

The State of the Industry Report

A REPORT ON THE STATE OF THE
AUSTRALIAN GRAINS INDUSTRY

Grain Growers Limited

June 2011



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Executive Summary

This report was prepared by Grain Growers Limited (GrainGrowers) with the assistance of ACIL Tasman to:

- Review conditions in the wheat industry and how it has responded since deregulation of wheat export marketing in 2008.
- Outline prospects for the grains industry and the priority actions required to advance the interests of producers in an internationally competitive environment.
- Establish a basis for evaluating the industry and opportunities in future 'State of the Industry' reports to producers.

This report has profiled the Australian grains industry and has identified a number of areas that GrainGrowers could act on to help improve the prospects for Australian wheat producers. There are other areas included in the report that will require additional investment to determine what, if any, action needs to be taken now. There are also areas where no action is required but GrainGrowers will continue to monitor.

This document is not a precursor to a grains industry strategic plan. It does not provide any 'blue print' for the industry. Rather this document attempts to analyse key elements of the grains industry, how they interact and how producers' interests can be enhanced by strategic and tactical interventions by grain producer representative organisations.

The key points of this report are:

- Australia's share of global wheat production has averaged approximately 3.75 per cent since 1960.
- Australia exports between 10 and 15 per cent of total wheat traded in the world:
 - Other Australian grains are not significant in world markets unless they are produced for specific purposes such as malting barley.
- Australia's total production has been increasing but yields do not appear to be increasing as fast as average global yields.
- Total Australian production and yields appear to be experiencing much higher levels of volatility.
- Global supply and demand is tightening as wheat production competes for inputs with other farm enterprises domestically and internationally, providing solid fundamentals for wheat and grain prices in general:
 - However, Australian wheat appears to exhibit relatively high levels of substitutability with other wheat origins.
 - As a result, Australian wheat prices are likely to remain volatile.
- The Australian grains industry may struggle to achieve the economies of scale required to continue to compete with other grain producers:
 - This is the reason why a number of Australian grain companies have been acquired by much larger multinational grain trading companies.
 - Consolidation of the Australian grains industry is likely to continue.
- Increasing foreign ownership of Australian grain companies will allow scale economies to be realised and provide new capital and integrate Australia into global trading networks, but there is a risk that incentives to invest to increase the demand for Australian wheat in export markets may decline.
- Producers face increased concentration in the Australian grains industry which, in the absence of a competitive fringe of small traders, and low barriers to entry generally, may mean that competition could decline:
 - Maintaining a competitive fringe of traders will provide a competitive constraint on the larger consolidated companies.

- Maintaining competition in the grain industry will also require continued low barriers to exit for wheat producers, and continuing to reduce the barriers to entry for the provision of storage, handling and transport services.
- Facing increasing price and production variability
Australian farmers' terms of trade may suffer.
 - Terms of trade dictate the ability of producers to capture the benefits of improvements in productivity investments.
- The future profitability of Australian grain producers lies in:
 - Receiving prompt and accurate price signals of what consumers want.
 - Reducing elasticity of demand for Australian wheat by differentiating from other wheat origins (marketing, technical assistance and new varieties with unique characteristics).
 - Ensuring a strong competitive fringe of smaller traders.
 - Reducing the costs of entry to the wheat marketing, storage, handling and transport markets.
 - Reducing the barriers to exit (reducing the sunk costs) of wheat production.



GRAINS INDUSTRY RECOMMENDATIONS

This report provides a comprehensive review of the Australian wheat and grain markets from which a number of key priorities and actions have emerged.

The following are a series of recommended next steps for the industry to consider:

■ Climate and production.

- More detailed research needs to be undertaken to determine the national shifts in production and productivity.
- Close scrutiny needs to be maintained on the productivity rates achieved by Australian producers and the competitiveness of the Australian supply chain.
- More research needs to be done to identify what is causing the reduction in WUE in southern areas.
- Surges in grain prices, as seen in 2008 will elicit significant supply responses from major production areas as there is sufficient technical and resource capacity to improve production to meet growing grain demand. As a relatively small grain producer Australia cannot afford to be complacent about their competitive position in world grain markets and need to ensure they find new ways to exploit any competitive advantage they have.
- Australian grain producers are facing considerable policy uncertainty and need an effective and credible voice in the formulation of climate, water and biodiversity policy.

■ Producer funded post farm gate research and development.

- Producers can benefit from research post farm gate under certain circumstances.
- In fact the majority of the benefits of off farm research to lift grain demand flow to producers. Given Australia's relatively small role in global grain production, and the capacity of the world to respond to increases in demand, Australian producers should collectively seek to increase demand for Australian wheat where the market fails to do so.

- There are likely to be occasions where grain traders under invest in promoting Australian grain (technically supporting and adding value to grain rather than generic promotion) and therefore producers will have to invest themselves collectively.
 - Traders have some incentives to invest in grain quality when they can capture some of the benefits through vertical coordination or integration of the supply chain. However, traders have less incentives to invest to increase demand for Australian grain.
 - Grain producers will almost certainly have to invest to increase demand for Australian grain through improvements in quality and technical support for Australian grain.
 - This type of investment is likely to complement investments made by traders, who will have incentives to promote certain aspects of Australian grain at times.
 - Producers investing collectively need to ensure that they apply a strict market failure criteria to investments to ensure they do not duplicate, or worse, crowd out, private investments in the supply chain.
 - The most serious effect of crowding out would be a reduction in the competitiveness of small fringe traders that offer marginal competition to large domestic and multinational traders.
- ### ■ The competitiveness of Australian producers.
- The benefits of investments in productivity flow to grain producers.
 - Efficient and transparent markets require information about prices, supply and demand to be available to all participants. The Australian grains industry, if it becomes too concentrated, may not be transparent.
 - The industry needs to ensure the grain market remains competitive and provides valuable market and supply chain information.
 - The provision of this information will also reduce the barriers to entry for small independent fringe traders that will be important participants in the grain market to ensure marginal competition for the large multinational and domestic traders and storage and handling companies.

- **Farmers' terms of trade and productivity.**
 - Investments in productivity may not be captured if the terms of trade are unfavourable. Therefore producer funded productivity investments must be made in conjunction with investments that improve producers' terms of trade. The factors that producers can invest in that are likely to have the greatest impact on terms of trade are:
 - ... Improving grain quality.
 - ... Increasing demand.
 - ... Ensuring competition in supply chain services such as trading, logistics and marketing.
- **Classification and segregation.**
 - Producers need to ensure that grain classification reflects the marginal value that buyers get from increasing grain differentiation.
 - There needs to be a regular review of classifications to ensure that they reflect buyers end uses of grains and transmit clear price signals from buyer to producer.
 - Further research needs to be conducted to see if Australian wheat classifications could be expanded to increase differentiation between varieties and regions.
 - The current classification system is not clear on how it identifies buyers demands and evolves classifications to meet them. Producers need to be confident the classification system can and will evolve in response to buyers needs.
 - Blending rents can be extracted by traders if segregations in the receival system are too broad. To ensure rents are not extracted by traders producers need to:
 - ... Ensure they are using sufficient segregation that reflect buyers demands.
 - ... Continue to invest in R&D to ensure on farm storage and handling systems are cheap and efficient.
- **Competitiveness of supply chain services.**
 - Producers need to ensure that the barriers to entry to the storage, handling and transport markets are low.
 - Producers should not oppose consolidation in the supply chain as scale and scope economies are critical to the competitiveness of Australian grain in international markets.
 - Producers need to ensure that the market is transparent to reduce barriers to entry. Consideration should be given to the collection and publication of key industry information and statistics, such as:
 - ... accurate and timely crop forecasting at a regional level.
 - ... stocks held by bulk handling companies, producers, domestic users and stocks in transit.
 - ... export sales and shipments.
 - ... market intelligence from export and domestic markets.
 - In addition to stocks information, transport statistics may also assist smaller traders to compete. Transport information may include:
 - ... shipping and container capacity, availability and location.
 - ... rail capacity reports and location of rail cars.
 - ... road freight costs.
 - ... grain freight indexes and differential prices between transport modes.
 - Not only is the collation and dissemination of this information likely to increase transparency, it will assist regulators responsible for competition regulation to ensure firms comply with competition laws.



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1 The Competitiveness of Australian grain producers

KEY POINTS: COMPETITIVENESS OF AUSTRALIAN GRAIN PRODUCERS

- Australian grain producers' prospects are determined by the rate of productivity growth they achieve, ensuring an industry structure that is conducive to producers being able to profit from productivity gains, and producing the highest value product for the lowest delivered cost.
- The main change brought about by deregulation of the grains industry is the way producers' interests are to be promoted in the grains industry.
- The Australian grains industry is characterised as a highly fragmented production base with an increasingly concentrated market for storage, handling and transport services.

If Australian grain producers are to supply what customers want, they have to compete in those markets against international rivals.

The economics of grain production have not changed much since partial deregulation of the export wheat market in 2008. Producers' prospects are still determined by the cost at which they can produce a tonne of grain, the competitiveness of the supply chain, and the value of the grain for processors and ultimately consumers.

The prospects for the Australian grains industry, and therefore producers, lie in three things:

- Productivity.
- Achieving scale and scope economies.
- The value of using Australian grain for millers and consumers.

In general terms, all stages of the Australian grain market are underpinned by the ability to achieve above average rates of growth in the factors listed above.

What has changed since deregulation is the way producers' interests are represented commercially and politically in the major decisions made in the grains industry. The extent and effectiveness of producer representation affects, in part, the share of benefits they can capture from the three key profitability drivers listed above.

1.1 ENHANCING PRODUCERS' INTERESTS

Deregulation of the export wheat market is the final step in a long process of removing policy barriers to productivity that began with the McColl Royal Commission into grain storage and handling in Australia in 1988. Following the McColl report the domestic market was deregulated and state by state restrictions on grain marketing, transport, storage and handling were progressively lifted.

As part of this process grain trading, storage and handling assets that were originally publicly owned were passed onto producers. Some producers willingly contributed to funding these assets, others were compelled. Those who willingly contributed believed that the only way that these assets would be operated to the benefit of producers was for them to be owned by producers.

By this stage the capital that producers had tied up in these assets was considerable. At the same time, without government underwriting of the pools, producers were also funding the entire wheat export grain inventory from farm gate to mill.

Initially, producers sought to maintain 'control' of the assets and raise additional capital by offering non-controlling interests to others through dual class share registries. During this period of producer ownership a large number of smaller statutory authorities merged or were acquired.

Over time the share registries were normalised. Now, all but one of the former statutory authorities are owned largely by non-producer investors or producers investing for purely financial reasons. CBH Grain remains a cooperative under the CBH Group structure.

Normalising the share registries has allowed the boards of these organisations to act more commercially in the best interests of their shareholders and has led to another round of mergers and acquisitions in the Australian grains industry. The aim of these acquisitions is to increase the scale and scope of the economies of these companies.

A number of new entrants have entered the Australian grains industry. Most of the new entrants (certainly those attracting the most attention) are large multinational commodity trading companies. This is because these firms are many times larger than the Australian firms.

Therefore producers no longer control the supply chain. Whether ownership actually allowed producers to capture a greater share of the net benefits produced by the industry from greater economies of scale and scope is open to conjecture, and is likely to be debated for some time. Producers are now faced with finding new ways to ensure

their interests are being advanced in the grains industry. One of those ways is to ensure that the supply chain is open and contestable so that the margins flow back to producers through exercising choice.

One of the perennial features of the Australian grains industry is the fragmented nature of production. There are over 25,000 grain producers supplying grain to a far smaller number of domestic and export traders, and an even smaller number of large scale storage and handling service providers.

Producers must therefore consider how and to what extent they should act collectively or independently to advance their interests in the grains industry.





2 Setting the scene

This section reviews the macro climate, market and policy setting of the Australian grains industry in 2011. Clearly there will be short term and local variations around the major issues and trends described in this section that individual groups of producers will have to contend with, but the focus of a nationally based organisation must and can only be those issues that affect the majority of growers.

2.1 CLIMATE, PRODUCTION AND PRODUCTIVITY

KEY POINTS: CLIMATE AND PRODUCTION

- Australian wheat production continues to increase but has shown signs of flattening out in recent years.
 - Increases in production appear to be occurring in local government areas (LGAs) along dry inland margins of the grain belt.
- There are signs that national wheat production is becoming more variable year to year.
- Australia produces on average 3.75 per cent of the world's wheat and 10 to 15 per cent of total wheat exported is from Australia.
- Australian wheat yields have been increasing but at a declining rate and appear to be increasingly falling behind international wheat yields.
- Sown wheat area continues to increase largely at the expense of livestock enterprises.
- Water Use Efficiency (WUE) and utilisation of total crop available moisture (CAM) is falling on average across Australia. However, there appears to be considerable differences across regions.
 - Northern NSW and Queensland appear to be increasing WUE and average yields per ha.
 - Southern NSW and Victoria appears to be experiencing falling WUE and yield.
- In south eastern areas where crop available moisture is falling, improvements in WUE are not increasing fast enough to maintain yields.
- Similar trends are evident in Western Australia where there is a strong increase in production in the traditional sheep wheat zone but a decline in total production in higher rainfall areas.

This section of the report reviews trends in Australian wheat production. Wheat is the focus of this year's report as it is the most important crop produced in Australia by value and volume. Studying wheat yield trends allows a number of issues for other crops to be identified at the same time as wheat has the greatest geographic production spread. Wheat is also the most important export grain by value and volume, and was subject to a national wheat export marketing system until July 2008.

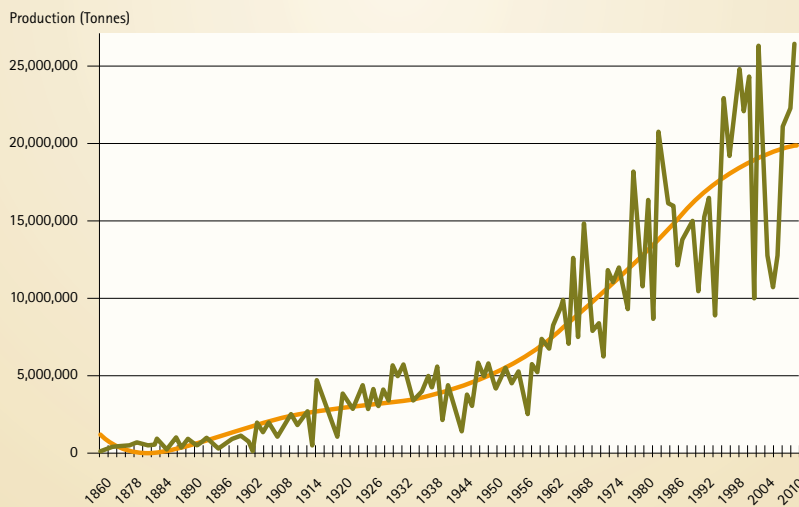
2.1.1 TRENDS IN AUSTRALIAN WHEAT PRODUCTION

Australian wheat production has increased dramatically since the 1950s (see Chart 1). But the variability of production has also increased as wheat areas have expanded in less reliable rainfall zones.

There are signs that from the mid 1990s to 2010 there has been a flattening out of the production trend that may not be explained by extended dry conditions alone.

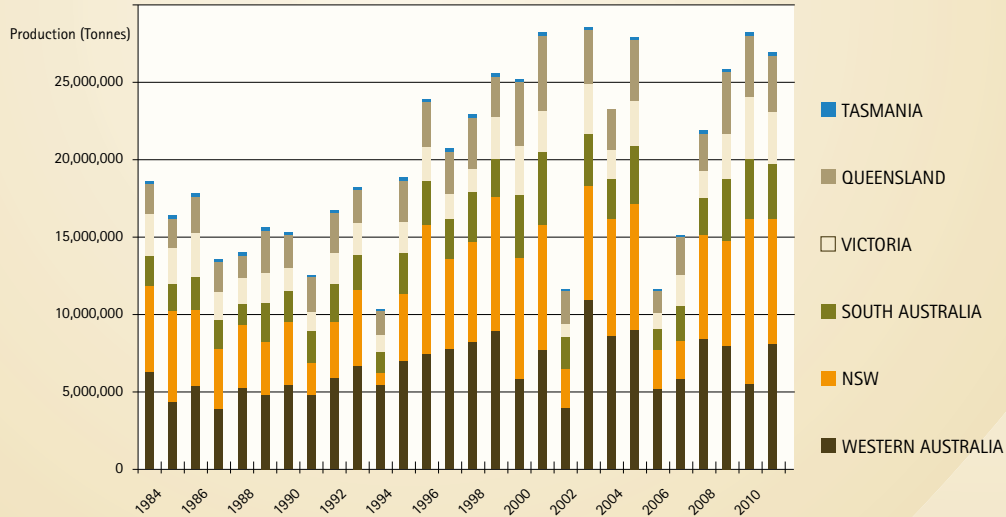
CHART 1

LONG TERM CHANGES IN AUSTRALIAN WHEAT PRODUCTION



On a long term average, and last five year average, Western Australia and NSW account for approximately 65 per cent of national production, with NSW and Western Australian production increasing at double the rate of South Australia and Queensland production is showing a small annual average decline (see Chart 2).

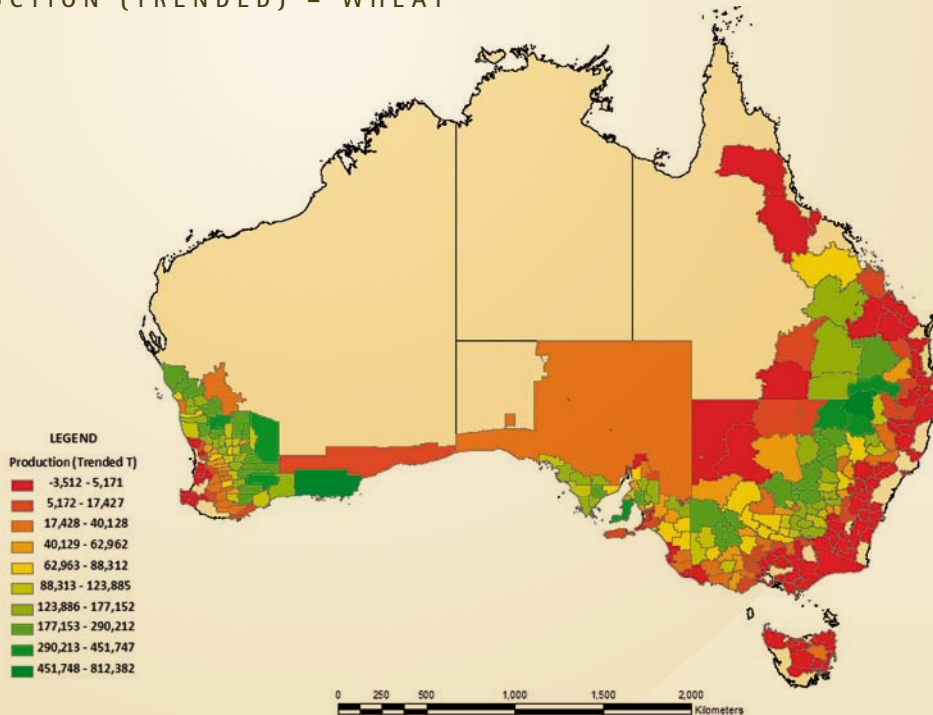
CHART 2
ANNUAL WHEAT PRODUCTION BY STATE AND NATION



DATA SOURCE: GrainGrowers

Increases in production appear to be occurring in local government areas (LGAs) along dry inland margins of the grain belt. There also appears to be a decline in wheat production in the higher rainfall zones on the east and west coasts (Chart 3).

CHART 3
PRODUCTION (TRENDED) – WHEAT

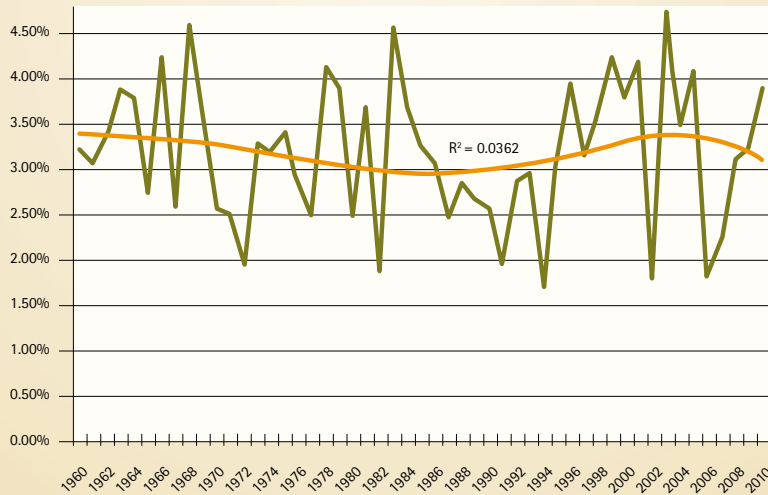


Data Source: GrainGrowers

The proportion of wheat produced by Australia as a percentage of total global wheat stands at 3.75 per cent, which has been largely unchanged since the 1960s (Chart 4).

CHART 4

AUSTRALIAN PRODUCTION AS A PERCENTAGE OF GLOBAL PRODUCTION

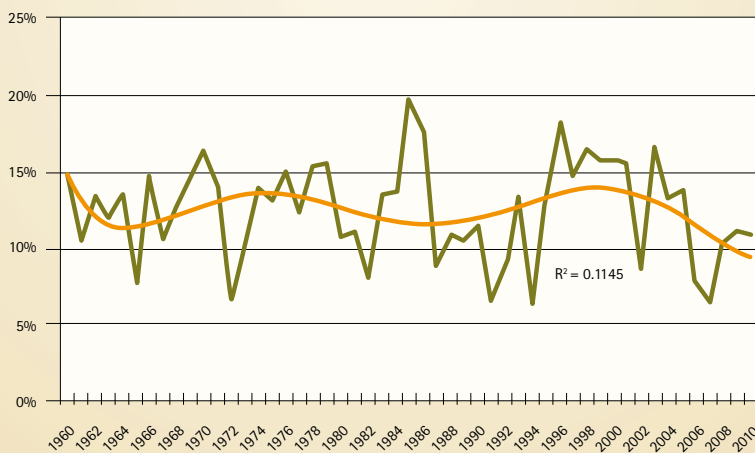


DATA SOURCE: GrainGrowers

Similarly, Australia's contribution to total world wheat exports has remained relatively flat at between 10 and 15 per cent with a decline in recent years due to drought (see Chart 5).

CHART 5

AUSTRALIAN EXPORTS AS A PERCENTAGE OF WORLD WHEAT EXPORTS



DATA SOURCE: GrainGrowers

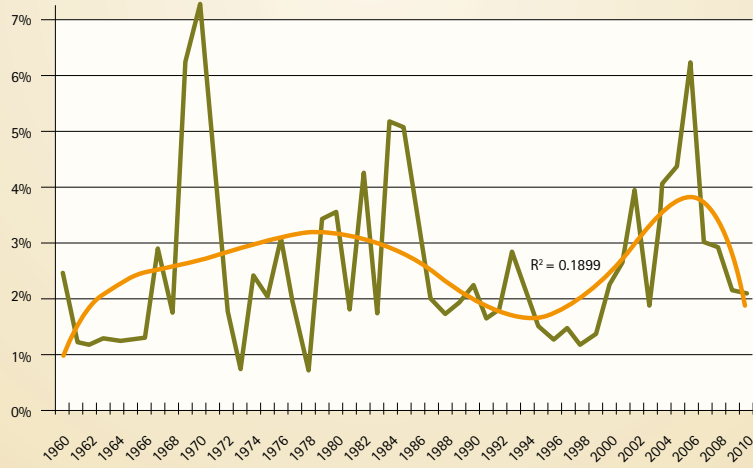
Overall, Australia's production has continued to increase albeit with increasing variability. Australia remains a minor wheat producer, however continues to be a more significant wheat exporter.

Given recent declines in the world stocks to use ratios, Australian production as a proportion of opening stocks is slightly increasing (see Chart 6) but again with considerable volatility. This is likely to lead to increasing Australian basis¹ volatility as where there is a decline in world stocks, Australian crop forecasts and production will be watched by international buyers.

