



Development of Wheat Export Market for the Taiwan Noodle Industry



GRDC Impact Assessment Report Series:

Title: **Development of Wheat Export Market for Taiwan Noodle Industry**

September 2008

GRDC Project Code: N/A

This report was commissioned and published by the GRDC.

Enquiries should be addressed to:

Mr Vincent Fernandes

Corporate Strategy & Program Support

Grains Research and Development Corporation

PO Box 5367

KINGSTON ACT 2604

Phone: 02 6166 4500

Email: v.fernandes@grdc.com.au

Author:

Agtrans Research

PO Box 385

TOOWONG QLD 4066

Phone: 3870 4047

Email: info@agtrans.com.au

ISBN No. 978-1-921779-06-0

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1 Introduction

The Asian noodle market represents about one-third of Australia's wheat exports and Taiwan is one of the richest nations in the Asia region. It is characterised by discerning buyers with high wheat quality requirements. Currently the United States holds 85% of the Taiwan wheat market however Australian wheat is considered to have significant processing and quality advantages to that of US wheat for noodle processing. Therefore the Taiwan market provides a significant opportunity for Australian wheat marketers.

This report evaluates the impact of the GRDC investment to increase the proportion of wheat sold to the Taiwan market.

The report identifies the relevant project outputs which lead to specific outcomes via the appropriate pathway to adoption. Assumptions on the outcomes are made to estimate economic impact. Social and environmental impact is also considered. A cost benefit framework is utilised and supported with non-financial quantitative indicators. Potential scenarios and Monte Carlo simulation is incorporated into the evaluation. The conclusions and lessons learned are then derived from the analysis.

2 Project Investment

Two projects make up this investment ie:

- BRI-00005 Development of Noodle Specifications for a Major Asian Noodle Manufacturer, and
- BRI-00033 Noodle and Dumpling Wheat for Taiwan.

Both projects were managed by BRI Australia (BRI).

BRI-00005 had the following aims:

- To identify the optimum wheat types for this segment of the Taiwan market and then work with noodle and dumpling processors to expose them to the benefits of Australian wheat, and
- To quantify the effect of key processing techniques and determine their impact on the use of Australian wheat for noodle manufacture.

BRI-00033 had the following aim:

- To increase wheat exports to Taiwan and develop long term demand based on effective research to ensure customer requirements are met.

Total investment in the two projects came to \$1.7 million with the GRDC contribution coming to approximately \$0.9 million. Table 1 below shows the total investment (in nominal \$ terms) contributed by GRDC and Other Funders and Table 2 shows the breakup of this investment by financial year.

Table 1 : Total Investment by GRDC and Other Funders

Project Name	GRDC Contribution	Non GRDC Contributions
BRI-00033 Development of Noodle Specifications for a Major Asian Noodle Manufacturer	\$121,100	\$117,200
BRI-00005 Noodle and Dumpling Wheat for Taiwan	\$788,278	\$681,144
Total	\$909,378	\$798,344

Table 2 : Total Investment by Year

Year	Other Funders	GRDC	TOTAL
2002/03	\$214,600	\$285,488	\$500,088
2003/04	\$228,300	\$245,486	\$473,786
2004/05	\$238,244	\$257,304	\$495,548
2005/06	0	0	0
2006/07	\$117,200	\$121,100	\$238,300
Total	\$798,344	\$909,378	\$1,707,722

3 Project Outputs

The primary outputs from these projects was information on the advantages of Australian wheat over US wheat for noodle processing for the Taiwanese market as well as providing assistance to Taiwanese noodle processors in their manufacturing process. This is further described in the Final Reports of each project and includes:

- Knowledge of Taiwan's wheat quality requirements and the promotion of technical awareness of the potential of Australia to supply suitable wheat for Taiwan's noodle markets.
- Development of noodle processing methods for the Taiwan market. A key component was the understanding of consumer preferences of noodle quality. The success of the developed methods was demonstrated when they were used to predict which flour types best suited the Taiwan market.
- Validation of wheat and flour specifications. The initial project identified the variety EGA Bonnie Rock with a protein content of 12.0 to 13.0% as ideal for the market.
- New knowledge on noodle processing technology. A study on the impact of vacuum mixing was included in the project showing the importance of flour quality.
- Quantification of wheat and flour specifications for the optimum production of instant and dried white noodles suitable for markets in Taiwan. The second project identified the variety Chara as being most suitable for achieving firm noodle texture required in instant bowl and cup style noodles.

