

Section 1: Economic Benefits

“The outcomes will contribute substantially to Australia’s industrial, commercial and economic growth.”

The Future Farm Industries CRC (FFI CRC) will transform agricultural systems across southern Australia by developing Profitable Perennials™, and applying perennial plant technologies to innovative farming systems that:

- Increase productivity of existing livestock and grain industries;
- Develop new regional industries through investment in woody crop production on farm, and
- Reduce the risk of natural resource degradation, including dryland salinity, and improve conservation of biodiversity and water resources.

Future Farm Industries CRC

Profitable Perennials™ for Australian Landscapes

FFI CRC is a unique co-investment between the three major Australian agricultural R&D investors, the largest agribusiness company, and the combined research power of six state agencies, four CSIRO divisions and four universities. The integrated activities of this partnership will deliver at least \$1.36 billion of industrial and commercial growth. It signals a new era in the major broadacre industries cooperating with science to achieve goals of profitability and sustainability.

Industry opportunities and needs

Multi-factor productivity (MFP) growth for agriculture has been substantially higher than for mining, manufacturing or services (2.8% vs around 1%¹). Nevertheless, a phase of renewed innovation is required if agriculture is to keep ahead of international competitive pressures, natural resource degradation and climate risk. The need for continuing MFP growth is illustrated by the fact that, since 1953, without productivity growth, the real gross value of agricultural production would have fallen by 60%, rather than growing substantially as it has done². R&D is a primary driver of this growth, thanks to an exceptionally well performed agricultural R&D sector. However, agriculture’s terms of trade has continued to decline 2.2% per year through this period and productivity growth of the key industries targeted by this FFI CRC proposal lagged behind, with the partial exception of crops. Their MFP growth was 4.7% for 1977-78 to 1989-90, but this dropped to 1.8% for 1988-89 to 2001-02³. Recent analysis conducted by the CRC for Plant-based Management of Dryland Salinity ('CRC Salinity') has identified a strategy based on Profitable Perennials™ as a key to boost productivity for mixed crop-livestock farming systems. Analyses indicate profit improvements at the farm level by as much as 50% resulting from innovative perennial-based systems⁴.

¹ Productivity Commission 2005, *Trends in Australian Agriculture*, Research Paper, Ch. 6, Canberra.

² Mullen, J. (2002) Farm management in the 21st Century, *Agribusiness Review* 10: paper 5

³Productivity Commission 2005, see above.

⁴ Ewing M and Flugge F 2004, *The benefits and challenges of crop-livestock integration in Australian agriculture*, in New directions for a diverse planet: Proceedings of the 4th International Crop Science Congress, Brisbane, Australia, 26 Sep – 1 Oct 2004 | ISBN 1 920842 20 9 | www.crops-science.org.au . Five 'prospect statements' in preparation by CRC Salinity; the first – *Lucerne Prospects: drivers for*

An additional factor driving the need for innovation is natural resource degradation. For the Murray-Darling Basin, the salinity costs to water, infrastructure and land are estimated at \$305 million per year⁵, while in Western Australia, the value of salinity-related losses of agricultural land will rise to between \$170 and \$260 million per year⁶ in coming decades. Given the poor profitability and limited scope of existing perennial plant options available to farmers, the cost of preventing or reversing impacts of salinity on key assets (biodiversity, infrastructure, water) is enormous. For example, the estimated current cost of protecting just 30 biodiversity assets in WA would be \$854 million; and the additional costs of maintaining at-risk road and rail is \$2.1 billion over 30 years.

Investment in this new phase of agricultural innovation will come from Meat & Livestock Australia (MLA), the Grains Research and Development Corporation (GRDC), Australian Wool Innovation Ltd (AWI), Landmark (an AWB company) and key primary industry agencies. This venture will take the CRC in a new direction for Natural Resource Management (NRM). Substantial profitability and productivity growth will create more commercial and sustainable business opportunities while mitigating key long-term risks. Our partners expect this CRC to create more profitable and resilient land uses for wide adoption and assured outcomes for conservation of natural resources.

