



# **QUALITY WHEAT CRC PROJECT REPORT**

**Project: 5.2.1 – Education & Training**

## **The Wheat Supply Chain**

**Industry Symposium**

**14<sup>th</sup> February 2001**

**Sponsored by: Quality Wheat CRC**

**Compiled by: Clare Johnson**

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## Quality Wheat CRC Symposium

# The Wheat Supply Chain

Wednesday 14 February 2001

Woolley Lecture Theatre N395

Science Road, Sydney University (near Ross St entrance from Parramatta Road)

Convenor: Clare Johnson, Manager, Education & Training, Quality Wheat CRC

### Program

9.30-10.15	<i>Vince O'Donnell, Manager, Agricultural Economics Research, ABARE</i> Overview of the wheat industry, market players and forces & ABARE services.
10.15-11.00	<i>Tony Kent, Manager, AWB Research Pty Ltd.</i> Differentiation: what defines quality and value in the market?
11.00-11.20	Break
11.20-12.05	<i>Prof. Gordon MacAulay,</i> <i>Head, Department of Agricultural Economics, University of Sydney</i> Economic assessment of the value of strategic research
12.05-12.50	<i>Prof. Brad Sherman, Director,</i> <i>Australian Centre for Intellectual Property in Agriculture</i> The importance of intellectual property to agriculture
12.50-1.40	Lunch
1.40-2.25	<i>Lina Melero, Director Public Affairs, Australian Food and Grocery Council</i> GMO foods – a food industry perspective
2.25-3.10	<i>Peter Flottmann,</i> <i>Principal, Peter Flottmann and Associates, Agribusiness Consultants</i> QA for identity preservation, enabling technologies and supply chain learning
3.10-3.30	Break
3.30-4.15	<i>Dr Bill Rathmell, Managing Director, Quality Wheat CRC</i> Taking up the challenge: Achievements and goals of the Wheat CRC, within the industry context
4.15-5.00	Discussion Forum

**Overview of the wheat industry, market  
players and forces & ABARE services**

**Vince O'Donnell  
Manager  
Agricultural Economics Research  
ABARE**

## Quality wheat CRC Symposium

### The wheat supply chain

Vince O'Donnell  
Senior Program Manager  
Agriculture

ABARE

## The supply chain

- Producers
- Grain handlers
- Marketers
- Processors

ABARE

## Challenges

- Agronomic
- Resource base
- Food safety
- Markets
- Competition
- Segregation
- Economic conditions
- Consumer preferences

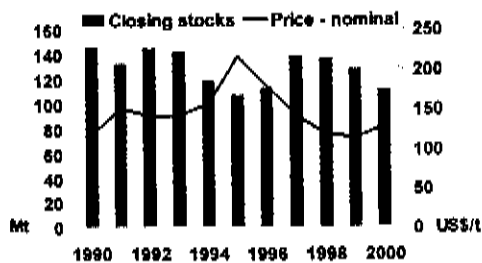
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## Overview

- World
- Australia
- Issues
- ABARE research

ABARE

## World wheat



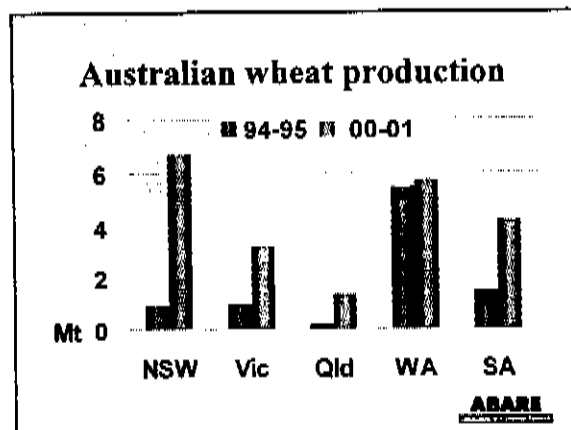
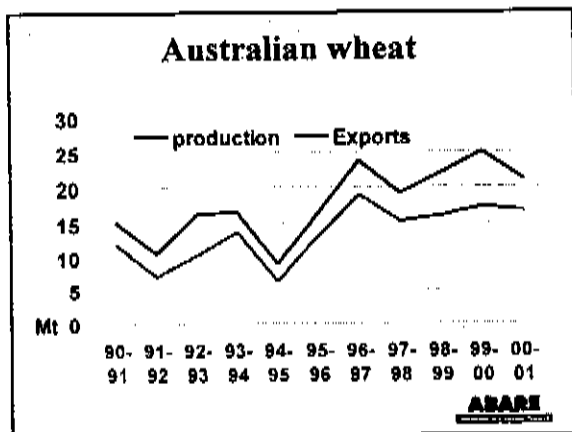
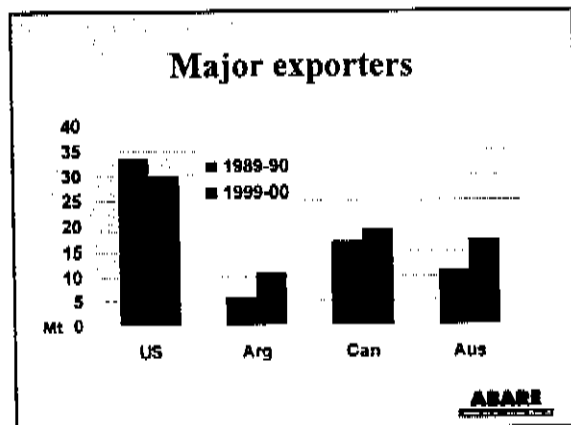
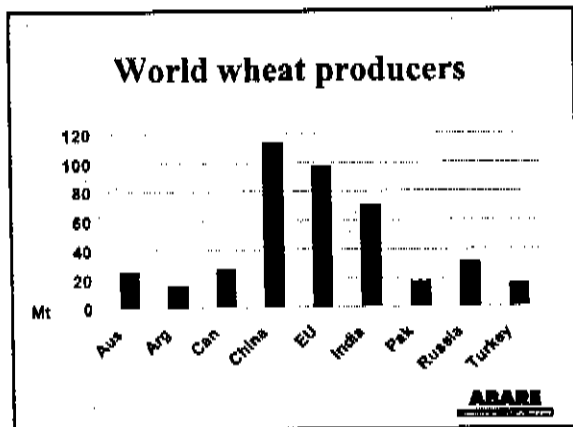
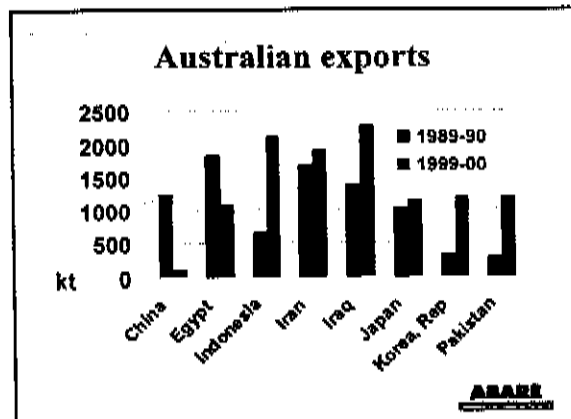
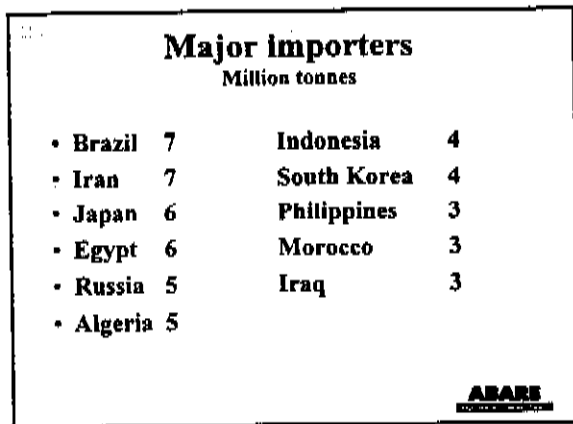
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## Key macro assumptions

Economic growth %

	98	99	00	01
• United States	4.4	4.2	5.2	3.3
• Dev countries	3.2	3.8	5.5	5.3
• World	2.5	3.3	4.6	3.9
• Australia	4.8	5.4	4.4	4.0
Exchange rate				
• US\$/A\$	0.68	0.63	0.63	0.56

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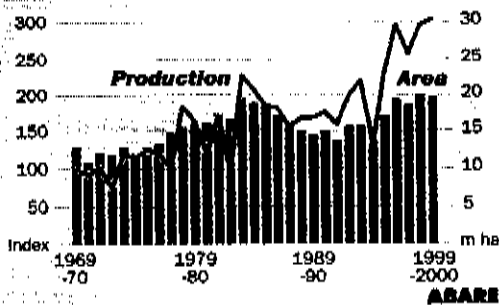


### Issues

- Productivity
- Resource base
- Trade
- Competition
- GM, IP, Food safety

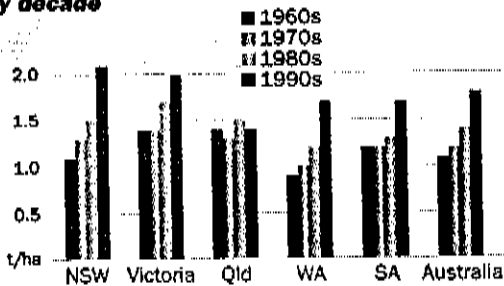
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### Australian grain area and production



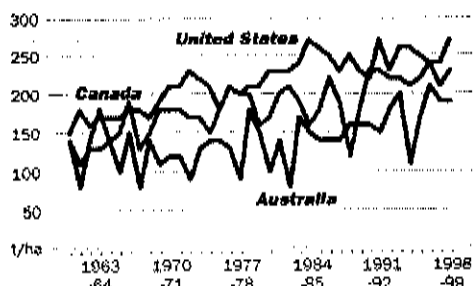
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### Australian average wheat yields by decade



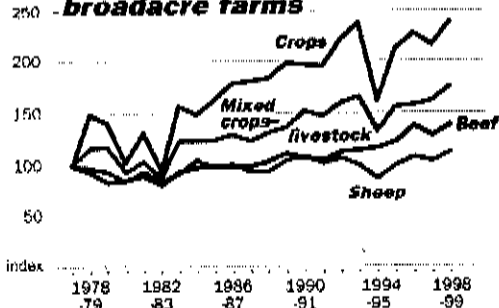
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### World wheat yields



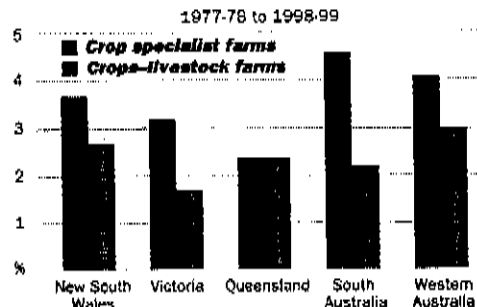
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### Productivity growth on broadacre farms



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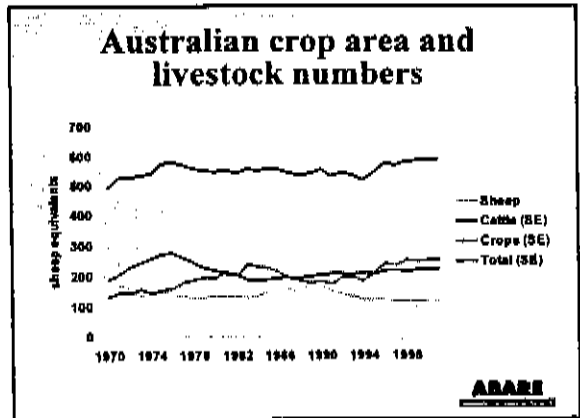
### Annual productivity growth




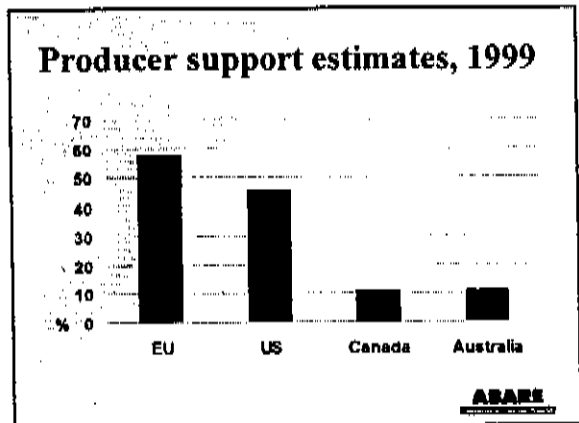
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## Resource Base

**risks associated with further productivity improvements**


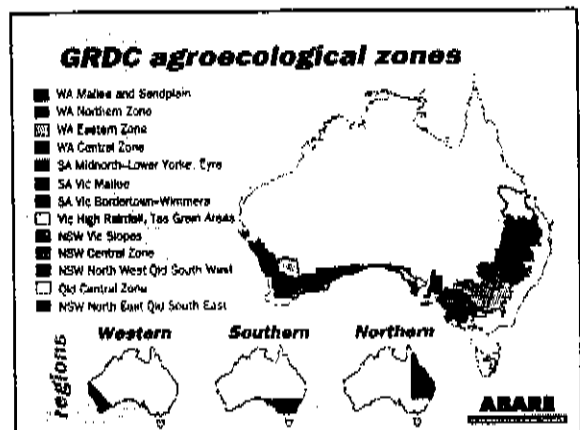



## Trade issues

## Other Issues

- Genetically modified crops
- Quality assurance
- Identity preservation
- Food safety

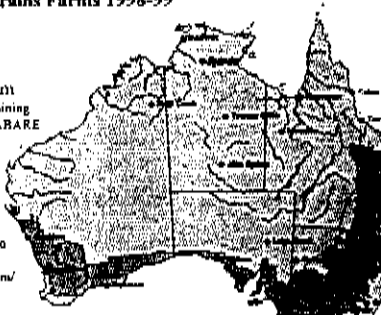



Average per farm, Grains Farms 1998-99

Grains@ccess program

- a graphical package for obtaining regional benchmarks from ABARE survey data.
- developed using industry-defined benchmarks.
- agronomical regions and survey data for grain farms


Program can be downloaded to your hard drive.  
<http://www.abareconomics.com/research/grainsaccess.htm>



Average per farm, Grains Farms 1998-99

Grains@ccess program

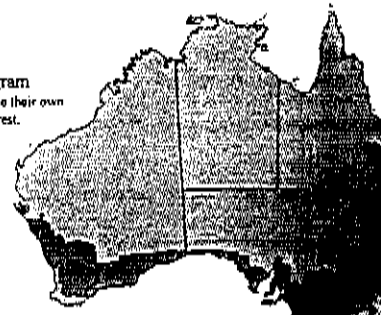
Users can use the set of built-in predefined regions to generate a report. The report will contain regional benchmarks for all of the variables that have been put into the grains@ccess data file, set out in table form.



Average per farm, Grains Farms 1998-99

Grains@ccess program

Users users can also define their own geographic region of interest, or use a region that they have previously defined and saved to a file.

