CSIRO

Our Ref: 08/307

Committee Secretary
Senate Select Committee on Agricultural and Related Industries
Department of the Senate
PO Box 6100
Parliament House
Canberra ACT 2600
Australia

15 September 2008

Dear Ms Radcliffe

RE: CSIRO's Submission to the Inquiry into Food Production in Australia

We thank you for the opportunity to provide comment on the Inquiry into Food Production in Australia. CSIRO is actively undertaking research on issues pertaining to sustainable food production in Australia.

Food production and the value added process associated with the food industry accounts for more than 10% of Australian GDP. However, the industry is facing several challenges; climate change, rising production costs and the need for increased productivity are but a few examples of serious problems that could potentially cripple the industry.

It is CSIRO's view that many of the challenges facing the food industry can be mitigated by a scientific response, but individual agencies often lack the critical mass to address problems of this magnitude. CSIRO believes that strategic co-operation between relevant research agencies in Australia would ensure that capabilities are optimally managed to ensure delivery of research outcomes. The National Research Flagship model adopted by CSIRO serves as a prime example of the successes that can be achieved by a coordinated capability management approach.

Should you require any further information regarding our submission, please do not hesitate to contact me or Mr Peter King (the main submission contact).

Yours sincerely

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CSIRO Submission 08/307

Food Production in Australia

September 2008

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Key Points

- In order to respond to a wide range of humanitarian, social and national security issues, the sustainable production of increasing amounts of food products will be a major international societal focus for the foreseeable future.
- Increasing food prices will place increased financial strain on certain sections of Australian society and may lead to associated poorer nutrition and health issues.
- Australia is a major exporter of agricultural products and stands to benefit from increased demand and real prices.
- Our ability to meet this opportunity/challenge is dependent on our ability to increase the productivity of our agricultural systems and reduce input costs, while simultaneously tackling major resource use issues to ensure long-term sustainability.
- Achievement of these balanced productivity-sustainability goals will require further investment in both the underlying science and strategies to ensure the rapid adoption of new practices and approaches that will maximize sustainability.
- A key step in this process will be the successful implementation of processes that maximize co-operation and minimize competition between research agencies across Australia.

Introduction

1. The importance of food production to Australia

Australian agriculture accounts for almost 5% of gross domestic product (GDP) at $39.5 billion in 2005-06[1]. Value addition in the food processing industry is worth another 2% of GDP at $17.4 billion. Food is one of the largest manufacturing industries, accounting for about 20% of manufacturing output[2]. Retail sales in the food sector within Australia in 2005-06 were $77.9 billion, representing 26.6% of total retail turnover and a further 1.5 per cent of GDP[3]. Contribution of the sector to GDP is greater than 10%.

Groceries and liquor wholesales contributes another 0.8% to GDP with $53.6 billion in sales in 2005-06[3]. In the same year, food exports made up more than 15% of total Australian merchandise exports and were valued at $23.8 billion[4]. Australian food, both unprocessed and processed, currently makes up almost 3% of global trade in food. Over half a million people are employed in food production and manufacture in Australia (192,000 people directly in food manufacturing, 383,000 in agricultural food production)[5]. Australia also plays a significant role in the animal feed industry, with an industry consuming around $4 billion of feed annually and a global industry with sales estimated at over $100 billion with over 615 million tonnes of feed sold each year[6]. Australian grains are an important component in the global feed supply chain, including the aquafeed market.