¹ Basis is the difference between the Australian price and the international price for comparable wheat grades.

CHART 6

AUSTRALIAN PRODUCTION AS A PERCENTAGE OF WORLD OPENING STOCKS



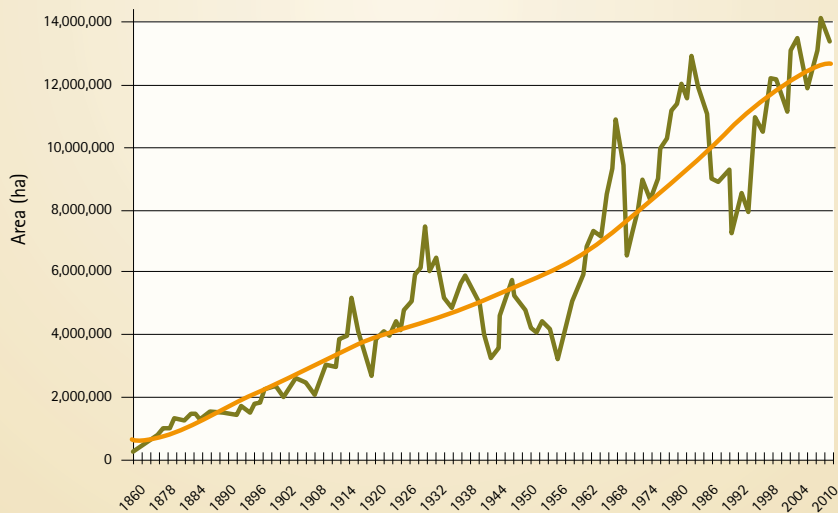
DATA SOURCE: GrainGrowers

2.1.2 TRENDS IN AUSTRALIAN WHEAT PLANTING

Wheat production is dependent on the area of wheat sown and the yield per ha produced. In general, Australian wheat planting reflects wheat production trends where plantings have been rising steadily. Of particular note is the rapid rise in wheat planting between 1992 and 2010 (see Chart 7).

CHART 7

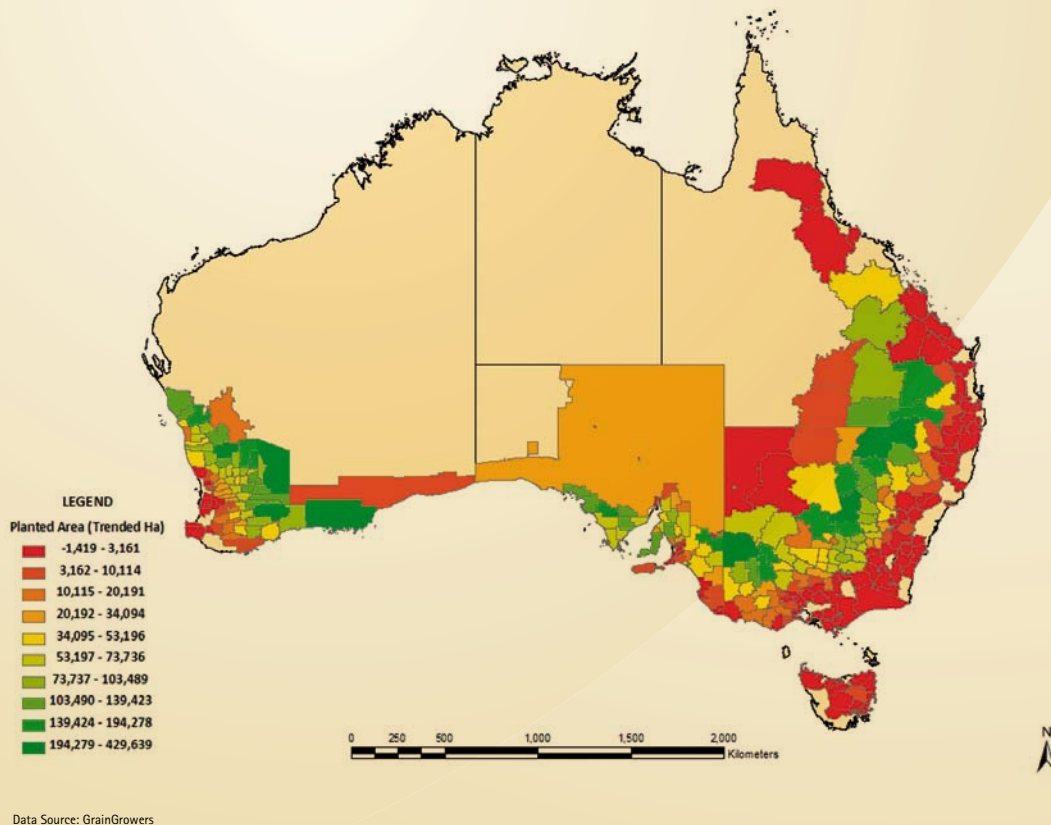
LONG TERM WHEAT PLANTING TREND (MILLION HECTARES)



DATA SOURCE: GrainGrowers

As with grain production, wheat planting increases have been strongest in NSW and Western Australia while wheat area in Queensland is declining. Most of the increase appears to have been in the margins of the grain belt. Declines in area planted have been mostly the higher rainfall LGAs although the reason for this is unclear at this stage.

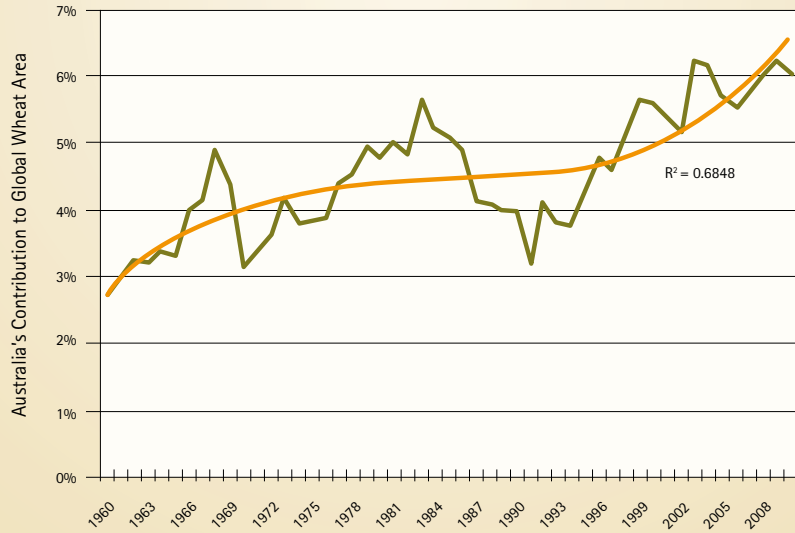
CHART 8
PLANTED AREA (TRENDED HA) – WHEAT



Of note is the rise in Australia's proportion of world wheat area planted. While Australia's contribution to world wheat planting is rising, our contribution to world production and exports is static. This shows that Australian wheat yields may not be rising as fast as world wheat yields per hectare.

CHART 9

AUSTRALIA'S WHEAT AREA AS A PROPORTION OF WORLD WHEAT AREA



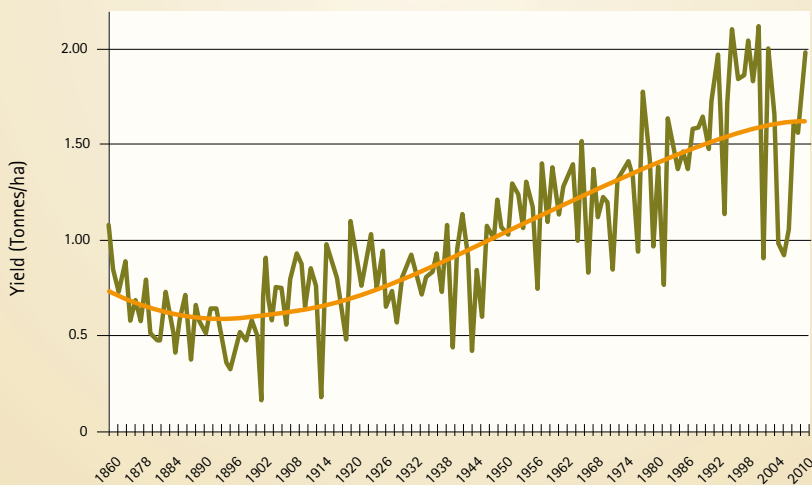
DATA SOURCE: GrainGrowers

2.1.3 TRENDS IN WHEAT YIELD

Australian wheat yields have been increasing steadily since the early 1900s but have shown signs of slowing since the mid 1980s (see Chart 10). Volatility of wheat yields appears to have been increasing at the same time that yield increases have shown signs of slowing.

CHART 10

LONG TERM CHANGES IN AUSTRALIAN WHEAT YIELDS



DATA SOURCE: GrainGrowers

However, world average wheat yields appear to be increasing at a much faster pace than Australian wheat yields (see Chart 11 and Chart 12).

CHART 11
WORLD AND AUSTRALIAN AVERAGE WHEAT YIELDS PER HECTARE

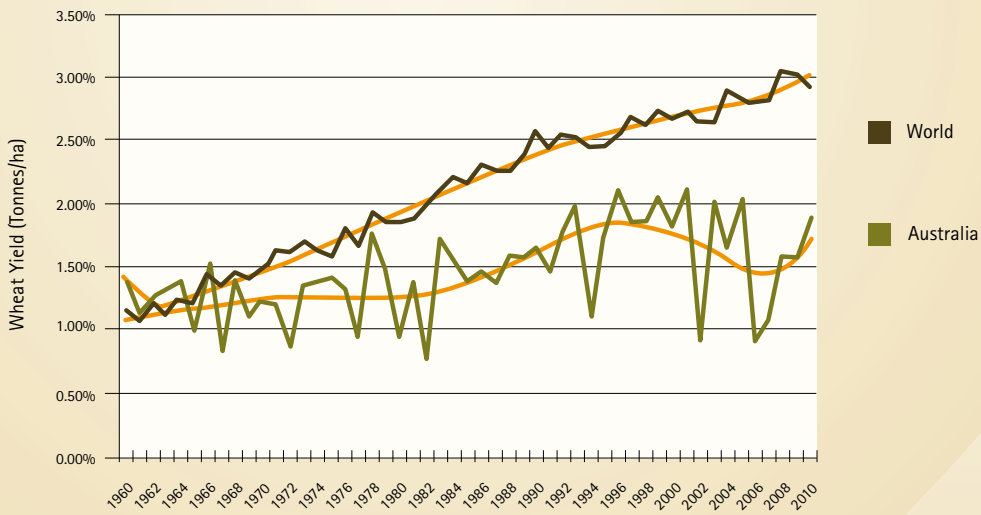
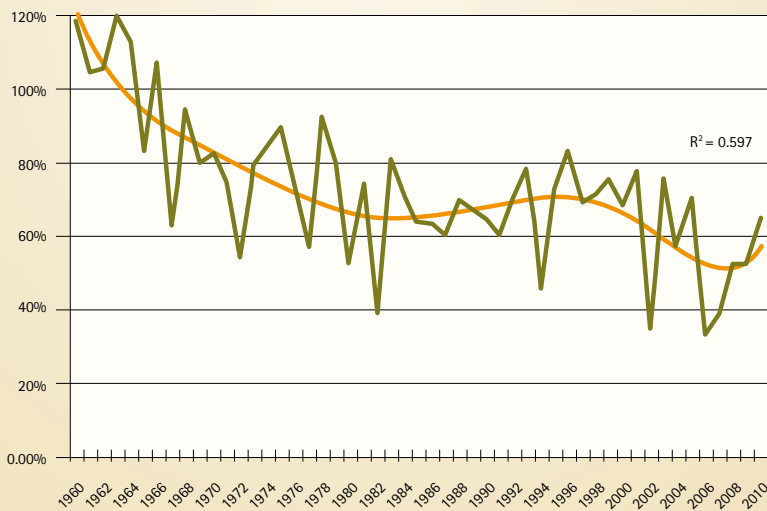


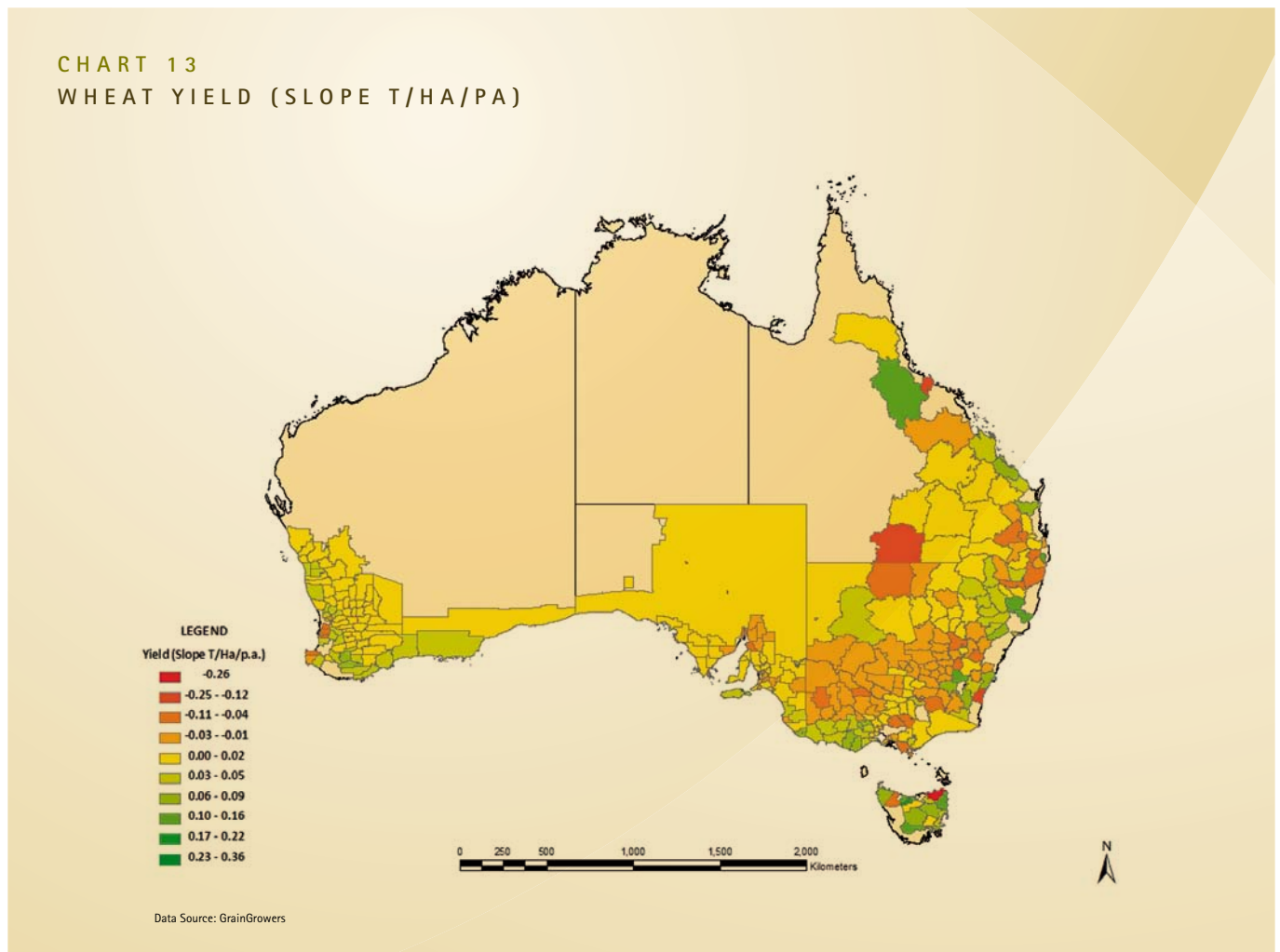
CHART 12
AUSTRALIAN WHEAT YIELDS AS PERCENTAGE OF GLOBAL AVERAGE



While aggregate yields are increasing albeit at a slower pace and falling behind global wheat yields, there are significant regional variations in yield trends.

Wheat yield declines appear to be occurring predominantly in southern NSW and northern Victoria. Wheat yield increases are static or improving across most of Western Australia, South Australia and northern NSW (see Chart 13).

It is also interesting to note that the high rainfall yields appear to be increasing but it is in these areas that the area being planted is contracting slightly.

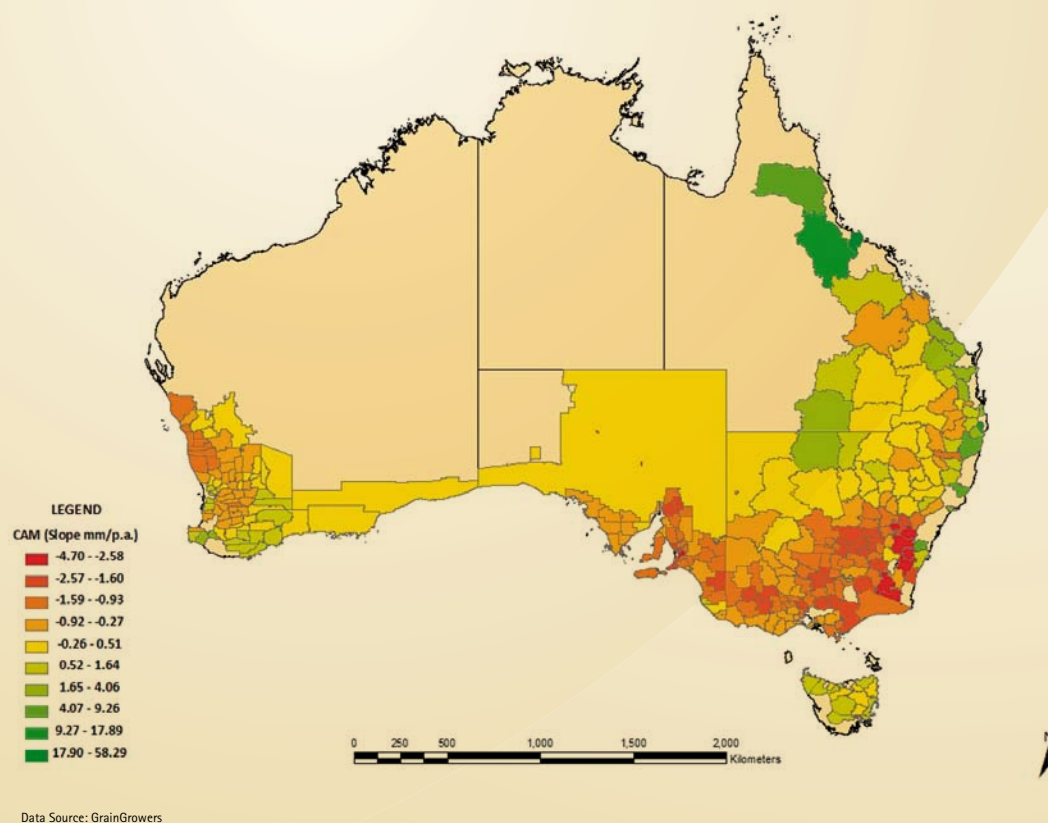


The decline in yield corresponds with a decline in crop available moisture² (CAM) in the south eastern wheat belt. A rise in yields corresponds with an increase in CAM in the northern and western areas of the Australian wheat belt (see Chart 14).

Declining CAM levels characterise each state except Tasmania, reaching a maximum of -1.3 mm p.a. in Victoria. Strongly negative CAM trends (of up to -4.75 mm p.a.) in all grain producing LGAs across southern NSW, Victoria, South Australia and western fringes of Western Australia appear to be attributable to declining winter rainfalls.

² CAM is calculated by adding soil moisture at planting and rainfall throughout the growing season and subtracting runoff and soil moisture at harvest

CHART 14
CROP AVAILABLE MOISTURE (SLOPE MM/PA)



To increase or at least hold yields as crop available moisture declines, water use efficiency must improve at a rate faster than CAM declines.

Water Use Efficiency (WUE) rates for wheat across Australia average around 10 kg/ha/mm (about half of the theoretical maximum of 20 kg/ha/mm) with a slightly upward trend of .05 kg/ha/mm p.a. WUE is:

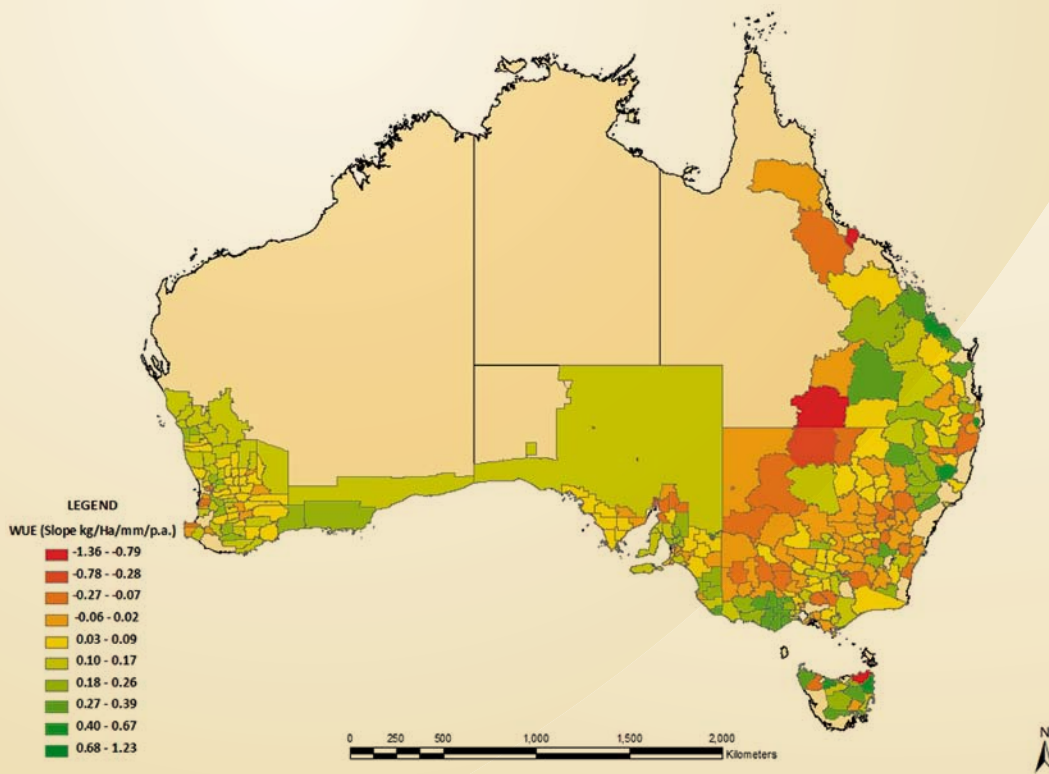
- Highest in Tasmania and Queensland and rising quite steeply at the rate of 0.12 to 0.20 kg/ha/mm p.a.
- Lowest in NSW and Victoria and mid range but rising at a moderate rate of around 0.07 kg/ha/mm p.a. across the drier states of Western Australia and South Australia.
- On a long term basis, WUE is falling in Victoria at the rate of about .01 kg/ha/mm p.a.

Wheat yield (at or approaching 2.5 tonnes/ha) and WUE (between 10 and 15 kg/ha/mm) is highest and rising strongly (>0.05 tonnes/ha p.a. for yield and > 0.67 kg/ha/mm p.a. for WUE) in LGAs across central southern to coastal mid-state areas of Queensland, northwest slopes and plains of NSW, south western Victoria and most of Tasmania. Except for Tasmania, these LGAs are characterised by heavier, dark grey to black self mulching soils which can store and retain large volumes of seasonal rainfall.

Best performing LGAs include Narrabri, Goondiwindi and Roma/Western Downs (see Chart 16). Esperance, with yields around 2 tonnes/ha and rising at the rate of .05 tonnes/ha p.a. and WUE exceeding 10 kg/ha/mm and rising at >0.25 kg/ha/mm p.a., leads the majority of LGAs across Western Australia where advanced farming practices have evolved to more than compensate for relatively thin and light textured sandy soils.

