts Biscuits Ltd. George Weston Foods, Goodman Fielder Ltd., Bunge/Defiance Ltd and the Grains Research & Development Corporation. In addition others providing funding include: NSW Agriculture, Agriculture Western Australia, the New Zealand Institute for Crop & Food Research Ltd, Bread Research Institute Australia Ltd, CSIRO Plant Industry and the University of Sydney. Funding is in cash and in-kind and supplemented by the Commonwealth until 2002.

Reference: Quality Wheat (1998): Newsletter Issue #2: December

**Contact: Dr Bill Rathmell, Managing Director, Quality Wheat CRC Ltd.:
Phone 02 9490 8488**

4.5 CRC for Hardwood Fibre & Paper Science

This CRC has contributed to added value of exports in several ways but perhaps the most transparent is the development of techniques for measuring quality of wood. With both the Silviscan for evaluation of standing trees and with the new confocal microscopy techniques which can measure fibril angle on wood chips, the CRC has developed tools which allow much tighter control of wood quality both for the Australian pulp and paper industry and for the export wood-chip industry-

The CRC for Hardwood Fibre and Paper Science is an unincorporated organization established under the Federal Government's CRC Program in July 1992 for seven years. The core industry participants are the Pulp and Paper Manufacturers Federation of Australia. Core university participants include Monash University (Australian Pulp and Paper Institute. Department of Chemical Engineering) and the University of Melbourne (School of Agriculture and Forestry). The Commonwealth core participant is CSIRO (Forestry and Forest Products).

**Contact: Dr Robert Johnston, Co-director,
CRC for Hardwood Fibre and Paper Science: Phone 03 9905 3422**

4.6 AJ Parker CRC for Hydrometallurgy

The Parker Centre's research is aimed at improving the hydrometallurgical processes used by the mining industry to add-value to raw materials. For example, the conversion of bauxite ore to pure alumina, which is the feedstock for aluminium smelters, is one of the largest areas of the Parker Centre's research. Another example is the upgrading of ilmenite (55% titanium dioxide) to synthetic rutile (> 95% titanium dioxide) which is used to make white pigment for paints and plastics. Current hydrometallurgical processes for making synthetic rutile are not as efficient as they could be. Hydrometallurgy is used in the production of over \$10 billion of mineral and metal exports and the Parker Centre has a range of industry and Commonwealth supported projects covering most of the important commodities.

The mining industry has not formally requested the Parker Centre to develop entirely new processes but has worked with the Centre to continue optimising and improving its current capital intensive, operating plants in order to remain competitive in world markets. Some of the industries to have directly benefited, or have significant potential to benefit, from the activities of the Parker Centre include:

Gold, where the more efficient utilisation of the chemical reagents, such as cyanide, used in the dissolution of gold has resulted in annual savings of \$1.2 million in one large gold mine alone and 5-30% reductions in cyanide usage in several others.

Alumina and Titanium Minerals, where a greater understanding of the operation of thickeners, used to separate solids and liquids, has saved millions of dollars in annual operating costs and possibly tens of millions in capital costs.

Industrial Minerals, where better management of scarce water supplies has the potential to decrease impurity levels in raw gypsum without increasing water consumption and ensure export markets, worth tens of millions of dollars, are retained despite increasingly stringent product specifications.

The AJ Parker Centre is an unincorporated organization established initially under the Federal Government's CRC Program in July 1992; it has just won funding in the recent sixth selection round for a further seven years from July 1999. In this new Centre the core industry participants are: Acacia Resources Ltd., Alcoa of Australia Ltd., Australian Mineral Industries Research Association Ltd., BHP Research & Technology Development, Comalco Aluminium Ltd., Normandy Mining Ltd. Pasminco Australia Ltd., Queensland Alumina Ltd., Resolute Ltd--- RioTinto Ltd., WMC Ltd., Worsley Alumina Ltd. In addition the university participants are Curtin University of Technology, Murdoch University and the University of Queensland. The WA Department of Minerals and Energy and CSIRO are also core participants from the State and Commonwealth respectively.

Contact: **Professor Ian Ritchie, Chief Executive Officer,**
AJ Parker CRC for Hydrometallurgy: Phone 08 9360 2552

This CRC aims to add value to coal in the form of technical information about its quality and processing behaviour that enables value in-use to be maximised. The research (or commercial benefits resulting from it) does not add-value to coal in the physical sense of upgrading the raw material or of creating higher value products from it. Some illustrative examples are provided.

- Ironmaking in blast furnaces relies mainly on expensive coking coal, which can be partially replaced by cheaper thermal coal injected with blast air. The value of a particular coal as an injectant depends on how the furnace material and energy balances are affected by its quality profile. The Centre's PCI Performance Predictor enables a coal to be evaluated for this use and thus to be marketed on an informed basis, and its PCI research program overall is believed to be as extensive and advanced as any in the world.
- Because new power generation technologies are being developed mainly in the US and Europe, Australian coals are not much used in commercial demonstration

Although the high moisture content of lignites leads to lower efficiencies than obtained from the more expensive competing fuels, the fuel costs for electricity production from Victorian lignites, Australian black coals and natural gas are of the order of \$3MWh, \$11-15MWh and >\$20MWh respectively.