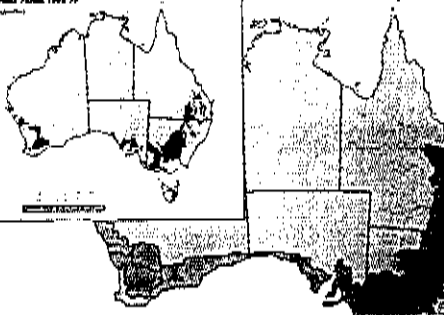


Grain Producers 1997/98 (continued)

	All farms data of interest		Your farm
	Average	Top 25%	
<b>Physical Characteristics 1997-1998</b>			
Total area operated	ha	2480	2630
Total area sown	ha	280	528
Proportion planted to crops	%	15.7	21.1
Wheat area sown	ha	270	418
Barley area sown	ha	75.2	117
Oats area sown	ha	3.31	6.51
Other area sown	ha	3.50	12.1
Wheat at 30 June	mt	1740	2375
Wheat milled at 30 June	mt	111	162
<b>Financial Outcomes 1997-1998</b>			
Revenue per farm business	\$	170000	220000
Operating surplus per farm business	\$	157000	170000
Depreciation surplus per farm business	\$	60700	86200
Leasing costs by region	\$	0.25	0.28
Wheat yield	t/ha	79.8	92.0
Operating surplus per family	\$	26300	36800
Net farm income	\$	30800	39800
Farm business profit	\$	1190	4100
Net non-farm income per family	\$	21100	29000
Disposable income per family	\$	23200	33000
<b>Performance Benchmarks 1997-1998</b>			
Wheat yield	t/ha	1.20	1.57
Wheat yield	t/ha	1.75	1.80

Average per farm, Grains Farms 1998-99

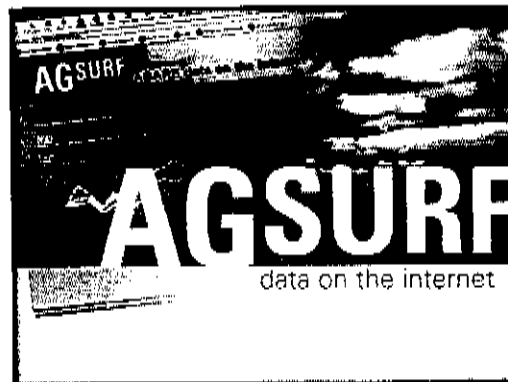
Wheat yield, Top 25% (continued)

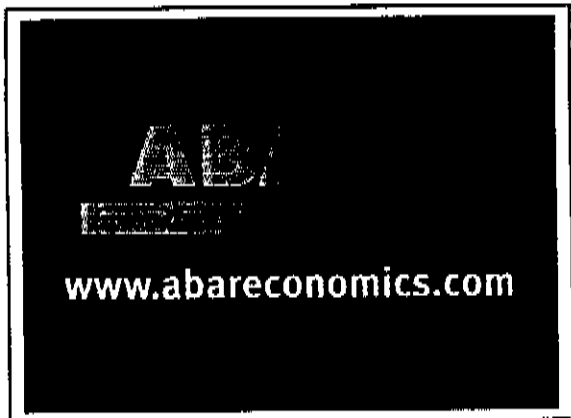


AGSURF

AGSURF

data on the internet







# ag @ ccess

© ABARE 1999

*AgAccess* is a graphical package for obtaining regional benchmarks from ABARE survey data.

With point and click the user can define their own geographical region of interest, can access a built-in predefined region or use a region that they have previously defined and saved to a file.

Once a region is defined a report can be generated for that region. The report will contain regional benchmarks for all of the variables that have been put into the *AgAccess* data file, set out in table form.

The data in *AgAccess* files has been geographically smoothed from ABARE farm survey data. This means that even small regions are meaningful, because every smoothed data point is influenced, and stabilised, by data from nearby surveyed farms. *AgAccess* can also be used to geographically display the smoothed data for any of the file's variables.

*AgAccess* was developed in-house by ABARE and is a single executable file. Thus installation procedures aren't needed, no third party GIS is involved, and there is no cost associated with the application itself.

When the release version is completed, it will be made available at ABARE's internet site ([www.abare.gov.au](http://www.abare.gov.au)) along with any publicly released *AgAccess* data files. The site will also contain information on the pricing of *AgAccess* data file production.

For more information on Ag Access contact  
Ray Hinde at ABARE on 02 6272 2213

**ABARE**

*Innovation in Economic Research*

[www.abare.gov.au](http://www.abare.gov.au)

**GRDC**

**Grains Research &  
Development Corporation**

## Food and Gene Technology Program

The BRS Food and Gene Technology Program commenced in 1999 and is currently active in four main areas of research:

- **Foundations for Food Quality systems**
- **Food Supply Chain Analysis**
- **Ecolabelling and**
- **Agricultural Biotechnology**

The program analyses and interprets food quality systems, best practice guidelines, codes of practice and international and national standards. We also validate risk assessments and Hazard Analysis Critical Control Point programs which are agreed internationally as the basis of food quality systems and international requirements. The aim is to make information on these systems more easily understandable and more accessible to industries.

The program further analyses Australian food and fibre chains, including identifying their geographical location, to enable better communication along the chains and the potential for efficiency improvements.

The use of gene technology in agriculture is increasing rapidly around the globe. Australia needs to be aware of competitors' progress with the technology and of public sentiment. The program keeps abreast of international advances and the use of technology in commercial agriculture, including food production. We are also involved in investigating the management of transgenic crops after they are approved for commercial use in Australia.

### Foundations for Food Quality Systems



Food quality systems are designed to improve the food reaching consumers and ensure its safety. To do this, the systems need to be based on a sound scientific analysis of where the risks are. BRS is reviewing the use of risk analysis in food quality systems and exploring the availability of international and domestic standards and guidelines to document the scientific foundation for food quality measures applied internationally in the agri-food industry. The aim is to provide information to enable more

uniform and robust quality systems to be developed in industry and to provide a common framework to facilitate auditing.

An initial analysis of recent attempts to promote and regulate the introduction of food safety and quality systems has been produced and will soon be available on the Internet: ***Evolution of Australian Food Quality Systems***

#### Contact:

Dr Stefan Fabiansson  
phone: 02 6272 5328  
e-mail: [stefan.fabiansson@brs.gov.au](mailto:stefan.fabiansson@brs.gov.au)

### Food Supply Chain Analysis



exploring options for improvements and further efficiencies. The aim is to identify the current extent of supply chain management practices in the Australian agri-food industry and limits for their potential in selected chains. Industry performance will be benchmarked against best international practice.

A review of current chain management practices has been undertaken to prioritize further research. The report will soon be available on the Internet: ***Chain Stocktake of Some Australian Agricultural and Fishing Industries***

#### Contact:

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phone: 02 6272 5160  
e-mail: [david.cunningham@brs.gov.au](mailto:david.cunningham@brs.gov.au)

## Ecolabelling



BRS is working with Supermarket to Asia to see if there is an international market for Australian foods grown using good environmental practices. We will test if Australia's environmental advantages can also be market advantages - to get preference on the shelves and possibly even a price premium for Australian products. We will be working with Australian food producers and overseas customers to test the market for this type of food product. We will consult

with buyers and consumers to see what quality and environmental factors are important and work with Australian suppliers to meet these expectations and to supply appropriate evidence of the quality products. If successful, we will investigate developing labels to promote Australia's environmental benefits - ecolabels.

### Contact:

Sandra Thomas  
phone: 02 6272 4016  
e-mail: [sandra.thomas@brs.gov.au](mailto:sandra.thomas@brs.gov.au)

## Agricultural Biotechnology



Genetically modified crops are providing more options to farmers. Cotton with 'built in' protection from insects is now grown commercially in Australia and over 200 field trials and extensions are now taking place around Australia. Many more crops are expected to become commercially available in the next few years. Details of the current and

future Australian genetically modified crops is contained in the BRS booklet;

[Agricultural\\_Biotechnology:\\_What\\_is\\_happening\\_in\\_Australia\\_in\\_2000](#)

The introduction of biotechnology to agriculture is raising many questions about the technology and its effect on human health and safety, agriculture and the environment. Many of the common questions are answered in the BRS booklet:

[Agricultural Biotechnology: Questions and Answers](#)

BRS Food and Gene Technology Program provides information on current and future developments with the technology and how they could affect Australian agricultural, fisheries, forestry and food industries. We also provide scientific and technical advice to support the development of AFFA policies on biotechnology.

BRS is working with State, Territory and Commonwealth Government agencies

- [Biotechnology Australia](#) in the Department of Industry, Science and Resources
- [The Australia New Zealand Food Authority](#)
- [The Interim Office of the Gene Technology Regulator](#)
- [The Genetic Manipulation Advisory Committee](#)

### Contact:

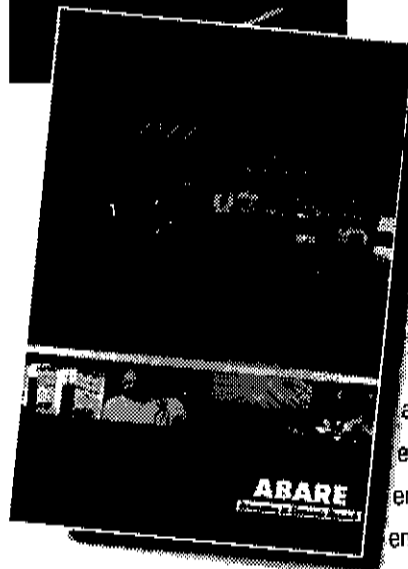
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phone: 02 6272 4016  
e-mail: [sandra.thomas@brs.gov.au](mailto:sandra.thomas@brs.gov.au)



**primary producer  
discount 20%**

# country

A U S T R A L I A



**T**HIS regional analysis of employment and population growth across Australia reveals a mixed but sometimes encouraging picture for development in inland and remote areas. Population growth is strongly correlated with employment growth. Nonmetropolitan employment in manufacturing and services, including tourism, has grown across the continent. But employment and population have declined in some areas with more than 30 per cent of total employment in agriculture. Other areas previously highly dependent on agriculture have found opportunities to widen their industrial base and improve the job and income security of residents.

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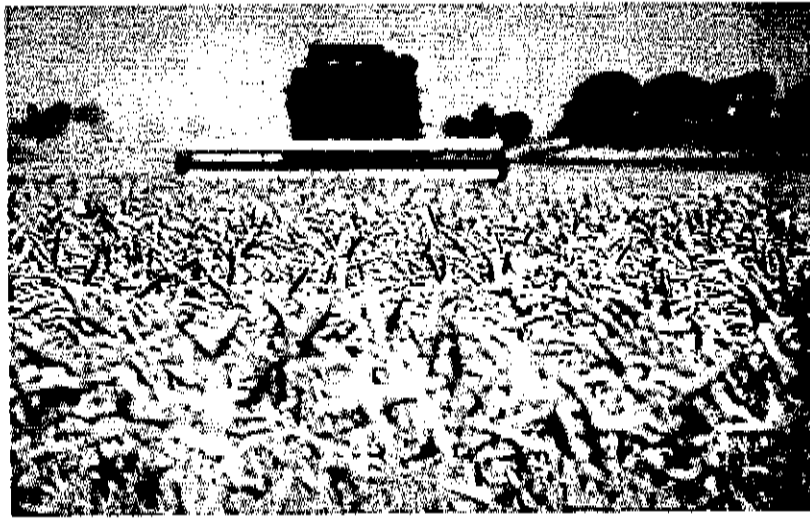


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**Differentiation: what defines quality  
and value in the market?**

**Tony Kent  
Manager  
AWB Research Pty Ltd.**



**AWB**  
LIMITED

*What defines quality in the  
market?*

**CRC for Quality Wheat**  
Wheat Supply Chain Symposium  
14 February 2001



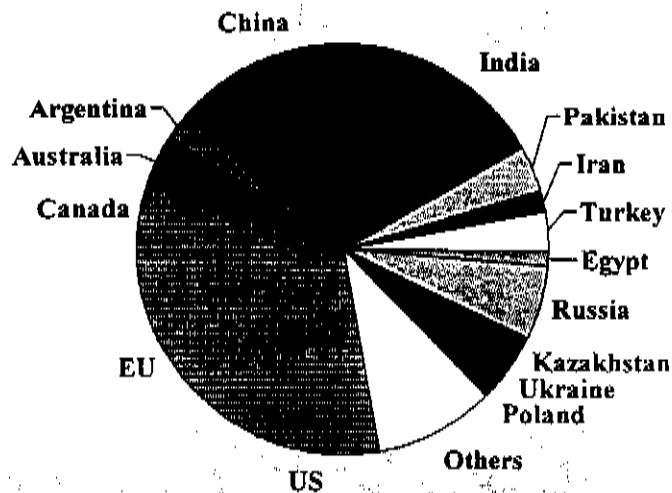
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## Today's issues

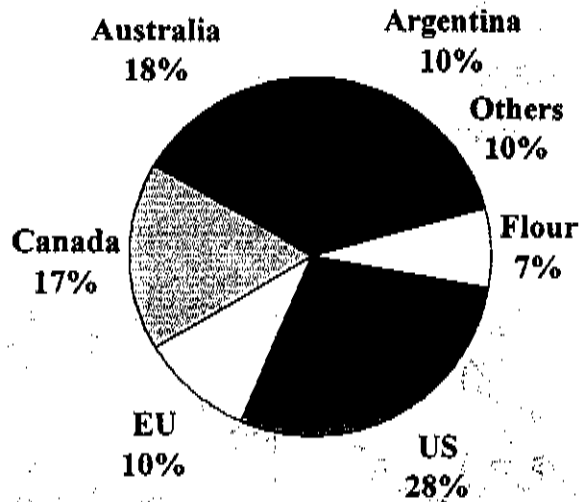
1. Is the market really changing? Australia in context
2. What does "quality wheat" mean?
3. Can added value in "quality" be captured and rewarded?
4. What does this mean for cereal science?