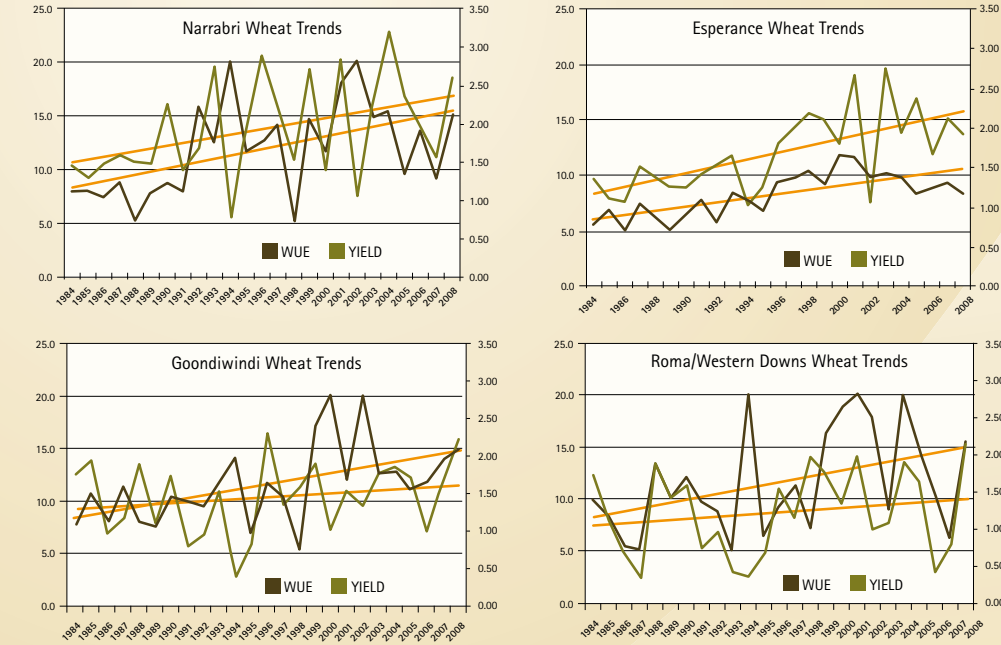
By way of contrast, wheat yield (at or below 1 tonne/ha) and WUE (in the range of 8-10 kg/ha/mm) is lowest and falling significantly ($>-.025$ tonnes/ha for yield and $>-.10$ kg/ha/mm p.a. for WUE) in LGAs across northern and central Victoria (including Mildura, Buloke and Yarriambiack) as well as isolated LGAs across central NSW (such as Lachlan) due to the combined challenges of declining winter rainfalls, poorer soils and inadequate crop management response (see Chart 17).

CHART 15
CROP AVAILABLE MOISTURE (SLOPE MM/PA)



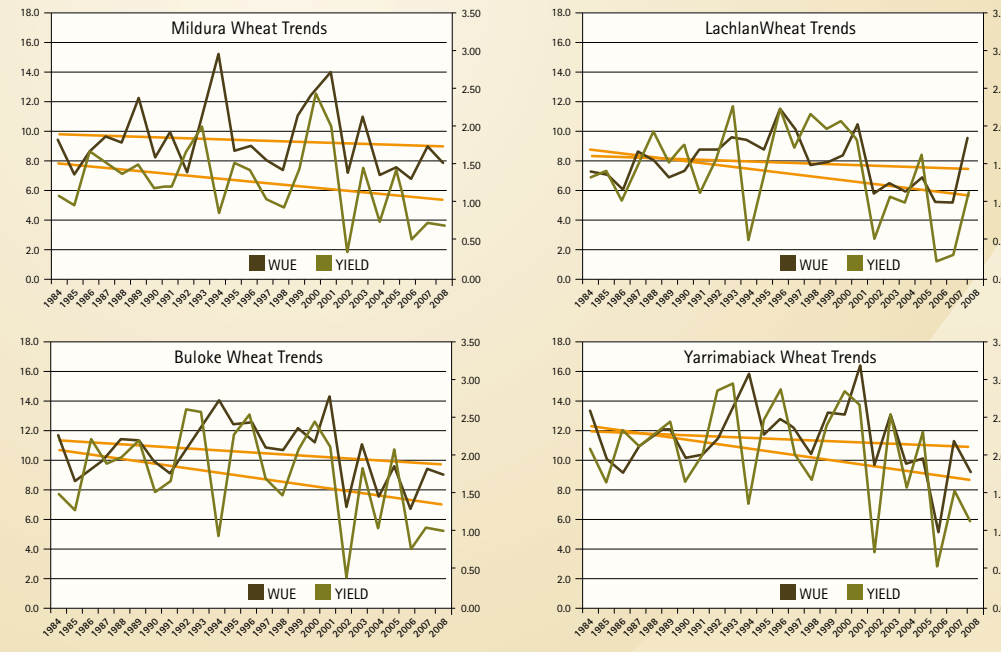
Data Source: GrainGrowers

CHART 16 WATER USE EFFICIENCY AND YIELD TRENDS - SELECTION OF BEST PERFORMING LGAS



DATA SOURCE: GrainGrowers

CHART 17 WATER USE EFFICIENCY AND YIELD TRENDS - SELECTION OF WORST PERFORMING LGAS



DATA SOURCE: GrainGrowers

In summary, it appears that where LGAs are experiencing declining CAM, improvements in WUE are not sufficient to maintain yields. Conversely, where WUE is highest CAM appears to be stable or rising slightly.

2.2 POLICY ENVIRONMENT

KEY POINTS: POLICY ENVIRONMENT

Major policy issues for Australian agriculture concern water, energy and land use:

- The Government is working through a process of prioritising key environmental assets, placing a value on them and specifying their water needs through the Murray Darling Basin plans and other water resource plans.
- The opportunity cost of water, both used for irrigation and water in the wider hydrological system (from rainfall to estuaries and ground water) is likely to increase due to increases in the value that the community places on biodiversity. Changes to rainfall trends, or anticipation of changes to rainfall trends, will accelerate increases in water opportunity costs.
- No guarantees can be given that water will be reserved for rural production.
- Consumers are increasingly demanding 'clean, green' products from agriculture but there is uncertainty as to how much they are willing to pay.
- The opportunity cost of using synthetic fertilisers, fungicides and insecticides will increase due to both lower product prices as consumer demand reduces and possibly tighter restrictions on their use.
- The opportunity cost of using land for farming will increase as a result of pressure from alternative uses.
- A carbon tax has been announced but there is much uncertainty about its implementation and its coverage of agriculture, including the opportunity for agriculture to provide green house gas offsets.
- There is a probability – albeit low – that the opportunity cost of inputs and products containing carbon will increase.

2.2.1 WATER

Current water policy in Australia is summed up in the document *Water for the Future*, which is the Government's long term initiative to achieve a better balance of the water needs of communities, producers and the environment.

It is complemented by the *National Water Initiative* (NWI) which was agreed by all states and territories in 2004 to establish a nationally compatible market, regulatory and planning-based system of managing surface and ground water for rural and urban use in a way that optimises economic, social and environmental outcomes. (COAG, 2004)

A key element of this water reform agreement is to remove barriers to trade in water and use an open water market to achieve the desired outcomes in the most efficient way.

From the Government's *Water for the Future* policy document it is clear that in the future specific interventions and administrative arrangements will be used less and less because the Government can see that the use of such arrangements for allocating water for environmental purposes conceals the opportunity cost of meeting environmental objectives and can crowd out more efficient market mechanisms.

Water reform is faltering at present because, within water plans, administrative arrangements are relied on to allocate portions of the water resource pool to a range of different uses, such as the environment, agriculture and urban activities. Moreover, the Government is the main barrier to a more efficient market mechanism because it has not been able to prioritise key environmental assets, place a value on them or specify their water needs.

If the Government does wish – as it says – to use the market to ensure that water is allocated to achieve the greatest overall net benefit to the community, it has to articulate clear environmental objectives, place economic values on its environmental objectives and be willing to pay for them accordingly. That is, the Government must be prepared to purchase water on the open market for public water use such as environmental flows.

There is much to be done before the NWI initiatives are anywhere near a reality. A more effectively functioning market would achieve greater efficiencies in water use, and go closer to allocating water to its best use from society's viewpoint, if price were used to allocate water. But for this to work it is essential for water markets to be integrated, which means that the water market would have to be open to all and driven by market demands and values. Fully integrated water markets would create powerful competitive pressures, stimulate innovation, improve productivity and bring about a more market-based concept of environmental management.

There will be no serious water reform until the Government spells out precisely what it wants to achieve for the environment and pays the going price for water to achieve it.

Agriculture has already moved a long way in adjusting to water trading as a means of allocating a scarce resource to its best use, so most producers are accustomed to the system. In the years ahead demand for water will increase and the price is likely to rise. It must be recognised that water in some areas may have more valuable uses than in agriculture, particularly if more water is purchased

for environmental flows, so no guarantees can be given for rural production in the future that depends on purchased water.

If or when water markets expand to include greater consideration of water use in dry land systems, such as interceptions of rainfall by crops and pastures, increasing water use efficiency on the farm may not be the most efficient use of the water.

2.2.2 BIODIVERSITY

Agriculture depends on healthy ecosystems to provide services that include nutrient and waste recycling, pollination from insects, sediment control, and clean water. Deterioration in biodiversity is one of Australia's more serious environmental problems, with significant losses occurring in some agricultural areas. Clearing of native vegetation, some grazing practices and inappropriate fertiliser use have contributed to a decline in water quality, ecosystem function and in biodiversity.

Current government policy in relation to biodiversity is covered in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) which, more broadly is the Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places which are defined in the Act as matters of national environmental significance.

Specifically, the EPBC Act aims to:

- Conserve Australia's biodiversity.
- Protect biodiversity internationally by controlling the international movement of wildlife.
- Provide a streamlined environmental assessment and approvals process where matters of national environmental significance are involved.
- Protect our world and national heritage.
- Promote ecologically sustainable development.

Caring for our Country is the Australian Government program that seeks to achieve an environment that is healthy, better protected, well managed and resilient, and provides essential ecosystem services in a changing climate. Since 60 per cent of Australia's landscapes are privately owned or leased for agricultural production, the practices adopted by land managers of these landscapes can play a major role in contributing to environmental sustainability and further improve the long-term security of food and fibre production.

By 2013, *Caring for our Country* aims to:

- Assist at least 30 per cent of farmers to increase their uptake of sustainable farm and land management practices that deliver improved ecosystem services.
- Increase the number of farmers who adopt stewardship, covenanting, property management plans or other arrangements to improve the environment both on-farm and off-farm.
- Improve the knowledge, skills and engagement of at least 30 per cent of land managers and farmers in managing our natural resources and the environment.

The policy commitment of government reflects what has already become established practice by many farmers, as seen in minimum and zero till cropping, tightly specified fertilisers targeted to individual soil types and the nutrient requirements of particular crops. Along with advances in plant breeding these improved agronomic practices have resulted in a doubling of yields in some cases. In the grazing industries significant improvements in stock and pasture management have resulted in productivity increases through greater moisture retention and the build up in soil microbial activity. The previous deterioration in biodiversity is being arrested to the point where, in many cases, the condition of soils has never been better.

The opportunity cost of improving biodiversity in cropping is mainly in the capital cost of the plant and equipment required, which is offset to a large extent by a higher net income from improved yields, lower fuel costs and more available soil moisture.

However, increasing water use efficiency on farm for both biodiversity outcomes and improving production, intercept more of the water that would otherwise pass through the farm into streams and ground water systems. Once in these systems, this water is usually subject to a series of entitlements for irrigators or for environmental managers. Therefore there is a significant, but not well understood, rising opportunity cost of increasing on farm water use.

Increasingly, consumers want to know more about how their food is produced and they want to be assured that it does not contain any elements that might adversely affect their health. Hence there is greater consumer resistance to food that has been sprayed with insecticides and fungicides, and preference is being shown for food that has been grown in 'organic' conditions. In the future it is likely that consumers will demand more and more verifiable information on where food has been grown, what fertilisers have been used, what chemicals have been applied and where and how it was processed. With lamb and wool production, some consumers demand assurances that the sheep has not been mulesed and has been treated humanely, even though this information is not useful in assessing the quality of the product.

The main opportunity cost facing farmers is land. There will be increasing pressure on land values from alternative uses such as urban development, lifestyle farming and, possibly, environmental policies such as tree planting or offsetting green house gas emissions.

The key policy issue is that governments are unlikely to intervene in the market for land to protect the position of agriculture if they judge that the broader community interest is best served by uses other than farming.

2.2.3 CARBON

The Government has announced its carbon tax will commence in July 2012. To date, very few details have emerged about its design, including its rate, the compensation component and how it might affect agriculture – especially the critical questions of fuel, fertiliser and food processing.

A carbon tax works by sending a signal to consumers to reduce their use of energy and energy dependent products such as fuel, fertiliser and machinery which are all vital inputs into farming. Increased costs arising from the tax will undermine Australian agriculture's ability to compete on domestic and world markets, even if agriculture's direct emissions are excluded from the scheme.

The Government has foreshadowed that low and middle income households will be compensated but this may not apply to farming businesses so farmers might be worse off. However, the Government is looking at a carbon abatement scheme, known as the 'Carbon Farming Initiative' that would enable farmers, foresters, indigenous communities and conservation groups to carry out various practices and land uses that cut pollution on the farm or sequester carbon in the landscape. Under the scheme these projects would be paid for by polluting companies elsewhere in Australia and around the world.

Moreover, questions over the justification for the tax remain. For example, how will it be applied, to whom and at what rate? Will it be compatible with tax regimes internationally? What will be its impact on global temperatures?

2.3 MARKET CONDITIONS

KEY POINTS: MARKET CONDITIONS

- Demand for agricultural products is likely to remain strong due to population increases and a steady rise in per capita income in China, India and other developing countries.
- World food production is expected to be able to keep pace with demand.
 - There is more land available for crop production in Latin America and Africa but there are costs associated with converting the land from current uses to food production.
 - Water is likely to be the most significant constraint on future food production but improvements in water use efficiency in developing countries are likely to offset increased water scarcity.
- However, there are risks as increases in agricultural production will be reliant on new innovations and there are increasing opportunity costs for some factors of production, water, land and biodiversity that agriculture will be held increasingly to account for.

2.3.1 WORLD AGRICULTURE FUNDAMENTALS³

There is significant concern currently as to whether the global agricultural industry will be capable of meeting the growing demand for food associated with a projected global population of 9 billion by 2050. This has led to unprecedented international interest in the issue of food security. This was driven by projections that:

- The number of undernourished people in the world reached 963 million in 2008, nearly 15 per cent of the world's population.
- Food availability in developing countries will need to increase by almost 60 per cent by 2030 and double by 2050 to feed growing populations.
- Such growth will be equivalent to a 42 per cent and 70 per cent growth in food production between now and 2030 and 2050 respectively.

Such concern was at a crisis point during 2008 when soft commodity prices hit historical highs. Although prices have receded recently, food security concerns remain. Thus it is important to examine whether, in fact, the world can indeed cater for 9 billion people.

2.3.2 IS FOOD PRODUCTION INCREASING?

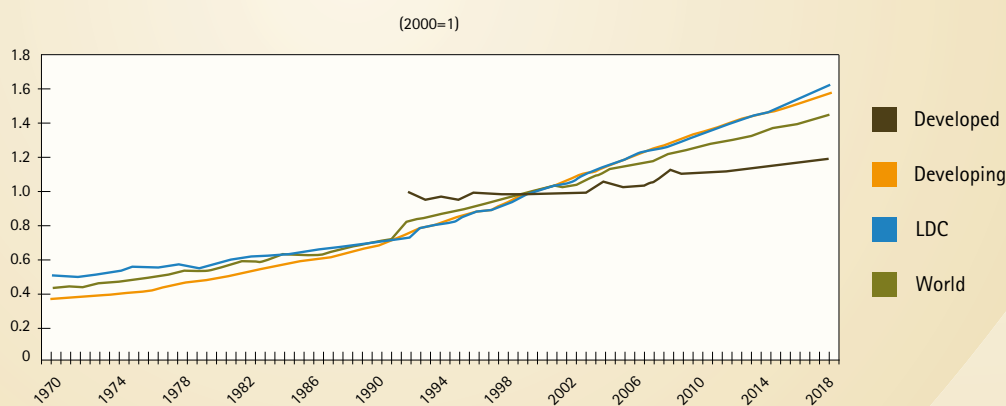
Since 1970 world food production has increased by 350 per cent, partly because of productivity gains and greater development of arable land. The Food and Agriculture Organisation (FAO) has constructed an agricultural production index which shows this sharp rise in production since 1970.

While the chart shows that there is increasing production globally, there has been a fall in the rate of growth in developed countries. Developing countries are continuing to experience a rapid rise in production.

To be able to meet an increase in demand of 70 per cent over the next 40 years, world agriculture production will need to achieve 20 per cent of the rate of growth it has achieved over the last 40 years.

The critical issue for Australian farmers is, at what costs will additional production be brought to bear, and will the additional production be in products that compete or with Australian produce?

FIGURE 1
FAO AGRICULTURAL PRODUCTION INDEX



DATA SOURCE: OECD-FAO, 2009

³ The following sections draw from the OECD/FAO 2009-2018 World Agricultural Outlook (OECD-FAO, 2009).

2.3.3 IS THERE MORE LAND AVAILABLE FOR CROPPING AND CAN IT BE USED MORE INTENSIVELY?

Land utilisation

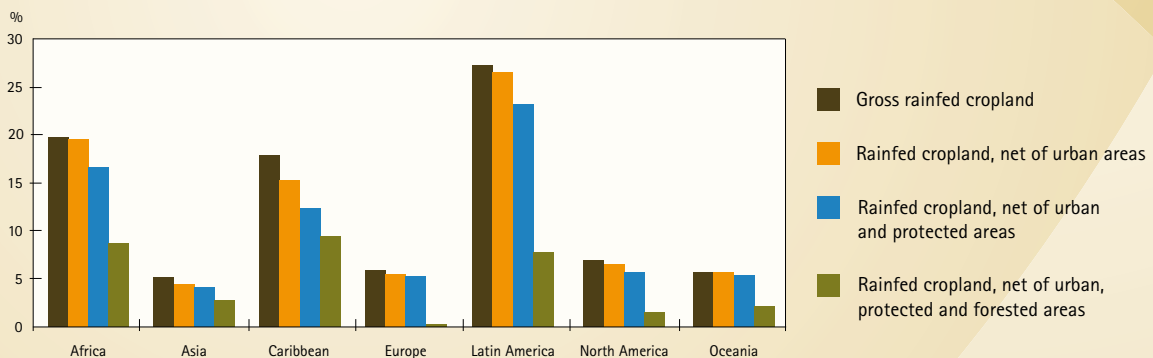
Whilst productivity and efficiencies are very important to increase overall agricultural production, increases in production capacities can be attained through increasing the amount of land being cultivated.

Gross Land Balances (GLB) is the total amounts of land potentially suitable for growing crops which is not already cultivated. Estimates have been made totalling rain-fed land availability at 4.3 billion hectares. Currently cultivated land is estimated at about 1.4 billion hectares, or 32 per cent of available land. Much of the additional land currently not cultivated is found in Africa and Latin America.

These figures are gross 'optimistic' estimates as they do not account for the fact that some areas available have already been allocated to other competing and socially acceptable land uses. However, competing land uses reduce the gross land balance by a little more than 10 per cent. Most of this reduction comes from Latin America, Africa and the Caribbean.

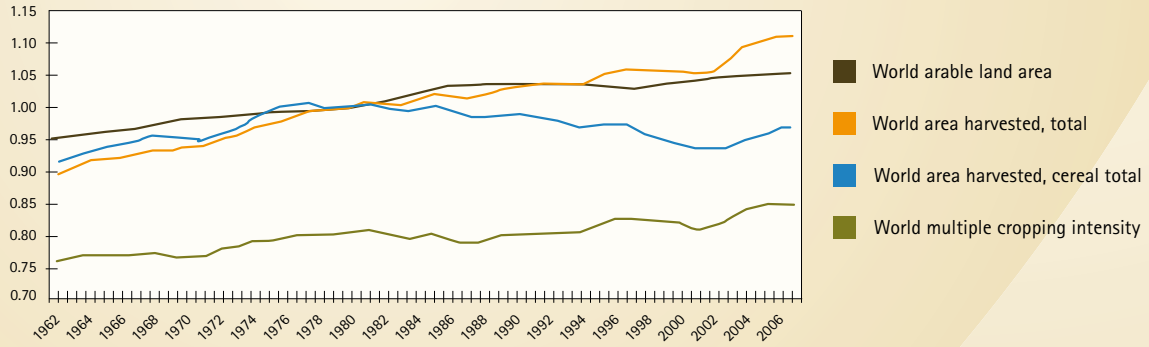
It could be expected that economies would have responded to supply constraints by developing far more land; however arable land in the world has increased by only 10.5 per cent since 1961-63, or by around 0.2 per cent p.a. Generally, the greatest expansion has come from countries with low income and a food deficit, such development being driven by domestic demand growth. The effect is greater in landlocked countries (increase of 160 per cent over period). However, many developed countries have actually decreased their amount of arable land (America had a reduction of 2 per cent annually since 1961-63). Such reductions are caused by sustained yield growth, farm consolidation, continuing urban expansion and government policy changes.

FIGURE 2
AVAILABILITY OF CROP LAND IN DIFFERENT REGIONS



DATA SOURCE: OECD-FAO, 2009

FIGURE 3
TRENDS IN WORLD LAND AVAILABILITY

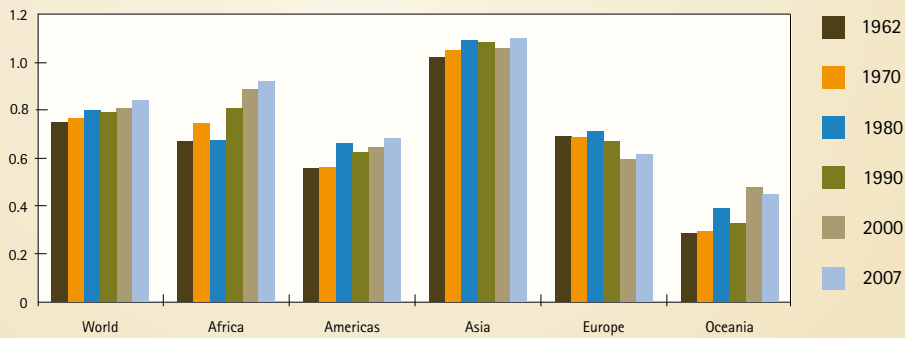


DATA SOURCE: OECD-FAO, 2009

Cropping intensity

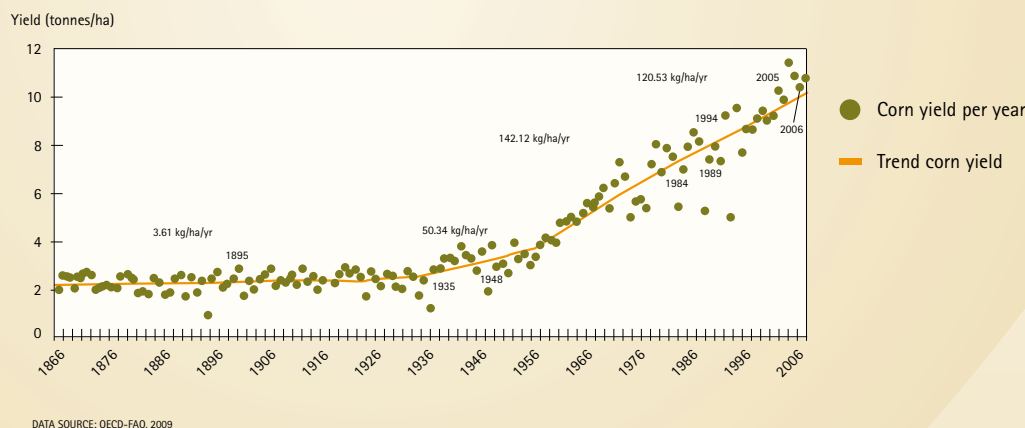
Cropping intensity is a measure of how many crops are grown on a single piece of land in a year. It is calculated by adding the area harvested and dividing this by the total arable land (not cultivated land). As can be seen from the depiction below, cropping intensity has been increasing due mainly to the increased use of irrigation.