Profitable Perennials™ are the key to future profitability, sustainability and adaptability of Australian agriculture. The CRC Salinity is demonstrating the capacities of these technologies to make greater use of rainfall, runoff and groundwater, convert water to higher value production than current farming practice, while mitigating land degradation. FFI CRC will integrate them into innovative farming systems and new regional industries across approximately 7.5 million hectares of farm land that will increase farm profitability by 10-50% while improving salinity management, biodiversity conservation, water quality and long-term sustainability.

FFI CRC, with its industry and R&D providers, will build the necessary capacity in commercialisation and utilisation, and education and training to market Profitable Perennials™ products. It will build on strong networks of influence and knowledge exchange in adoption already established by the CRC Salinity, including 12,000 subscribers to *SALT* Magazine. A looming shortage of scientists in agriculture⁷, declining State agency extension staff and a high turnover in extension professionals generally⁸ are placing product delivery at risk. To offset these constraints FFI CRC has sought out organisations new to sustainable agriculture including private companies, catchment management organisations (CMOs) and farm production groups – e.g. Landmark, Enecon, The Oil Mallee Company, North Central Catchment Management Authority (CMA) and Kondinin Group. The CRC will integrate its commercialisation and utilisation, and education and training programs to build new capacity for achieving adoption targets.

Contribution to Industrial, Commercial and Economic Growth

The new CRC focuses its outcomes explicitly on the goal of industrial, commercial and economic growth:

widespread adoption of lucerne for profit and salinity management in the Australian wheatbelt – is due for publication in August 2006.

⁵ Wilson SM 2004, *Determining the Full Costs of Dryland Salinity Across the Murray-Darling Basin*, Final Report to The Murray-Darling Basin Commission, Canberra.

⁶ Sparks T, George R, Wallace K, Pannell D, Burnside D and Stelfox L 2006, *Salinity Investment Framework Phase II*, Western Australia, Department of Environment, Report No. SLUI34.

⁷ Productivity Commission 2005, as above.

⁸ Roberts K, Paine M, Nettle R and Ho E 2005, *Mapping Rural Industry Service Providers*, Cooperative Venture for Capacity Building, RIRDC, Canberra.

Industrial growth

- Increased growth in the meat, grain and wool industries, across southern temperate Australia driven by greater productivity and profitability. This benefit will be realised in the medium to long term, within and beyond the life of the new CRC.
- Establishing the new woody biomass base for regional manufacturing and processing industries. This benefit will begin in the medium term with value added in the long term, beyond the life of the CRC.

Commercial growth

- Business growth, particularly in the agricultural service industry, coming from demands associated with productivity growth.
- New enterprises around new commercial products, and export of technologies and services. This benefit will occur in the short to medium term, within the CRC's life.

Economic growth

- Added growth to the Australian economy and exports based on the industrial and commercial growth described above. This benefit will occur from the short to the long term, within and beyond the life of the CRC.

The estimate of \$1.26 billion net present value in commercial and industrial growth generated by the Future Farm Industries CRC⁹, will be made up of:

- \$650 million present value of benefits derived from productivity growth in existing farm industries and from additional returns to off-farm investors in new processes and services, such as wood processing. The new CRC is estimated to increase or accelerate the adoption of new perennial plant-based farming systems on 7.5 million hectares (mha) of agricultural land, including 100,000 ha of new woody crops and 850,000 ha of crops and pastures on saltland. This is 12% of the 60 mha sown to crops and pastures in the target zone.
- \$350 million present value of benefits from commercial gains due to salinity containment. It is assumed conservatively that 1.6 mha of agricultural land will have the onset of salinity delayed or prevented, which is 25-30% of the likely salt-affected area under a 'business as usual' scenario.
- \$360 million present value of benefits from better informed policy and investment of public funds. Work of the CRC with governments, CMOs and regional NRM groups will bring up-to-date science and decision tools to better targeting and adoption of land use options, to achieve greater efficiency of investment of public and private funds.
- \$95 million present value of costs of operating the CRC.