## International Wheat Production

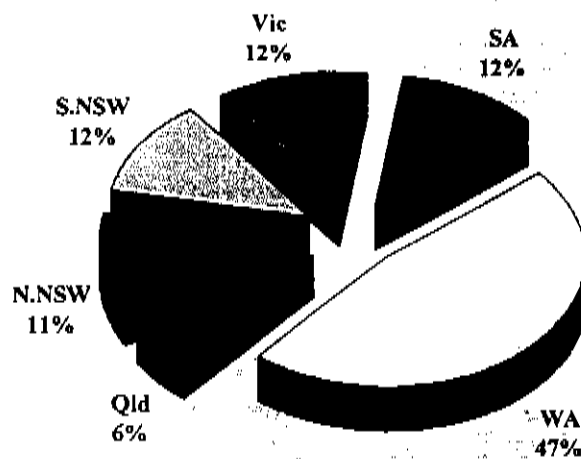


## International Wheat Trade



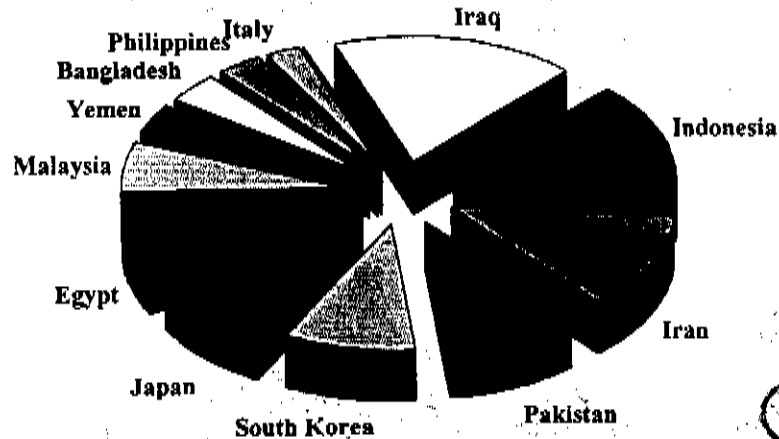
## AWB Wheat Receivals

(1999/2000 Harvest)



## Top 12 Export markets

(August 1999 to July 2000)



## In summary:

- Australia is small wheat producer
- Australia is a significant wheat exporter
- AWB exports large volumes to a small number of markets
- Important regional differences between export markets



## Market Fundamentals

- Increased specification
  - Influence of decentralized grain buying
  - more customers, more & varied demands on suppliers
- Growth of integrated global food corporations
  - Automation changes quality focus
  - New breeding tools will raise expectations
- Still demand for bulk wheat grades with broad application



## Quality wheat (i)

- Starts with intrinsic characteristics (“the G”)
- Degree of complexity of quality required varies by:
  - Product
  - Customer
  - Market



## Technical quality of wheat (ii)

*Complex interaction of genetic and environmental factors which determine processing quality and suitability for end use*



## Physical Factors

- Grain density  $\Rightarrow$  Test weight
- Grain size  $\Rightarrow$  1000 kernel weight
- Screenings  $\Rightarrow$  thru's of a 2.0 mm screen
- Grain hardness  $\Rightarrow$  Particle size index [PSI]
- Grain moisture  $\Rightarrow$  Content %
- Rain damage  $\Rightarrow$  Falling Number



## Milling Quality

- Yield
  - Amount of flour from a tonne of wheat
- Purity
  - As measured by flour colour and/or ash
- Ease of milling – mill throughput
- Milling value
  - Clean, dry and white



## Flour & Dough

- Flour
  - Colour
    - Brightness and yellowness
  - Enzyme activities
  - Ash
- Dough Properties
  - Water absorption
  - Strength or mixing effort
  - Extensibility



## End Products

- Western styles
  - Pan and hearth breads
  - Biscuits, pastries and cakes
- Asian styles
  - Noodles
  - Steamed products
  - Sheeted products
- Middle Eastern flat breads
- Aquaculture, industrial and other



## Quality wheat (iii)

- Technical quality is worthless unless its value can be captured along the market chain
- Some key considerations
  - Product to meet the market ("G x E")
  - System efficiency
  - Consistent delivery (Quality & Volume)
  - Returns to each chain contributor reflecting the value each adds and the risks taken

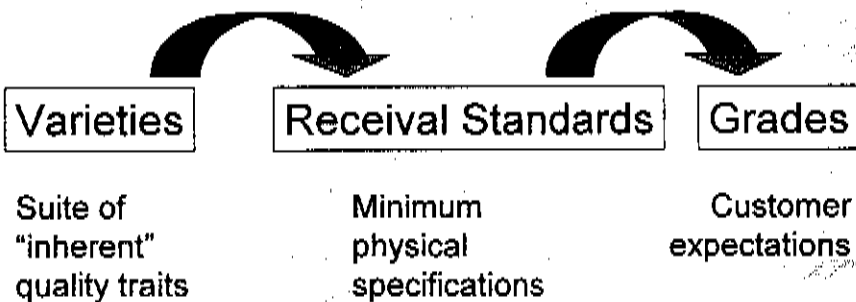


## Capturing the value in quality

- Logistics management, system quality & QA
  - Receivals
    - Variety ID
    - Grain testing
    - Segregation efficiency
  - Logistical management
    - Identity preservation
    - Outturn integrity
  - After sales service



## AWB Receival Standards “Market System Link”

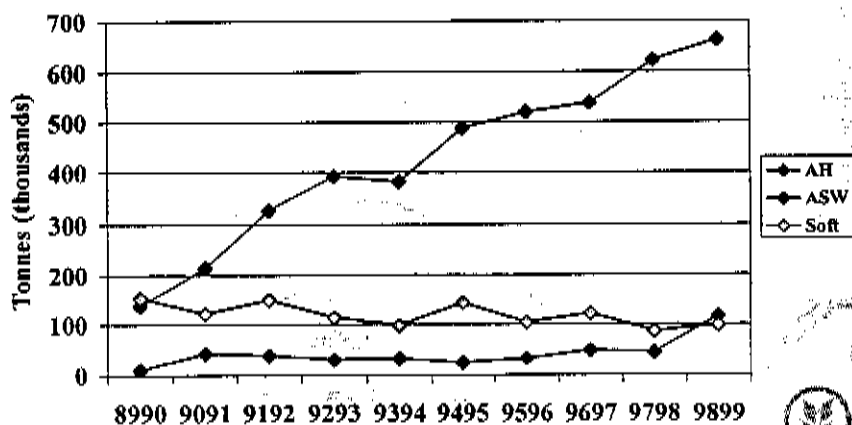


## Case study: South Korea

- 15 years ago 100% US market (2.5mmt)
- AWB captured around 40% market share. How?
  - Identify quality which adds value & set parameters
  - Consistency of supply
- “ASW-T” sub-grade created
  - Suited to processing requirements for instant noodle
  - Product meets Korean market tastes



## AWB Exports to South Korea



## Future markets: Taiwan

- US dominated market
  - Preference for high protein, strong wheats
- AWB technical collaboration began 1999
  - performance of selected Australian grades demonstrated
- First ROC purchase of AHard 1999
- New dry noodle product launched 2000



## Future markets: Philippines

- R&D collaboration commenced 1999
- Purchases commenced 99/00 SY
  - Initially container purchase different grades
  - Followed by bulk cargoes
- Purpose built flour mill and Instant Noodle Plant commissioned
  - Set up to utilise 100% Australian wheat
  - Supply contracts



## Quality & Value

- Consider market fundamentals...always
- Intrinsic quality research is part of the package
- But other contributions add value, need R&D
- Value capture achieved by ensuring the total package:
  - Right product on farm
  - Differentiation at receipt
  - Product management in chain
  - Integrity at outturn
  - After-sales service



**Economic assessment of the value of  
strategic research**

**Prof. Gordon MacAulay  
Head  
Department of Agricultural Economics  
University of Sydney**

# **Economic Assessment of the Value of Strategic Research in the Wheat Supply Chain**

by

T. G. MacAulay  
Department of Agricultural Economics  
The University of Sydney, NSW 2006

Paper presented to the  
Quality Wheat CRC Symposium on  
The Wheat Supply Chain at  
The University of Sydney

Wednesday 14 February 2001

## **Economic Assessment of the Value of Strategic Research in the Wheat Supply Chain**

by

T.G. MacAulay

Department of Agricultural Economics  
The University of Sydney, NSW, 2006

Assessment of the economic value of research is an area of research that has been intensely studied in recent years. An example of some recent applied work on the research of the Grains Research and Development Corporation and the Quality Wheat Cooperative Research Centre is illustrated in this paper. The approach discussed is an illustration of the kind of results that can be obtained using economic modelling approaches.

Research is classified in various ways. One of these is into tactical, strategic and basic research. Another is applied and theoretical. In the work of the Industry Commission (1995, p. 5) the following definitions are used:

‘Pure basic research—experimental and theoretical work undertaken without looking for long-term benefits other than the advancement of knowledge.

‘Strategic basic research—experimental and theoretical work undertaken to acquire knowledge directed towards specified broad areas in the expectation of useful discoveries. It provides the broad base of knowledge necessary for the practical solution of recognised problems.

‘Applied research—original work undertaken to acquire knowledge with a specific application in view. It is undertaken either to determine the possible uses for the findings of basic research or to determine new ways of achieving some specific and predetermined objectives.’

These classifications reflect differences in the outcomes to be expected for different types of research problems. Similar techniques of economic analysis are used for each of the areas but there being increasing difficulty in estimating the payoffs as the research becomes more pure basic research.

### **The Economic Character of Strategic Research**

Research resources are limited or scarce and often limited for a research program and also for research projects. This means that there will usually be a return from the

research to be maximised subject to a budget constraint. There may, of course, be other constraints. Thus the basic resource allocation problem for research is the maximisation of the wellbeing from the research activity subject to a set of constraints. Research resource allocation in economic terms is a capital budgeting or investment problem subject to a set of constraints. The criteria that result therefore require equating the marginal returns from the research effort so that the budget constraint is satisfied. This may not always mean choosing the projects with the highest net present value and working down the list since equating the marginal returns to the limited resources is required and this may not necessarily be the highest net present value. This is because net present values are calculated without capital rationing imposed.

Consider a very simple case of two projects  $y_1$  and  $y_2$  where the net present value of the stream of benefits and costs from the project are \$100 thousand for the first project and \$50 thousand for the second. Suppose there is \$50 thousand dollars available to be spent on the projects and the first project will take \$20 thousand and the second \$30 thousand. Also, the restriction is added that it is only possible to have one of the projects or one of each project. The variables  $y_i$  can only take the values of zero or one. This problem is known in the economic literature as the zero-one programming problem (see Lee, Moore and Taylor 1981, p. 742). In Figure 1 the three possible solutions are represented by the black dots. Assuming the objective is to maximise the total net present value as a reflection of wellbeing from the research then the combinations of the projects which would give a total net present value of \$150 thousand are given on the objective line. With the two projects the net present value is \$150 thousand. If project  $y_1$  were chosen then the net present value would be \$100 thousand and if project  $y_2$  were chosen then the net present value would be \$50 thousand. In this case it pays to choose the two projects.

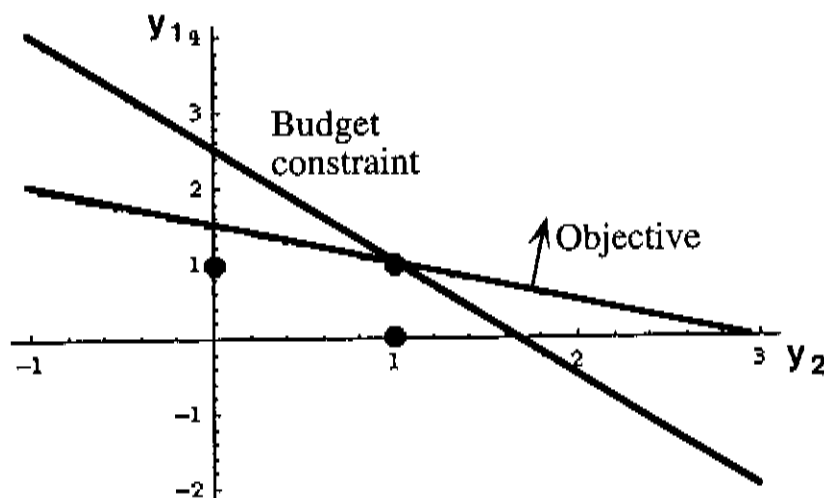


Figure 1 Representation of Project Choice

The essential result from the capital budgeting problem is that project choice requires the budget constraint to be satisfied so that the best fit is achieved for the objective being maximised. Although there are clearly technical and conceptual issues with using net present value as an objective for research funds allocation it is practically the best available. This is not to ignore the possibility that there may be other objectives that must be weighted into an overall measure of wellbeing for those for whom the research is carried out.

### Measuring Research Benefits

An extensive review of the methods of evaluating research payoffs is given in Alston, Norton and Pardey (1998). Since research involves an initial expenditure and there is then some time before adoption and the effects of the research are obtained, some way is required to compare the returns and costs across different time periods. An illustration of the nature of the returns and costs through time is given in Figure 2. The costs may be incurred well before any benefits begin to flow. Using a discount rate the value of the returns and the expenditure are accumulated in net present value terms so that costs incurred at the beginning of the project are comparable to returns obtained at the end of the project. The net present value is calculated as:

$$NPV = \sum_{k=0}^{\infty} \frac{(B_{t+k} - C_{t+k})}{(1+r)^k}$$

Where B is the time-dated benefits, C is the time-dated costs, r is the discount rate and k is the time period.

In order to evaluate the effects of the research it is essential to establish a base case or what is known as a 'counterfactual scenario'. This scenario is designed to establish what would happen if the research outcomes were not adopted. Using the base case scenario and a scenario with adoption of the research it is possible then to take the difference between the two scenarios and use this as the value of the research. Economic modelling may be the only way that it is possible to establish the nature of the two hypothetical scenarios in the case of ex ante evaluation and the hypothetical base case for ex post evaluation.

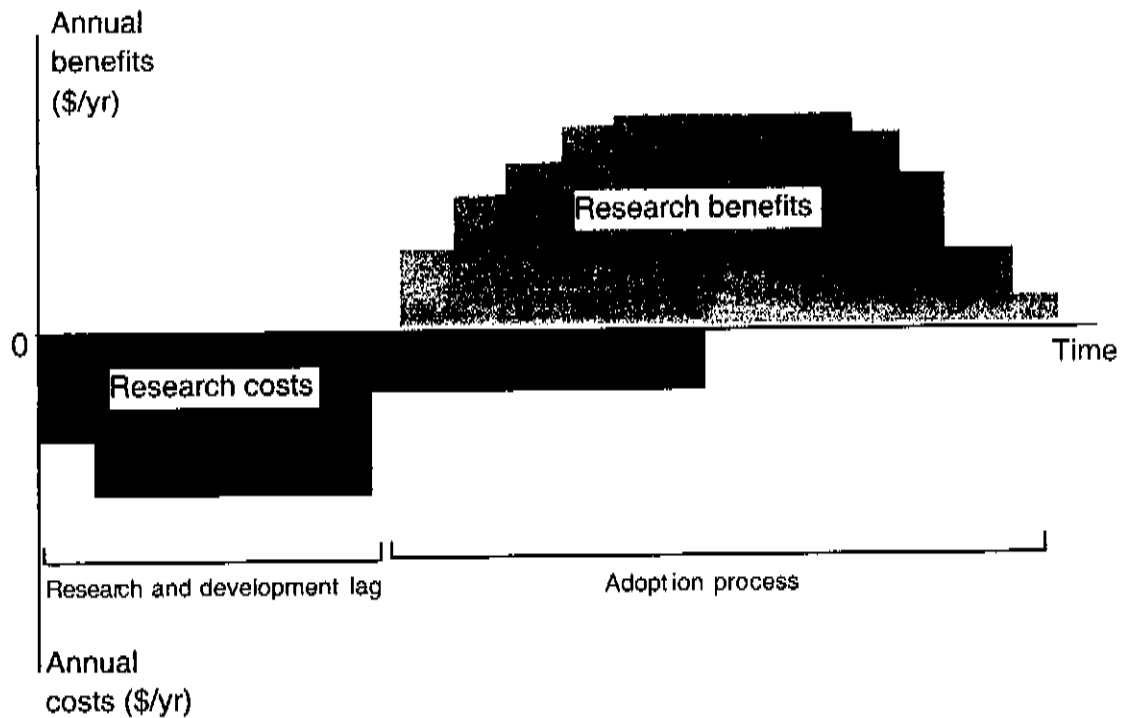


Figure 2 Benefit and costs streams over time

### Effects of International Trade

With extensive international trade in a commodity, such as wheat, benefits of research activity are transmitted globally. The basic manner in which this occurs can be depicted in a simple set of supply and demand diagrams as in Figure 3. Transport costs and exchange rate effects are ignored to keep the diagram simple. Before the research the exporting country has a supply function  $S_1$  and after the research the supply function is assumed to move downwards through a cost saving technology to  $S_1'$ . Before the research, the exports of the exporting country are represented by the difference between the supply and demand at the market price  $p$ , that is, by the distance  $ab$ . After the research has been adopted and the exporter has a new supply function then the exports are  $cd$  at the lower price  $p'$ . Consumers and producers in the exporting country now face a lower price. Also, in the importing country both producers and consumers face a lower price even though the technology was not adopted by the importing country (another scenario). The effect of the new technology is to increase exports and thereby reduce the price. The effects on welfare are more complex but for various cases have been worked out by Edwards and Freebairn (1984).