FIGURE 4
CROPPING INTENSITY AROUND THE WORLD



DATA SOURCE: OECD-FAO, 2009

FIGURE 5
US CORN YIELD TREND



Increased land utilisation trends and higher cropping intensities are set to continue, albeit at a slower pace. It is projected that industrialisation and urbanisation will turn vast tracts of land from cropping to residential or industrial uses. Whilst increased cropping intensity should be lauded, it is a factor which has to be taken into account in land degradation.

Can productivity increases solve the problem?

Crops

Throughout history progress in the areas of technology, genetic improvement, chemical fertilisers, pesticides, equipment, machinery and management have led to significant productivity gains. Over the past decade agricultural productivity in developed countries has slowed compared to prior periods. Conversely, empirical evidence suggests that developing country productivity has actually accelerated. Productivity increases are incredibly important in the equation of increasing production. For example, the diagram below shows that Iowa Corn yields doubled between 1956 and 2006. If such production increases can be maintained towards 2050, the world will go a long way towards increasing food production by the required 70 per cent.

As stated above, empirical evidence suggests that production increases are unlikely to come from developed countries. Rather, it is the significant productivity gains being achieved by developing countries which will allow the sector to feed 9 billion people in 2050.

Livestock

Technical advances in livestock production are a result of genetic improvements in animals, improved disease control, improved structures and improved management strategies. The utilisation of artificial insemination, cross breeding and disease control have led to large increases in livestock productivity. For example, some of the most productive dairy farms are those in the US containing between 5,000–10,000 cows. Livestock growth rates are still highest in developed countries and this indicates that global livestock productivity could be greatly increased if the productivity drivers are disseminated throughout the world.

TABLE 1 – LIVESTOCK PRODUCTIVITY IMPROVEMENTS

Region	Total Livestock	Ruminants	Non-ruminants
Developed countries	1.04	0.93	2.11
Developing countries	0.57	0.38	2.38
Least developed countries	0.54	0.4	1.24

Data source: (OECD-FAO, 2009)

Research and productivity growth

Research and development (R&D) investment is increasingly being undertaken by private enterprise and has the potential to drive considerable productivity growth.

For example, the US seed industry has set a goal of doubling corn, soybean and cotton yields in the US by 2030. The drive by private industry to develop genetic modification (GM) technology is also likely to lead to greater production in the future.

How will increasing demand for water impact the agricultural industry?

Water scarcity is a problem confronting humanity on an increasingly serious scale. This is likely to impact heavily on the ability of agriculture to use water for irrigation. Currently 1.2 billion people live in areas where water scarcity is absolute (human water use has surpassed sustainable limits). By 2025 this is projected to increase to 1.8 billion people.

Such increased scarcity will occur mainly in developing countries and will be caused by greater water use which will be inflicted by increased population, urbanisation and incomes. This will be accompanied by increased food demand so that countries such as India and China that will experience these dynamics will not be able to rely on increased irrigation to produce greater food volume as demanded. Also, water scarcity is likely to have an impact on productivity gains.

As a consequence, future gains from agriculture are unlikely to come from increased water use (although developing countries will extract 13 per cent more water in 2050 compared to 2000), rather it will come from improved performances of existing irrigation. This will come from infrastructure improvement and better utilisation and management.

How will climate change affect water policy?

Future water policy will be heavily impacted upon by climate change policy and climate variability, although actual impacts from climate change are difficult to predict. Severity of floods and droughts has been increasing in OECD countries in the recent past. It is likely that existing water infrastructure and management will be used as a buffer to handle these severe weather events. This is likely to affect irrigation.

Climate change is expected to have a dual effect on irrigated agriculture. First, higher evaporation will lead to higher levels and intensities of water withdrawals. Secondly, the anticipated increase in volatility of rainfed production will put pressure on irrigation areas to act as a buffer against global production risk.

So, can agriculture really feed an increased population?

None of the three supply factors examined – land, productivity and water – present absolute barriers to increasing agricultural production. However, as presented, there are substantial risks that must be managed and investments that must be undertaken to ensure future food security.

Furthermore, agriculture is likely to be forced to be more accountable in the future as there are growing societal concerns about the environment, intensive farming, the use of GM technology and food quality.

The world's land surface is 13.2 billion hectares, around 4.3 billion of which is moderately to highly suitable as rainfed cropland. Currently, there is around 1,560 million hectares which is not being used for crop production that could be used. Thus, crop production could be increased dramatically. A restricting factor is that the areas not currently used are relatively less efficient for crop production. Furthermore,

if regulations and prices were such that these areas could be developed, challenges would come from society at high development costs.

Increasing private R&D investment can deliver new technologies which can assist in enhancing agricultural productivity. However, for the strong productivity growth numbers of the past to continue, governments must continue to invest in R&D. As stated above, the world will need to produce 70 per cent more food to feed a population of 9 billion people and if R&D is able to replicate

productivity increases of the previous 50 years, then the agricultural industry will be able to feed the projected 2050 population.

Water scarcity has the potential to impact on production. Changing dietary habits and an increased emphasis being placed on bioenergy is likely to impact on agriculture's water use. The increased population will lead to greater demand for water from the environment for residents and industry. Thus, it is important to strive for greater water efficiencies in the future.

BOX 1: IMPLICATIONS FOR THE GRAINS INDUSTRY

- More detailed research needs to be undertaken to determine the national shifts in production and productivity as these have implications for research, storage and handling infrastructure and transport development.
- A general decline in productivity has been identified by ABARES and others but greater scrutiny by a well resourced producer representative organisation needs to be applied to those research organisations receiving grain producer and/or public funding, to ensure that they are discharging their responsibilities in an effective and efficient manner.
- Close scrutiny needs to be maintained on the productivity rates achieved by Australian producers and the competitiveness of the Australian supply chain.
- More research needs to be done to identify what is causing the reduction in WUE in southern areas. These areas appear to be experiencing a fall in average CAM that is occurring at a rate faster than WUE.
- There is no technical reason why the world cannot produce sufficient grain to meet growing demand for the foreseeable future. Therefore, while the fundamentals of supply and demand are likely to remain favourable, there is capacity in the world to increase grain supply in response to increases in demand in the medium and long term.
- Surges in grain prices, as seen in 2008 will elicit significant supply responses from major production areas. Therefore Australian grain producers cannot afford to be complacent about their competitive position in world grain markets and need to ensure they find new ways to exploit any competitive advantage they have.
- Australian grain producers are facing considerable policy uncertainty and need an effective and credible voice in the formulation of climate, water and biodiversity policy.
- GM policy needs to ensure producers have a choice to adopt the technology if it delivers the productivity and quality gains promised. However, this should be a commercial decision between the technology provider and the grain producer. Where there are premiums for non-GM producers should be able to pursue them, but not at the expense of others being denied access to GM and other emerging technologies.

3 How would producers benefit from collective investments in the grains industry?

KEY POINTS: BENEFITING FROM COLLECTIVE INVESTMENTS

- Grain producers contribute levies to the Grains Research & Development Corporation (GRDC) to undertake research and development on their behalf and recoup considerable benefits from the research portfolio.
- Producers in other industries also contribute levies to organisations to undertake marketing on their behalf, but the ability of producers to benefit from these investments (in fact, any off farm supply chain investments) is dependent on a number of variables in the supply chain.
- There is a general consensus that consumers benefit from investments in R&D irrespective of at what level of the supply chain this investment is made. This is through the provision of cheaper, safer and higher quality food.
- Such benefits provide the basis for public contributions to R&D where producers, acting alone or collectively, cannot capture sufficient returns from individual investments to justify making them.

To generate returns to producers, the industry can collectively invest in a range of areas to achieve the following aims:

- Reduce the unit cost and the risks of producing a tonne of grain (investing in productivity).
- Increase the demand and/or price for Australian wheat (in part, by improving quality).
- Ensure that the market for products and services required by producers is competitive and offers a diverse range.
- Ensure the best combinations of crops and other enterprises are available to use.

3.1 PRODUCTIVITY AND MARKETING INVESTMENTS

In economic terms, productivity and marketing investments should be made with the aim of shifting the supply and demand for a commodity or agricultural product in a way that grain producer profitability is increased. This does not

mean that grain producers must capture all of the gains, only sufficient gains to justify whatever investment is required to improve profitability.

Farm-level collective action has been addressed in the grains industry for much of its R&D needs by the establishment of the GRDC and the investments it makes. However, some in the industry hold the view that to create demand for Australian wheat, there is a need for collective marketing and promotion investments similar to those undertaken by Meat & Livestock Australia, Australian Wool Innovation, Dairy Australia and others.

Demand increases can lead to an increase in price which in turn may increase the total quantity produced. Increases in demand can be achieved by producing products that the market values more highly, leading to either increased volumes or a willingness to pay higher prices for qualities that differentiate Australian wheat from other suppliers or grain types.

3.1.1 PRODUCERS' ABILITY TO CAPTURE THE BENEFITS OF R&D AND MARKETING RETURNS

Where the benefits of any particular R&D investment in the grains industry are to be found is complex. Fundamentally, the benefits of any R&D investments are distributed up and down supply chains according to the supply and demand responses of the players in the supply chain and the degree to which various inputs substitute for each other. It should be recognised that producer funded R&D can be focussed at many points in the supply chain and the returns to producers will be different for R&D at the consumer level, the wholesale level, the processing level or the producer level.

Another important element in the transmission of R&D benefits is the impact of international trade and in the case of grains, the point of export. Generally, grains are exported in an unprocessed form. Further, Australia is usually a small country in a large world market and therefore has little influence on world prices. When exports are a significant share of total production, as is the case for wheat, then R&D investments at the pre export level tend to be returned to farmers while R&D investments in the supply chain, post the export level (such as in domestic processing), tend to be passed on to consumers (a public benefit). However, in both cases, if the R&D or marketing investment is such that the volume of exports sold is increased or the grain consumed domestically is increased then this is mostly passed back to the producer directly. If the R&D is such that the processing or marketing technology is changed to favour non-grain inputs (for example, better packaging or more labour used and less grain) then this provides for the possible substitution of other inputs for grain and the benefits are, in part, passed along to the suppliers of packaging or to labour (Holloway 1989).

Also, the incentives for producer investment in agricultural R&D and post farm gate marketing lie in having suitable institutional arrangements to overcome the free rider problem. Free riders are those that benefit from the investment but do not contribute to its cost.

Compulsory levies are usually successful in reducing the number of free riders and give rise to a closer matching of benefits and the incidence of costs. This is providing the benefits remain positive after the costs of collecting and administering the levies are deducted and the distribution of the benefits compared with the distribution of the levy are similar. Otherwise, there will be cross-subsidisation between some beneficiaries and some levy payers.

Critical to the ability of producers to collectively obtain sufficient benefits is how the benefits of R&D investments are shared between consumers, other stages in the supply chain (such as storage, handling, transport and processing) and producers. There is a reasonable consensus that the consumer generally receives benefits from agricultural innovation stemming from R&D and marketing investments (Zhao, Griffith, and Mullen 2001; Alston and Scobie, 1983; and Verikios, 2006). The consumer benefits are usually in the form of a greater diversity of cheaper, safer food and fibres. However, there are situations or circumstances where various policy interventions, the degree of competition being limited (oligopoly or monopoly) and where an industry is export dominated, that there is leakage of the benefits or different patterns of transmission up or down the supply chain (Alston, Edwards and Freebairn 1998).

The degree to which benefits are shared between producers, processors and consumers is dependent on a number of factors. In regard to the wool industry, Verikios (2006) observed:

Another important factor is the traded nature of the good produced in the stage experiencing research. Where research is localised in a production stage which produces highly traded goods which are highly substituted with foreign production, the member of this production stage, and members of stages close to this production stage, are most likely to gain. For consumers we find support for previous work; consumers always gain from research as it will generally lead to lower prices and therefore higher economic surplus.

By using a global general equilibrium model of the wool market, Verikios examined to what extent wool producers benefit from R&D investments and found that there are large external benefits from wool research, which justify public support (Verikios 2006):

... these results suggest a large external effect (benefit) to wool research, one that far exceeds the effects internal to the wool production system. This suggests that, in this case, it would be inappropriate for members of the wool production system only to contribute to the funding of this wool research, and that some public funding of this research is justified.

Thus, Verikios and others have shown that the returns to producers are dependent on the stage of the supply chain where the investment is made, as well as the elasticity of supply and demand and the degree of substitution of inputs in the supply chain (Holloway, 1989). For example, Alston and Scobie (1983) found that farmers gain a greater proportion of returns from on-farm R&D, compared to research at the consumer level. Indeed, they found that farmers in certain circumstances may sometimes lose from off-farm research.

This does not mean that off-farm research cannot have benefits for producers, rather it shows that the returns

producers get from off-farm investments is sensitive to the substitution elasticity between farm and processing inputs (Holloway 1989; Zhao, Griffiths, Griffiths, and Mullen, 1998). That is, if a processor can substitute for the raw input (not increase the use of the input or avoid paying more for it) to meet any increase in demand from the marketing investment, the grain producer will receive only limited benefits.

Therefore, investing in appropriate places and in appropriate ways up and down the supply chain can clearly be beneficial for producers. A better understanding of the payoffs to various types of investments is clearly needed before significant off farm producer funded research and develop investments are made.

However, R&D and marketing investments which make greater use of wheat or other grains up and down the supply chain or which enhance the volumes exported while also not diminishing the value of the product, such as through enhancing the demand for exported product, will benefit producers. With returns to agricultural R&D regularly being found to be high, it is clear that there are opportunities for investments which will also pay off for producers and others in the supply chain.

BOX 2: IMPLICATIONS FOR THE GRAINS INDUSTRY

- Producers can benefit from research post farm gate under certain circumstances.
- In fact the majority of the benefits of off farm research to lift grain demand flow to producers. Given Australia's relatively small role in global grain production, and the capacity of the world to respond to increases in demand, Australian producers should collectively seek to increase demand for Australian wheat.
- Increasing demand is unlikely to result from generic grain promotion as has been undertaken by wool and meat producers. Rather, technically supporting and assisting millers to understand and increase the value extracted from Australian grain is likely to yield greater demand responses.
- Where these investments are made producers need to ensure that those investing their R&D levies and public funds have a detailed understanding of how producers benefit from research post farm gate, and that investments are actively monitored.

4 The competitive structure of the industry

KEY POINTS: COMPETITIVE STRUCTURE OF THE INDUSTRY

- To improve profitability producers need to not only improve their productivity but ensure that they can capture the benefits.
- The extent to which producers can capture the benefits generated from individual or collective investments in the industry is dependent on the following:
 - Buyer and supplier power.
 - Barriers to entry and exit.
 - The substitutability of Australian grain with other origin grain by buyers.
 - The extent of rivalry between Australian grain producers.

To ensure producers share in the profitability of their industry it is important to first understand the competitive pressures that they face. A useful model to review these competitive pressures is Michael E. Porter's (1985) model of the five competitive forces that determine industry profitability. Porter's model is applied to the grains industry in Figure 6.

FIGURE 6 PRODUCERS' COMPETITIVE SITUATION
(BASED ON PORTER'S FIVE COMPETITIVE FORCES)



With producers occupying the central box, the five competitive forces they face are:

- The power of buyers (traders, handlers, packers, exporters, millers, maltsters, oilseed crushers, feedlots and intensive animal industries).
- Substitutes where one type of grain can be substituted with another grain or other input (such as algal forms of biofuel feedstock).
- New entrants to the market including farmers converting from livestock to crop production, new crop areas being developed in other countries (for example the Black Sea region).
- Internal rivalry between current Australian producers. This relates to the extent to which producers compete away gains from innovation and compete for inputs such as land and labour.
- The market power of suppliers including seed, fertiliser, chemical companies and service providers such as storage, handling and transport companies.

To improve profitability, producers need to not only improve their productivity but ensure that they can capture

the benefits. For instance in an industry where there are low barriers to entry, significant productivity gains achieved by existing producers may be competed away as new entrants bid the price down. Alternatively, suppliers might raise prices to capture some of the increased profitability produced by a new seed variety or new fertiliser application.

Therefore, producers need to ensure that the structure of their industry is conducive to capturing sufficient benefits from the investment in improving technology to make it in the first place. That does not mean producers have to capture all the benefits, in fact some will have to be shared with others in the supply chain to ensure services continue to be provided. The key question is whether sufficient gains can be captured to justify the investment. Similarly, others in the supply chain will have to share some of their productivity gains (usually from scale and scope economies in the case of storage and handling companies) with producers to encourage grain production and delivery of the grain into their facilities.

These five forces of competition are explored in more detail in the following sections.

BOX 3: IMPLICATIONS FOR THE GRAINS INDUSTRY

- Efficient and transparent markets require information about prices, supply and demand to be available to all participants. The Australian grains industry, if it becomes too concentrated, may not be transparent.
- The industry needs to ensure the grain market remains competitive and receive valuable market and supply chain information.
- The provision of this information will also reduce the barriers to entry for small independent fringe traders that will be important participants in the grain market to ensure marginal competition for the large multinational and domestic traders and storage and handling companies.
- In short, there is a need for an independent organisation to provide credible and timely information on a range of grains industry issues.

5 Productivity of grain production

KEY POINTS: PRODUCTIVITY OF GRAIN PRODUCTION

- It is estimated that between 1974 and 2004 Australian grain producers achieved an annual productivity rate of 2.8 per cent above the rate achieved by the economy as a whole and most other agricultural enterprises.
- Since 2000 it is estimated that the rate of productivity increase has stagnated.
- Australia's rate of productivity growth appears comparable to our major wheat trading competitors, who also appear to be experiencing a slowdown in productivity growth over the past 5 to 10 years.
- However, achieving productivity growth alone will not improve the profitability of grain production if most of the productivity gains are competed away or given up due to unfavourable or volatile terms of trade (the terms of trade are the prices received for outputs divided by the costs of inputs).
- Thus, producers should not only invest to improve productivity but to improve their farmer terms of trade.
- Many of the factors that make up input and output prices are largely beyond the control of producers individually and even acting collectively. Those that can be influenced by producers are:
 - Grain quality.
 - Supply chain costs where the structure of the industry can be influenced through effective producer representation.
- Quality is of particular interest to producers as it can be impacted at a number of points in the supply chain including:
 - Plant breeding.
 - Variety classification.
 - Segregation.
 - Blending.
 - Grain containerisation allowing greater differentiation and identity preservation.

This section looks at recent trends in productivity rates in Australia and in our main grain growing competitor countries, and some of the main factors underpinning productivity rates in Australia. It then draws on a paper from MacAulay (2008) on the relationship between productivity and farmers' terms of trade.

5.1 PRODUCTIVITY

5.1.1 AUSTRALIA

Agriculture's competitive position with the rest of the economy depends on how it performs relative to other domestic activities competing for the same resources (Mullen and Crean, 2007). Australian agriculture over the years 1975 to 2004 has returned on average 2.8 per cent per annum productivity growth, a figure considerably stronger than the rate achieved by the economy as a whole.

Agriculture has outperformed all other industries in Australia, bar the communications sector (Productivity Commission, 2005). This productivity growth has been due to producers' ability to expand without significantly increasing their relative use of inputs (Nossal, Zhao, Sheng, E, & Gunasekerra, 2009). 0

Analysis at an enterprise level reveals that over the years 1977-2008, in general, productivity growth for cropping specialists has been higher than for livestock specialists. Mixed crop-livestock enterprises have experienced an intermediate rate of productivity return (Table 2). Input and output movements reveal how total factor productivity (TFP) levels have been achieved. For the total broadacre cropping industry, productivity has been achieved by increasing outputs more than the use of inputs. Mixed enterprises have significantly reduced input use whilst maintaining output growth. Those producers specialising in beef production have achieved productivity growth by increasing outputs and keeping inputs fairly constant, whereas sheep specialists have stable total productivity due to cutting back input use more than the reduction in output.

The relative rates of productivity growth for competing land uses underpins an increase in cropping over livestock production in many regions in Australia in recent years.

Productivity in agriculture is heavily influenced by seasonal conditions, hence there can be great volatility in figures, with significant drops often reflecting years of drought, such as in the 1994, 2002 and 2006 seasons (Nossal and Gooday, 2009). The long-term movement in growth can be attributed to specific drivers, as discussed in the section on 'productivity growth factors'.

Regional disparities influence rates of productivity too, and an analysis of regions in Australia reveals that although TFP rates are similar across the country, how these were achieved varies (ABARES-BRS, 2010). Western producers have recently benefited from the better seasonal conditions and the structure of their broadacre industry giving them larger cropping operations with scale economies through large-scale mechanisation (Nossal and Sheng, 2010).

5.1.2 INTERNATIONALLY

Australian agriculture derives a large proportion of its income from the highly competitive world market, hence it is important to understand how Australia compares with its major competitors. Roughly half of all the wheat produced in Australia is export oriented, and our major customers are in Indonesia, Japan, Korea, Malaysia, Egypt and Iraq (Grain Growers Association, 2010). Benchmarking ourselves against other countries' agricultural productivity reveals our international competitiveness.

TABLE 2 – AVERAGE BROADACRE INDUSTRY TOTAL FACTOR PRODUCTIVITY GROWTH (%), 1997-2007

	TFP Growth	Output growth	Input growth
Total broadacre	1.4	0.8	-0.6
Cropping	1.9	2.1	0.2
Mixed crop-livestock	1.4	-0.1	-1.6
Beef specialists	1.5	1.6	0.2
Sheep specialists	0.3	-1.5	-1.7

Data source: (Nossal & Sheng, 2010)

The Productivity Commission in 2005 found that in comparison with other OECD countries, Australia appears to have experienced relatively high productivity growth over the past two decades. However, we not only compete with OECD economies, so it is necessary to examine non-OECD countries. It is important to note the complexities of this. Consideration must be given to reporting and measurement standards plus the impact that differences in resources, prices, technologies, regulatory systems and institutional and political settings can have (Mullen and Crean, 2007).

Mullen and Crean (2007) did a comparison of TFP rates for six different inter-country studies, ranging across the years of 1961 - 2001. They concluded, after removing an outlier, that Australia's average productivity growth rate was 2.16 per cent per annum, comparable to that of the US and UK, although behind China, France and South Africa.

5.2 CURRENT TRENDS

The productivity growth of the Australian economy as a whole has experienced stagnation throughout the 2000s, a phenomenon that many OECD countries have experienced. Australia has been able to keep pace with the European Union over this time, but has fallen behind that of the United States (Productivity Commission, 2008).

The Productivity Commission reports negative productivity growth for the agricultural sector over the period since 2000. Adverse seasonal conditions help to explain some of the downturn. The drought season of 2006 alone is cited as subtracting 1.3 per cent from the multi-factor productivity (Productivity Commission, 2008).

Mullen and Crean (2007) concur with the deceleration of productivity growth in recent years, however their scope of analysis allows them to reveal that this may only be for the cropping industry. The livestock industry, particularly beef specialists, appears to be accelerating. Noting that drought conditions have had a severe impact on cropping specialists, (Knopke, O'Donnell and Shepherd, 2000) consider the productivity decline for cropping to also be related to increased expenditure on capital inputs as wheat prices have recovered.

Nossal and Sheng (2010) draw attention to the increased beef and sheep industries' long-term productivity. Over the period 1977-1995 the beef and sheep industries averaged growth of 0.9 and -1 per cent per annum respectively. From 1977 to 2007 this rose to 1.5 and 0.3 per cent per annum respectively. Cropping and mixed crop-livestock industries averaged over 3 per cent annually for most of the 1980s and 1990s, but for the past decade have averaged -2.9 and -2.0 per cent a year respectively (Jackson, 2010).

5.3 PRODUCTIVITY GROWTH FACTORS

5.3.1 PAST PRODUCTIVITY DRIVERS

Productivity growth through the 1980s and 1990s was particularly strong in agriculture. There are many key growth factors discussed in the literature, but the most frequently cited ones attribute growth to favourable weather, shifts in enterprise mixes, technical advances, new crop varieties, better management practices, research and development investment and structural changes such as increases in farm size.