- Improved knowledge on the impact of specific flour properties for Asian noodle production. This information can be used to describe the effect that flour properties have on noodle quality. This will be specific to instant and white salted noodles for Taiwanese consumers.
- Knowledge to assist a large Taiwanese noodle manufacturer (Unipresident Enterprise Corporation) in the use of Australian wheat and flour.
- The identification of the link between protein composition and noodle firmness. This can be of assistance in the development of future wheat varieties (GRDC, 2008).

4 National and Rural Research and Development Priorities

The National and Rural Research and Development (RRD) Priorities are shown in Table 3 below.

Table 3: National and Rural Research and Development Priorities

National Research Priorities	Rural Research and Development Priorities
1. An Environmentally Sustainable Australia 2. Promoting and Maintaining Good Health 3. Frontier Technologies for Building and Transforming Australian Industries 4. Safeguarding Australia	1. Productivity and Adding Value 2. Supply Chain and Markets 3. Natural Resource Management 4. Climate Variability and Climate change 5. Biosecurity 6. Supporting the Rural Research and Development Priorities

The investment primarily contributes to:

“Productivity and Adding Value”

This is improving the profitability of the grains industry by creating an opportunity for better returns from wheat exports.

“Supply Chain and Markets”

It is assisting in the development of a better understanding of international markets and consumer requirements in Taiwan.

By contributing to the RRD priorities above the projects are satisfying the National Research Priority of **“Promoting and Maintaining Good Health”** through “strengthening Australia’s social and economic fabric” (DAFF, 2007, p.12).

5 Pathway to Adoption

The primary pathway to adoption of the project outputs is the communication of the results to key users and beneficiaries. The key users of this information are

Australian wheat exporting companies, grain growers, wheat breeders, and noodle processors in Taiwan.

The projects sought to increase exports through a push-pull strategy. This was achieved through increasing the awareness of Australian wheat quality for noodle manufacture in Taiwan (see Figure 1). BRI personnel visited with noodle manufacturers and flour millers within Taiwan communicating the benefits they can gain by using Australian wheat. BRI worked closely with 3 of the top 5 noodle making manufacturers in Taiwan ie Uni President Enterprises Corporation (UPEC), Lien Hwa Industrial and Chia Fwa Enterprises Co Ltd. Several trip reports have been provided by BRI detailing the interactions with these firms.

BRI has also communicated the opportunities that Australian wheat has in the Taiwan market to Australian wheat marketing companies to incorporate in their own promotion and marketing strategies (see Figure 2). Four major Australian wheat marketing companies are looking to market into Taiwan. These include AWB, ABB, Graincorp, and CBH. This has primarily been through direct marketing missions with references made to the information developed through this investment.

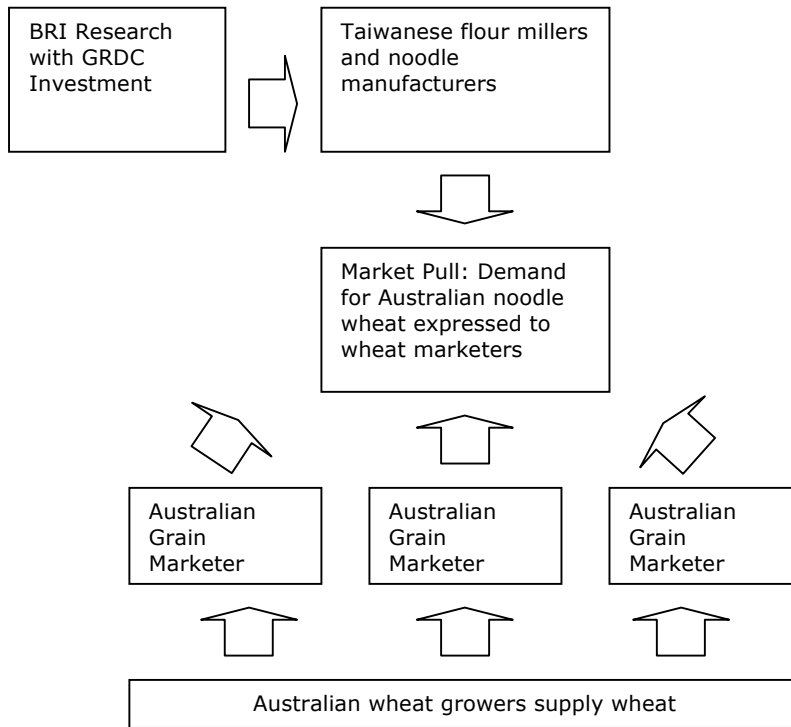
Other forms of communication have included:

- A presentation made to the AWB/GRDC Wheat Quality Forum in 2005. A further detailed presentation was conducted in November 2005.
- GRDC Media releases in April and September 2006, March 2008 and an article published in Ground Cover in June/July 2006.