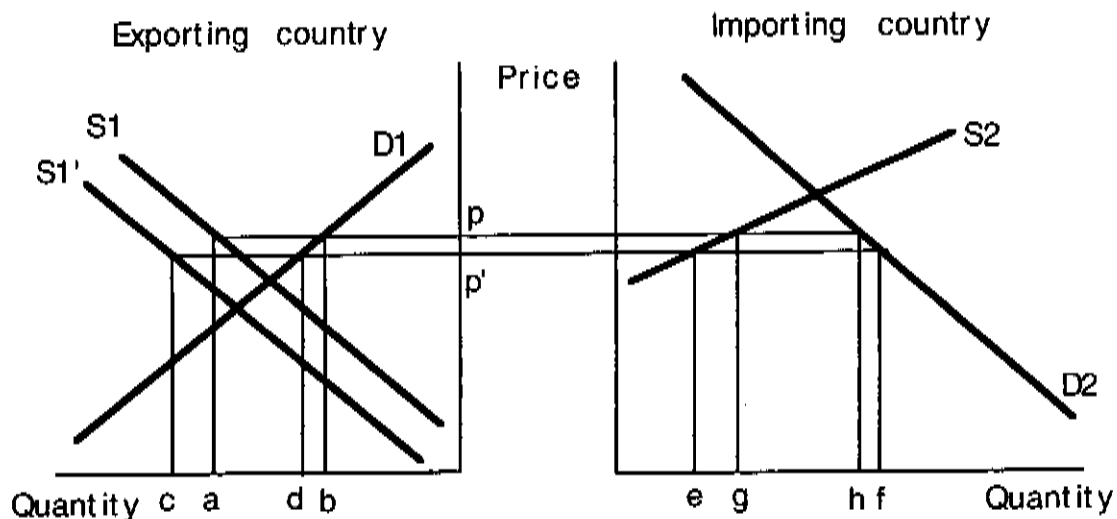


Figure 3 Transmission of effects of research internationally

### Quality Wheat Case Study

The work to be reported on as a case study was undertaken for the Quality Wheat Co-operative Research Centre and the Grains Research and Development Corporation by the Centre for International Economics as a consultancy (Centre for International Economics (CIE), 1999). The author was a member of the management committee for the consultancy. An overview of the methods used and the general approach taken will be given along with a summary of some of the results.

#### *General approach*

The general approach to the study was as follows:

##### Stage 1

- establish which projects to include in the study
- classify the projects into meaningful streams of research according to their characteristics
- determine the nature of the analytical approach to evaluation
- assess the broad types of data required for the analysis

##### Stage 2

- gather detailed information by questionnaire
- clarify the information by interviews with researchers
- conduct a general two-day workshop to gather information

##### Stage 3

- construct a value chain model (production through to exports and domestic consumption)
- collection and analysis of wheat export data in consultation with the Australian Wheat Board

- development of a research-breeding model

#### Stage 4

- assess the benefits of the quality wheat research program
- compare benefits with costs for various streams of research

#### *Basic model structure*

The basic model used was a value chain model which links the farm production of wheat with the final users of the wheat products. The value chain is simply the value added accumulated up the chain. All the steps along the value chain from farmer to consumer are included as well as many of the interactions that occur along the way. There are various possibilities for substitution to take place between different types of wheat and possibilities for tradeoffs throughout the production system. It is the substitution and tradeoffs in production, processing and consumption that allow the price to adjust to keep supply and demand in balance. The research and development has impact at various points along the value chain.

The value chain captures the notion that income is earned at each point in the production process and the fact that value is created and distributed up and down the chain. The value contributed by research and development is also passed up and down the chain so that both consumers and producers receive some of the benefits and bear some of the costs of the new technologies created by research and development. Different types of research will create value at different points in the chain and be distributed in different ways.

A simplified or schematic version of a value chain is presented in Figure 2. In this figure there are different regional demands for each product, a processing and distributing sector in which costs are involved in processing and handling the wheat and then a farm supply in the various regions. As the raw material is delivered up the chain there are changes in the physical quantities (represented by the boxes under the top pair of panels). There may also be trade flows (indicated by the arrows) between regions in the raw materials or the processed products.

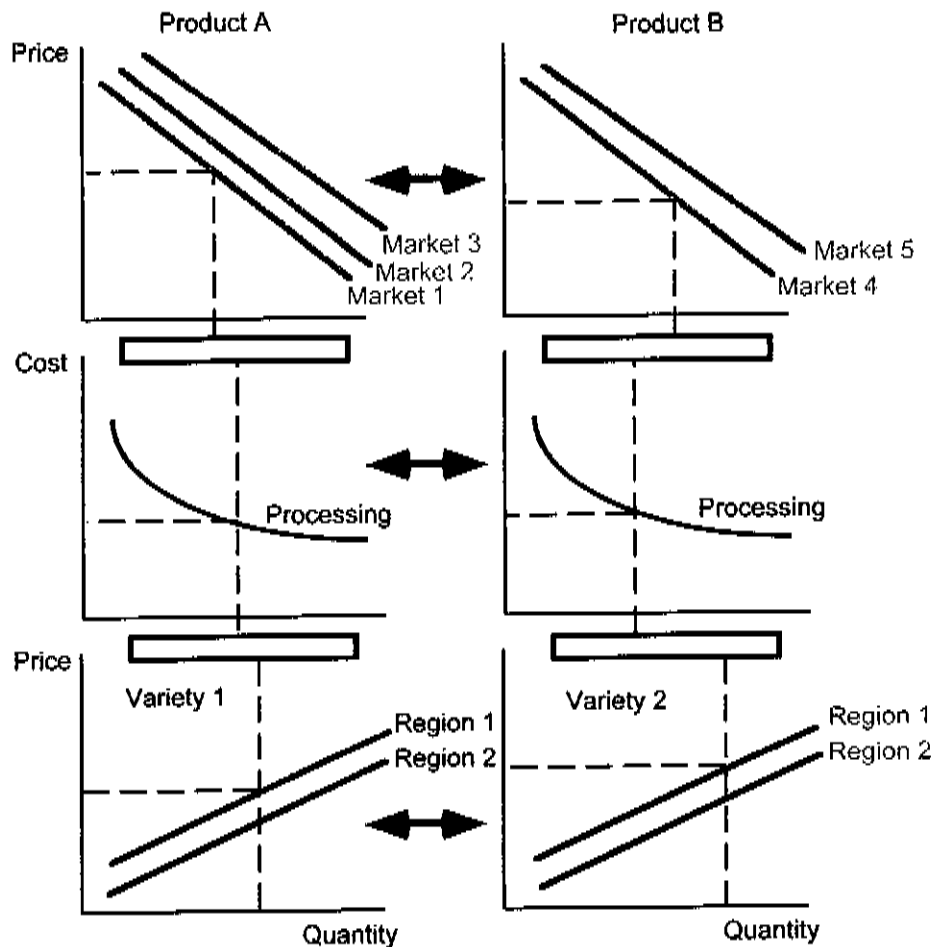


Figure 2 Representation of a Value Chain

### ***Regional and commodity structure***

The regional breakdown and commodity groups for the value chain model are given in Table 1. Production is divided into nine products and this reflects the fact that farmers have some choice in the type of products they produce and the total level of production. The grain demand categories were based on advice from the Australian Wheat Board. Each of the export markets specified has the option of purchasing wheat from Australia or other countries. Thus, the model only incorporates the countries with which Australia trades. Implicit within the model is a set of behavioural choices reflecting some of the major choices that decision makers in the industry make (Figure 4). Broadly these choices relate to production and competition with other production choices, the choice to export or sell domestically and a set of choices that then flow from this choice for domestic millers and foreign millers.

Table 1 Key Elements in the Value Chain

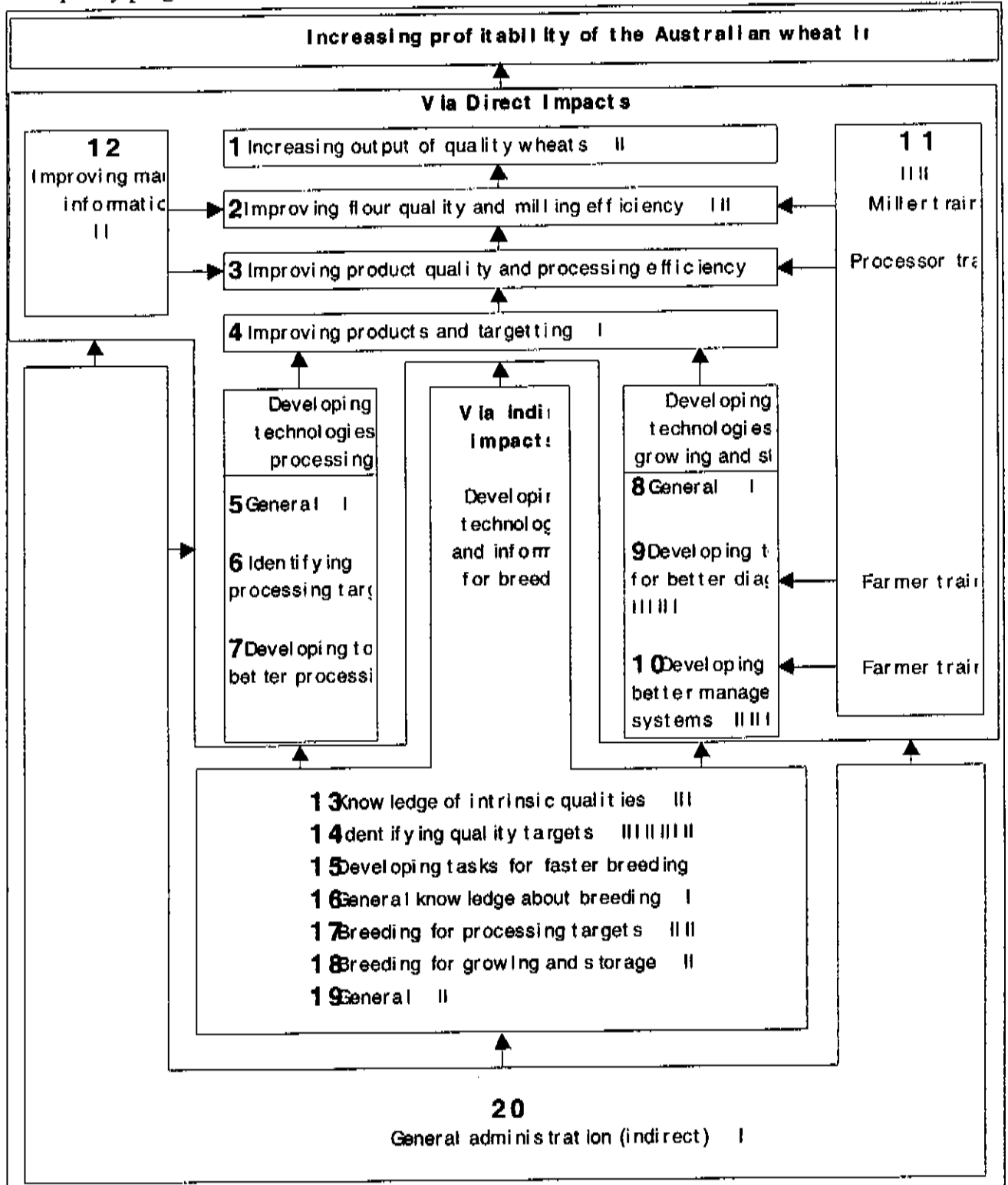
Item	Item
<b>Regions</b> <ul style="list-style-type: none"> <li>• Australian production by state</li> <li>• Domestic</li> <li>• North Asia</li> <li>• Central Asia</li> <li>• South East Asia</li> <li>• Middle East</li> <li>• Pacific</li> </ul>	<b>Grain demand level</b> <ul style="list-style-type: none"> <li>• Pan bread</li> <li>• Flat bread</li> <li>• Steamed products—low protein</li> <li>• Steamed products—high protein</li> <li>• YA noodles—low-medium protein</li> <li>• YA noodles—high protein</li> <li>• White salted noodles</li> <li>• Instant noodles</li> <li>• Biscuits, cakes and snacks</li> <li>• Starch and gluten</li> <li>• Pasta</li> <li>• Other</li> </ul>
<b>Farm level commodities</b> <ul style="list-style-type: none"> <li>• Protein low—PL</li> <li>• Protein low (soft)—PLS</li> <li>• Protein medium—PM</li> <li>• Protein 9.5% to 10.9%--P9</li> <li>• Protein 11.0% to 12.5%--P11</li> <li>• Protein &gt;12.5%--P12.5R</li> <li>• Protein &gt;12.5% (Ramen)—P12.5R</li> <li>• Durum</li> <li>• Other products</li> </ul>	

Source: Centre for International Economics 1999.

#### **Data base**

Based on the categories in Table 4, data were aggregated and collected for the 1995-96 production year. Major parts of the data were obtained from the Australian Wheat Board.

Figure 3 Main objectives and streams of R&D in GRDC and the CRC's wheat quality programs



Source: Centre for International Economics 1999.

### **Model implementation**

Implementation of the model is through the GEMPACK modelling software and this uses the general approach of computable general equilibrium models. Measures of

performance and welfare changes were at three levels of the farm, the Australian mill and the Australian consumer. Foreign producers and consumers were not considered.

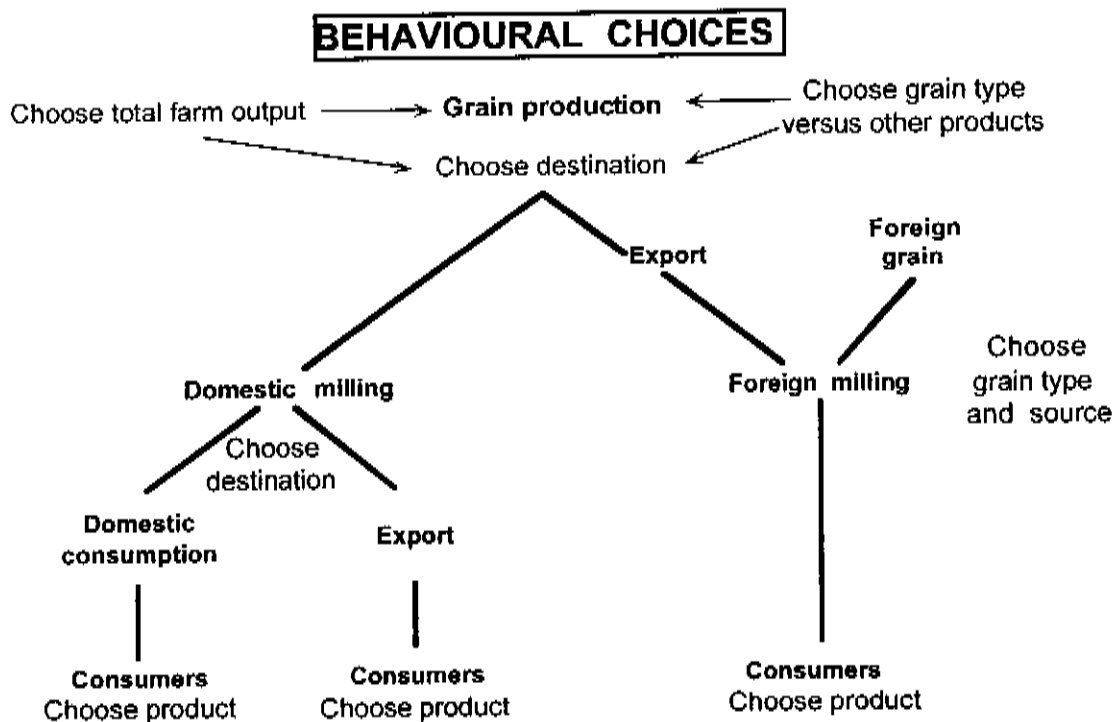


Figure 4. Behavioral choices in the value chain model  
(Source: Centre for International Economics, 1999)

### The Impact of Research and Development on Markets

For research to have an economic impact it must ultimately change the techniques used to supply, consume or process and deliver goods and services. Marketing and other associated activities may also be involved. The changes to supply in the wheat model may come from changes in the:

- yield of wheat
- costs of production; and
- mix of wheat types produced.