Technical advances, or change, arise from public and private investment in R&D and extension. Mullen and Crean (2007) dedicate much of their research report to analysing its contribution to agricultural productivity growth, its expenditure trends and returns. They state that technical change is the largest component of TFP, accounting for 2 per cent per annum over the long-term. Other factors in this long-term productivity growth are attributed to farmer education levels and the state of public infrastructure in the form of transport and communications.

5.3.2 CURRENT DRIVERS

Drought conditions over the past decade have exacerbated the downturn in agricultural productivity (Sheng, Mullen, and Zhao, 2010). In addition to this increased climate variability, another reason for the negative productivity growth over the past decade points toward declining public investment in agricultural research and development (Sheng, Mullen, and Zhao, 2010). This trend has been identified in many developing economies (Pardey, Alston, and Beintema, 2006).

Grain producers are reporting that the prolonged drought has weakened their ability and confidence to invest in new technologies (ABARES, 2010). It appears that risk management could be a factor depressing productivity as producers change their input use and management practices to address the riskiness caused by drought. These changes are often resulting in inputs being over or under-committed, with negative consequences for productivity growth (Nossal and Sheng, 2010).

Other factors highlighted in the ABARES-Grains Research and Development Corporation (GRDC) workshop included that break crops have become less profitable, human capital availability was diminishing and that research priorities had moved away from productivity and towards natural resource management and sustainability (Jackson 2010).

5.4 PRODUCTIVITY AND TERMS OF TRADE

As discussed in section 4, improving productivity rates in grain production may not be sufficient alone to improve the profitability of grain production if most of the productivity gains are competed away or given up due to excessive buyer or input supplier power.

Much of the research effort in the grains industry is being focussed on improving total factor productivity trends to something like 2-3 per cent per year (Peter Reading, Managing Director GRDC, personal communication, August 2009). However, there is recent evidence to suggest that TFP is actually falling, but the causes are unknown at present.

It is useful to consider the role that terms of trade play in the decisions that producers make about the productivity improvements they should make to maximise profits. A farmer's terms of trade is the ratio of the prices received and the cost of inputs. The terms of trade are expressed as output prices divided by input prices.

In maximising profit, firms may at some times raise their total factor productivity and at other times reduce it. Moving the production function up through R&D is one way of raising total factor productivity but this may be countered by the effects of the changes in the terms of trade and the consequent incentives to reduce total factor productivity.

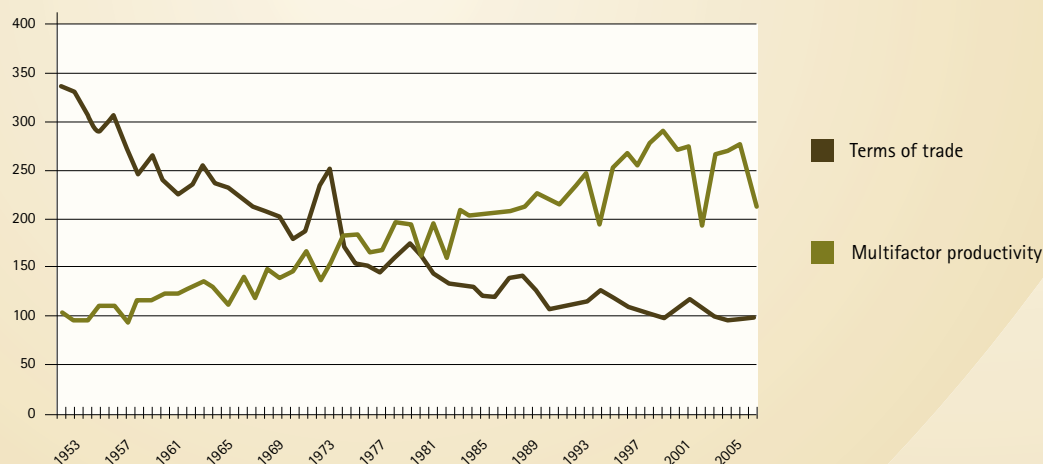
Further, in periods in which R&D is not particularly successful in raising the production function, the terms of trade may also imply that to maximise profits farmers should reduce their total factor productivity. Thus, research should not only be focussed on improved productivity but also on the terms of trade.

It can be readily shown (in a mathematical sense) that net farm income is leveraged more powerfully through a change in the price of wheat rather than a change in the yield. This does not mean that a yield improvement is not important, but it does show the role productivity plays in the context of a profit maximising firm. For a detailed mathematical explanation of the relationship between productivity and terms of trade see appendix A.

Productivity at the farm level is generally measured as the ratio of aggregate outputs to aggregate inputs where the weights used are the prices of inputs and outputs. This ratio, according to ABARES calculations, has been declining in recent years.

At the same time, farmers' terms of trade (output prices/ input prices) have been declining but more gradually than in the past (see Figure 7). If farmers are responding to terms of trade that are above trend in recent years the implication is that output prices have been favourable so it is likely that it is optimal for productivity to fall.

FIGURE 7
TOTAL FACTOR PRODUCTIVITY AND FARMERS' TERMS OF TRADE



DATA SOURCE: Mullen, Productivity growth and the returns from public investment in R&D in Australian broadacre agriculture, 2007

For profits to be maximised it is necessary for the following relationship to hold (this is a derivation of the profit maximisation requirement that the price ratio must equal the marginal product or the slope of their production function):

Terms of trade = elasticity of production \times total factor productivity.

The elasticity of production is the sensitivity of output to an input change and this could be expected to be reasonably stable with a particular technology, but would change as new technologies are implemented.

Recent analysis of elasticity of production indicates that producers do readily make changes in their production in response to changes in price.

Wheat supply price elasticities range from 0.1 to over 1.0 in the short run, and from 0.3 to 3.8 in the long run. For a discussion of the elasticity of production see section 10.1.1.

If product prices rise relative to input prices a profit maximising firm will be likely to increase the total factor productivity so as to maximise profit (it is assumed that the farm is subject to diminishing marginal returns from the use of inputs and that there has been little change in the technology which seems to be the recently observed case). However, if input prices rise relative to product prices the TFP will need to fall to maintain profit maximisation.

A corollary of this result is that if the fertiliser price were to rise relative to the wheat price, it would mean that the TFP of a profit maximising firm would decline in order for producers to maximise profits.

The factors that contribute to grain prices in Australia are quality, international prices, the AUD exchange rate and the costs deducted in the supply chain to get the grain from the farm gate to consumer. Alternatively, the supply costs can be considered as input costs, however, for the purposes of this discussion the difference is immaterial as it is the difference between input and output prices that is important.

Many of the factors that make up price are largely beyond the control of producers individually and even acting collectively. Those that can be influenced by producers are:

- Grain quality.
- Supply chain costs where the structure of the industry can be influenced by producers and others through effective representation.

Quality is of particular interest to producers as it can be affected at a number of points in the supply chain including:

- Plant breeding.
- Variety classification.
- Segregation.
- Blending.

Wheat quality expressed through variety selection is a complex set of characteristics but with the protein content of wheat or flour being one of the more important.

From National Variety Trial data it has been found that there is a -0.6 correlation between protein content and yield of wheat (data for the period 2000 to 2007). Consideration of the wheat classification system suggests that there is likely to be inbuilt incentives for increases in yield rather than quality.

There are cases in plant breeding where there has been success in simultaneously improving both the quality and the yield (eg Sunco), however, this does not appear to be common. This is in part due to the fact that relatively little is known about the willingness of the buyers of Australian wheat to pay for traits such as flour colour, dough strength and baking and noodle making properties. To determine the direction of breeding programs more needs to be known about the monetary value millers and bakers place on the different characteristics.

There may be good economic reasons for TFP to decline when the terms of trade are such that it is economically rational for farmers to reduce the units of output per unit of input. Thus, a focus of R&D on yield only misses an opportunity to leverage other factors that determine farm level profitability.

In regard to the impact of supply chain costs on the terms of trade, the extent to which producers can influence these depends on the amount of influence they can exert on creating an industry structure favourable to their competitive situation. That means ensuring that markets and the supply of services are open, transparent and contestable and that there are low and non-discriminatory barriers to entry and exit. This will, to some extent, depend on the extent that producers make use of the small competitive fringe of traders and marketers and the capacity and freedom with which these firms can enter and exit the industry.

BOX 4: IMPLICATIONS FOR THE GRAINS INDUSTRY

- Investments in productivity research have to be supported by improvements to producers' terms of trade.
- The factors that producers can invest in that are likely to influence terms of trade include:
 - Improving grain quality.
 - Improving competition in the supply of inputs and supply chain services.
 - Increasing the demand for Australian wheat.

6 Marketing/Buyers

KEY POINTS: MARKETING

- It is essential to know who customers are and to supply what they want and for this information to be transparent through the supply chain.
- Australia must ensure that variety classification, receival standards and biosecurity align with attributes required by buyers, and are backed by independent technical support, traceability and verification.
- 65-70% of Australia's wheat is currently exported but likely to decline as domestic consumption outpaces growth in domestic supply on the east coast.
- There is potential to increase Australia's market share in Asia, but this market is highly competitive.
- High levels of foreign ownership of grain trading in Australia may increase the risk of under investment in technically supporting and marketing Australian grain to increase demand.

Grain producers will profit most by producing the types of grain which consumers prefer, and by producing that grain as cheaply as possible.

The key to expanding the industry is knowing who the customers are and what they want and having prices transmitted as transparently as possible.

6.1 FEATURES OF THE WHEAT MARKET

Global wheat consumption has doubled in the past four decades to about 650 million tonnes, with some 100 million tonnes or 15.4 per cent, being traded internationally. Australia typically supplies about 10 to 15 per cent of the world trade in wheat.

There are many international customers for wheat. In an average year:

- Only six countries import more than 5 million tonnes of wheat.
- A further 10 countries import 3-5 million tonnes.
- 32 countries import between 1-2 million tonnes.

- 72 countries import between 500,000 and 1 million tonnes.

The major customers importing wheat from the international market between 2005 and 2009 were Italy, Spain, Algeria, Brazil, Japan, and Indonesia, with shares of between 4-5 per cent of world trade.

Developing countries account for about 75 per cent of annual wheat imports and these customers are likely to continue to account for growth given the combination of increasing population, increasing urbanisation, higher incomes and changing dietary patterns.

The purposes for which wheat is used in developing countries differ from those in developed/western countries. This has caused a shift in quality requirements and will continue to do so in the future. Three key shifts occurring in the trade environment that could demand a response from Australia are:

- The role of China in balancing its demands for wheat that could potentially be significant in world trade depending on China's production, grain stocks and policy on food security. Although in recent years Chinese imports have been small, from the 1960s and up

to 1996-97 they varied from about 5–10 million tonnes. During 2004-05 they were 6.7 million tonnes but in 2007-08 they were as low as 50,000 tonnes.

- Changing trade patterns in the Middle East. From 1990 to 2000 imports declined to around 10 million tonnes from about 18 million tonnes as a result of recovery in domestic production and stagnant consumption. This contraction in the Middle East market was an important trend for Australia, with around 40 per cent of Australia's exports going to the region. The share of exports to the Middle East has now fallen to about 17 per cent or just 2 million tonnes over the five years 2004-05 to 2008-09. The Iraq war and limitations on its imports from Australia has cost Australian wheat sales. Recently, however, imports by the Middle East have almost doubled to more than 20 million tonnes. Australia has also faced increasing competition in this market from both traditional competitors such as the United States and Canada and newer competitors, such as India.
- Opportunities to develop new customers as the United States and Canada shift away from wheat to corn and soybeans and the notable long-term decline in their shares of international trade in wheat. For much of the Asian region, where growth is forecast, demand for wheat will be met by imports as many Asian countries do not produce wheat. Some of the major consumers of wheat are also producers, such as Iran and Iraq, but they are not self sufficient and therefore need to import various quantities from year to year. Other significant consumers, such as China and some of the states of the former Soviet Union, are opportunistic importers and exporters as there can be significant swings in production.

The world market for wheat-based products is dominated by bakery products with production of baked goods, breakfast cereals and biscuits making up about 88 per cent of the market segment. Pasta accounts for about 5 per cent and noodles about 7 per cent. This share is similar for Australia.

It is clearly important for Australia to focus on the large baked goods market while at the same time developing approaches that can lead to product differentiation. In the

Asian markets, to which most Australian wheat is exported, the importance of noodles is greater.

Australian wheats are generally suitable for making these products because they are white and usually have very low screenings and moisture contents, all of which allow flour millers to increase their yields compared with typical red-grained wheats with higher moisture and quantity of screenings.

More than 52 per cent of Australia's wheat goes to six countries – Indonesia, Japan, Korea, Malaysia, Egypt and Iraq. Indonesia is Australia's largest market. The main customers for Australian wheat, 2004-2008 five year average, can be seen in Table 3.

Country	Average wheat imports
Indonesia	2.3 mt
Malaysia	1.2 mt
Japan	1.1 mt
Korea	900,000 t
Egypt	700,000 t
China	600,000 t
Vietnam	250,000 t

Data source: Grain Growers Association 2010

The amount of grain which these importing customers take is quite changeable from year to year. The remaining exports are more widely spread although freight proximity to Asia, as well as the quality of Australian wheat, means that a significant proportion is exported into other Asian and Pacific region markets. These markets, in order, include China, Yemen, Iran, Thailand, India, New Zealand, Kuwait, United Arab Emirates, Pakistan, Bangladesh, Papua New Guinea, Fiji (countries with more than 100,000 tonnes average for five years).

Australia also exports a small quantity of the higher-value durum wheat (1–4 per cent of total exports), mainly to Italy.

During the late 1990s the share of Australia's exports to the Asian countries declined significantly, while exports to the Middle East grew. Then, with the economic growth of Asia

came a growing demand for wheat and a dramatic growth in the allocation of Australia's wheat to Asia at the expense of the share going to the Middle East.

Australia's major international customer is Indonesia with an average demand of well over 2 million tonnes per year. On a value per tonne basis Indonesia is a middle-value market, whereas Japan, Korea and Sudan are high unit value markets. Italy is a high unit value niche market which imports much of Australia's durum wheat.

To meet customer demand, the grades of Australia's bulk exports in 2008-09 can be seen in Table 4.

Grade	Per cent of exports, 2008-09
APH	13
APW	35
AH	20
ASW	14
Milling	4
AGP	2
Feed	4
Durum	2
Noodle	7

Data source: Wheat Exports Australia Report for Growers 08-09

Domestic milling markets consume a little over 10 per cent of production or 2.3 million tonnes of wheat annually, with nearly three quarters of that being for human consumption. Australia produces about 2 million tonnes of flour per year with about 13 per cent of it being exported. The major domestic use is bakery products which account for 37 per cent of the total, with bread the major component.

Overall, Australia is in a fortunate geographic location to compete in the growing Asian market, however the industry will need to continue to innovate and improve quality so as to ensure Australian wheat continues to meet the high standards expected of it in a market subject to intense international competition.

Having the diversity of product and the flexibility to take advantage of opportunities in other markets will

also be increasingly important. Effective differentiation, branding, technical support, traceability, quality assurance and reliability will all play an important role in winning customers and thus maintaining market share in the higher-value markets.

These opportunities should be seen in the context of recent complaints from a number of Australia's largest customers that wheat quality is falling, and becoming more variable. This is particularly so for containerised grain shipments. However, it should also be noted that there does not appear to be an increase in shipment rejections in either bulk or container exports.

6.2 PROMOTING AUSTRALIAN GRAINS

In a deregulated market many private firms have invested significantly in building capacity to trade Australian grains. Some maintain this capacity in infrastructure, others have invested in execution networks to acquire grain from producers through having a number of agents present in grain growing areas. Once a company makes a significant investment its prospects are dependent on the amount of Australian grain that is grown and consumed and the share of the market it can capture.

Therefore, each company will have an interest in ensuring that their own grain is competitive in world markets and will act to promote the grain that the company can acquire and sell using its Australian assets. Some multinational traders may market Australian wheat as part of a suite of wheat types that they source from around the world. This may be as part of a unique blend or as individual grain origins.

However, while there may be incentives for private interests to technically support and market Australian wheat, there may be occasions when there is likely to be underinvestment. This will occur where individual traders cannot individually or acting collectively recoup sufficient returns on the investments to support the consumption of Australian wheat and other grains. Also, when margins are tight and resources limited there may be alternative uses of the private sector's funds that give a higher return than

from providing technical support. This may be due to the generic nature of the investment or that the transaction costs associated with any collective action are prohibitively expensive or expose firms to loss of corporate information.

A trader may also profit more from substituting its own services and inputs at the expense of the grain.

Also traders will only invest where they can capture sufficient returns to justify the investment. Investments to encourage improvements in grain quality pre farm gate are difficult and expensive for markets to capture. Vertical coordination or integration does provide some opportunities for traders to capture returns from investments in grain quality pre farm gate. There are signs that some firms are moving in this direction (for example Cargill aims to be an integrated grain supplier worldwide, GrainCorp also appears to be moving toward this type of strategy at present).

Similarly, the benefits from increasing demand for Australian grain are difficult for traders to capture. Increases of demand for Australian grain are more likely to flow to producers, reducing incentives for individual traders to make investments in this area. It is likely at times to be more efficient for traders to compete for market share, or trade grain from a wide range of sources that promote increases in demand for Australian grain.

Therefore, it is likely that there will be at times underinvestment in increasing the demand for Australian wheat. Recent discussions with millers in Asia, conducted as part of gathering information for GrainGrowers' "*What the World Wants from Australian Wheat*" project suggest that Australian wheat is not currently being supported as much as it was under the single desk. This may be due to Australian based traders being preoccupied with establishing market share and mergers and acquisition activities or it may be due to something more permanent.

Examples of where underinvestment may occur in market access and development include:

- Training of millers in the use of Australian wheats, as millers can apply these skills to a range of Australian wheats and are not committed to purchasing from one supplier.
- Providing technical support and specialist industry knowledge to trade negotiators.
- Developing processing techniques that are applicable to a range of Australian wheat types, such as rapid dough techniques.
- Providing medium and long term market intelligence to the public research sector.
- Biosecurity.
- Training customers in the most effective and efficient means of storing and handling Australian wheat.
- Many activities under this theme may be conducted in cooperation with a number of commercial players who require an independent facilitator of the investment. An example of this may be the development of new processing technologies that a group of small traders may not have the capacity to undertake individually, but collectively they could do so.

Any grain producer representative organisation undertaking a role in the activities cited above needs to ensure there is a likelihood of market failure before investment is undertaken.

ACIL Tasman has developed a check list to use in deciding when and how to invest producers' funds, which would also be applicable to any mutual grains industry development organisation. The check list can be summarised as:

- Which groups are likely to benefit from the proposed investment?
- Do some, or all, of these groups have an incentive to make the investment?
- What might happen in the absence of the organisations' involvement?

- Why are industry participants, or those servicing the industry, not making all or part of the investment?
- Are there identifiable market imperfections (market failure or policy distortions) leading to underinvestment or inappropriate levels of activity?
- Why are the transaction costs of bringing together potential beneficiaries so high? Can they be reduced?
- Are there impediments that mean that the investor lacks the incentive to invest?
- If the organisation makes the investment, and the outcome is successful, will the results be adopted, or will the program otherwise impact upon industry profitability?
- Is the situation innate or a legacy of past attitudes and culture within the industry and service suppliers?

How should the organisation become involved? Should it:

- Focus on removing impediments that are reducing the incentives for others to invest?
- Seek to change the culture through some form of short-term involvement, with a view to medium term withdrawal?
- Focus on “solving the problem” as identified?

What are the implications of the organisations’ involvement for investment by others:

- Will the investment be made anyway, in the same timeframe, and with the same expected outcome?
- Are private interests acting strategically to induce the organisation to pay?

What should the organisation do?

- Act as a facilitator between investors and industry participants?
- Act as coordinator for private interests willing to fund investments collectively?

To undertake this role to provide the Australian wheat industry with the capacity to identify and correct market failures an organisation acting on behalf of members will need to:

- Adopt a strong market failure framework to assist in the identification of market failures and how best to respond.
- Develop a network of contacts and agents that can market intelligence trends and information from Australia’s major wheat markets.
- Collect and analyse information on milling, baking, processing, retailing and consumer trends.
- Collect intelligence on competitor trend and strategies.
- Have good knowledge of the public and private activities in wheat R&D, technical capacity and commercial promotion and product development.
- Monitor the marketing activities of companies involved in the marketing of Australian wheat to domestic and international companies.
 - invest in regular customer interviews and surveys to determine the level of knowledge of Australian grain innovations, crop status and concerns with marketing support and technical assistance.
- Have access to the skills and infrastructure to carry out the required activities once identified.

Where market failures are identified a grains development organisation could undertake the following specific activities:

- Technical support for the Australian wheat industry:
 - Technical expertise in grain quality and processing advice and trouble shooting.
 - Nutritional information and promotion of Australian wheat.
 - Packaging and delivery of targeted information on the grains sector to current and prospective customers.
 - Substantial international food industry networking and alliance building.

- Training and generic customer support services:
 - Specialist training in milling technology, cereal sciences, baking technologies, Asian product development.
 - A range of analytical testing.
 - Grains industry product development.
 - Economic assessment of the grains industry supply chain.

BOX 5: IMPLICATIONS FOR THE GRAINS INDUSTRY

- There are likely to be occasions where grain traders are likely to under invest in promoting Australian grain (technically supporting and adding value to grain rather than generic promotion) and therefore producers will have to invest themselves collectively.
- Traders have some incentives to invest in grain quality when they can capture some of the benefits through vertical coordination or integration of the supply chain. However, traders have less incentives to invest to increase demand for Australian grain.
- Grain producers will almost certainly have to invest to increase demand for Australian grain through improvements in quality and technically support Australian grain.
- This type of investment is likely to complement investments made by traders, who will have incentives to promote certain aspects of Australian grain at times.
- Producers investing collectively need to ensure that they apply a strict market failure criteria to investments to ensure they that do not duplicate, or worse, crowd out, private investments in the supply chain.
- The most serious effect of crowding out would be a reduction in the competitiveness of small fringe traders that offer marginal competition to large domestic and multinational traders.

7 Receival standards and variety classification

KEY POINTS: RECEIVAL STANDARDS AND VARIETY CLASSIFICATION

- Importance of accurate and prompt price signals to producers.
- Effective and well resourced producer representation is needed in Grain Trade Australia.
- Blending margins available from owning and storing grain.
- There is a trade-off between increasing the number of wheat grades and the cost of increasing segregations in the bulk handling system.
- Traders have strong incentives to increase the spread between delivery grades to increase the opportunities to blend grades and capture higher returns.

7.1 VARIETAL CLASSIFICATION AND RECEIVAL STANDARDS

Wheat classification in Australia is managed through varietal classification and receival standards. The wheat variety is initially classified into a grade (or class) through the Wheat Classification Guidelines as set by Wheat Quality Australia (WQA). Variety classification of wheat is based on processing and end product quality traits inherent in the grain, taking into account attributes that cannot be tested for at delivery. These attributes include criteria such as flour yield, colour, dough strength and extensibility and performance in end product (Wheat Quality Australia, 2011).

Receival standards allow for the categorisation of physical deliveries into binning grades according to the receival standards framework. This categorisation at site relies on the producer's variety declaration at delivery, and focuses on the physical attributes and condition of the grain such as protein, screenings, moisture, test weight and contaminants. These receival standards are managed by Grain Trade Australia who annually review the standards on behalf of the industry (Grain Trade Australia, 2010).

7.2 WHEAT QUALITY – HOW IT WORKS

7.2.1 THE RELATIONSHIP BETWEEN WHEAT GRADES AND BINNING GRADES

Figure 8 shows how binning grades, as defined by the receival standards, are utilised across varying grade classifications of wheat. Likewise, a variety of wheat assigned a certain grade has the potential to be categorised into various binning grades according to its quality attributes at delivery.