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[1] ABS 7501.0 - Value of Principal Agricultural Commodities Produced, Australia, Preliminary, 2005-06 and 1301.0 - Year Book Australia, 2006

[2] 'Australian food industry' ABARE research report 06.23

[3] ABS 8622.0 Retail and wholesale industries, Australia 2005-06

[4] DAFF website 'http://www.daff.gov.au/agriculture-food/food'

[5] National Food Industry Strategy 2006

[6] http://www.allaboutfeed.net/feed_around_the_world/

2. Drivers of agricultural production

Given the range of new opportunities being generated through the molecular revolution in biological sciences, and broader industry innovation, agricultural production will continue to be an innovative and profitable part of Australia's future. There are, however, some well-defined challenges. The value of those exports, their commodity mix and their ultimate destination has varied over time. This will continue to be the case especially as the economic, environmental and social drivers around agricultural production and consumption are highly dynamic. In this context, it is important to realize that the production and marketing of agricultural production is essentially a global business, and hence with the exception of the application of trade-distorting subsidies (as occurs in several of Australia's major competitors), prices and demand at least for major crops and animal products are largely determined trans-nationally although this does not preclude market premiums for the supply of high quality product.

After a period of relative stability, recent changes to drivers on the global and domestic stage are having a major impact on the price and availability of agricultural produce for human consumption (Box 1). In addition to these current drivers, any greenhouse gas mitigation policies that are introduced by government have the potential to significantly affect agriculture in the future. Thus, although key decisions to include agriculture in CO_2 and other greenhouse gas reduction schemes are not expected until 2013, impacts on costs of production for farmers and food processors are likely to occur much earlier as a result of proposed emissions limits to be placed on the energy and transport sectors. The Australian Bureau of Agricultural and Resource Economics (ABARE) farm survey data indicate between 30 and 40% of broad-acre farm input costs are likely to be sensitive to energy prices. Furthermore, depending upon the price of carbon offsets, should future greenhouse policy settings favour the provision of forest-based carbon offsets from land previously in agricultural production, then there is a risk of reductions in food production due to major land use changes to sequester carbon. However, the reverse could also occur once the key role that crop and pasture species grown across large areas of the Australian landscape can play in capturing carbon from the atmosphere via photosynthesis is recognized.

Finally, as we are already seeing in the Murray-Darling irrigation areas, the availability of water for irrigation has the potential to have a significant impact on agricultural production in the future.

Global and domestic drivers acting on food production costs

Food Demand

- Globally, food supply for more than 800 million people is insecure – rapidly rising rural-urban income disparities and extreme rural poverty are major sources of tension[7].
- Demand for cereals is predicted to increase by nearly 50% between 2000 and 2030[7].
- Consumption of fish, dairy, wheat and meat products all increase as incomes rise. Demand for more animal protein by the burgeoning middle-income classes in India and China has been predicted to increase 85% between 2000 and 2030[8].
- Food imports are predicted to more than double by 2030 in sub-Saharan Africa[7]
- Changing Australian consumer tastes have resulted in a 15% increase in per capita consumption of fruit and vegetables over the past decade[9].

Ability to Supply

- Changes in global climatic patterns are leading to poor harvest in various parts of the world, including Australia, in recent years caused by drought or other adverse climatic conditions.
- Human population growth has led to animal production activities being constrained to poor or limited peri-urban areas, and where environmental impacts cannot be managed successfully.
- Long-term global trend of increasing reliance upon nutrient inputs to maintain food production has been disrupted by rapidly escalating prices (in past 2 years N-fertiliser costs have doubled and P-fertiliser costs have increased by 4-5 fold).

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[7] World Development Report 2008

[8] ibid; Delagado et al. The Unfinished Agenda, 2001.

[9] National Food Industry Strategy 2006

- Global rate of yield improvement have been declining over time (average rice and wheat yields increased by 2.9 and 3.5% pa, respectively over the period 1980-1990; equivalent yield increases were only 1.13 and 1.0% pa between 1990 and 2005)[10].
- With the exception of East Asia, the yield gap for cereals between *developed* and developing countries has widened[7].
- Loss of animal diversity as indigenous breeds are replaced by globally commercialized breeds of production animals, balanced on a narrow genetic base.
- The annual growth in investment in agriculture research and development, global and domestic, has been declining over the past three decades[11].