Changes to demand arise from:

- quality and price of the products; and
- amount consumed.

Changes to the processing and delivery cost reductions:

- efficiency of domestic milling
- efficiency of foreign milling; and
- costs of delivery to markets.

It is clearly possible for the breeding program to have an influence, in an indirect fashion, through changes in yield and possibly costs of production and the quality of the wheat produced.

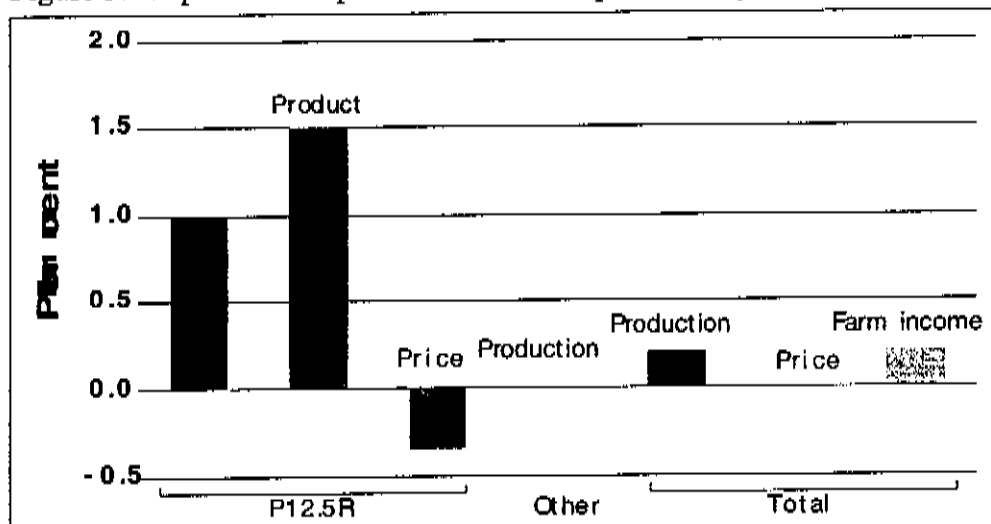
### Productivity Increase Experiments

#### *Yield increase for P12.5R*

Much of the research work in the quality wheat programs is focussed on developing tools that will reduce the time involved in breeding new and better varieties. Thus an experiment that increases yield by 1.0 per cent in the P12.5R wheats generates more than a 1.0 per cent increase in production (about 1.5 per cent). Making P12.5R more profitable has producers substitute from other classes of wheat and from other forms of production. Also, more other inputs, such as fertiliser and labour, will be used on P12.5R and less on other activities so as to maximise returns for the P12.5R.

Overall, P12.5R increases by 60 per cent more than the yield increase, however, as a result the price falls so the additional wheat is consumed. The international price is lowered, which as a result lowers the domestic price and thereby forces the Australian industry to share some of the benefits of the yield increase with foreign and domestic consumers.

Figure 5. Impacts of a 1 per cent increase in productivity of P12.5R grade

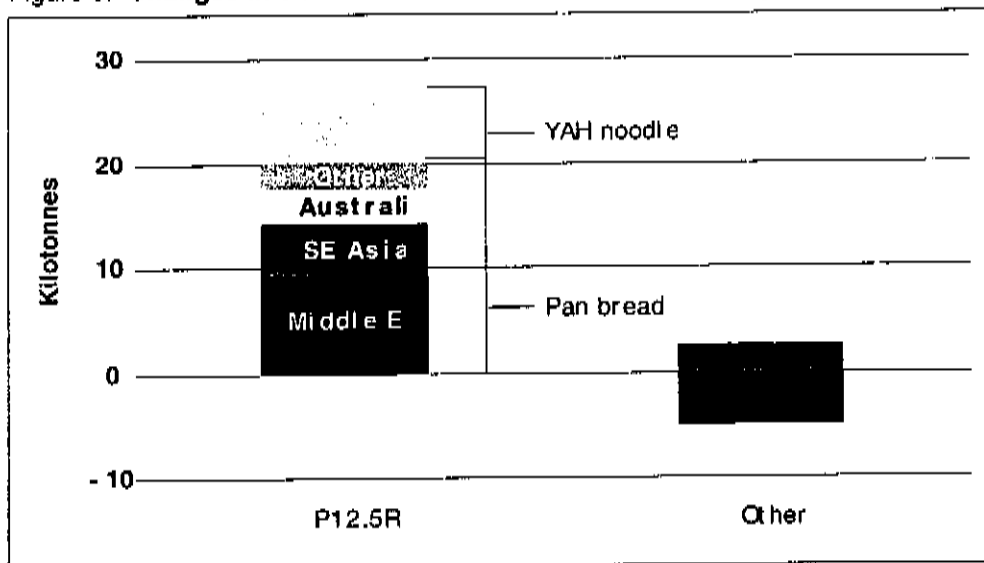


Data source: CIE model.

The effects of the yield increase on the sales to different markets is also of interest. The P12.5R wheat production increase is distributed across a number of regional markets. Although P12.5R has a relatively low share of the total Australian wheat production, total production increases by only 0.25 per cent and the average price

decreases by only a tiny amount of 0.05 per cent and overall farm income increases by about 0.2 per cent or \$4 million per year.

Figure 6. Changes in classes of wheat to markets with a 1% yield increase in P12.5R



Source: CIE 1999.

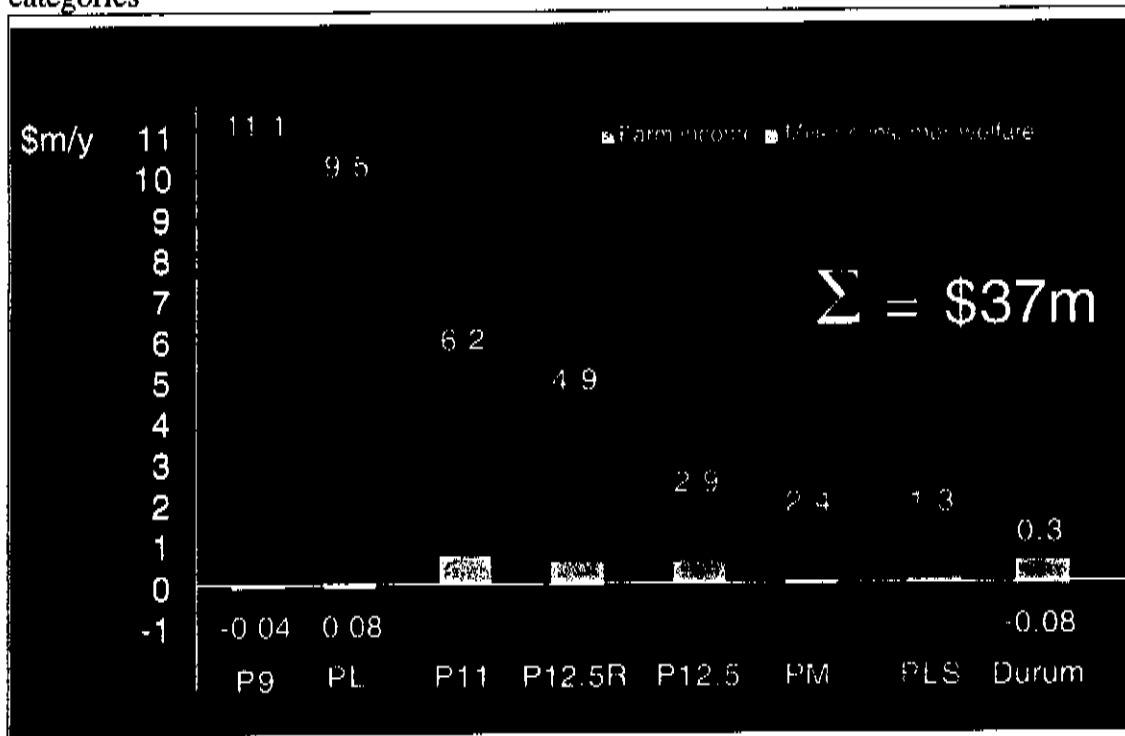
#### *Yield increase in all categories*

The effect of a 1 per cent increase in yields across all classes of wheat on measures of Australia welfare are given in Figure 7. The gains roughly reflect how much wheat is produced in each class. Mixed with this is the effect of different price reductions across the classes. In the case of durum wheat the price decline outweighs the production increase resulting in a small decline in grower income. The overall gain of an across-the-board increase in yield by 1 per cent is \$37m. At the same time there are small gains and losses in some classes for millers and domestic consumers.

#### *Decreases in the cost of production*

Some of the research in the quality wheat program is focussed on the use of inputs such as fertilisers and thereby reducing production costs. The effect of a 1 per cent reduction in input costs is similar to that of a yield increase.

Figure 7 Impact on annual income of a 1 per cent increase in the yield of all wheat categories



Source: CIE 1999.

#### ***Changes in the Mix of Production: Upgrades***

Some of the research in the R&D program is targeted toward having farmers achieve better grade targets for the wheat they sell. The effect is not to produce more grain but to substitute a higher grade for a lower grade. Alternatively, a quality downgrade may be avoided. Using the model, it was possible to examine the impact of a 20kt upgrade of PL to P9 in Victoria. This caused a 2.5 per cent contraction in PL production and a 3 per cent expansion in P9. Along with this goes a 19 cent a tonne decline in the price of P9 and a 22 cent per tonne rise in the price of PL. Farm income in Victoria is increased as is New South Wales, but other states have falls in farm income.

By examining a number of similar cases it was possible to conclude that where the difference in price between classes is larger there is more scope for a positive effect on income than if the difference between classes is small. This is because the larger price difference can compensate for the price fall in the category of wheat being increased. Overall, the effect of causing upgrades or avoiding downgrades is very much dependent on the circumstances. R&D aimed at small upgrades is only likely to benefit foreign consumers by effectively reducing the foreign price of the category of wheat that is expanded.

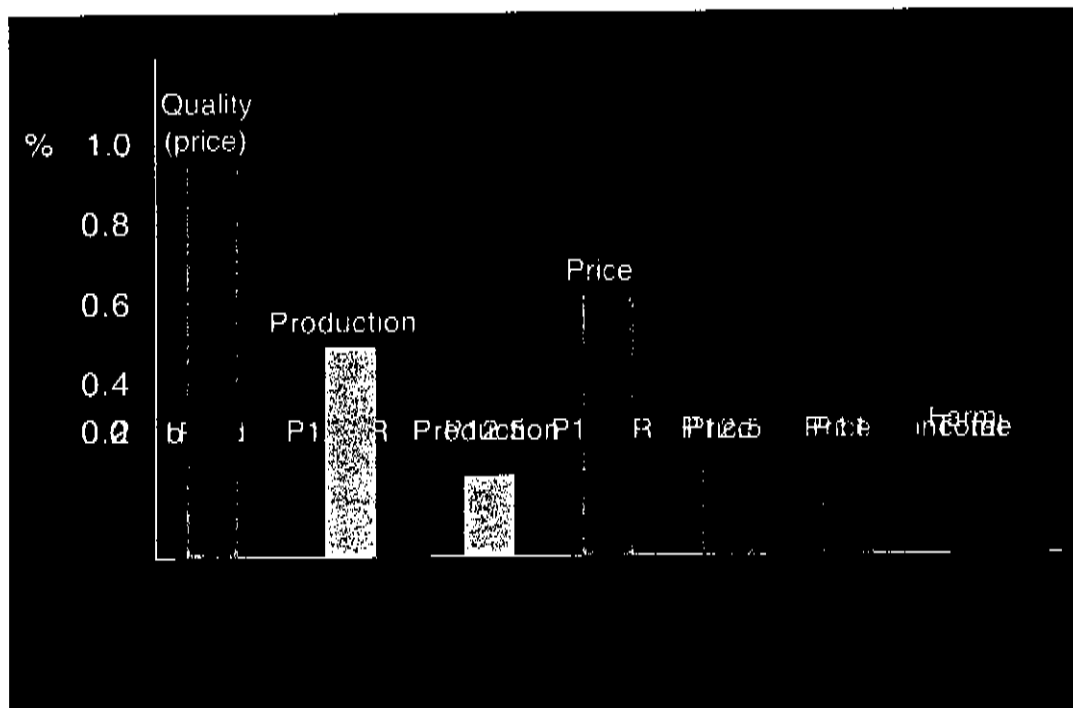
## Quality and Price Increases

As well as increasing yields some of the R&D is aimed at increasing the rate of quality increases in crops. Other R&D is aimed at developing tools to facilitate breeding programs to achieve this aim. Increasing quality is aimed at increasing value of the product. The increases in value will raise miller and baker derived demand or consumer final demand. In turn, this will raise the price. Thus, the effect of increased quality economically is to raise the price of the product through a shift in the demand by creating a higher quality product.

To illustrate the effect of a 1 per cent increase in quality in the wheat classes used for pan breads (P12.5R, P12.5 and P11) Figure 8 is presented. The higher prices induce increases in production. As well, some P12.5R, P12.5 and P11 is reallocated away from other markets, particularly the noodle market to meet the increased demand for pan breads. The higher prices in domestic and international markets, particularly noodle markets raises farmers' incomes. This lowers the welfare of domestic consumers and millers to some extent.