This was not a before and after comparison; the benefits attributed to the FFI CRC were estimated relative to the base case of 'no new CRC'. This counterfactual allowed for innovation and productivity improvement in the absence of the proposed CRC. Selection criterion 4 explains why the basis for our conservative estimates of adoption rates is robust.

Industrial and Commercial Growth Benefits for End-users

Our benefit:cost analysis was based on a comprehensive path model that scaled up the contribution of FFI CRC's research and commercialisation to industrial and commercial benefits end-users on six pathways, to:

- Farmers from more productive farming options and farming systems

⁹ Pannell D 2006, "Benefit-cost Analysis of Proposed CRC for Future Farm Industries", The University of Western Australia (independently reviewed by Allen Consulting Group).

- Farmers from improved environmental management
- Off-farm investors from development of new industries
- Water users from improved management of water catchments, and
- Communities through more effective use of public funds in NRM policy programs.

Non-financial benefits through enhanced environmental values were also described and are additional to the values above.

Additional verification of our estimated benefits came from modelling of contributions of FFI CRC outcomes to industrial and commercial growth and its calibration against independent reference points.

Productivity growth in existing industries

The rates of productivity improvement indicated by the benefit:cost analysis are consistent with (indeed conservative relative to) historical rates of productivity growth in the agricultural sector, which are among the highest in the Australian economy (see earlier).

Meat/wool industry: The CRC will increase the productivity of livestock production through applying innovative grazing systems to a new perennial pasture and forage base across agro-climatic zones. We know that a one percentage point increase in pasture utilisation generates \$90 million net return to the sheep industry¹⁰. There is scope for significant improvement in plant production and efficiency of water use, better adapted to a wider range of agro-climatic zones, through breeding, selection and management. MIDAS modelling conducted by the CRC Salinity has shown that implementation of Profitable Perennials™ can lift farm profitability by 50% with a 50% decrease in leakage of rainfall to groundwater. More stable production from grazing systems based on native plants better adapted to climatic variability can be achieved. Woolgrowers can improve yields and financial performance 25-30% above historical or district benchmarks, by converting to perennial native pastures, more intense grazing management and woody perennials¹¹.

Grain industry: The CRC will directly address a challenging sustainability issue – how crop farmers can remain viable in the face of ever-declining terms of trade, salinity and other threats and the need for production systems to better adapt to soil and climatic constraints. Productivity of mixed farms has increased more rapidly than for specialist cropping farms in recent years¹². This provides opportunity to diversify into more perennial-based farming systems and to optimise financial performance through rotations that use natural resources more efficiently¹³.

Profitable new industries

Woody biomass industry: The CRC will develop new woody crops able to supply alternative materials for panel board, charcoal and bio-energy, as well sequester carbon. Some companies recognise the looming shortage of woody biomass from current sources and their participation in feasibility studies and business case development will determine their best opportunities for overcoming them. The global demand for engineered wood products has

¹⁰ Meat & Livestock Australia 2005, Strategic Plan, Sydney.

¹¹ Land & Water Australia, *Insights: case studies on how woolgrowers are successfully managing native vegetation and biodiversity for profit and sustainability*, Land Water and Wool, ISBN 1 920860 68 1, Canberra.

¹² Australian Bureau of Agricultural and Resource Economics 2004, Australian Sheep Industry Productivity, Canberra.

¹³ Ewing M and Flugge F 2004, as above.

grown 7% per annum since 1995¹⁴. This longer term initiative is higher risk with a very high pay-off potential; scoping studies are already showing strong industry interest. Success will mean new options for sustainability in farming and resource-based industries, economic activity in regions and management of Australia's natural resource base. Woody biomass grown on wheatbelt farms can be delivered at regional sites at a price highly competitive with conventional sources, if there is a technological breakthrough on harvesting¹⁵.

Agribusiness and NRM consulting services: The CRC is aware that of the 4,000 professionals servicing Australian agriculture, about 1,200 are in the private sector. They and professionals employed by CMOs are growing in number¹⁶, and represent the new opportunity for FFI CRC's path to adoption. Every \$100 of farm activity draws on \$19 of input services¹⁷. A Landmark Client Service Manager (CSM) could generate \$500,000 revenue over five years from developing and implementing a single farm business plan based on FFI CRC technologies and farming systems. Major revenue would come from the farm planning fee-for-service, sales of capital items (e.g. fencing, seed) and consumables (e.g. fertiliser), and commissions on sales and financing, involving five of the six Landmark activity areas¹⁸.