Competing demands

- Legislative support and subsidization of biofuel production in the USA (and to a lesser extent in the EU) has reduced supply into food markets.
- Competing alternative demands for environmental resources like water and biodiversity are leading to direct reallocation of such resources to non-agricultural uses or to novel pricing structures that alter the economics of production.
- Rising consumer and government scrutiny of Australian produce in domestic and major markets in the developed world with respect to food safety, pesticide-free production, ethical animal production and processing practices, bio-security and environmental protection are increasingly imposing a range of environmental and social expectations that must be met.
- Increased expectations of economic returns from public and private investments in agricultural R&D within developed countries has reduced the spill-over of ideas into the public domain from which many *developing world* agricultural systems historically sourced their know-how, contributing to the observed reduced rates of productivity gain.

3. CSIRO's expertise in agricultural production

CSIRO has a broad range of skills and capabilities covering the full gamut of research relevant to plant and animal production agriculture and to sustainable management at all spatial scales from the individual paddock to entire catchments. The expertise for these capabilities resides in a broad range of Divisions but is integrated into themes of focused activity in which the Agricultural Sustainability Initiative, and the Food Futures, Climate Adaptation, and Water for a Healthy Country Flagship programs play a leading role.

CSIRO's research is particularly distinguished from other providers in the National Innovation System by its ability to focus large multi-disciplinary teams onto complex multi-dimensional problems. It is also particularly well attuned to the need to ensure effective delivery of its research.

Response to specific discussion points

One question that inevitably arises in any consideration of food prices is whether or not the recent surge is a short-term anomaly that will be followed by a return to previous levels, or whether prices will find a new, higher level. United Nations Food & Agriculture Organization projections suggest that while the excessively high prices reported in the media in recent months will not be sustained, prices will settle to a significantly higher level than has prevailed in the past two decades. While this provides some positive benefits to producers in exporting countries (such as Australia), it will result in higher food prices for all consumers. The most vulnerable nations will be low-income food deficit countries in Africa, Asia, Latin America and the Caribbean where civil order and security may be threatened[12].

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[10] FAO Production Statistics.

[11] Pardey, Beinterna, Dehmer and Wood (2006).

[12] FAO Secretariat (HLC/08/INF/1: Soaring food prices: Facts, perspectives, impacts and action required. April 2008).

This analysis seems credible and is accepted as an input to CSIRO's research planning and strategic science investment. The response provided here to the Senate Inquiry specifically focuses on two of the main terms of reference, *viz*:

- ***Viability for production by farmers***
- ***Sustainable impact***

It provides some general commentary on the organization of science in Australia and considers a number of areas of concern and possible science responses to improving growing and supplying food for Australians and for export. This includes the breeding and production of crops and livestock, and the environmental sustainability of those activities.

4. Viability for production by farmers

Agriculture provides stewardship over approximately 75% of the Australian continent and in doing so farmers have a vital interest in the long-term environmental sustainability of agricultural production. However, until the recent surge in commodity prices there has been a long-term decline in terms of trade for many Australian rural products (i.e. costs of inputs rising faster than prices received). This has resulted in substantial technological, managerial and industry adjustment as farm numbers decline and sizes increase, and high levels of mechanization are embraced. Despite this, significant increases in productivity are essential to maintain the viability of production.

To increase, or at least maintain, the economic viability of production agriculture a number of major issues need addressing. In essence, the immediate ***economic viability*** of agriculture is determined by the balance struck between the farm gate returns obtained as a result of yield and quality of the commodity produced, and the total cost of inputs needed to generate that yield. Hence, economic viability for growers may be achieved by tackling either of these factors, but only by controlling or reducing input costs per unit of product and increasing farm gate returns (by greater yield and or quality) are we likely to maintain economic viability as well as tackle the problem of food security.