To continue to develop this market ongoing communication and promotion to the Taiwan noodle manufacturing companies is necessary. The cost of this is estimated at about \$60,000 a year ¹.

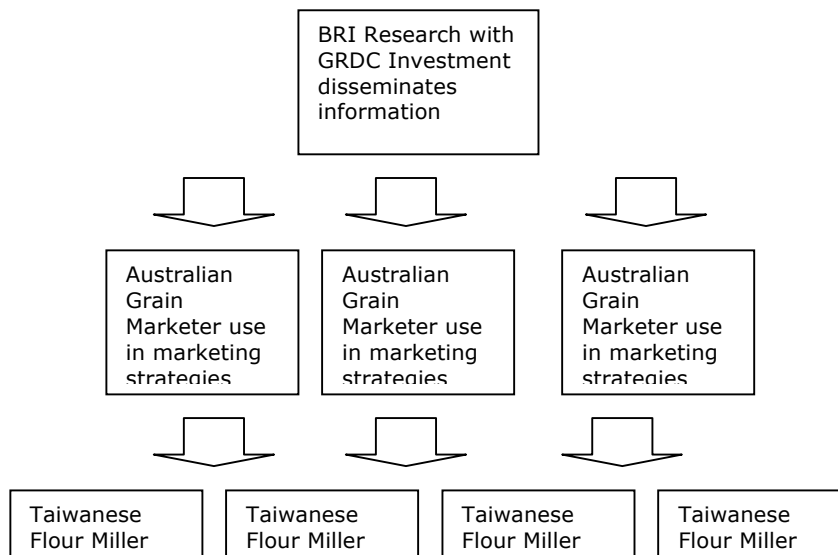
¹ Estimate provided by BRI Australia

Figure 1: Model for market pull, where Taiwanese noodle manufacturers request Australian wheat



Source: BRI Australia

Figure 2: Model for market push



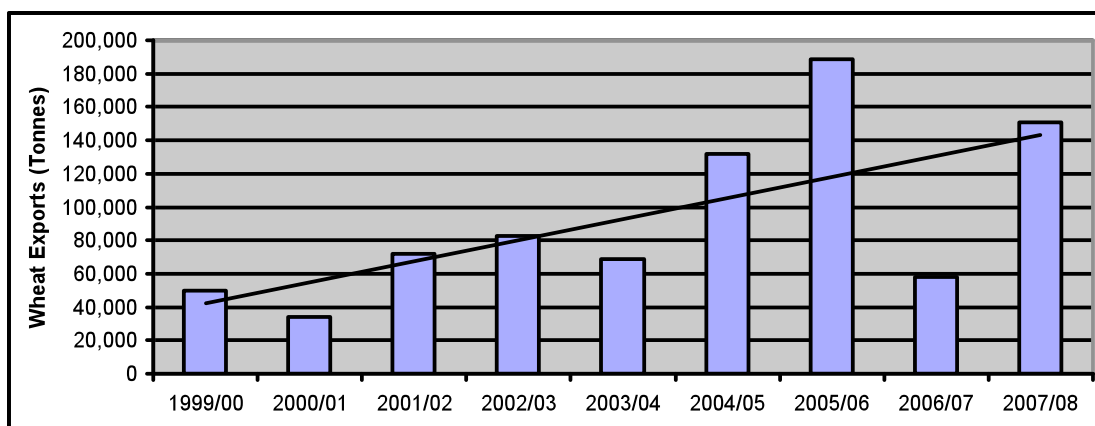
Source: BRI Australia

6 Outcomes

6.1 Economic

The primary outcome of these projects is the generation of additional exports of Australian wheat to Taiwan (see Figure 3 below). Average exports to Taiwan for the years 1999/00 to 2000/04 was 62,000 tonnes however this increased significantly in 2004/05 to 131,000 tonnes and again in 2005/06 to 188,000 tonnes. This was at the same time as BRI was undertaking visits to Taiwan to communicate and promote the findings of their research. In 2006/07 drought reduced exports to 58,000 tonnes. As shown in Figure 3 there is an observable uptrend in exports over the last 9 years.