As an example, let's assume that a producer delivers a load of grain and declares that it is an APW grade. From the figure below we can ascertain that this grain will only be received into either APW1 (or 2 depending upon state), ASW1, AGP1, AUW1, HPS1, SFW1 or FED1. This will be dependent on where the grain fits in the quality parameters set out in the receival standards. APW grain cannot be binned as a APH2, H1, H2 or AUH2 because these are for hard wheat grades APH and H2. WQA has determined that APW wheat does not meet the target and marginal parameters for variety, class and region as set out in the Wheat Classification Guidelines.

FIGURE 8
WHEAT GRADE AND BIN GRADE MATRIX

		WHEAT GRADE (OR CLASS)								
		BIN GRADE	APH	AH	APW	ASW	AGP	ASF1	ASWN	ADR
HARD	APH2	■								
	H1	■	■							
	H2	■	■							
	APW1	■	■	■						
	APW2	■	■	■						
	ASW1	■	■	■	■					
	AUH2	■	■							
MIXED	AGP1	■	■	■	■	■	■	■		
	AUW1	■	■	■	■	■	■	■		
	HPS1	■	■	■	■	■	■			
	SFW1	■	■	■	■	■	■	■		
	ANW1								■	
	ANW2								■	
SOFT DURUM	SFT1						■			
	SFT2						■		■	
	DR1								■	
	DR2								■	
	DR3								■	
	FED1	■	■	■	■	■	■	■	■	■

Data source: Productivity Commission 2010

The significance of these binning grades, also referred to as segregations of grain, is that acquirers make bids to the producer or even other acquirers in the market based on these. This is where the relationship between wheat grades and binning grades starts to facilitate a market system for trading.

7.3 THE RELATIONSHIP BETWEEN THE TYPE OF GRAIN, PROTEIN CONTENT AND END USE

Associated with the classification system illustrated in Figure 8 are three fundamental factors that explain most of the variation in wheat quality. Grain hardness (soft, mixed, hard or durum), protein content and dough or protein quality aspects are the basic quality determinants for wheat

grain (GRDC, 2009). Figure 9 demonstrates how for specific end products there is a definite range of protein and hardness that is required.

These fundamental quality determinants form the basis for world wheat trade and the grading systems that countries, like Australia, use to provide grain to the trade. Protein is considered the single most important quality factor in international trading (GRDC, 2009).

FIGURE 9
THE RELATIONSHIP BETWEEN
GRAIN HARDNESS, GRAIN PROTEIN
CONTENT AND END PRODUCTS



7.4 NEW AND EVOLVING CLASSIFICATIONS

The wheat industry today is a dynamic market that is being constantly impacted upon by the global economy, national aspects and agricultural development. Changes to the regulatory system, growing end-user sophistication and increasing on-farm storage are all examples of how the industry is evolving. The importance of our classification system to be commercially relevant and reflect the value of the grain to the end-user is paramount to its efficiency.

The criteria by which a variety can be considered eligible for a given grade evolves, or can be created, in response to changing market signals and/or the specific make up of grades required by the end user. For example, in 2010/11 there was the creation of an APWN grade in Western

Australia. This new wheat grade was introduced to focus on the Japanese and Korean markets, to capture the high starch pasting quality of some of WA's APW wheat varieties. Only certain APW varieties are eligible for the grade and in terms of receival standards the variable factor from an APW wheat classification is the protein requirement. APWN wheat protein must fall between 10 and 11.5%, as opposed to just being over 10% for APW.

Variety classifications may be developed to incorporate a wider range of varieties whose quality can be demonstrated to meet the varietal and production protocol.

Additional binning classifications may open up in response to seasonal conditions, allowing the producer to capture value from grain that would otherwise be downgraded and giving the trader opportunity to work with off-spec grain.

7.5 VALUE CHAIN ANALYSIS OF THE CLASSIFICATION SYSTEM

7.5.1 WHY HAVE A CLASSIFICATION SYSTEM?

The Australian wheat classification system has been gradually developing since the mid-1950s. As domestic millers started to initiate their own segregation and blending processes to meet quality criteria of their customers, entrepreneurial grower groups followed, realising the price premiums that could be generated through the innovation of grading.

The incentive to classify a commodity is to provide industry good to all those involved in the market; to improve producers' returns, to enhance buyers' satisfaction and to increase the efficiency of marketing (Freebairn, 1967).

The differentiation of wheat quality in Australia through the classification system is a crucial component of the Australian wheat industry. It supports international competitiveness by providing benchmarks for trade and quality assurance and helps improve the value of Australian wheat for all involved by enhancing the marketability of

the grain through the supply of a consistent product. This consistent product is important to have within and between deliveries, whether they be domestic or international. Wheat classification also facilitates cost-effective bulk handling and storage, aiding in lowering the transaction costs associated with grain logistics (Productivity Commission, 2010).

7.6 THE EFFECT OF CLASSIFICATION ON MARKET FUNCTION

The market expresses satisfaction in the system by offering more for the graded commodity compared to the price they would be prepared to pay for the same quantity ungraded. However, economic analysis shows that if grades are not differentiated enough from each other as there becomes more the issue of substitutability erodes this buyer satisfaction (Freebairn, 1967). It is important that the number of classifications and relevance of them to market conditions and demand is appropriate and balanced. Otherwise asymmetric opportunities open up within the market and the fundamental function of the system is compromised.

The wheat classification system also creates additional demand for the commodity as potential buyers view the graded commodity as having greater value (Freebairn, 1967). This demand helps to maintain (or even expand) market share, and whether it comes from the domestic or international market results in a higher level of return back through the value chain and keeps the producer in business.

Therefore, critical to an efficient classification system is its ability to respond to buyers marginal value of additional classifications and reducing the costs of segregating different classes of grain. This creates a potential tension between those that establish the classifications and those that provide the segregations in the bulk handling system, and suggests the establishment of grain classes should not be controlled by those offering segregation services.

In Australia, there may be an opportunity to increase the number of classes of wheat and then allow the bulk

handling system to determine what level of segregation it can offer that optimises its marginal returns. This may open up opportunities for smaller traders and collections of farmers to offer segregations not available in the bulk system. It may also encourage greater competition between the larger bulk handling service providers.

7.7 WHEAT CLASSIFICATION IN OTHER COUNTRIES

7.7.1 OTHER MAJOR EXPORTERS

The United States

The United States Standards for Wheat has eight official classes for wheat, some with subclasses, determined by hardness, colour of the kernel and of the planting time (winter and spring) (U.S Department of Agriculture, 2004). The United States has the widest array of wheat classes and does not concentrate on quality parameters with respect to varietal release or the official grading standards (U.S Department of Agriculture, 1993).

The Australian classification system is relatively simpler than the United States, and Canada's for that matter, in the respect that we only have one planting each year and all of our grain has a white seed coat. Also, the United States and Canada use geographic separation given the vast distances between their major production regions (GRDC, 2009).

Canada

In the case of Canada, stringent quality control is used as a marketing tool. Their wheat classification system has tight control on varietal registration, with varieties being carefully evaluated for end-use quality performance, agronomic performance and disease resistance. The grading system ensures that all grain loaded meets tight export standards (Canadian Wheat Board, 2008).

The strict wheat classification system in Canada encourages blending before it reaches port. Tight varietal control, plus efficient transport and handling systems, means grain from a large geographic basis can be easily blended at country elevators before reaching the terminal elevators (Canadian Wheat Board, 2008).

Australia's relatively rigorous classification system also means that a lot of blending occurs on farm or at the site of storage and handling.

Argentina

Argentina, like the United States, is not heavily concentrated on quality. It is the Argentinean Government who controls variety licenses through a committee of industry representatives, whose bias appears to be towards quantity. Grading is similar to the criteria used in the United States (U.S Department of Agriculture, 1993).

7.7.2 AGRICULTURAL INTERVENTION DISTORTING WHEAT QUALITY

Australia, relative to the rest of the world, does not employ the use of government intervention in the agricultural sector. Producer support offered through the Common Agricultural Policy in the EU and the United States Government's support programs through various domestic and trade policies have a significant effect on their market structure and how they deal with wheat quality.

The mechanisms of the support programs offered by the United States and EU tend to encourage yield over quality, distorting the prices achieved for grain internally and also externally (U.S Department of Agriculture, 1993). These programs have ramifications through the whole of the wheat industry, right back to plant breeders being focused on breeding for increased yield.

This implies that even if the United States worked to improve their wheat quality through a tighter classification system, it would need trade liberalisation to support it and send the quality message back through the chain (U.S Department of Agriculture, 1993). The US Department's (1993) comprehensive study also found that "wheat quality matters most in markets that do not receive export subsidies or other forms of export assistance, and countries that conduct imports under a state trading system are less likely to be sensitive to quality and more sensitive to price".

7.7.3 INTERNATIONAL SIGNIFICANCE OF WHEAT QUALITY

Obviously wheat quality is not the only consideration of an importer. Other factors such as price, trade-service reliability, availability of credit or food aid grants and intergovernmental relations can play a part in decision making.

Of the 18 countries assessed in the aforementioned United States Department's study, 44% rated price as their premier consideration when purchasing wheat internationally. Quality was the first consideration for 22% of countries, and trade servicing an equal 22%.

BOX 6: USDA METHODOLOGY FOR ASSESSMENT OF WHEAT: THE CONSUMER PREFERENCE INDEX

In order to assess other countries perceptions of United States wheat quality foreign buyers were asked two sets of questions. These responses were then indexed for consumer preference.

The 2 sets of questions were;

- i) purchase criteria- buyers were asked to rank the importance of various factors associated with their choice of a country supplier for the dominant class of wheat. They then had to rate the performance of United States wheat and the performance of a major competitor on each of the noted factors.
- ii) quality factors- buyers were asked to identify the most important quality characteristics in their purchase decisions, and again to then rate United States wheat and the wheat of a major competitor on each of these.

7.7.4 FARMER COOPERATIVE STORAGE AND BLENDING RENTS

A clear benefit of on-farm storage over delivering to a local receival point and warehousing is that producers retain control of their grain and can take the opportunity to blend it if the opportunity arises. The opportunities are increased if several producers are able to cooperate to accumulate grain and share the gains from creating blends, which meet market specifications. The present grades of wheat and barley are very broad categories, with substantial differences in price between each grade at times. In April 2011 the spread between PH2 13% and Hard Wheat 11.5% was \$65.00 and the spread between APW 10% and AGP 10% wheat was \$44.00. Similarly, the spread between malting barley and feed barley was \$71.00 (*The Land*, 14 April 2011).

Provided buyers can be found, there are opportunities to increase producers' returns by capturing the blending margins enjoyed by bulk handlers and traders because not all buyers necessarily want grain conforming to the grades determined by the Wheat Classification Council. For example, a parcel of PH1 valued at \$378 per tonne may average at least 14% protein so it is possible to blend it with some PH2 and still achieve the PH1 price of \$378 per tonne, provided the protein level of the blend is at least 14% (to meet the PH1 receival standard). Clearly there are some costs associated with the additional handling of the grain but these can be small if the facility has scale economies.

Producers who have developed a relationship with buyers have also found that a lot of grain can be sold 'out of specification'; that is, the buyer's requirements may be different from the grades set and used in the bulk handling system and they will pay a premium to purchase precisely what they want. In the most recent harvest, large quantities of barley were just outside the test weight set for the malting barley category but, instead of it being downgraded to the feed category and being discounted by \$62 per tonne, farmer cooperatives were able to sell it for close to the malting price and return that price to producers because several buyers were short of their malting barley

requirements. By contrast, producers who delivered to the conventional system only received the feed price because that was how their barley was graded. The trade took the difference (Personal communication: Neil Luehman, Berriwillock Grain, Victoria, 2011).

The farmer cooperatives generally do not trade grain; their policy is to find out what the buyers want, blend to their requirements and then offer parcels of tightly specified grain to buyers. All grain is either tested in on-farm silos or on delivery and initially segregated and stored according to test results.

Members of the farmer cooperatives also benefit from shared local storages which are best built at a site which is easily accessible to all of the members. The preferred size is about 150,000 tonnes. The cost of operating the facilities is of the order of \$7 per tonne and the members of the cooperative are charged about \$10 per tonne. Other (non-member) producers are charged \$16 per tonne plus carrying charges, which compares with about \$20 per tonne at the local bulk handlers' facilities.

The cost of \$25,000 - \$30,000 per producer to join the cooperative funds the construction of site works, silos, bunkers, receival dock(s) and testing equipment. Operating costs are funded from the handling margin.

However, it should also be noted that when producers do join a storage cooperative they take on all of the commercial risks of grain classification and segregation. Although there have been some high profile cooperative collapses in Australia, the fact that storage cooperatives can be formed at relatively low costs and reasonably quickly demonstrates that there are low barriers to entry in storage and handling.

Provided the cooperative storage and blending operations are run conservatively and sound relationships are developed with buyers, they are an effective way of improving producers' returns whenever the current grading system continues to create economic rents from blending.

7.7.5 A BULK HANDLERS RESPONSE TO ON-FARM AND COOPERATIVE STORAGE

Last season CBH Grain trialled a producer weighted averaging system, known as Quality Optimisation. This system gave producers greater control and flexibility over the quality grade of their grain by allowing them to virtually blend loads.

Through the use of LoadNet, CBH's online service for monitoring deliveries and associated paperwork, producers could offset individual loads not meeting certain specifications against their own quality bank of loads. This decreased the need for the physical on-farm blending of grain, saving the producer time and money.

The trial involved 216 producers at five sites from across the Geraldton and Esperance port zones, allowing them to Quality Optimise for wheat grain. In a post trial survey, 89 per cent of participants reported that the Quality Optimisation system had rewarded them more directly for the quality they delivered. This concept of value adding post delivery also had other benefits including the ability to reduce harvest time by an average of two days, a harvesting set-up using less equipment and the lowering of freight and cartage bills.

For those companies involved further along the grain supply chain it enhanced the consistency of grain quality out-turned from the bulk handling facilities.

This coming harvest CBH Grain will go ahead with a full roll out of the system, making it available to grain producers in Western Australia, who on average deliver in aggregate more than 330,000 loads of grain into the bulk handling sites each year. It will still only be applicable to wheat.

BOX 7: IMPLICATIONS FOR THE GRAINS INDUSTRY

- Producers need to ensure that grain classification reflects the marginal value that buyers get from increasing grain differentiation.
- There needs to be a regular review of classifications to ensure that they reflect buyers end uses of grains and transmit clear price signals from buyer to producer.
- Further research needs to be conducted to see if Australian wheat classifications could be expanded to increase differentiation between varieties and regions.
- The current classification system is not clear on how it identifies buyers demands and evolves classifications to meet them. Producers need to be confident the classification system can and will evolve.
- Blending rents can be extracted by traders if segregations in the receival system are too broad. To ensure rents are not extracted by traders producers need to:
 - Ensure they are using sufficient segregation that reflect buyers demands.
 - Continue to invest in R&D to ensure on farm storage and handling systems are cheap and efficient.

8 Suppliers

KEY POINTS: SUPPLIERS

- Storage, handling and transport services are a major input cost in the transaction between grain producers and grain buyers.
- Scale and scope economies are critical to the profitability of the grain handling system.
- The storage and handling system is largely export oriented and relies on the amount of grain produced and exported.
 - On the east coast of Australia exportable surpluses of grain are likely to decline and become less frequent as domestic demand increases faster than production and if supply volatility remains high.
 - On the west coast and in South Australia export markets are likely to continue to dominate the markets making the bulk handling system almost exclusively export focused.
- However, barriers to entry are falling for grain storage and handling on-farm and as a result on-farm storage and handling capacity is increasing.
- Grain transport services also face low barriers to entry and there is strong competition between rail and road transport.
- Price transparency in the supply chain has increased as producers can sell grain at multiple points in the supply chain (on-farm, silo, regional centre port etc) and over time. This means that transport, storage and handling costs have now been unbundled from the grain price making comparisons between service providers simple, quick and effective.

Benchmarking studies of grain producers have consistently shown that the main costs to the grain business are:

- Fertiliser.
- Weed and pest control.
- Machinery operation and depreciation (including contract services).
- Fuel.

According to Holmes and Sackett (2009) these costs made up 75 per cent of direct wheat production costs, on average, between 1998 and 2009. These costs were higher as a proportion of total costs for barley and canola production. If post farm gate costs are also considered as inputs then the major grain production costs also include:

- Storage and handling (on-farm and off farm).
- Transport.

8.1 STORAGE, HANDLING AND TRANSPORT

8.1.1 TRENDS AND CURRENT SITUATION

Many of the recent changes to the storage, handling and transport markets have their origins in the decision by the Hawke Government to deregulate the domestic market for grain. At the same time there were also considerable changes to freight regulations which no longer mandated the use of rail to cart grain away from local silos, largely the result of the Government's response to the McColl Royal Commission into Australia's grain storage, handling and transport markets.

On-farm storage has also played an increasingly important role in the storage and handling market in Australia. According to an ABARE survey conducted in 1998-99 there was 10.5 million tonnes of on-farm storage in

NSW, Victoria and Queensland (Turner, Connell, Hooper, & Gleeson, 2001). Today the ABS estimates that there is over 11 million tonnes of on-farm storage on the east coast, representing an increase per year of approximately 4.8 per cent.

In WA in 2009 the CBH Group surveyed the majority of its grain producer members on their current and future on-farm storage capacity. The survey results show that current on-farm storage capacity appears to be at 2.35 million tonnes and could possibly grow to 4.22 million tonnes within three years. The majority of this growth in capacity will be in storages of greater than 1,000 tonnes (ACIL Tasman, 2009).

At the same time the bulk handling companies were being moved to grower ownership, privatised and were merging with one another. These changes allowed capital to be raised and increased competition creating incentives to invest in new facilities and services (Turner, Connell, Hooper, & Gleeson, 2001):

The large increase in grain production [in the 1990s], combined with increased competition in grain handling and storage, has resulted in grain handlers providing larger and more technologically advanced storage facilities. Grain handlers have built new storage facilities, increased the size of others in strategic areas, relocated facilities from areas that were considered to be underutilised or inefficient, and sold others. These changes are aimed at reducing delivery and receival times, improving grain quality, reducing cost and increasing segregations and therefore boosting marketing options.

However, while there have been significant changes to the grain market there have not been any significant changes to the rail network and, in particular, the linkages between port zones. This restricts the amount of grain, and rail capacity (wagons) that can be transferred cheaply and quickly between port zones.

8.1.2 LESSONS FROM THE 2010-11 HARVEST IN SOUTH AUSTRALIA

In 2010-11 there was a record harvest of 10.43 million tonnes of grain in SA, exceeding the previous record crop of 9.36 million tonnes in 2001-02 by some one million tonnes. Harvest was made all the more difficult because of heavy rain at the time.

Producer frustration was very high as a result of delays at receival points and anomalies in classifications based on visual assessment, which led to classifications being inconsistent from one site to the next. Some farmers reported that their grain from one bin received three different gradings from visual assessment and that the financial losses from incorrect downgrading were huge (Personal communication. Leighton Huxtable, Lowaldie April 2011).

There was talk of legal remedies to recover the financial losses and, not surprisingly, rural-based politicians took up the cause. The Shadow Minister for Agriculture alleged that Viterra's decision not to use a falling number machine in every case had cost producers money; that some producers had to freight their grain much greater distances to receive up to an extra \$130 per tonne by taking their grain to competitor sites that were utilising a falling numbers testing machine.

There were also serious logistics problems at Port Adelaide where ship loading was delayed due to unusually large quantities of poor quality grain and insect infestations. The need for more thorough testing resulted in delays and there were rejections for export by the Australian Quarantine Inspection Service because the grain did not meet importing countries' requirements. The port operator, Viterra, came in for much criticism for the delays but the basic cause was that significant quantities of grain were not up to export standards.

Lessons

There is general agreement that some grain was downgraded incorrectly as a result of errors in visual assessment and that, as far as possible, all grain should be tested objectively according to the requirements of the market. Objective testing will require greater investment in equipment.

There would not have been the rush on receivals – and the pressure on the bulk handlers to speed up the rate of receivals by using visual assessment – if more producers had on-farm storage. An increasing number of producers have already decided to construct their own storage, both for harvest management and for more control over marketing.

8.1.3 THE EAST COAST GRAIN MARKET

The east coast grain market is divided between domestic human, industrial and livestock consumption and exports. In a typical year approximately 15 million tonnes⁴ of grain are produced in Victoria, NSW and Queensland. Of this, up to two thirds or 10 million tonnes in an average year is likely to be purchased for use in the domestic market and 5 million tonnes is likely to be exported (ABARE, 2009). Where supply does not exceed 10 million tonnes, little if any grain is exported from the east coast. In these years grain is likely to be imported from South Australia, Western Australia or from overseas by east coast grain consumers.

Domestic use is divided between livestock production, industrial use and human consumption. As can be seen in Chart 18, grain consumed to produce milk, chicken meat and beef is increasing. It is also likely that industrial use of grain will continue to increase for ethanol production. This, though, is highly dependent on state governments maintaining ethanol mandates for petrol.

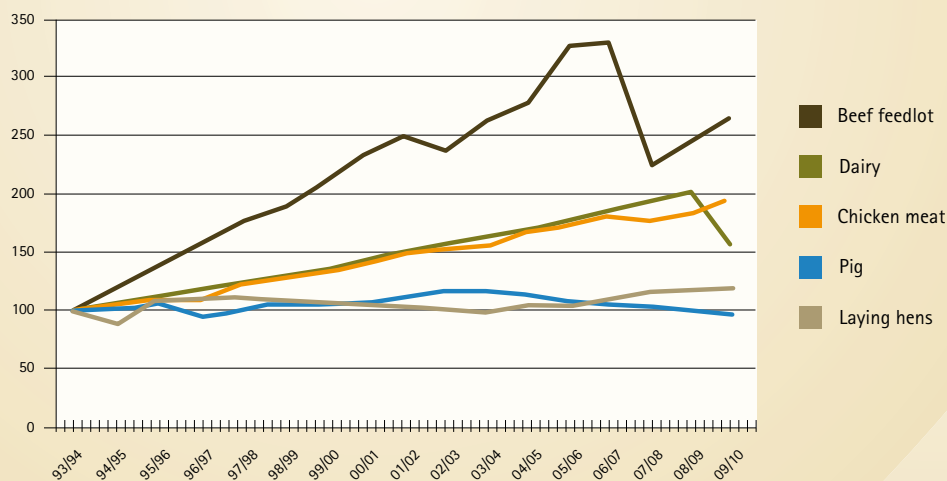
The increasing domestic consumption is likely to reduce the average quantity exported and increase the frequency of no or negligible east coast exports. This may also reduce the amount of grain exported from WA to international customers as this grain may be diverted to the eastern states in drought years.

Of the amount of grain exported, approximately 1.5-2.0 million tonnes is exported in containers and 2.5-3.0 million tonnes is exported in bulk. Of the grain exported in bulk, there are eight bulk export terminals between Portland on the South Australian/Victorian border and Mackay in central Queensland.

Given the wide range of domestic uses and the competing export modes of bulk and containers, the supply chain for grain is complex and offers many pathways that will change depending on the circumstances. The situation is the same on the east and west coast only the proportions exported are different given the relative size of production from each side of the country. The numerous potential grain paths from farm gate to processors are laid out in Chart 19. Of particular note are the numerous paths and the number of times the grain can potentially change hands along the supply chain.