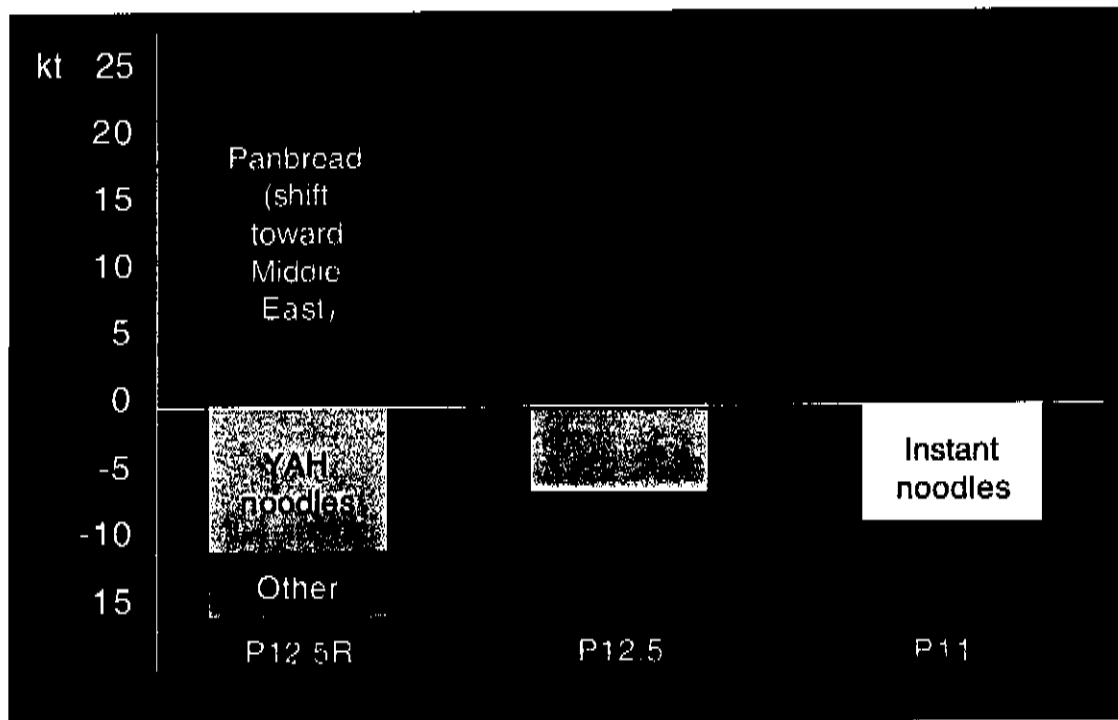
The benefit of a 1 per cent increase in quality to all product categories to international markets are given in Figure 10. Reflected in the chart is the importance of targeting quality improvements to flat bread, instant noodles and pan bread markets. The benefits to Australia of a 1 per cent increase amount to close to \$50 million a year.

Figure 8 Impacts of a 1 per cent increase in quality of wheat used for pan breads



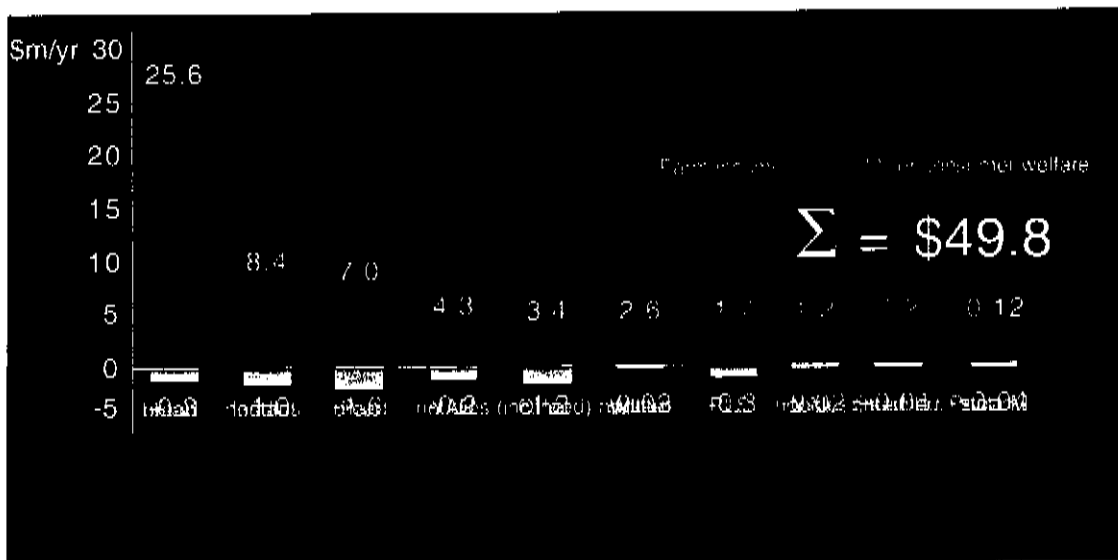
Source: CTE 1999.

Figure 9 Changes in classes to wheat markets with a 1 per cent quality increase



Source: CIE 1999

Figure 10 Impact on annual income of a 1 per cent across the board increase in quality to international markets by product categories



Source: CIE 1999.

### ***Increases in Milling or Processing Efficiency***

The quality wheat program also includes research on directly increasing the efficiency of milling or processing operations through the development of information or technology that increases the efficiency of the mill or provides new processes. This R&D is unlike that embodied within Australian wheat that is generated through plant breeding. The technology may also increase the efficiency of foreign millers as well as Australian millers. Thus the technology will “leak” to other countries largely through the transfer of information. It will thus have a lesser impact on Australia because of the leakage. With 100 per cent leakage of a 1 per cent increase in milling and processing efficiency the gains of \$4.35 million are small relative to those from yield and quality increases.

With such disembodied technology it may be possible to licence the technology, through patents or clever marketing and thereby restrict the leakage that results. If the leakage could be restricted to 50 per cent then the gains would increase sixfold to \$27m. There are thus significant incentives to retain the benefits for Australia. With increases in milling efficiency targeted to Australian mills there is scope for the leakage to be very low. If there is no leakage the returns for Australia are significantly enhanced.

### **Breakeven Points for R&D Streams**

Knowing the cost of the projects in a stream and given some assumptions about the period of the benefit stream and allowing for the opportunity cost of funds (discount rate) it is possible to work out what annual economic benefit the stream must return to break even. To do so, assumptions must be made about the pattern of the benefit stream through time. One simple assumption is a flat stream of equal returns in each time period for a given number of years, say 10. Paybacks beyond 10 years are greatly diminished once the discount rate is taken into account. An alternative possible pattern is gradually rising benefits for the first five years and then constant afterwards. Such a pattern requires a 30 per cent greater return than the first case. If all the projects in the program are assumed to have a uniform return pattern then the annual benefits of the program need to be about \$10 million per year increasing to about \$13 million for a non-uniform pattern. A further way of considering the program in a breakeven context is that if there were equal yield and quality increases they would have to be at an rate of 0.085 per cent per year over the next 10 years to pay for the program.

Some of the research streams in the quality wheat research program are best represented as uniform. Others connected with the breeding program are more complicated since once introduced they are potentially multiplicative as

improvements in one year is carried forward into future years. Currently, it takes approximately 10 years to conduct a breeding program and to release new varieties. Using new technology in breeding programs also is likely to be slow in introduction, particularly if the impact is mainly in the early phases of the breeding program. Thus, there are likely to be significant gains to shortening the length of a breeding program.

### **Overall Evaluation**

Overall it was estimated for the study that the wheat quality programs achieve a benefit-cost ratio of 2.7 to 1. This was based on a set of assumptions on the probability of success for the streams of work and also an estimated rate of adoption provided by the scientists involved. With higher rates of adoptions and longer life of the technology higher rates are obtained. With 80 per cent of the funds spent on the breeding program it was estimated to have a benefit cost ratio of 2.1 to 1 and a ratio of 11.5 to 1 for the more optimistic scenario.. A rate of 2.7 to 1 corresponds to a rate of return over 10 year of 10.6 per cent at a discount rate of 5 per cent. Over the more realistic time period of 22 years the rate of return for breeding drops to 3.6 per cent a year.

In carrying out the type of analysis reported there is considerable uncertainty around the data used and the assumptions made. The probabilities of success and the rates of adoption may be optimistic and the payback period and extent of leakage may be pessimistic. A level of 100 per cent leakage was assumed and any reductions in this leakage of Australian milling technology could have high returns. In addition, the breeding technologies were assumed to only apply to wheat. It is possible they may be applicable to other crops in some cases.

Overall, sensitivity examination indicated that the model was not sensitive to the market parameters.

### **Conclusions**

#### *Domestic milling*

With little international leakage the returns to improving domestic milling have a high relative payoff and are likely to have a high rate of adoption. Increasing the efficiency of the use of inputs other than wheat is also promising.

#### *Foreign milling*

Even with 100 per cent leakage improving the efficiency of foreign milling is also beneficial. For this to be so, relatively high rates of adoption are required and getting such high rates may be a costly exercise and diminish some of the returns. With

clever marketing and protection of the intellectual property further benefits may be obtained for Australia.

#### *Large upgrades and avoiding large downgrades*

Marginal upgrades or downgrades appear to be of lesser benefit but when the value differences are large the payoffs are similarly larger.

#### *Over-investment in breeding technology*

With 80 per cent of the budget allocated to breeding it is possible that there is over-investment in this area. However, if the breeding program cycle can be shortened so that the research effort is rapidly incorporated into shortening the breeding cycle the returns to breeding will clearly rise.

#### *Physical limits*

The wheat industry is a highly competitive industry with a long history of research and development. This means that many research breakthroughs have been made and some of the technical limits may be being approached such as limits on the amount of flour that can be generated from a tonne of wheat. However, this is not to imply that there are not other efficiency gains that are still to be made.

#### *Re-direction of funds*

The various average returns to the broad streams suggest that there may be gains from some re-allocation of funds toward milling and processing and away from breeding unless the breeding cycle time can be shortened. The shortening of the breeding cycle will raise the average return to funds spent on breeding. Care should be taken in making the changes since for the breeding program small incremental gains or losses last over very long periods of time and accumulate. Finally, it should be noted that a 0.1 per cent annual improvement in quality raises the benefit cost ratio by around 22 per cent from 2.7:1 to 3.3:1 and every extra year that the benefits of breeding endure raises the benefit cost ratio by 6 per cent.

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## Appendix A

**Factors that Affect the Payoff to Research and Development**

1. The size and timing of the benefit stream resulting from the impacts of the research
2. The size and timing of the cost stream
3. Time lags between the discovery and adoption and the nature of the adoption profile
4. The size of the units to which the discovery applies and the number of units in the industry
5. The size of the industry and the growth prospects of the industry
6. The discount rate
7. The length of the useful life of the new technology (some cases may be completely replaced while some may depreciate in value)
8. The probability of success in obtaining an outcome that can be adopted
9. Nature and extent of any positive and negative externalities
10. The transferability of the research to other countries
11. The price elasticity of demand of the products produced with the new technology
12. The nature of the export or import demand elasticity for the product in the rest of the world
13. The technological and economic relationships involved in the processing and marketing chains for the product and the level in the chain of the research impact
14. The degree and nature of the competition in the industry
15. The outlook for the industry which is dependent on supply and demand conditions and the resultant future prices.

**The importance of intellectual property  
to agriculture**

**Prof. Brad Sherman  
Director  
Australian Centre for  
Intellectual Property in Agriculture**

**GMO foods -  
a food industry perspective**

**Lina Melero  
Director Public Affairs  
Australian Food and Grocery Council**

## Love & War – the GM Food Fight

### GM Food – An industry perspective

Lina Melero, Public Affairs Director  
Australian Food and Grocery Council

Wheat CRC  
Wednesday 14 February 2001

## Australia's Food & Grocery Industry

\$53 billion industry (\$48 billion food/drink)  
1 in 5 employed / 20% total manufacture  
Strong source of regional employ – fastest  
90% Australian ingredients  
\$19 billion agri-food exports / \$12.1 b processed, \$4.9 b highly processed

## Australian Food & Grocery Council

Established 1995  
Peak representative body  
Public policy issues  
Represents 85% of industry  
185 companies - Australian made products

## On the Radar – Industry's Agenda

International trade reform  
Economic / environmental management  
Improving supply chain / food regulation  
Maintaining hygienic integrity of products  
Fostering positive consumer attitudes

## Looking Down the Barrel

Consumers world-wide increasingly sceptical  
9 in 10 Australians concerned about food  
Living longer healthier lives  
Losing faith in science  
Distrust of industry/governments

## The Road to Victory

Confidence in packaged food / industry  
Sound political / social environment  
Confidence in regulatory system  
Protect public health / environment  
Provide meaningful consumer information

## Holding fire – GM food



Technology is a reality  
Consumers determine success – acceptable products  
Commercial imperatives – meet demands  
Manage the environment – sustain food  
Increase food demand – 2.6 billion by 2025

## Looking Down the Barrel



Frankenstein Food  
Playing God / Tampering with nature  
Fear of the unknown  
Unnecessary risks / Mistakes of science  
Lead to cloning

## The European Scene



Strong opposition by activists  
Consumer backlash  
GM health / environment risk?  
Distrust of government / science  
Concern re ethical and moral issues  
High demand for labelling  
Little public education  
EU slow to implement regulatory regime

## The US Scene



Consumers open to new technologies  
Public education backed by research  
Less consumer concern (currently)  
Less opposition by activist groups  
Partnership - biotech industry, government, universities & independents  
Regulatory regime seen to be credible and transparent

## The Aussie Scene



Don't understand food/biology  
Sensational media coverage  
Fear of unknown  
No immediate consumer benefits  
Not well understood / uncertainty  
Consumers right to choice:  

- Information (Some say) labelling
- Slow introduction of gm foods
- Regulation and testing

## Consumer Perceptions



66% 'swinging voters'  
42% know little about the issue  
73% quote reservations  
45% cite benefits  
Negative arguments "stronger voice"  
Concerns "unknown" risks

## Shooting to Win – What's in it for me



- Consumer Benefits
- Environmental Benefits
- Not Producer/Farmer Benefits

## All Guns Blazing – Consumer Acceptance



- Medical applications
  - Cure / prevention
- Environment
  - Reduce chemicals / preserve nature
- Better food
  - Healthier / prevent disease
  - Tastier / long shelf life / year round

## GM for Functional Foods



## Point Blank – Why the concern?



- Misinformation
- Highly technical
- Is it safe?
- Is it ethical?
- Is it natural?
- Impact on environment

## Loading the Gun – AFGC Policy Position



- Conducive market and regulations
- Seek effective regulatory system
- Provide practical and meaningful labelling
- Reassure virtues of products / industry
- Not advocate technology
- Enlist support for open transparent communication

## The Shooters – Government



- Biotechnology Australia / OGTR
- Parliamentarians briefings
- Government public awareness
- Point-of-sale information
- Website / Consumer line
- Media briefings
- Science exhibition

## Holding Fire



- Labelling of food / ingredients where novel DNA and/or protein is present in final food
- Labelling of food / ingredients where the food has altered characteristics
- Allows an ingredient to contain up to 1% of unintended presence of GM product

## Extended GM Labels



Exempt from these requirements:

- highly refined food where the effect of the refining process is to remove novel DNA and/or protein;
- processing aids and food additives except those where novel DNA and/or protein is present in the final food;
- flavours which are present in a concentration less than or equal to 0.1% in the final food;
- food prepared at point of sale.

## Food Science Bureau



- Leverage Food Science Bureau
- New technologies (including gene technology)
- Number of initiatives
- Scientific experts
- Food Science Summit

## Targeted Approach – Food Science Bureau



1. Scientific expert panel
2. Partnership programs
3. Resource base - Facts on Food
4. Consumer extension

**1. Scientific Expert Panel**

Dr Baghurst / CSIRO Health Sciences & Nutrition  
 Associate Professor Brand-Miller / University of Sydney  
 Professor Caterson / University of Sydney  
 Dr Eyles / Food Science Australia  
 Professor Head / CSIRO Health Sciences & Nutrition  
 Dr Peacock / CSIRO Plant Industry  
 Dr Loblay / University of Sydney / Royal Prince Alfred Hospital  
 Professor Millis / Melbourne University / Latrobe University  
 Professor Nestel / Baker Medical Research Institute  
 Dr O'Dea / University of Sydney  
 Mr Shay / Food Science Australia  
 Professor Wahlquist / Monash Medical Centre

**2. Allies – Partner Programs**

Australian Institute of Food Science and Technology  
 CSIRO  
 Dieticians Association of Australia  
 Home Economics Institute of Australia  
 Nutrition Australia

**In the Battlefield**

Genetically Modified foods

How do I know if my genetically modified food is safe?