Figure 3: Australian Wheat Exports to Taiwan (2000 to 2008)^{2 3}



The United States is the dominant exporter of wheat to Taiwan and holds market share of 85%+. The United States Department of Agriculture (USDA) do not see Australian wheat as a major threat stating in their GAIN Report for 2006, “the superior milling characteristics and price competitiveness of Hard White Wheat are expected to cut Taiwan imports of Australian hard wheat” (p.4). The report also goes on to say that the “most serious potential threat to US wheat exports is an opening to PRC (People’s Republic of China) flour, wheat or processed products....If PRC imports of noodles and other processed products were allowed, PRC products could compete strongly in the Taiwan instant noodle market.” (p.5).

2007 was a record year of US exports of wheat to Taiwan at 1.3 million tonnes (USDA, 2008) while Australian exports were the lowest in over 5 years. This would indicate that market share will need to be regained to establish a strong foothold in the Taiwan market. This also shows that production uncertainty (usually due to drought) plays a key role in the ongoing expansion of this market.

It should be noted that AWB were also doing similar work to that of BRI. The BRI projects were considered complementary to this work. AWB has been actively marketing wheat into Taiwan since 1999. AWB are of the opinion that BRI did not contribute significantly to their marketing strategies. However, it should also be said that all of the AWB staff who had interactions with the projects have since left the organisation.

² Statistics sourced from Wheat Export Authority (wea.gov.au) and Export Wheat Authority website (ewc.gov.au)

³ 2007/08 production is estimated based on first 6 months results

If the information coming out of the BRI project was not utilised by AWB then any significant benefits are likely to have been generated from the collaboration, communication and promotional activities undertaken by BRI Australia to flour millers and noodle manufacturers within Taiwan. BRI has undertaken 5 trips to Taiwan throughout the period of the project.

If the projects were not undertaken then it would have been left to AWB to undertake all marketing and promotional activities. It is likely there would still have been some growth in exports but probably not at the rate of growth experienced.

Therefore the assumption is made that exports will increase at the rate of trend growth from 1999 to 2004 for the "without project scenario" and the rate of trend growth from 2000 to 2008 (estimated) for the "with project scenario". The year 2007 was badly affected by drought therefore the additional benefit from the project is assumed to be zero in this year.

The benefit in terms of dollars is assumed to be the benefit obtainable from exporting wheat to Taiwan as opposed to selling the same quality wheat to more traditional customers in the Middle East or Africa where freight costs may be higher and stiffer competition exists from eastern European countries. This has been estimated at \$33 per tonne.⁴

We assume that 50% of the additional exports can be attributed to the BRI work and this decreases over time as new information comes to market.

In our analysis project costs have been indexed to 2006/07 dollars. Benefits and costs prior to 2006/07 have been indexed by the GDP deflator to 2006/07 dollars. Benefits have been discounted at the rate of 5% per annum. Table 4 summarises these assumptions.

Table 4 : Summary of Assumptions

Description	Assumption
'Without project' scenario export growth	Rate of linear trend growth 1999/00-2003/04. When extrapolated this was 113,859 tonnes in 2007-08 and approximately increasing by 4.4% thereafter to 2026/27
'With project' scenario export growth	Rate of linear trend growth 1999/00-2007/08. This was 150,638 tonnes in 2007-08 and approximately increasing by 4.6% thereafter to 2026/27
Benefit achieved per tonne ⁴	\$33
Proportion of benefit attributable to BRI projects	50%
Maintenance Cost	\$60,000 per annum in 2007/08 and 2008/09
Depreciation Factor of Information	10% per year after 2008/09
Indexation	GDP Deflator. Refer http://www.rba.gov.au/Statistics/Bulletin/G04hist.xls .

⁴ Estimate of \$30 per tonne presented at 2005 AWB Forum based on freight differential between shipment of wheat to Asia and Middle East and price competition posed by Kazakhstan and other eastern European suppliers. Benefit indexed by GDP Deflator to 2006/07 prices ie $\$30 \times 106.2/97.4 = \33

Description	Assumption
	Index taken at June for each financial year
Discount Rate	5 %

6.2 Social

The project outputs were not intended to achieve any specific social outcomes. However it may have enabled the development of improved business confidence and establishment of relationships between Australia and Taiwan which may lead to spillover benefits in other areas of food manufacturing and processing.