Input costs cover a very broad range of items including: fuel and machinery costs; fertilizer, pesticides, herbicides, water etc; labour availability and costs; feed, seed and germplasm costs. Many of these costs have risen steeply in recent years, a trend that is showing little sign of abating. Farm gate prices are also driven by a range of factors including quality (and how quality premiums are shared between growers and down-stream marketers), but in the broadest terms the major driver of total revenue is yield.

4.1. Science response:

The negative effects of many, but not all, input costs are amenable to the application of research outcomes, while gains in productivity are similarly obtained through a variety of pathways including the application of science solutions. However, CSIRO believes that if maximum advantage is to be obtained from the capacity of Australia's research community to tackle significant challenges in the generation and sustainability of food production, further development must occur to:

- Ensure greater co-operation and integration of the science capacity and capability of research groups in State and Commonwealth agencies and in the Universities. Such integration is essential to generate critical mass, to ensure effective use of limited resources, and to ensure problems of major significance are tackled. Work currently being conducted in the Primary Industries Standing Committee to focus State and Commonwealth agency input into major crop sectors is leading the way in this integration process[13]. Similar processes are underway for the livestock production sector and in

[13] Primary Industries Standing Committee. 2008. Future directions for the PISC National RD&E framework.

terms of State government, regional and local responses to climate variability and change.

- Integrate the flow of information between basic and production science [genome → phenome → new crop varieties or livestock genetics]. The transition of information and breakthroughs along the chain from genome studies to applications in breeding is often incomplete or fractured with small groups working in isolation to one another. Furthermore, while basic knowledge of genetic controls of cellular processes is fundamental to long-term breakthroughs, there needs to be a greater understanding of where basic research needs to be invested (i.e. reflecting significant current or potential production blockers) as well as an accelerated sense of urgency.

- Achieve greater acceptance by industry of the global nature of agriculture and the need to work with other countries and multinational companies to achieve aims. The international nature of science, the complexity and cost of new transformational technologies, and the fact that progress is based on the exchange of ideas and resources (for example, germplasm), makes it essential to fully utilize external developments to ensure that Australian producers continue to enjoy the benefits of new technologies at least at the same time as their international competitors. Impediments to global thinking and exchange will inevitably lead to stagnation and a drop in Australia's agricultural competitiveness.

In addition to these basic changes to the way in which science is organized and executed within and among the major research agencies in the country, there are a number of large major targets, that when successfully achieved will substantially improve the economic viability of farmers while simultaneously significantly increasing production per hectare. These areas include:

a) Maximizing potential yield. Over the past 10 years, annual gains in yield from cereal breeding programs have plateaued to less than a third of those seen between 1960 and 1988. There is a clear need for a transformational advance in cereal yields over and above the incremental annual increases afforded by current plant breeding technologies. Evidence is mounting that cereal yields are now becoming limited by the capacity for the plant to fix sufficient carbon during its lifecycle and translate this carbon in to harvestable grain. A major focus needs to be aimed at maximizing yield in a water-limited environment. Such a program could be achieved through an integrated multi-faceted program that would deliver short, medium and long-term outputs resulting from the utilisation of variations in existing old and wild varieties, the redesign of plants changing their morphology, and through longer-term transgenic approaches aimed at significant improvements in the efficiency of photosynthetic and carbohydrate storage mechanisms in plants.

The animal production equivalent is Total Factor Productivity (TFP)[14], with evidence that technology adoption by growers is often a larger hurdle to productivity gains than is scientific discovery. However the red meat industry for example, is undergoing significant consolidation and it has been argued that supporting higher TFP in the leading enterprises is more likely to deliver benefits to Australia in the medium to long term, than will a focus on the whole farmer population. Leading enterprises are more likely to fund improvements, focus on defined market niches (e.g. marbling over yield in Japan), and establish supply chain alliances, and hence contribute more broadly to the sustainability of food production sector.

b) Input cost reduction and/or improved efficiencies of use of inputs. The productivity of agricultural enterprises, both plant and animal, has always relied on a balanced supply of essential nutrients to maximise productivity. Research in the last few decades when fertilizer inputs costs were relatively cheap, focused on maximizing the supply of major nutrients often in excess of plant and animal requirements. When fertilizer nitrogen is applied to soil it is not used

[14] Total factor productivity, also known as multifactor productivity, compares total outputs relative to the total inputs used in production of the output.

efficiently, and plants seldom assimilate more than 50% of the nitrogen applied. Equivalent data for phosphorus fertilizers suggest that commonly less than 20% is used in the year of application.