The cost of fuel is, of course, only one element in the total cost of power production - the other principal components are capital cost and operations and maintenance of the power station. The fuel cost does, however, starkly show the strategic advantage of lignite in power production in Australia.

The CRC for Clean Power From Lignite is adding value to Australia's vast reserves of lignite by developing an advanced cycle to ensure continued use is made of the lignite for power generation. The technology is

Advanced Pressurised Fluid Bed Combustion (APF13C) and is widely recognised as having the highest projected efficiency for power generation from coal. It is at an early stage of development.

Recent estimates of the cost of power sent out from a power station based of the CRC's APFBC technology and fuelled by Victorian lignite indicates a power price that will be lower than from competing technologies and fuels. Further, it can be argued that the relative advantage will increase in future decades which will maintain competitive pressures on other sources of energy thereby maintaining low energy prices in Australia.

With growth in demand in the southern states and eventual replacement of some existing plants, up to ten 1000MW power stations will need to be installed over the next 40 years. Compared to existing technology (pulverised lignite-fired boiler power stations) commercial adoption of the CRC's APFBC technology could potentially reduce Australia's greenhouse gas emissions by over 400 million tonnes in total over that period -about the same as the total Australian emissions in any one year. Furthermore, compared to existing technologies and assuming the introduction of an emissions trading scheme, there would also be a cost saving of about \$10 billion!

The CRC for Clean Power from Lignite is an unincorporated organization established initially under the Federal Government's CRC Program in July 1993; it has just won funding in the recent sixth selection round for a further seven years from July 1999. In this new Centre, the core industry participants are: Loy Yang Power, Hazelwood Power, Yallourn Energy, Flinders Power, Geo-Eng. University core participants are Monash University, University of Adelaide and Swinburne University of Technology. In addition core participants from the Commonwealth and State are CSIRO (Commonwealth) and the Victorian Department of State Development as well as the Strategic Industry Research Foundation (State). They all provide cash and in-kind contributions which are supplemented by the Commonwealth until July 2006.

Contact: **Dr David Brockway, Chief Executive Officer,**
CRC for Clean Power From Lignite: Phone 03 9239 0800

plants and thus may be disadvantaged in these new markets as they emerge. The CRC's research program overcomes this potential disability by producing performance data with high engineering credibility but without resort to pilot plants, which are very expensive for the new pressurised processes. The centrepiece of this program is a \$3M advanced gasification research reactor, which is one of very few in the world and which has some unique capabilities.

Competition between power generators in Australia and elsewhere is causing them to relax coal quality specifications and buy cheaper coal. This creates risk because established methods of predicting performance of a new coal in one of the large pulverised coal-fired boilers typical of modern stations are relatively crude and known to have quite limited reliability. The CRC has pioneered application of several new techniques that enable more detailed and accurate evaluations to be made. Demonstrating the technical acceptability of a producer's coal to a customer can be instrumental in gaining or keeping a large supply contract, possibly worth \$ 100M. Forced shutdowns of large boilers due to coal-related effects can cost a generator foregone revenue of perhaps \$0.5M a day.

The CRC for Black Coal Utilisation is an unincorporated joint venture established in July 1995 under the Federal Government's CRC Program. The core industry participants are AUSTA Energy, Delta Electricity, Pacific Power; Rio Tinto Research and Technology Development; BHP Coal Pty Ltd., Oakbridge Pty Ltd., Pacific Coal Pty Ltd., ARCO Resources Ltd., Coal & Allied Operations Pty Ltd., Peabody Resources Ltd. Core university participants are the University of Newcastle, The University of Queensland and The University of New South Wales. CSIRO (Energy Technology) and the Queensland Department of Mines and Energy are also core participants from the Commonwealth and State Sector respectively.

Reference: Extracted from the independent letter to the Inquiry Committee with the permission of the Director

Contact: **Mr John Hart, Executive Director,**
CRC for Black Coal Utilisation: Phone :02 4921 7313

4.8 CRC for Clean Power from Lignite

Coal is the principal fuel for power generation in Australia providing about 80 percent of electricity production. Two thirds of the electricity generated from coal in Australia relies on high-rank coals (bituminous coals) and one-third on lignites (low-rank coal with a moisture content of 30 to 70%). The Electricity Supply Association of Australia (ESAA) projects that electricity demand will grow by 37% over the next 15 years. While some of the increased demand will be taken up by excess capacity in NSW, a significant amount of new plant will be required in the coming decades. In the longer term, demand growth is conservatively estimated to grow at 1.5 to 2% per annum.

The strategic advantage of lignite for power generation, particularly in the Australian economy, essentially relates to the very low cost of the fuel- It is important to Australia's international competitiveness that technology be developed to ensure continued generation of low cost energy from this fuel in an environmentally responsible manner.

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