6.3 Environmental

There is no significant environmental outcome from this investment.

7 Cost Benefit Results

Base Case

Based on the assumptions above in section 6, the estimated cash flows attributable to the investment were estimated and projected over 20 years. The net present value of the total investment and the GRDC investment is shown in Table 5 and Table 6 respectively. This is considered to be the benefit accruing to Australia. This benefit primarily accrues to grain marketing companies. In turn these benefits would be expected to flow onto grain growers through better returns for wheat exports.

Table 5: Economic Impact of Total Investment

Total Investment	Year 0⁵	+5 Years	+10 Years	+20 Years
Cumulative PV of Costs	\$2,180,121	\$2,180,121	\$2,180,121	\$2,180,121
Cumulative PV of Benefits	\$2,377,948	\$4,673,841	\$5,921,812	\$5,987,040
Cumulative NPV	\$197,827	\$2,493,820	\$3,741,691	\$3,807,620
Benefit Cost Ratio (BCR)	1.1	2.1	2.7	2.8
Internal Rate of Return	6%	29%	30%	31%

Table 6: Economic Impact of GRDC Investment

GRDC Investment	Year 0⁵	+5 Years	+10 Years	+20 Years
Cumulative PV of Costs	\$1,165,878	\$1,165,878	\$1,165,878	\$1,165,878
Cumulative PV of Benefits	\$1,271,671	\$2,499,515	\$3,166,847	\$3,202,104
Cumulative NPV	\$105,793	\$1,333,637	\$2,000,969	\$2,036,226
Benefit Cost Ratio (BCR)	1.1	2.1	2.7	2.8
Internal Rate of Return	6%	29%	30%	31%

⁵ Year last cash investment is made

8 Other Scenarios

Optimistic

A more optimistic scenario may involve exports increasing to approximately 500,000 tonnes (497,682 tonnes in calculations) by 2012 and being held constant until 2020 and then gradually declining. This scenario provides the returns as shown in Table 7 for the GRDC investment. This scenario indicates that quite significant returns are possible given normal years of wheat production and exports, demand continues to grow, and competition from other countries is not severe.

Table 7: Return to GRDC Investment – Optimistic Scenario

GRDC Investment	Year 0⁵	5 Years	10 Years	20 Years
Cumulative PV of Costs	\$1,165,878	\$1,165,878	\$1,165,878	\$1,165,878
Cumulative PV of Benefits	\$1,271,671	\$4,992,066	\$9,013,738	\$9,166,789
Cumulative NPV	\$105,793	\$3,826,188	\$7,847,860	\$8,000,912
Benefit Cost Ratio (BCR)	1.1	4.3	7.7	7.9
Internal Rate of Return	6%	41%	45%	45%

Pessimistic

A pessimistic scenario may reflect a lower expected return to wheat exporters and grain growers from possible competition. US and China are considered competitive threats to Australian market share in Taiwan (USDA, 2006). Black Sea countries such as Russia, Kazakhstan, and Ukraine also have the potential to decrease Australia's comparative freight advantage into Asia (ITS Global, 2006). We assume in Table 8 that the return per tonne of wheat is \$20 (base case \$33) per tonne.

Table 8: Return to GRDC Investment – Pessimistic Scenario

GRDC Investment	Year 0⁵	5 Years	10 Years	20 Years
Cumulative PV of Costs	\$1,165,878	\$1,165,878	\$1,165,878	\$1,165,878
Cumulative PV of Benefits	\$770,710	\$1,491,010	\$1,895,454	\$1,916,822
Cumulative NPV	-\$395,168	\$325,132	\$729,576	\$750,944
Benefit Cost Ratio (BCR)	0.7	1.3	1.6	1.6
Internal Rate of Return	-ve	8%	12%	12%

9 Monte Carlo Simulation

A Monte Carlo simulation was undertaken to give an indication of the probability of achieving certain net present value and benefit cost ratio outcomes. Tonnes exported, the expected dollar benefit per tonne, and the proportion of exports attributable to BRI were varied according to minimum, likely, and maximum parameters and the distributions within these ranges. These are shown in Table 9 below. @Risk software was then used to generate 5,000 possible outcomes. The distributions of net present value and benefit cost ratio are shown in Figure 4 and

Figure 5 below.