Why Genetically Modified Foods?

Where can I buy genetically modified foods?

Gene Technology Information Service

**3. The Bullets – Facts on Food**

EXERCISE & HEALTHY LIVING

FOOD TECHNOLOGY

ANTHROPOMORPHIC

**4. Consumer Extension**

Welcome to the Food Science Bureau website

FOOD SCIENCE BUREAU

Home Page  
 Media Newsroom  
 Links  
 Healthy Living  
 Food Technology  
 Fresh Off the Shelf

What's New  
 From 1/11 For many

Quiz  
 Systems & Quiz Drive

Get it  
 Get it

The Food Science Bureau is an initiative of the Australian Food and Grocery Council

**Media Relations**

Represent the industry  
 Defend integrity of food products / brands  
 Issue not specific to one company  
 Tackle scare-mongering

## Scattergun Approach – Media coverage



Simply a matter of choice GM foods explained Modified foods to be labelled

Modified food: your questions answered

Fine-tuning GM labels

### GM food: the facts

Table of accuracy in National Geographic should have a public referral notice.

A

## Rallying the troops



- Independent third parties
- Orchestrate support / balance in media & public arena
- Factual articles in mainstream
- Presentations to key targets
- More voices in the debate

**QA for identity preservation, enabling  
technologies and supply chain learning**

**Peter Flottmann  
Principal  
Peter Flottmann and Associates  
Agribusiness Consultants**




# Quality Wheat CRC Symposium

The Wheat Supply Chain  
Sydney University  
February 14, 2001



Peter Flottmann and Associates



“Quality Assurance/IP, Enabling  
Technologies and Supply chain  
Learnings”

Or a Renovators guide to the Australian  
Grains Industry

## What I`ll cover

- On farm QA and current activities
- Bigger Picture Issues/Barriers to adoption
- Enabling technology/its role with QA

## QA- the last 12 months

- Raised more questions than providing a solution to a market need
- Is QA/IP important?
- If so, to whom?
- What benefits does it bring?
- What`s our state of readiness?
- By when/how much is too much ?


## QA- the last 12 months

- Adoption of QA by grain **producers** has been slow...retarded by
  - politics
  - poor market signals = confusion
  - bad timing
  - the "domino effect" = what else and what next?

## QA- the last 12 months




- Adoption of farm QA by **processors** has also been slow...retarded by
  - low compliance requirements = low priority
  - perceived cost
  - someone else's job


# Current Activities



## Great Grain

Cereals • Pulses • Oilseeds




→

→







# Current Activities

## Great Grain

Cereals • Pulses • Oilseeds


↕


## Bigger Issues..it`s not just QA

- GM food labelling
- Legislation- is it providing direction or implying it?
- Govt involvement in supply chain management- intervention or facilitation?
- E-commerce- applications for agribusiness

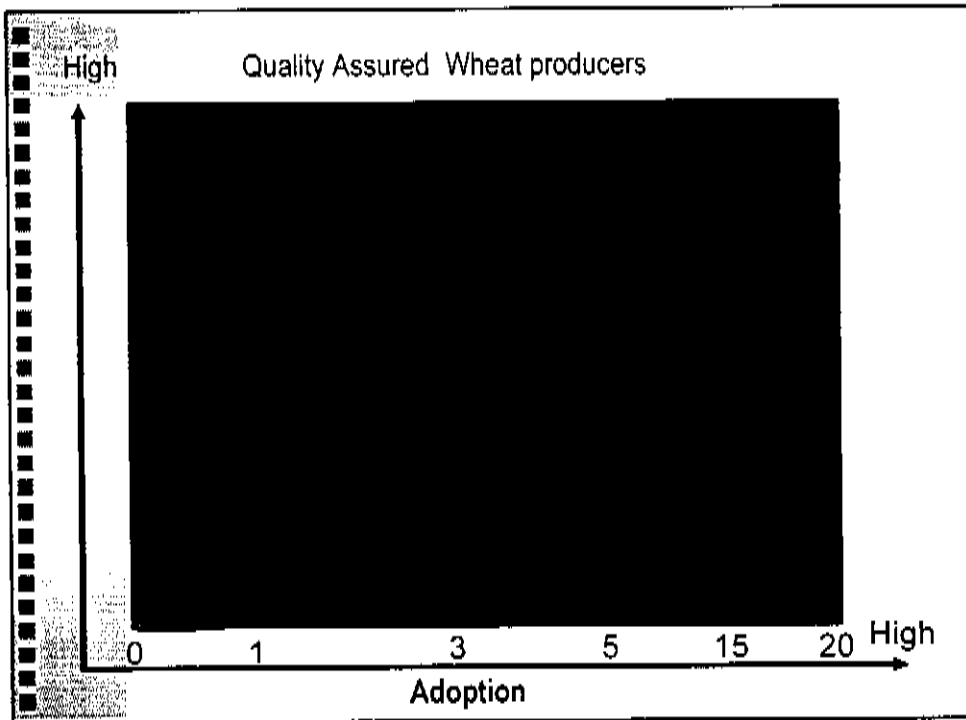


.com



## Industry Issues

- Task not process focussed
- market perception of system management
- but not a systemic approach to supply chain management
- lack of ownership
- development of proprietary technology



## Enabling technology

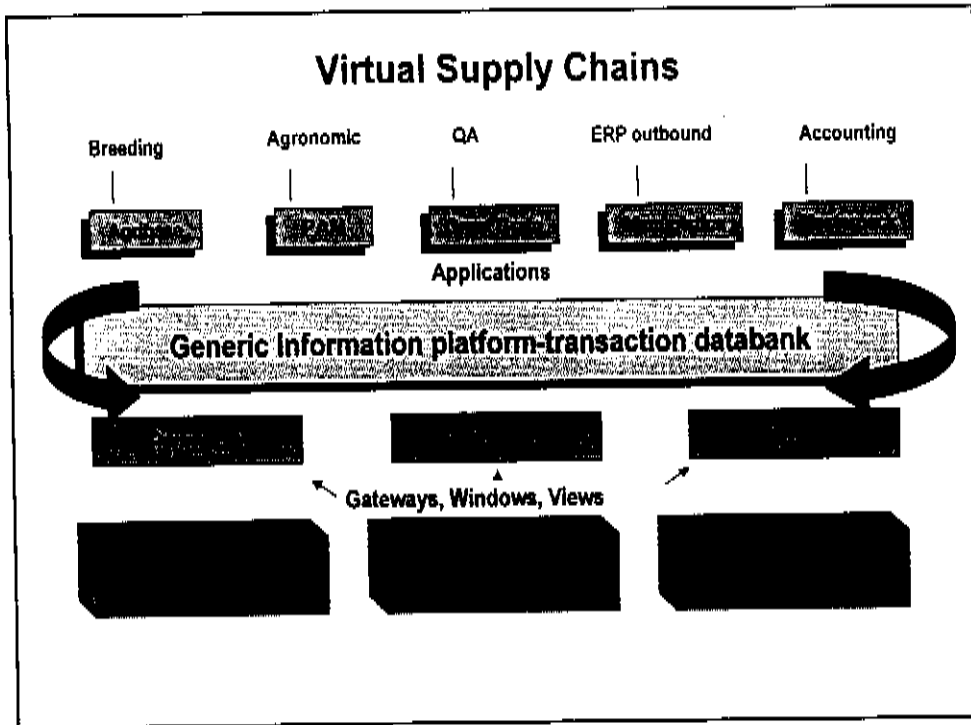
- The grain industry is rapidly uptaking technology and systems but...
- we're behind the game with adoption of e-procurement functionality against other industries

## Enabling technology

- Not an end in itself- lessons from the dotcoms?
- Should be a given
- Should follow business models not the other way around
- Is being developed in segments/not always with scalability


## Characteristics of Enabling Technology

- Transportable
- flexible/scaleable
- low cost/ease of replacement
- rapid deployment
- robust
- highly automated/remote data capture
- ease of interface with other systems, models

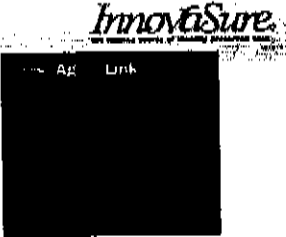


Elsewhere **CropVerifeye.com™**

- Higher profile of web based identity preservation systems in the US and Europe
- Focus on verification/ screening and transactions not through chain product value



**Identity Preserved.com**  
Capturing Value for Food & Agriculture



**InnovisSure**  
The World's First of Identity Preservation

## Summary- What`s the future for QA?

- Enabling technology will remove **some** barriers to adoption but...
- Is the timing right?
- Can industry collaborate on a precompetitive basis?
- What are the extremes? Pressure for triple bottom line- ethical audits?

## Summary- What`s the future for QA?

- We need to “renovate” our market to ensure we are not left behind.
- Act locally, think globally

**Taking up the challenge:  
Achievements and goals of the  
Wheat CRC, within the industry context**

**Dr Bill Rathmell  
Managing Director  
Quality Wheat CRC Ltd.**



## Wheat Facts

- ◆ **Wheat is Australia's dominant grain crop forming one quarter of all Australian farm production**
- ◆ **Wheat accounts for approximately 16% of Australia's total farm exports and 18% of international wheat trade**
- ◆ **Australia is the third largest exporter of wheat in the world**
- ◆ **Australian hard white wheat is unique in the world; other exporters are trying to copy us**
- ◆ **Australia exports to over 70 countries including Iran, Egypt, Indonesia, Iraq, South Korea, Japan, Pakistan, Malaysia and India**



- ◆ Annual revenue from the Australian economy from wheat :  
(1996-99 average)

Total ex-farm gate	\$5 billion
80% exported	\$4 billion
20% domestic consumption	\$4 billion value-added
Indicative industry total	\$8 billion



- ◆ 155,000 farming family members and 70,000 direct employees depend on wheat for most of their income
- ◆ It affects 550,000 people most of whom are in rural and regional Australia and in small enterprises

## Cooperative Research Centres

- ◆ Commonwealth Government Scheme
- ◆ Funded over \$2M per year (average)
- ◆ Industry/public sector collaboration
- ◆ Outcomes from research for commercial development
- ◆ Quality Wheat CRC incorporated 1995
- ◆ Value Added Wheat CRC will start mid-2001



## **New CRC – New Partnership**

- ◆ **Five Commercial Core Participants**
- ◆ **Three Core Research Providers**
- ◆ **All wheat growing SDAs**
- ◆ **Both wheat breeding Universities**
- ◆ **High-technology genomics/proteomics etc**



## **Wheat Industry Needs**

- + **To create a new Australian wheat industry**
- + **Move from “commodity” basis to higher-value added sectors**
- + **Capitalise on technical and commercial change**
- + **Turn around the declining terms of trade**

## **Importance to Australia**

- + **\$8 billion industry**
- + **Mostly export**
- + **300,000 + people depend on wheat industry for livelihood**



## **Industry Demanded Outcomes**

- ◆ Improved classification, storage and handling
- ◆ Novel and improved food products
- ◆ New varieties with improved Manufacturing processes
- ◆ Tools for Managing production risk, higher productivity and returns
- ◆ Improved industry sector and consumer education
- ◆ Improved availability to industry of researchers



## **Research Program “Outputs”**

- ◆ Ingredients flexibility
- ◆ Strategic research underpinning target identification
- ◆ Specialty and more robust germplasm
- ◆ Decision support systems
- ◆ New generation educated for all sectors of wheat industry

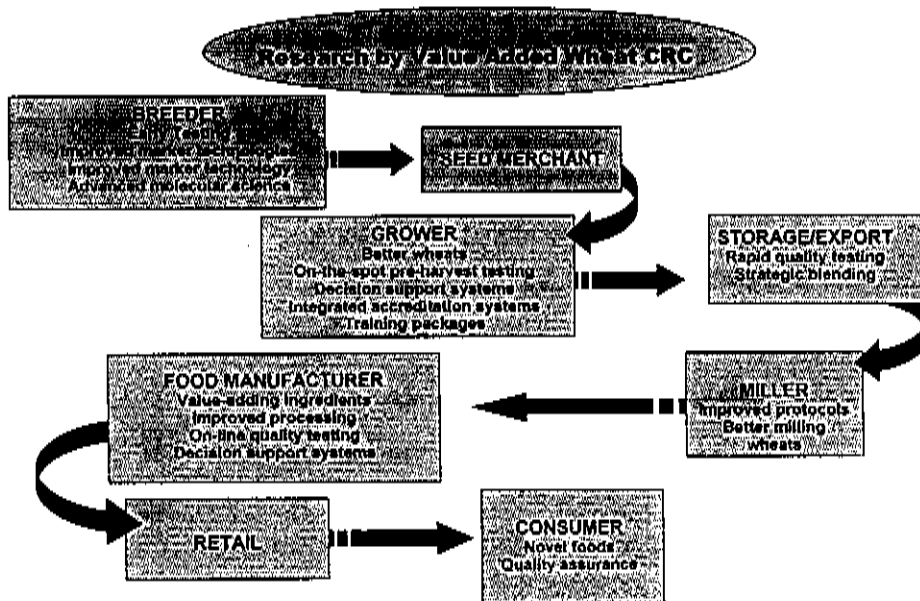


## Business Areas

- ◆ Wheat Germplasm
- ◆ Wheat Processing
- ◆ Diagnostics
- ◆ Quality Assurance
- ◆ Education and Technology Transfer



## VAW CRC - Adding Value to the Supply Chain



## **Wheat Supply Chain (Research Outputs Version)**

- ◆ Knowledge
- ◆ Germplasm
- ◆ Quality (harvest)
- ◆ Identity preservation
- ◆ Process technology



## **Scientific and Technical Links Essential**

- ◆ Otherwise technology can't deliver
- ◆ Examples (a) processing (b) molecular markers
- ◆ CRC structure encourages collaboration
- ◆ Wheat science and technology now developing
- ◆ Australian scientific leadership
- ◆ Multinationals slow to develop wheat



## **Wheat industry evolution in Australia**

- ◆ **Public/private sector interface (AWB, breeders)**
- ◆ **Consolidation (agricultural supply, bulk handlers)**
- ◆ **Competition (bulk handlers, AWB)**
- ◆ **Deregulation (bulk handlers, breeders)**



## **The CRC functions in this environment**

- ◆ **Research funding from taxpayers, growers' levy and industry**
- ◆ **70:20:10%**
- ◆ **Research providers remain in the public sector**
- ◆ **Industry has low historic research investment (except growers)**



## Challenges for the new CRC

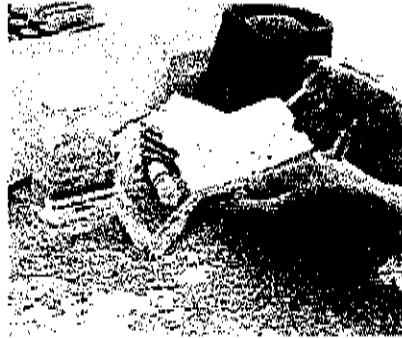
- ◆ Secure royalty revenue for sufficient to stand alone in seven years
- ◆ Cause technology developments that result in royalty earning products