CSIRO scientists are world leaders in the study of the regulation of the nitrogen and phosphorus cycles, biological nitrogen fixation and nutrient uptake by plant roots, gene discovery, plant and animal breeding, and farming systems research. As a consequence, Australia is uniquely placed to take advantage of a number of underutilized breeding strategies through traditional selection approaches, or the introduction of new genetic traits that can improve the efficiencies of fertilizer use. Furthermore, CSIRO field-based skills have identified several agronomic opportunities to either improve nutrient use efficiencies, or to replace fertilizer nitrogen requirements with renewable inputs of N via biological nitrogen fixation by crop and pasture legumes. These approaches will need to be combined with the provision of decision-making tools that can optimize nutrient use by better matching nitrogen and phosphorus supply with plant demand, or improve the management of the overall pasture feed-base and supplementary feeding systems to boost animal ovulation rates and livestock finishing through a more targeted supply of balanced nutrition to livestock at specific times throughout their productive life.

c) Climate-ready crops and livestock. In Australia, climate change will have multiple effects on crop growth and grain quality via increased CO_2, increased temperature and potentially different patterns of rainfall. To remain competitive, farmers will need to adapt through both agronomic and genetic responses. Studies of climate change effects on crop productivity and quality have not investigated the opportunities for plant breeding solutions, and have only superficially investigated the interactions of the multiple climatic effects with each other and with agronomy. Based on existing knowledge, there is a reasonable expectation that some of our wheat varieties will differ in their yield response to climate change conditions. However, our understanding is currently poor regarding the key morphological and physiological traits that will definitively contribute to high yield and quality under conditions of elevated CO_2.

The challenges of efficient on-farm production of animal products and then collecting, processing, value-adding and delivering to the consumer will not change appreciably in the medium term. However climate change predictions if shown to be accurate, will drive significant changes in the environment which supports on-farm production and some of the science-based responses might include:

- Breeding animals that are genetically resistant to the parasites and infectious disease agents whose geographic range will alter as a result of climate change. Genetic solutions will also underpin approaches to the minimization of chemicals and drugs on-farm.
- Breeding for heat and drought tolerance animals for extensive production systems, again without compromising production efficiency or product quality.
- Genetic or behavioural approaches to development of easy care animals – animals that produce efficiently with minimal inputs from humans, thereby addressing the issues of rural labour shortages, and animal welfare policies.

In addition to research activities in its core capability homes of the Divisions of Livestock Industries and of Plant Industry, CSIRO has two National Flagships – Food Futures and Climate Adaptation – that are instrumental in creating, developing and implementing science-based solutions to issues affecting the economic viability of producers.

> A number of major issues, such as rising production costs and greater productivity, need addressing to increase, or at least maintain, the economic viability of production agriculture. The application of research outcomes will help address these issues. However, greater integration of science capability and capacity is needed coupled to better acceptance of the global nature of agriculture by industry.

5. Sustainable impact

The range of drivers affecting agricultural production has changed significantly over the past 20 years. Prior to that time the most important driver was production cost with yield being a paramount factor in decision-making at the level of the individual business unit. More recently, significant changes in land use arising from a combination of economic, environmental and social factors are impacting the agribusiness sector.