CHART 18

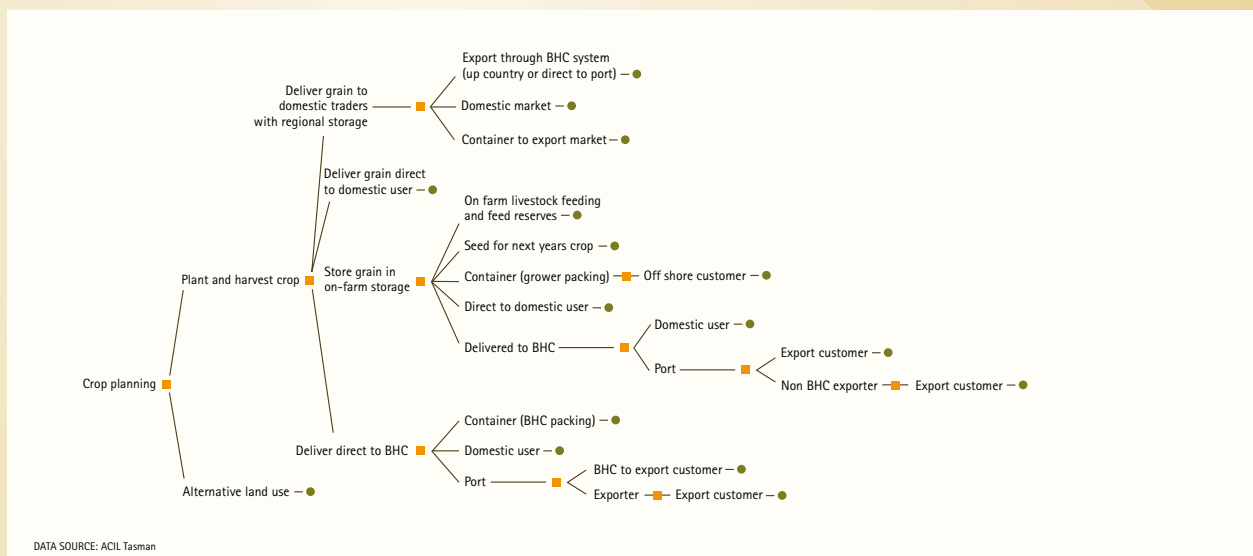
FEED GRAIN CONSUMPTION TRENDS 1993-94 TO 2009-2010



DATA SOURCE: Spragg, 2010

⁴ Includes wheat, barley, canola and other coarse grains.

CHART 19
ILLUSTRATION OF EAST COAST GRAIN MARKET PATHS AND LIKELY MARKET SHARE FOR EACH OPTION



8.1.4 THE WEST COAST MARKET

Western Australia has produced on average in the five years to 2007-08, 41 per cent of Australia's wheat, 27 per cent of Australia's barley, 83 per cent of Australia's lupins and 43 per cent of Australia's canola (ACIL Tasman, 2009). Typically Western Australia does not experience the same volatility of production as the east coast (ACIL Tasman, 2005).

On average 80 to 90 per cent of total grain production is exported annually from Western Australia. As the main grain growing regions of the state harvest the entire crop between October and January each year the storage and handling infrastructure has been developed to receive and store this grain close to production areas. This was in part due to the relative cost of storage compared to transport at the time, particularly road transport. As the Western Australian grain belt was developed, individual truck capacity was much lower than it is today and the road network was in its early stages. Therefore, it was cheaper to build more storages on railway lines close to producers than to cart the grain long distances in trucks. Also, there were many cross subsidies between producers so the real cost of each site was not generally borne by those using it. Traditionally the grain is then exported over an eight to nine month period before the next harvest begins. Typically, the majority of the grain is exported before June

following the end of harvest. The peak grain shipment months are usually been between January and April where up to one million tonnes of grain are shipped each month. This is to ensure that the majority of the grain (mostly wheat) is exported before the northern hemisphere harvest commences (ACIL Tasman, 2009).

8.2 IMPROVEMENTS IN PRICE TRANSPARENCY

One of the most important changes brought about by deregulation has been improvements in the transparency of grain and supply chain costs.

Under the export wheat monopoly, AWB Ltd operated a national pool that was sold through a largely fixed sales program. Pooling was the only way any benefits produced, by compelling producers to collectively export their wheat, could be distributed equitably to producers.

When grain is pooled, the supply chain costs incurred by the pool are borne by producers who contribute to the pool, as they are the residual claimants to the proceeds from the pool. Pooling also contained considerable cross

subsidisation between producers, particularly when operated at the national level. Hence the national pool provided limited transparency of costs on a range of supply chain services (ACIL Tasman, 2005).

Producers and all grain buyers and sellers can now receive prices from multiple sources and at multiple points in the supply chain. For example, prices can be quickly obtained by producers from:

- The Chicago Board of Trade (CBOT) which provides global grain price discovery.
- Market commentators quoting Free on Board (FOB) which is the price of the grain once loaded on the ship.
- The delivered port price which is the price of the grain once it has arrived at, but not entered the port facility.
- The delivered silo price (which could mean the local receival site or domestic trader/buyer facility).
- The farm gate price (individually calculated).

The main difference between each of these prices when quoted at the same time is the storage, handling and transport costs incurred by physically moving the grain from one point in the supply chain to another.

As prices are quoted at each of these points producers, traders and end users are able to enter into a transaction at each point also. The result is that buyers and sellers can separate the grain price from the logistics costs.

Consider the situation where a producer has the opportunity to sell grain at the local silo or deliver it direct to a large regional centre. The producer can obtain quotes at each delivery point. The difference in the prices is the transport, storage and handling costs that the buyer can obtain between the silo and the regional site. If the producer can obtain a lower logistics cost than that which is implied by the difference in the silo and regional price, the producer will agree to the regional price and arrange his own logistics.

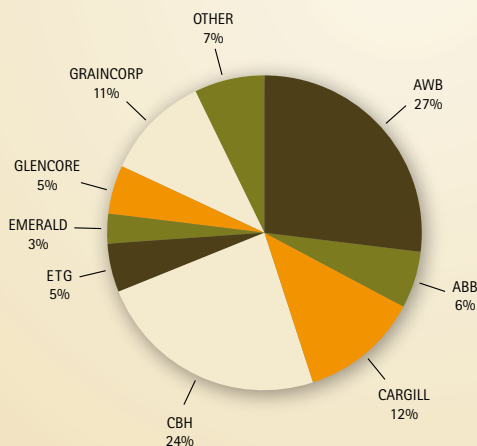
If the logistics costs diverge, arbitrage opportunities occur. Where arbitrage opportunities do occur, the multiple buyers and sellers now active in the wheat market will compete the opportunity away.

The entry of new traders in the export wheat market (see Chart 20), combined with the proliferation of smaller domestic traders means that not only will arbitrage opportunities close quickly when they do open, producers are being offered a range of new selling options and products.

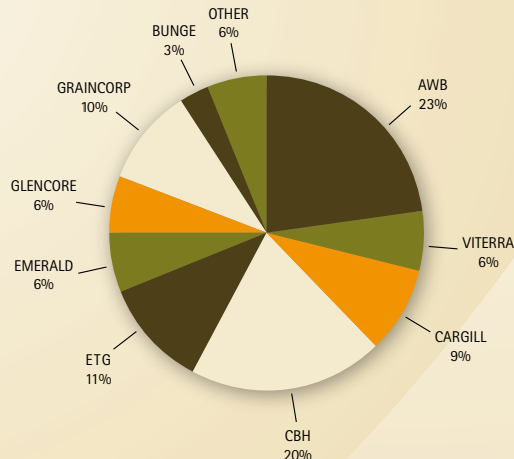
CHART 20

ESTIMATED MARKET SHARE FOR EXPORT WHEAT

2009 CY Bulk Wheat Exports Share – 16 exporters



2010 YTD Bulk Wheat Exports – 15 exporters



DATA SOURCE: Green, 2010

8.2.1 GREATER TRANSPARENCY OVER TIME

In addition to multiple price points in the supply chain, they are quoted at these points with different delivery times. Buyers and sellers can now enter into a grain sale that specifies a location (separating grain price and logistics), and a time for settlement. The difference in price between one time period and the next is the cost of storing the grain by either the seller or the buyer.

As buyers and sellers can trade grain across locations and over time, the logistics, storage and grain price are now

able to be separated. This means that buyers and sellers cannot only choose the least cost logistics option, they can also choose the least-cost storage option. This is important when considering the benefits of building on-farm storage. In summary, the high level of transparency of prices at each point in the supply chain at multiple points in time means that producers can choose the lowest cost combination of services that suits their own situation. This also lowers the barriers to entry to the storage, handling and transport markets and increases competition, thereby providing producers with protection against the monopolisation of the market.

BOX 8: IMPLICATIONS FOR THE GRAINS INDUSTRY

- Producers need to ensure that the barriers to entry to the storage, handling and transport markets are low.
- Producers should not oppose consolidation in the supply chain as scale and scope economies are critical to the competitiveness of Australian grain in international markets.
- Producers need to ensure that the market is transparent to reduce barriers to entry. Consideration should be given to the collection and publication of key industry information and statistics, such as:
 - accurate and timely crop forecasting at a regional level.
 - stocks held by bulk handling companies, farmers, domestic users and stocks in transit.
 - export sales and shipments.
 - market intelligence from export and domestic markets.
- In addition to stocks information, transport statistics may also assist smaller traders to compete. Transport information may include:
 - shipping and container capacity, availability and location.
 - rail capacity reports and location of rail cars.
 - road freight costs.
 - grain freight indexes and differential prices between transport modes.
- Not only is the collation and dissemination of this information likely to increase transparency, it will assist regulators responsible for competition regulation to ensure firms comply with competition laws.

9 Competition and sharing returns from improvements in the productivity of the supply chain

KEY POINTS: COMPETITION AND SHARING RETURNS FROM IMPROVEMENTS IN THE PRODUCTIVITY OF THE SUPPLY CHAIN

- Scale economies are important in reducing the unit cost of storing and handling grain.
- The natural monopoly from declining unit costs does not matter if the service is contestable. Hence the importance of producers having a choice.
- Competition is the only effective way of ensuring that producers receive a 'fair share' of the margins created by improvements in productivity.
- Producer organisations have an essential interest in monitoring and removing barriers to entry and exit in industries serving grain producers.

The degree of contestability, and therefore efficiency, in markets for grain receipt, storage, handling, land transport, port terminal and ship loading facilities depends on the extent to which certain key conditions are met. In summary they require:

- That a potential provider [potential new entrant] of storage, handling or transport services does not face any legislative or other barrier that is not already imposed on an existing operator.
- That any operator of storage, handling or transport facilities is free to leave the market without incurring significant costs (including costs of writing off assets).
- That new entrants not be at any disadvantage compared to existing operators so far as all aspects of service provision and customer loyalty are concerned.
- That new entrants have the prospect of making a profit and are not obliged to compete with existing operators' prices that are below the marginal cost of providing the service and designed explicitly to force the new entrant from the market. (McColl, 1988).

According to McColl the extent to which potential resource cost savings may be available to producers and other players in the industry from greater efficiency in the grains handling, storage and transport system depends on:

- Whether there is a natural monopoly.
- Whether that natural monopoly is contestable.

9.1.1 NATURAL MONOPOLY?

Economies of scale occur when a given increase in all inputs results in a more than proportionate increase in outputs. Hence the average cost of a service declines as the level of production is increased. Where this reduction in cost occurs over the whole range of outputs up to the level which satisfies market demand, the average unit cost of production of a monopolist will always be less than if there were more than one firm in the market.

Economies of scope, by contrast, occur where it is possible to provide a service at a lower cost by producing it in combination with other services than is possible by producing it alone. In these conditions a multi-product firm is always able to provide a service at a lower cost than a single-product or specialist firm.

A similar situation arises when, due to the existence of indivisibilities in fixed capital, the efficient minimum scale of operation is large relative to market demand so the spreading of overheads over a range of outputs reduces unit costs. These economies of scale – commonly known as economies of density – are seen in automotive manufacture and are particularly important in railway operations and vertical, concrete grain storage facilities.

9.1.2 ARE THERE ECONOMIES OF SCALE AND SCOPE IN COUNTRY STORAGE AND HANDLING?

The Royal Commission into Grain Storage, Handling and Transport demonstrated that since larger facilities have lower construction costs per tonne and that unit operating costs decline as throughput increases, there are economies of scale and, accordingly, country storages and handling facilities display some features of a natural monopoly.

However, that monopoly power is limited by the cost of transporting grain from the point of harvest to the facility and alternative facilities. Given the same farm gate price, producers take total storage, handling and transport costs into account when deciding on the destination of grain deliveries, so the volume of grain that can be captured by any individual operator of storage and handling facilities is limited. Should an operator of a country facility attempt to charge a price for his/her services significantly above cost, the total cost of storage, handling and transport to an alternative facility will become more attractive.

Economies of scale and scope are found from operating several facilities or activities as part of a single concern. There are benefits to the operator up to a point from sharing resources such as a central workshop for repairs and maintenance and the coordination in the accumulation of grain across several receival sites. However, beyond that point – which is different for every operator – diseconomies can occur from the cost of trying to co-ordinate large quantities of grain at dispersed storage and handling facilities.

Economies of scope can also be achieved by integrating storage, handling and transport with marketing activities. Efficiencies gained from this integration have been a feature of the benefits to the grains industry from less regulation of grain marketing.

9.1.3 IS THERE CONTESTABILITY IN COUNTRY STORAGE AND HANDLING?

Contestability in the market depends on the costs of entry and exit from that market. The ability of country storage and handling operators to exploit any potential natural monopoly depends on the effectiveness of competition from alternative facilities and effective contestability.

For example, vertical concrete silos do not threaten an existing natural monopoly because they are costly to construct, have few, if any, alternative uses and the salvage value would most likely be less than the establishment cost if the investor wanted to exit the industry. If concrete silos were the only effective system of storing grain then spatial monopolies around receival sites would exist.

By contrast, bunker storage has characteristics which are much closer to the requirements of a contestable market. The construction cost is comparatively small and much of the equipment such as mobile receival grids, conveyors and covers can be relocated elsewhere. Basically, there are opportunities for new entrants to provide bunkers at receival points without incurring large sunk costs, thereby contesting the market position of an existing operator.

Additionally, producers have the choice of constructing their own on-farm storage and entering into cooperative arrangements with neighbouring producers to construct local storages into which they deliver direct from the grain harvester and hold for marketing, thus creating the opportunity to capture some of storage, handling and marketing margins for themselves.

A key reason for the low barriers to entry to the market for country storage is the increasing availability of on-farm storage. As the Grain Growers Association has noted (2009, p. 16):

The major development in competing facilities is that producers are developing increased levels of on-farm storage and so not necessarily delivering into the bulk system at harvest.

The capacity of on-farm storage to compete with country storage operators, particularly the central storage and handling system has been recognised by the Chairman of the Australian Government's Wheat Industry Expert Group, Mr John Roger, in testimony before a Senate Committee hearing during 2008 (Senate Standing Committee on Rural and Regional Affairs and Transport, 2008, p. 36):

What we will see is that the bigger farms particularly—and this is an issue, big and little—will within five years have their own ability to store at least two-thirds of their crop. Why? It makes economic sense to do so. The grain-handling authorities are under an enormous pincer movement that they have not quite worked out yet. They will be providing very expensive intermediate storage and they need to work out how to get their costs down and their volume up. If they do not do that their businesses will suffer dramatically. We can already see that in the other grains—we can see that in the eastern states where there is a very diverse marketplace and we are seeing it in South Australia right now as more and more South Australian farmers realise how important it is to be able to control their own rate of delivery of grain. I really believe the marketplace will sort that out very quickly, and it is already doing so.

9.1.4 EXCESS CAPACITY

Contestability in the supply of country storages is also improved because of excess capacity. Since operators are competing for volume they are offering competitive prices. Estimates of the total grain storage across eastern Australia exceed 30 million tonnes while the average annual grain crop across the same region is approximately 15 million tonnes.

A similar over-capacity exists in Western Australia where there is in excess of 20 million tonnes of storage in the receival system for a 12 to 16 million tonnes average grain harvest. In addition, to the system operated by CBH Group there is likely to be in excess of 4 million tonnes of on-farm storage within the next 2 to 3 years (ACIL Tasman 2009). Excess capacity in the presence of low barriers to entry and substitute products imposes a substantial competitive constraint on the ability of storage operators to exercise any market power.

In summary, the natural spatial monopoly of established country storages can only be exploited to the detriment of producers in the absence of more competitive facilities.

9.1.5 COMPETITION AND CONTESTABILITY IN LAND TRANSPORT

Farm to receival point

There are many operators providing road transport, the initial investment in a truck or prime mover and trailer(s) is not large relative to operating costs and capacity is quickly reached. These factors imply that economies of scale are of little importance for road transport and that the industry is contestable.

Conditions for a competitive industry are also met because the sunk costs (overheads) of road construction are borne by governments rather than transport operators so, as a consequence, road transport operators can enter and leave the industry at a low cost relative to total costs. Moreover, the fact that many grain producers transport their own grain, or could do so, means that road transport contractors are unable to extract 'economic rents' from the system.

Receival point to domestic destination or port

Most grain destined for export is hauled by rail. The large initial outlay on rail track construction and rolling stock relative to the costs of operation would suggest that, once a railway is built, increased use will result in continuously falling average costs until capacity is reached.

Although rail transport has the features of a natural monopoly there are two effective constraints which prevent the rail operator from making excess profits at the expense of producers. They are:

- The low barriers to entry for grain transported by rail for new entrants and grain traders seeking access to existing rail capacity.
- The ease of moving between rail and road transport for domestic and export grain.

These factors make the rail transport task highly contestable.

While the transport of export grain has traditionally been dominated by rail, it has been subject to increasing encroachment from road transport. The Productivity Commission (2010, p. 189) has listed several reasons as to why the share of export grain transported by road has increased:

- The technical efficiency of road compared with rail has increased. Road infrastructure has improved, the capacity of heavy vehicles has increased and there is also better heavy vehicle route access (in most states).
- At the same time, rail infrastructure has deteriorated, leading to slower delivery times by rail.
- Deregulation of the wheat market has changed the dynamics of the supply chain, encouraging greater use of road transport:
 - Diversified grain requirements have meant that smaller parcels of grain are more likely to be delivered to niche markets using trucks, as trucks are more efficient for moving smaller amounts of grain.
 - Developments in up-country storage (rationalisation and a change in location of sites) require trucks to move wheat further distances than before.
 - Changes from network-based pricing to site-based pricing have revealed inefficiencies of rail use on outer branch lines, shifting the transport task to road.

Contestable port terminal services

The potential for a natural monopoly position of existing port terminal operators to emerge is reduced by the prospect of alternative port operators entering the market, as evidenced by the competition which GrainCorp is facing in Victoria and Queensland. The temptation by port operators to charge higher prices is also moderated by the imperative to maximise throughput and thus attract more grain by reducing charges.

Another competitive constraint on port terminal operators shipping bulk grains is the alternative means of shipping grain in containers. According to the Productivity Commission (2010, pp. 23-24), around 16 per cent of Australian wheat exports were shipped by bag and container in 2008-09 but it was as high as 32 per cent in 2007-08 (a result of low-priced containers). Over the five year period to 2008-09, non-bulk exports accounted for about 35 per cent of Victoria's wheat exports, 20 per cent of Queensland's and 20 per cent of NSW's wheat exports (Productivity Commission, 2010, p. 23).

9.2 FERTILISER

During the latter part of 2007 and early 2008 there was a rapid increase in fertiliser prices.

The fertiliser industry was accused of collusion and abusing its market power to gouge high prices out of producers. Some producer organisations and rural politicians alleged that, in the case of urea, after the international price had fallen later in 2008 to the equivalent of A\$360 per tonne, the fertiliser companies did not pass on the price reduction and were charging farmers \$1,200 per tonne in Australia (*The Land*, 20 November 2008).

The Australian Competition and Consumer Commission (ACCC) was asked to examine the fertiliser industry and, in particular, consider the reasons behind the significant increases in fertiliser prices in Australia at that time.

It concluded that the 'spike' in fertiliser prices in Australia was mainly attributable to rapidly increasing global fertiliser prices and that the shortage in Australia was due to producers moving quickly to secure supplies.

On the allegation of collusion, the ACCC did not have any evidence; nor had it found any evidence of price gouging or distributors withholding supply. Its investigation also showed that the increase in market concentration over the past decade among domestic fertiliser manufacturers and distributors was not a factor in domestic fertiliser prices.

Since about half of the fertiliser used in Australia is imported and there are low barriers to entry to the Australian market, fertiliser prices in Australia are driven by international prices and shipping costs. Prices rose sharply in 2007 and 2008 because:

- High agricultural commodity prices (particularly grains for food, feed for livestock and bio-fuels) caused a corresponding increase in world demand for fertilisers.
- Of the inability of the industry to increase production quickly because existing plants operate at near capacity and a long lead time is required to expand capacity. Producers also need long time periods to source feedstock such as natural gas.

- Natural gas – which is a key ingredient in the manufacture of nitrogen and ammonium phosphate fertilisers – increased significantly in price during the same period.
- Phosphate rock prices rose by up to 400 per cent over 2006 and 2007.
- International freight rates which were rising substantially due to increased fuel costs and a much greater demand for shipping as world trade increased rapidly.
- Of a cut in fertiliser exports from China in February and April 2008 as the Chinese Government attempted to reserve more fertiliser to meet its rapidly expanding domestic requirements.

In Australia, two events in late 2007 altered the normal seasonal demand for fertiliser and caused a supply shortage:

- Forecasts of improved weather increased expectations of improved growing conditions and recovery from years of drought, so more fertiliser was ordered.
- Producers responded to rapidly rising fertiliser prices by securing their supplies early to avoid anticipated future price increases. In a market where there was virtually no capacity to increase supply in the short term, the unexpected surge in demand led to significant shortages.

Suppliers were caught short. Generally, their response was to ration supplies by giving priority to loyal (established) customers and allocating the remaining stock broadly in proportion to past purchases from the supplier. Not surprisingly this non-price rationing was the source of complaints from those further back in the queue of favouritism of, refusal to supply, failure to honour supply agreements (or expectations), refusal to commit to prices at time of accepting fertiliser orders and price gouging. These complaints were anecdotal and general in nature and could not be confirmed by the ACCC.

Apart from noting that non-price rationing is an economically inefficient way to allocate scarce resources, the ACCC advised that it was not illegal, unless it involves misleading or deceptive conduct. However, the use of non-price criteria, ie quotas, to allocate limited supplies was bound to create dissension amongst those who were not favoured.

As to 'price gouging', the ACCC was not presented with sound evidence of it, but noted that pricing is an economically efficient way to allocate scarce supplies and works well in the fruit and vegetable industries where prices vary to reflect availability and seasonal factors.

10 Barriers to entry and exit

KEY POINTS: BARRIERS TO ENTRY AND EXIT

- Barriers to entry and exit to grain production are important determinants of the competitiveness of Australian producers.
- Producers' responsiveness to changes in the price of grain (price elasticity) are relatively high, especially beyond one year, so suppliers of services are limited in their capacity to extract quasi-rents from producers.

Barriers to entry and exit to and from grain production are important determinants of the competitiveness of Australian producers. The lower the barrier to entry the more likely supply will move with price: in economic terms this is called supply elasticity to price. The higher the supply elasticity the more grain will be produced if prices are high and less when prices fall.

High supply elasticity for wheat production means that barriers to entry and exit are likely to be low. Low barriers to exit from producing a crop, such as wheat, mean that it is difficult for grain buyers to extract greater revenue from producers as producers can switch from wheat to other crop types or land uses at low cost. In other words, buyers need to continue to offer prices high enough to encourage crop production. The implication is that there are advantages to producers and the industry to ensuring that it is easy to enter and exit various forms of grain production quickly and at low cost.

10.1 SUPPLY RESPONSE IN AUSTRALIAN GRAINS ⁵

Griffith et al. (2001) have provided an extensive review of supply response elasticities for the wheat industry in Australia. In general, the wheat supply price elasticities range from 0.1 to over 1.0 in the short run, and from 0.3 to 3.8 in the long run. These estimates are made under many different models and conditions and reflect a considerable diversity. Considering the range of values a wheat supply elasticity of 0.4 to 0.6 in the short run and over 1.0 in

the longer-run seem reasonable. The cross-elasticities with other commodities of sheepmeat, wool and cattle are also provided in (Griffith, Anson, Hioll, & Vere, 2001) and vary considerably but are generally quite small and frequently negative.

One of the most recent estimates of short-run supply elasticity for wheat is in Rambaldi and Simmons (2000). Their estimate of the short-run price elasticity is 0.42 (within a year) and the long run at 1.21. They were also able to estimate that the risk premium producers are willing to pay at 10.27 per cent of expected profits, the coefficient of absolute risk aversion is very low and the coefficient of relative risk aversion was 0.1049. This coefficient of relative risk aversion was lower than a number of other studies indicating that Australian wheat producers are not very risk averse but are willing to pay about 10 per cent of profits or 2.76 per cent of revenue as a premium to reduce risk.