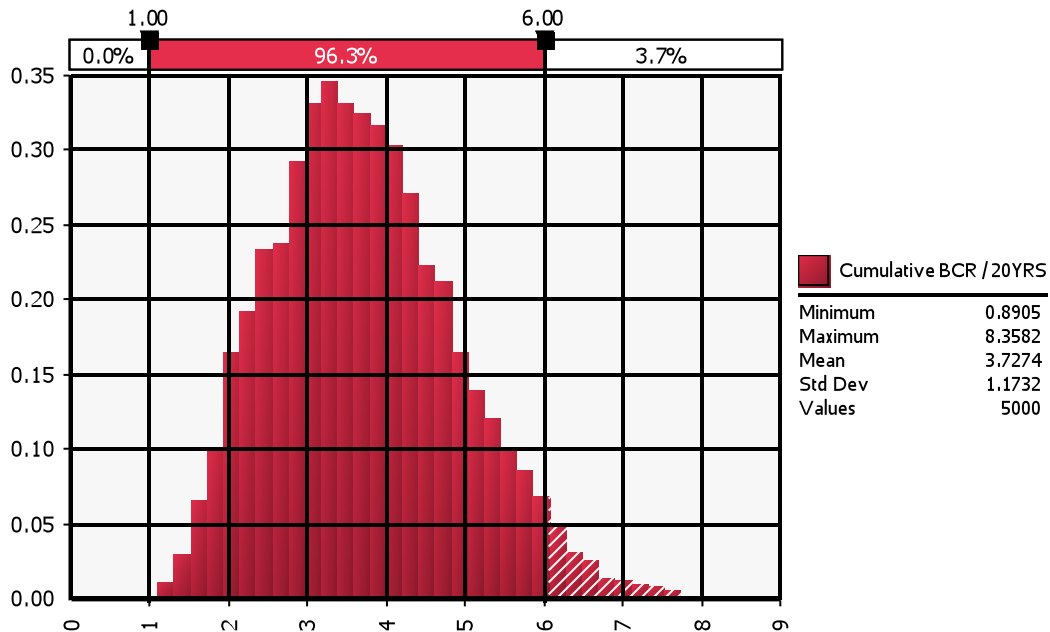
Table 9: Monte Carlo Simulation Variables

Assumption	Min Value	Likely Value	Max Value
Tonnes exported	113,859 tonnes in 2007-08 and approximately 4.4% increase thereafter to 2026/27 (ie without project scenario)	150,638 tonnes in 2007-08 and approximately 4.6% increase thereafter to 2026/27	Exports increasing to 497,182 tonnes by 2012 and being held constant until 2020 and then gradually declining
Benefit achieved per Tonne	\$20	\$33	\$40
Proportion of benefit attributable to BRI projects	20%	50%	80%

Figure 4 : Net Present Value (20 Yrs)



Figure 5: Benefit Cost Ratio (20 Yrs)



This analysis indicates the investment has a very high probability of returning a net present value greater than zero, given the ranges assumed for the three variables. There is a 96% probability of achieving a benefit cost ratio between 1 and 6, and a 4% probability of a benefit cost ratio over 6.

10 Conclusions and Lessons Learned

This investment is primarily providing economic benefits to wheat exporters and grain growers. The benefits appear to have contributed to a significant increase in wheat exports to Taiwan in 2004/05 and 2005/06. It was difficult to have this confirmed by AWB who was Australia's sole exporter of wheat at the time. However, trip reports substantiate the work undertaken promoting the research findings to prospective Taiwanese customers.

The projects have resulted in a positive net present value for base case and optimistic scenarios discussed above. The pessimistic scenario is also positive although the expected benefit is considerably lower. Based on the Monte Carlo simulation the probability that the investment returns a positive net present value appears almost certain given the ranges of critical variables assumed, and a benefit cost ratio between zero and six is most likely.

The primary beneficiaries are wheat exporters through achieving better returns from exporting to Taiwan. It would be up to wheat marketers to transfer some of these benefits to grain growers.

Future benefits expected from the project will rely heavily on sustaining an adequate level of production, and growing the demand from Taiwan. There is also likely to be increased competition from the US and possibly China. The Taiwan market needs to be effectively and regularly informed of Australian wheat availability and quality. This will assist in maintaining market share and assist wheat marketers in growing demand.

Acknowledgements

Dr Ken Quail, Director Grain Products/Asian Food, BRI Australia
Mr Paul Meibusch, Program Manager New Products, GRDC
Mr Peter Chudleigh, Managing Director, Agtrans Research Pty Ltd
Staff at AWB are also acknowledged for providing their feedback about the projects

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