These changes include:

- environmental degradation (e.g. salinity, acidity, water quality, invasive species) and associated yield declines and/or reductions in land area suitable for food production;
- increased variability in rainfall and temperature patterns across Australia;
- increasing focus on environmental credentials in global markets (e.g. ISO 4000);
- greater community concerns with biodiversity issues;
- continuing migration of the rural population to major urban centres;
- market driven quality assurance systems dictating such activities as animal husbandry practices and food safety initiatives; and
- the rise of consumerism demanding greater choice within existing product ranges (e.g. cage/barn/free-range eggs; organic produce)

Australian farmers have developed highly adaptive land management systems. However, the combined cumulative impact of the issues above will expose farming systems to conditions not experienced previously. This reinforces the need to focus on the very real issue of long-term agricultural sustainability[15]. Indeed, over the next two decades there are likely to be very significant shifts in the distribution of Australian agriculture as major farming systems move into different environments and are pushed out of others due to environmental change[16].

These are issues that cannot be tackled effectively by concentrating on the individual paddock or farm level. Instead a more holistic approach is essential – one that sees greater integration of agricultural and forestry activity in a regional / catchment framework. At the same time, the changes that need to be implemented then must be translated into on-ground actions that will often occur at the farm or paddock level.

Ensuring the ***environmental sustainability*** of farming systems is a vital component of Australia's continued contribution to the world's food supply. Currently there are many factors that clearly indicate that the current situation and trends around the fundamental 'health' of the biotic and abiotic 'infrastructure' of Australia's production lands, are leading to a major crisis in sustainability and hence long-term production. To halt and then reverse these trends will require significant on-going investment and a continuing change in the way in which agriculture is conducted. In essence the long-term environmental sustainability of agriculture will be dependent on how we respond to key problems associated with soils, water availability, climate variability and change, and increasing CO_2 levels in the atmosphere, to name just a few. A major complication is the fact that these, and many other factors do not impinge on agricultural production through a series of independent interactions. Rather it is their inter-dependence, their tendency to have impacts at a range of scales ranging to whole river catchment systems, and their diversity, that makes addressing sustainability issues so complex.

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[15] Grains Council of Australia (2004). Towards a single vision for the Australian Grains Industry. www.singlevision.com.au

[16] Dept Agriculture, Fisheries & Forestry (2004). Climate change – adaptation in agriculture. Science for decision makers. December 2004.

Science response:

The points raised in 4.1. above regarding the need to integrate and organize science across Australia are equally applicable to issues of the sustainable impact of agricultural activities as they are to production issues. Similarly, CSIRO believes that many of the solutions needed to increase the environmental sustainability of agriculture can and will be delivered through the application of science-derived solutions. However, the way these solutions are delivered, and the extent to which the whole community needs to be involved, is undoubtedly substantially different to approaches adopted in the past. Indeed, maintaining and building on agricultural production gains will only be achieved through the application of highly dynamic management approaches that are continually adjusted and re-optimized in response to continuing changes in a range of environmental parameters.

Research around plant and animal-based agricultural production in Australian agencies has recognized the implications of sustainability drivers for some time. Unfortunately, though, the teams dedicated by individual agencies are often too small or too limited in their skills base to fully address the complexity of problems. CSIRO has addressed this critical mass issue by establishing the Agricultural Sustainability Initiative with a specific charter to draw on skills and capabilities from multiple Divisions to progress the creation, development and implementation of management practices aimed at improving sustainability. Going forward, areas that will need particular attention to ensure real progress in the environmental sustainability of Australia's agricultural industries include:

- Improving water-use efficiency of rain-fed crops and rotations as well as enhanced efficiencies in the delivery and application of irrigation water
- Increasing uptake of improved management and genetic solutions. That is, increasing the proportion of farmers at the frontiers of technological adoption and moving those frontiers to higher levels.
- Exploring possible emissions trading regimes to identify opportunities and trade-offs with food production, and the potential implications of agriculture being audited for green-house gas emissions from 2015 on the ability to crop the land or raise livestock without major changes in current farming practices that may reduce productive potential through enforced reductions in stocking rates or fertilizer application.
- Undertaking regional life-cycle analyses of green-house gas emissions from major cropping and livestock industries to quantify emissions under Australian climatic conditions and production practices rather than extrapolating from international data which may grossly overestimate the true contributions from Australian agriculture.
- Development of flexible farming strategies and best-management practices able to respond to climate risk and providing tools to assist improve decision making.
- Identifying and implementing strategies to reduce net greenhouse gas emissions from agricultural enterprises.
- Improved integration of science knowledge into policy formulation and implementation