A small-scale econometric model was used to estimate the supply response in the wheat and coarse grains sectors. The model was based on the assumption that the area of crop planted adjusts slowly (more than one year) and for this purpose a partial adjustment model was used (Nerlove, 1958).

The results of the model show the short-run price elasticity for wheat was estimated to be 0.48 and for coarse grains it is 0.25. These estimates are consistent, and in the mid range, with the literature on the subject.

⁵ This section and Appendix A and B have been prepared by Emeritus Professor Gordon MacAulay, Principal Economist at GrainGrowers

The differences between the short and long run elasticities are likely to be due to the short term difficulty (one year) of switching out of wheat and coarse grains to other land uses. Switching crops in one year poses some difficulties as crop rotations are typically set for 5 to 10 years depending on the level of crop intensity and the location of the farm. Longer run changes are easier as they can be planned for at the end of a rotation or at a more convenient point.

Despite the difficulties, short run elasticities of 0.48 for wheat and 0.25 for coarse grains, they are relatively high given some of the barriers to exit from crop rotations once in place.

Long run elasticities approaching and exceeding 1.0, as reported by Griffith et al (2001) and Rambaldi and Simmons (2000) are high and suggest even small price changes will result in considerable changes to crop land use at the margin. This represents a considerable constraint on the ability of the grain supply chain participants to extract quasi-rents from grain producers which, in turn, suggests that sunk costs are low for grain cropping.

11 Risk management

KEY POINTS: RISK MANAGEMENT

- Australian wheat (and grain prices generally) are highly correlated with international grain prices.
- Highly inelastic consumer demand for wheat in general increases price variability.
- Increased Australian production variability and high international wheat price variability will create greater risks for grain producers.
- Producers have a well established and liquid market to manage price risk with ample commercial service providers offering price risk management advice.
- Risks should be able to be borne by those best able to manage them. Structural adjustment including low barriers for new well capitalised entrants in the production and storage and handling stages of the supply chain will play an important role in the grains industry in the future.

11.1 MANAGING RISKS

Agriculture in Australia, particularly those areas likely to experience significant increases in risk will have to adapt to greater climate variability and, most likely, trading risk due to government mitigation policies. Added to this will be increases in the value of water as it becomes scarcer due to reduced rainfall and stream flows.

Agriculture has two broad adaption options available:

- Operationally manage risk through improved adaptation tactics, however this often requires additional capital.
- Allow the risks to be borne by those best able to manage them.

Management of risk by adapting enterprises to manage risk better requires changes at the enterprise level such as new crop varieties, and greater flexibility of enterprise to adjust to seasonal conditions as they arise. Adaptation strategies usually require additional capital investments to be made on the farm, such as the adoption of new R&D outcomes, training, changes to machinery etc. This additional capital has traditionally been funded from surplus cash flow or debt. There are prudent limits to debt, and investments from surplus cash flow can be sporadic and slow to accumulate for many farms.

As a general rule, the intention is to modify production systems to manage the downside risks but retain exposure to upside potential.

Allowing risks to be borne by those best able to manage them deals with:

- Structural adjustment as enterprises able to adjust are expanded at the expense of those that have limited capacity to adjust (within the farm and between farms).
- Introducing new ownership models to introduce equity investments that allow a portfolio to be constructed with exposure to investments outside agriculture that can be adjusted in response to relative changes in risk across the portfolio.
- Insurance products that allow the marginal difference of risk management to be traded.

Climate change is likely to increase the variability of climate as well as affect general climate trends.

11.1.1 SOURCES OF INCOME VOLATILITY ON FARMS

Although the volatility of gross income from farming operations is well recognised and described, the sources of this volatility have generally not been clearly quantified.

In general, gross income volatility can be attributed to two broad sources; production risk and commodity price risk. There are also two other forms of risk that farmers face that can usually only be managed by collective action: policy risk and sovereign risk.

11.1.1.2 COMMODITY PRICE RISK

Producers also face the risk of volatile commodity prices when selling grain. There is also considerable variation in premiums for quality.

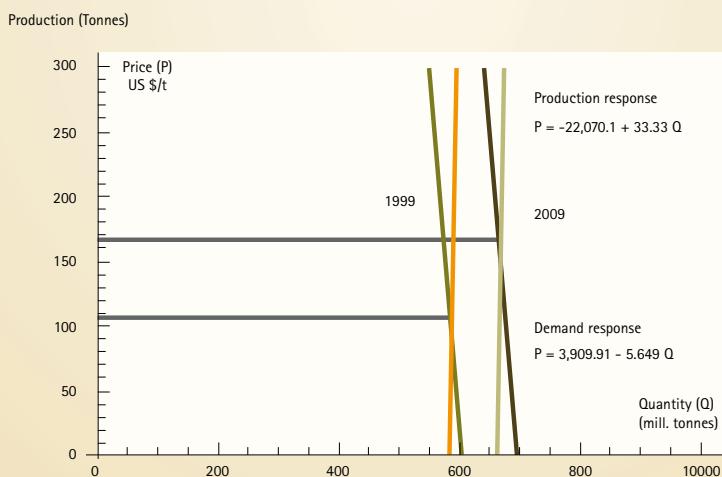
In wheat, in particular, Australian prices relate closely to international prices. Over a very long period of time world wheat prices have frequently 'spiked'. The global 'thermometer' or measure of this phenomenon is the stocks to use ratio. When the ratio gets down to about 25 percent, prices rise rapidly. However, they nearly always fall as rapidly as they rise. The simple economics of this is that the behaviour of wheat consumers and producers at a world level is such that a small change in the quantity produced or demanded gives a large change in price (see Chart 21). A major reason for this is that bread and other wheat-based foods are only a small part of consumers' budgets. A second important reason is that producers tend to base their production decisions on last year's price and can adjust the area planted easily. Put these together and you have a market with highly variable prices. Risk management strategies are thus vital for success in wheat production.

To make matters a little more complicated, production risk and price risk are not independent from each other. For example, if a wheat farm has a very poor yield, it is likely that others will be suffering a similar situation, and thus grain will be scarcer and consequently wheat prices will tend to be higher.

There are several strategies that may assist grain producers to better manage production and price risks that need to be considered:

- Differentiating Australian wheat from competitors' wheat may reduce elasticity of demand and reduce the correlation between Australian and international wheat price.
- Differentiating Australian wheat from other sources of wheat will also increase barriers to entry into Australia's main export markets to other suppliers.
- Further reducing the barriers to exit for Australia grain producers. Making Australian grain producers able to exit wheat production when prices are low would reduce price volatility as supply would be more responsive to price.
 - Barriers to exit could be lowered by making alternative crops more competitive and reducing the level of sunk costs associated with grain production (although this will also reduce the barriers to entry for domestic grain producers).

CHART 21
WHEAT SUPPLY AND DEMAND RELATIONSHIPS



DATA SOURCE: Grain Growers Limited

12 Conclusion

This report has for the first time since deregulation provided an overview of the Australian grain market two harvests after deregulation of the export wheat market. Its focus is from a producers perspective and how their interests can be enhanced in the grain industry.

The report highlights a number of areas where producers should be acting collectively to improve their profitability. This report also includes some discussion of the checks and balances that need to be put in place to ensure producers do not invest where traders and others have incentives to do so.

An important theme emerging from this analysis is the need for grain producers to revisit investing in ways to differentiate Australian grain from grain from other countries. The case for this appears strong.

Australia is a small producer of most grains in the world market. Even Australian wheat production, our dominant crop, represents a small portion of total wheat production and trade. This means that Australian traders, storage and handling companies and even researchers will struggle to reach competitive levels of scale economies.

While the fundamentals of supply and demand are sound for grain, there appear to be few serious technical and even physical barriers to increasing grain production in the long term. Increasing production will not be without cost but the key issue is that world grain production will be able to respond to higher prices by producing more grain.

Differentiation of Australian grain can benefit producers. Traders have some incentives to invest in grain quality improvement pre farm gate and promote Australian grain but they are not likely to extend to increasing demand.

Australian producers can capture the benefit of increasing demand for Australian wheat and these investment, if done sensibly, can complement the investments made by traders.

However, to capture the benefits of increasing demand, Australian producers need to ensure the Australian grain market remains competitive. Reducing barriers to entry by ensuring the market is transparent is likely to be the most effective way for producers to achieve this.

13 Works Cited

- ABARE. (2008). *ABARE Commodity Statistics*. Canberra: Australian Bureau of Agricultural and Resource Economics.
- ABARE. (2009). *Commodity Statistics*. Australian Bureau of Agriculture and Resource Economics. Canberra: Australian Government.
- ABARE-BRS. (2010). *Australian grains: Grains outlook for 2010-11 and industry productivity*. Canberra: Australian Bureau of Agriculture and Resource Economics.
- ACIL Tasman. (2009). *A review of the Wheat Marketing Act 2008*. Perth: Cooperative Bulk Handling.
- ACIL Tasman. (2005). *Marketing WA Wheat*. Perth: Western Grains Committee of the Pastoralists and Graziers Association.
- AgForce Grains Ltd. (2010). *Supplementary Submission to the Productivity Commission: Wheat Export Marketing Arrangements*. Brisbane.
- Alston, J.M., Edwards G.W., Freebairn, J.W. (1988). Market distortions and benefits from research, *American Journal of Agricultural Economics*, 70(2), 281-288. Alston, J. M., and Scobie, G. (1983). Distribution of research gain in multistage production systems: Comment. *American Journal of Agricultural Economics*, 65 (2), 353-56.
- Asciano Limited. (2007). *Investor Briefing 11 December 2007*. Melbourne.
- Asciano Limited. (2008). Restructure of Export Grain Business. *Media Release*, 5 May.
- Australian Competition and Consumer Commission. (2008). *Decision in respect of a notification lodged by Cooperative Bulk Handling Ltd*. Canberra.
- COAG. (2004). *Intergovernmental agreement on a national water initiative*.
- Department of Infrastructure, Transport, Regional Development and Local Government. (2009). *New South Wales Grain Freight Review*. Australian Government.
- Ernst and Young. (2000). *Multiperil Crop Insurance Project Phase Two Report: Assessing the Feasibility of Establishing Multiperil Crop Insurance*. Canberra: Department of Agriculture Fisheries and Forestry.
- Fischer, T., Wilson, P., McQuilten, J., McGowan, B., Murphy, K., & Spence, R. (2007). *Victorian Rail Freight Network Review, Switchpoint: The template for rail freight to revive and thrive!* Melbourne: Department of Infrastructure.
- Grain Growers Association. (2010). *What the World Wants from Australian Wheat: Update 2010*. Sydney: Grain Growers Association Limited.
- GrainCorp. (2009). *GrainCorp Submission to the Productivity Commission Review of WEMA*. Sydney.
- GrainCorp Operations Limited and AWB Limited. (2004). *Export Logistics Joint Venture between GrainCorp Operations Limited and AWB Limited*. Sydney and Melbourne.
- Green, R. (2010). Export Logistics for the Australian grains industry: An exporters perspective. *Australian Grains Industry Conference*, (p. 16). Melbourne.
- Griffith, F., Anson, K., Hioll, D., & Vere, D. (2001). *Previous Supply Elasticity Estimates for Australian Broadacre Agriculture*. NSW Agriculture. Orange: NSW Government.
- Hertzler, G. (2006). *Prospects for Insuring Against Drought in Australia*. Perth: School of Agriculture and Resource Economics, University of Western Australia.
- Holloway, G. (1989). Distribution of research gains in multistage production systems: further results. *Australian Journal of Agricultural Economics*, 71 (2), 338-43.
- Holmes and Sackett. (2009). *Aginsights: Knowing the past: shaping the future*. Wagga Wagga: Holmes and Sackett.
- Industries Assistance Commission. (1986). *Crop and Rainfall Insurance*. Canberra: Industry Assistance Commission.
- Knopke, O'Donell & Shepherd, (2000). *Productivity Gains in the Australian Grains Industry*. Canberra: Australian Bureau of Agriculture and Resource Economics.

- McColl, J. (1988). *Royal Commission into Grain Storage, Handling and Transport*. Canberra: Australian Government.
- Mullen, J. (2007). *Productivity growth and the returns from public investment in R&D in Australian broadacre agriculture*. *Australian Journal of Agricultural and Resource Economics*, 51(4), 359-384.
- Mullen, J., & Crean, J. (2007). *Productivity Growth in Australian Agriculture: Trends, Sources, Performance*. Sydney: Australian Farm Institute.
- Multi Peril Crop Insurance Task Force. (2003). *Report*. Canberra: Department of Agriculture Fisheries and Forestry.
- Nerlove, M. (1958). *The Dynamics of Supply: Estimation of Farmer's Response to Price*. Baltimore: John Hopkins University Press.
- Nossal, K., & Sheng, Y. (2010). Productivity Growth: Trends, drivers and opportunities for broadacre and dairy industries. *Australian commodities*, 17 (1), 216-230.
- Nossal, K., & Gooday, P. (2009). *Raising Productivity growth in Australian agriculture*. Issues Insights 09.7.
- Nossal, K., Zhao, S., Sheng, E. Y., & Gunasekera, D. (2009). Productivity Movements in Australian Agriculture. *Australian Commodities*, 16 (1), 206-216.
- NSW Farmers Association. (2009). *Initial Submission to Productivity Commission Inquiry into Wheat Export Marketing Arrangements*. Sydney.
- OECD-FAO. (2009). *Agricultural Outlook 2009-2019*. Paris: Organisation for Economic Cooperation and Development, Food and Agriculture Organisation of the United Nations.
- Pardey, P., Alston, J., & Beintema, N. (2006). Agricultural R&D spending at a critical crossroads. *Farm Policy Journal*, 3, 1-9.
- Porter, M. (1985). *Competitive Advantage*. New York: The Free Press.
- Productivity Commission. (2008). *Annual report 2007-08*. Canberra: Productivity Commission.
- Productivity Commission. (2005). *Trends in Australian Agriculture*. Canberra: Productivity Commission.
- Productivity Commission. (2010). *Wheat Export Marketing Arrangements*. Draft Inquiry Report, Canberra.
- Sheng, Y., Mullen, J., & Zhao, S. (2010). Has growth in productivity in Australian broadacre agriculture slowed? *Paper presented to the Australia Agricultural and Resource Economics Society Conference*. Adelaide.
- Spragg, J. (2010). Profile of the feed grains industry: trends in demand. *Australian Grains Industry Conference*, (p. 32). Melbourne.
- Strategic Design and Development. (2008). *Grain Supply Chain Pilot Study Stage One Final Report*. Sydney: National Transport Commission.
- Strategic Design and Development. (2009). *Pilot Supply Chain Studies - Grain & Livestock: Stage 2 - Final Report*. Report to the National Transport Commission, Sydney.
- Telser, L. G. (1958). Futures Trading and the Storage of Cotton and Wheat. *Chicago Journals: The Journal of Political Economy*, 33 (3), 233-255.
- Turner, S., Connell, P., Hooper, S., & Gleeson, T. (2001). *On-farm storage in Australia*. Australian Bureau of Agriculture and Resource Economics. Canberra: The Australian Government.
- Verikois, G. (2006). Understanding the World Wool Market: Trade productivity and grower incomes: Part 5: Relative returns to Australian wool producers of on and off farm research. (D. o. Economics, Ed.) *Discussion Papers*, 06 (24). [Online.] Accessed at <http://msc.uwa.edu.au/?f=146994>
- Zhao, X., Griffith, W., and Mullen, J. (2001). Farmer returns from new technologies in the Australian beef industry: on-farm research versus off-farm research. *Australasian Agribusiness Review*, 9 (1).
- Zhao, X., Griffiths, E., Griffiths, G., and Mullen, J. (1998). Probability distributions for economic surplus changes: The case of technical change in the Australian wool industry. *Working Papers*, 100.

A Profit maximisation and the terms of trade

Assume that a firm produces one output, y , with a price of p and uses one input, x , with a price of w (further work would allow this to be generalised to multiple outputs and inputs). The net profit function, π , is:

$$1. \quad \pi = p y - w x$$

The profit maximising condition for such a firm is:

$$2. \quad \partial\pi/\partial x = p \partial y/\partial x - w = 0$$

Within this optimisation condition the terms of trade are effectively p/w .

Rearranging gives:

$$3. \quad p/w = \partial y/\partial x$$

Multiplying both sides by y/x or the total factor productivity gives:

$$4. \quad \frac{p y}{w x} = \frac{\partial y}{\partial x} \frac{y}{x}$$

$$5. \quad ToT = \frac{\partial y}{\partial x} \frac{x}{y} TFP$$

$$6. \quad ToT = \varepsilon_{yx} TFP$$

Thus, for a firm to maximise profits it will tend to align its organisation so that the terms of trade are equal to the total factor productivity times the elasticity of output with respect to inputs, ε_{yx} .

When a firm faces externally determined change in its terms of trade (often the case for small firms such as those in agriculture) then the adjustments the firm will face are changes in the ratio of outputs to inputs or total factor productivity. Or, the elasticity of production is changed which implies changing the optimising position on the production function and the relationship between outputs and inputs.

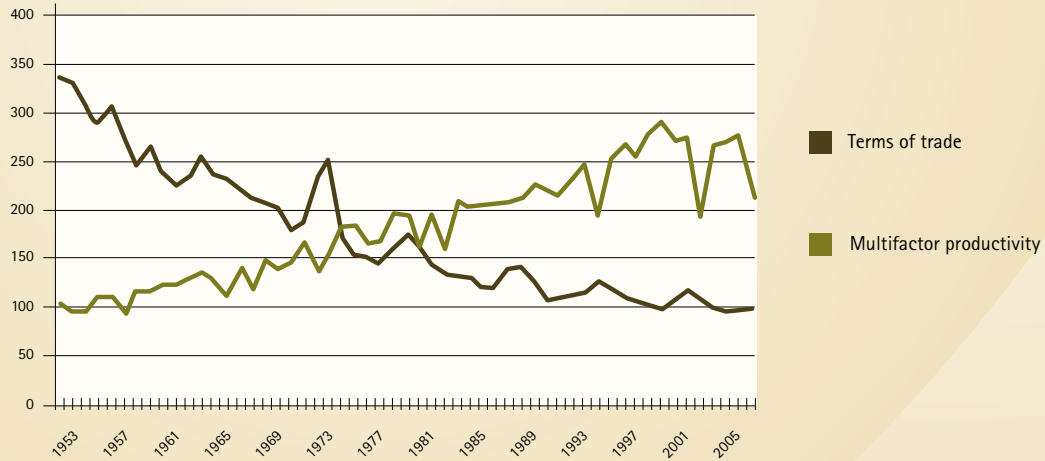
Consider an example. If the terms of trade is, say 100, and the total factor productivity is 300 then the elasticity of production will be 1/3. If the terms of trade fall to 90 then the total factor productivity will need to be adjusted to 270 assuming the elasticity of production stays stable and profits are being maximised. If terms of trade rise to 110 then with an elasticity of production of 1/3 the total factor productivity would need to be adjusted to 330.

It can be seen in Figure 3, where the elasticity of production is calculated as the ratio of the *ToT* to *TFP*⁶, that the elasticity of production has remained stable in recent years but declined dramatically in the 1970s. It is likely that there were very significant technological changes in this period that allowed a move out in the aggregate production function (that is the x/y ratio fell).

If the terms of trade fall or become smaller as a result of a relative rise in the input prices and there is no or little opportunity to change the elasticity of production then the total factor productivity will fall so as to maintain profits.

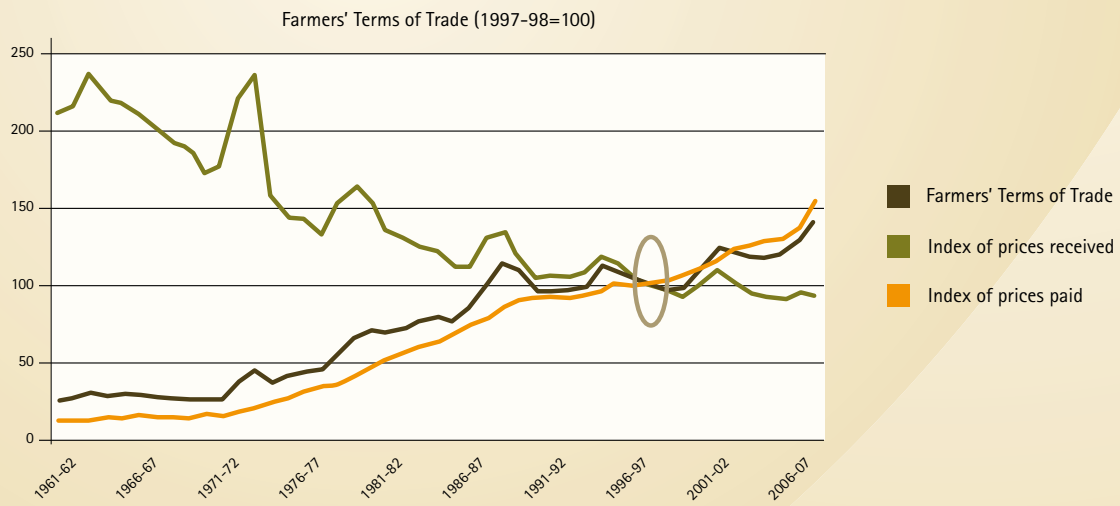
⁶ As a rough approximation of total factor productivity the farm gross receipts was divided by the index of prices received to give an output index and similarly ABARE's estimates of agricultural farm costs were deflated by the index of prices paid to give an index of inputs.

FIGURE 10
TOTAL FACTOR PRODUCTIVITY AND FARMERS' TERMS OF TRADE



DATA SOURCE: Mullen, Productivity growth and the returns from public investment in R&D in Australian broadacre agriculture, 2007

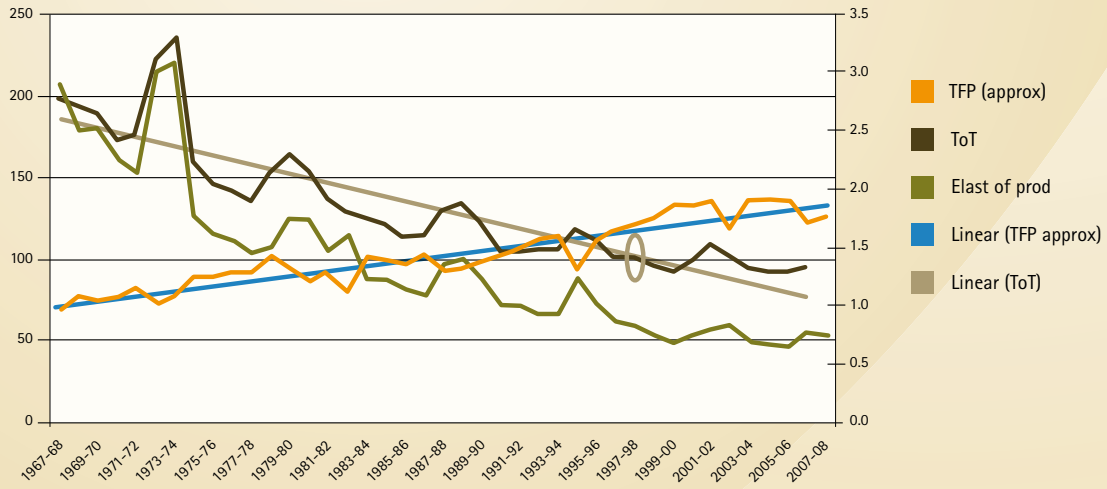
FIGURE 11
COMPONENTS OF THE FARMERS' TERMS OF TRADE



Note: Total factor productivity is an estimate based on the deflation of gross value of farm production by the index of prices received and farm costs estimates deflated by the index of prices received. The estimates differ from those in Figure 10 above.

DATA SOURCE: ABARE, 2008

FIGURE 12
FARMERS' TERMS OF TRADE, TOTAL FACTOR PRODUCTIVITY
AND ELASTICITY OF PRODUCTION, 1967-68 TO 2007-08



DATA SOURCE: ABARE, 2008