## Diagnostics

- ◆ WheatRite™ and ReadRite™
- ◆ Rapid Variety diagnostic based on antibodies
- ◆ Rapid quality diagnostics for breeders
- ◆ Diseases, others

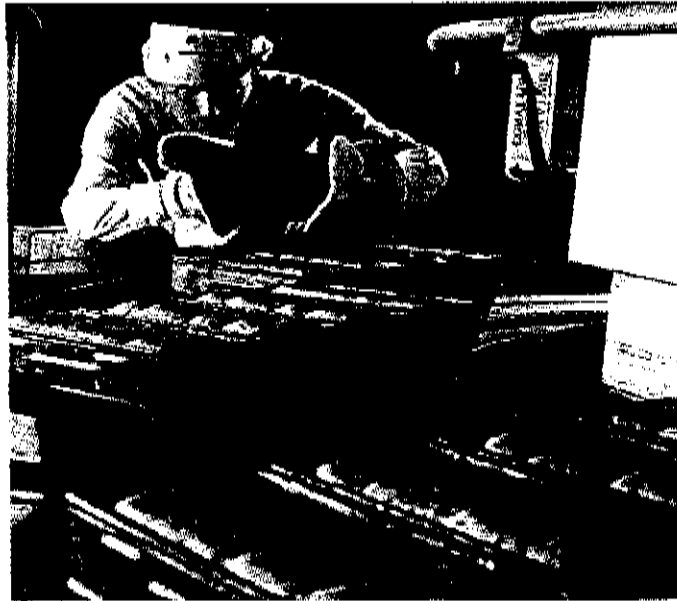




## Germplasm

- ◆ Speciality wheats (specific processing benefits)
- ◆ Improved qualities (agronomic benefits)
- ◆ Use of advanced biotechnology (markers etc)
- ◆ Non-GMO at this stage





## Commercialisation Challenges

- ◆ Germplasm complex because of wheat breeding structure
- ◆ Need ability to negotiate a commercial arrangement
- ◆ Competing public sector programs
- ◆ Privatisation process slow and uncertain
- ◆ Diagnostics relatively straightforward



## Conclusions 1 - The Strengths

- ◆ Australia pre-eminent in wheat (especially white types)
- ◆ Technology watershed still to come
- ◆ Multinationals still drifting
- ◆ World-class science in Australia
- ◆ Fertile ground for VAWCRC



## Conclusions 2 - The Weaknesses

- ◆ Competition between public sector agencies
- ◆ Naivety about IP issues
- ◆ Remoteness from much of the action
- ◆ Privatisation uncertainties





**VAWCRC has a big opportunity to catalyse change in the way  
wheat science is managed through the value added chain.**

# Cooperative Research Centre for Value Added Wheat

## Research Program "Outputs"

- On-the-spot quality tests
- Ingredient flexibility
- Strategic research capability, quality targets
- Speciality and high quality emphasis
- Decision support systems
- New experts educated for all sectors of wheat industry

## Industry Demanded "Outcomes"

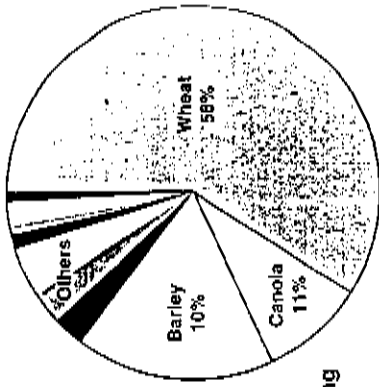
- Improved classification, storage and handling
- Novel and improved food products
- New wheats with manufacturing benefits
- Tools for managing production risk: higher productivity and returns
- Improved industry and consumer education
- Improved availability to industry of researchers

## Wheat Industry Needs

- To create a new Australian wheat industry
- Move from "commodity" basis to higher value-added industry
- Capitalise on technological and commercial change
- Turn around the declining terms of trade

## Importance to Australia

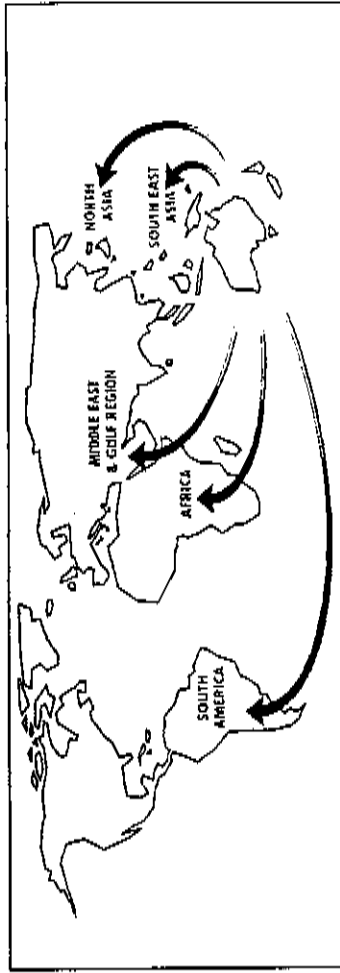
- \$8 billion industry
- Mostly export
- Over 550,000 people are affected by the wheat industry in urban, rural and regional Australia



## facts



- Wheat is Australia's dominant grain crop, forming one quarter of all Australian farm production.
- Wheat accounts for approximately 16% of Australia's total farm exports and 18% of the international wheat trade.
- Australia is the third largest exporter of wheat in the world.
- Australian hard white wheat is unique in the world; other exporters are trying to copy us.



- Australia exports wheat to over 70 countries including Iran, Egypt, Indonesia, Iraq, South Korea, Japan, Pakistan, Malaysia and India.
- Annual revenue to the Australia economy from wheat: (1996-1999 average)
  - Total ex-farm gate \$5 billion
  - 80% exported \$4 billion
  - 20% domestic consumption \$4 billion value added (1999)
  - Indicative Industry Total \$8 billion
- 155,000 farming family members and 70,000 direct employees depend on wheat for most of their income.
- It affects over 550,000 people most of whom are in rural and regional Australia and in small enterprises.

# Why a new CRC for Australian Wheat **NOW?**

## Deregulation and Privatisation in the Wheat Industry

- Opportunities for new commercial links.

## Reorganised Australian Wheat Breeding

- VAWCRC will provide value-adding germplasm and technologies.

## Industry Commitment to Cooperative Research Plan

- New initiatives applying and expanding QWCRC outcomes.

## Technical and Commercial Activity of Multinationals

- Collaborating Australian groups can interact with advanced international science.

## Technology Change

- New VAWCRC science enables solutions to old industry problems.
- Cost-effective: up to \$80 return per research dollar invested.

## Development of Speciality Markets

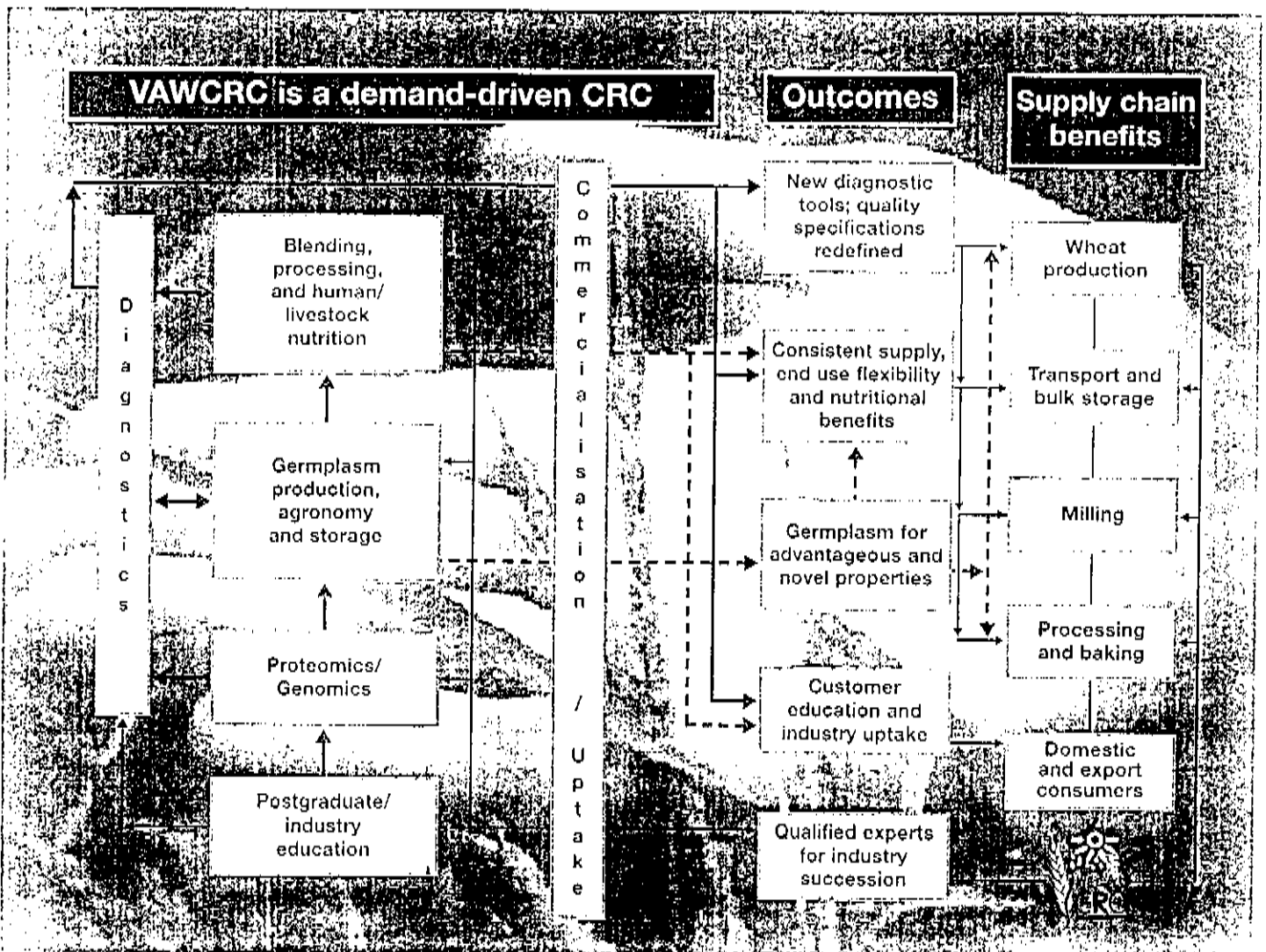
- VAWCRC has science for more profitable use of existing crop.
- Supported by new, on-the-spot tests for quality.

## GMO Debate: VAWCRC offers alternative

- Wheats with specific traits for overseas markets without splitting genes.



## Opportunity to move wheat from commodity status



## Objectives of the CRC

- ◆ Create a new “state of the art” CRC, with a new core business, applying new science and technology to more of the links in the Australian wheat and food industry’s value-chain.
- ◆ Structure and govern the CRC to be immediately efficient in contracting, managing and commercialising the outcomes of a high-quality, market driven program of pre-competitive and competitive research and development.
- ◆ Achieve a high return on the funds and resources employed in adding value to the wheat/food chain, by equipping the industry with new scientific knowledge; plant genetic material; agronomic expertise; diagnostics and new human capacities in science and technology
- ◆ Using a risk-managed approach, focus on:
  - a) increasing the potential value of the industry’s output under expected (“normal”) seasonal conditions, by facilitating the development of new and differentiated products and services, reducing the proportion of output that is produced and marketed on a “commodity” basis; and
  - b) Increasing the realised value of the industry output, by providing the production technologies and diagnostics to achieve maximum value in whatever seasonal conditions eventuate.



3a

## Operating Environment

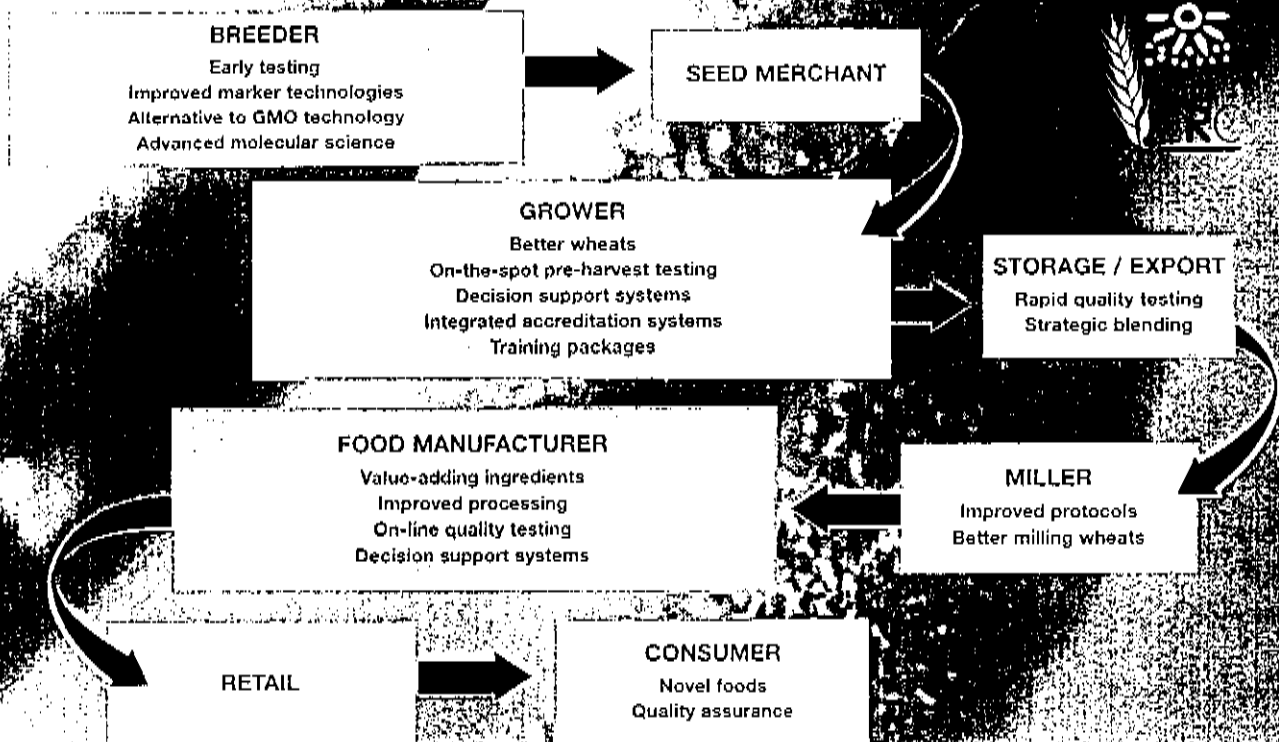
- ◆ Commercial revolution : horizontal “layers” to through-chain value creation
- ◆ Commercialisation / Privatisation (in progress)
  - Storage and handling (CBH, Graincorp, Grainco)
  - Marketing (AWB Ltd, niche markets, domestic)
  - Wheat breeding
- ◆ Commercial rationalisation
  - Milling and Baking (GF, Bunge, Defiance, GWF)
  - Farm services (WDL, Elders, IAMA (SGB))
- ◆ Technological revolution
  - Biotechnology
  - Precision agriculture diagnostics
  - Control technology, communications, data management
  - E-business



2

# VAWCRC Adding Value to the Supply Chain

## Research by Value-Added Wheat CRC



## VAWCRC Cooperative Research Locations