Clearly, in the area of the emerging productivity plateau (***Maximizing potential yield:*** see 4.1a) there are major opportunities to maximize science-based solutions through programs that interlink genetic solutions with environmentally-based management responses. It has long been recognized by plant and animal breeders that getting the genetics "right" is a necessary but not sufficient outcome. For virtually all traits, genetic potential is modified by environmental circumstances. It is at this G x E boundary that gains in genetic potential will be realized and as environmental factors change through time, optimizing this interaction will be vitally important to both the economic and environmental sustainability of agriculture.

In a similar way, realizing the potential gains in ***input cost reductions and improved efficiencies of input uses*** (see 4.1b) that will become available through new genetic approaches to fertilizer usage (e.g. nitrogen, phosphorus) will only be fully achieved if new varieties carrying these traits are integrated appropriately into farming systems.

Finally, any consideration of the development of a program for ***"climate-ready" crops and livestock*** (see 4.1c) can only realize its full potential by close integration of genetics and management that together will lead to a sustainable system. Climate change will reduce both productivity and quality of crops (e.g. reduced protein and dormancy) and require both agronomic and genetic responses. Adaptation options will range from simple adjustments to management, through changes in genetics, to complete changes in land use. Agronomic approaches to maximizing soil water storage or utilization in future drier climates, such as by enhanced infiltration, may require changes in plant root or canopy architecture to allow full exploitation of their benefits.

Ensuring the ***environmental sustainability*** of farming systems is a vital component of Australia's continued contribution to the world's food supply. It is CSIRO's view that many of the solutions needed to increase the environmental sustainability of agriculture can and will be delivered through the application of science-derived solutions. However, the concentration of critical mass in individual agencies is often too small to fully address the complexity of the problems. In addressing problems of this scale and complexity, CSIRO's National Flagship Programmes and the recently established Agricultural Sustainability Initiative provide a blueprint for the optimization of capability management and solution delivery.

Food security versus production opportunity

The consequences of the impact of the national and international drivers affecting agricultural production have been a substantial tightening of the world's food supplies and rapidly rising prices. In Australia these escalating commodity prices have already lead to significant increases in both plant products – e.g. flour and bread – and animal products – e.g. chicken meat. While these impacts are undesirable and create some social pain, the consequences are significantly less than the potential impact of rising and sustained higher food prices for global security. Indeed, underlining the seriousness of these changes are events like: food riots in Haiti; bans on the export of cereal staples (especially rice) by several countries in Africa and Asia; and significant export tariffs on cereals from Argentina.

Australian food production is a very small fraction of global food production (i.e., around 1%). However, Australia exports a relatively high proportion of its food production and we provide around 3% of the food that is traded annually. This means that droughts in Australia have some (albeit small) impacts on global food markets. While Australian food exports make a positive contribution to global food security, the quantities involved are still small and the provision of physical food exports is not the most significant contribution Australia can make to global food security. Instead, we can make our greatest contribution to global food security through the provision of science-based agricultural technologies and management practice to stimulate agricultural productivity and sustainability in the developing world. Australia is well placed to assist, with soils, climate and farming systems that have much in common with many parts of the developing world. We are also endowed with a strong tradition of leading edge agricultural R&D, in particular focused on over coming harsh soil and climate constraints and managing risk in highly variable climates. CSIRO is engaged in discussions with AusAID and ACIAR with regard to how best Australian agricultural science might support Australia's food security response.