Triple bottom line benefits

Better adapted land-use changes: The CRC will develop innovative farming systems and changes in land uses that are better adapted to salinity, subsoil constraints and climatic variability; do not significantly trade off other important values e.g. water resources; and minimise the weed and genetic pollution risk to biodiversity. FFI CRC plans to develop decision tools capable of predicting these impacts and planning these changes for commercialisation.

Reduced salinity damage: The CRC will prevent future salinity in some areas and significantly delay its onset in others, through high-water-using farming systems, salt-adapted grazing and cropping systems and integrated management of earth works. There is a growing list of case studies for how this can be done profitably¹⁹.

Enhanced biodiversity: By placing perennial systems on the farm, often with native species, more diversified landscapes will provide additional habitat as well as other ecosystem benefits. The CRC will quantify these to build a more robust approach to developing markets for ecosystem services. There is potential for a much better informed public policy outcome through this approach and application of new decision tools²⁰.

Capacity building: The establishment of a nationally accredited training program for agribusiness and wider client networks, and the provision of industry-ready science professionals to the research community provide an important element in the 'pathway to adoption' for FFI CRC products. In the case study undertaken for Landmark as part of the development of its commercial partnership with the CRC (see above), the CSM would be

¹⁴ Davidson A and Hanna D 2004, *Engineered wood products: prospects for Australia*, ABARE e-Report 04.14, Canberra.

¹⁵ ENECON 2001, *Integrated tree processing of mallee eucalypts*, RIRDC publication 01/160, Canberra.

¹⁶ Roberts K and others 2005, *Mapping of rural industries service providers*, Publication No. 05/044, Rural Industries R&D Corporation, Canberra.

¹⁷ Productivity Commission 2005, as above.

¹⁸ Powell J 2006, Case study for Landmark company (unpublished), CRC Salinity, The University of Western Australia, Crawley.

¹⁹ LandWater and Wool 2004, *Case studies on how farmers are successfully managing saltland for profit and sustainability*, Land & Water Australia, Canberra.

²⁰ Ridley AM and Pannell DJ 2005, *SIF3: an investment framework for managing dryland salinity in Australia*, SEA Working paper 1901. CRC for Plant-based Management of Dryland Salinity, The University of Western Australia, Perth.

accredited to Certificate III in NRM to prepare the farm plan for the client on a fee-for-service basis. Postgraduate research project outputs will deliver a significant contribution to the body of knowledge generated by all research programs of the FFI CRC, and to the delivery of innovative new farming systems.

More specifically, benefits to farmers from more rapid or more substantial adoption of plant-based systems will include:

- New species and varieties of woody perennial plants (shrubs and trees) that can enhance profits when integrated into existing farming systems
- New varieties of crop plants that are superior to existing options in particular circumstances. Superiority may arise from perenniality, resulting in cropping systems that are more sustainable, or from salt-tolerance
- New pasture options that increase availability of feed for livestock at times when paddock-feed is traditionally relatively scarce, particularly in Mediterranean climates (WA, SA, Vic, southern NSW)
- Higher quality of feeds, due to more legumes in the diet, and production of green feed when traditional systems provide mainly dry feed
- New species and varieties will combine to allow greater carrying capacity of livestock on farms, generating greater profit to producers from increased income and lower costs
- Mitigation of risk in livestock production due to diversification of land uses, and of feed sources, and the ability of perennial pastures to produce feed in conditions that are adverse for annual pastures
- Improved quality of wool and higher prices, due to less tender wool caused by low feed availability and quality during summer/autumn
- Increased out-of-season meat production and potentially higher sale prices, due to increased lamb weights at slaughter
- New designs for integrated farming systems that encompass the above options
- Profits to off-farm investors associated with new perennial plant-based industries, through provision of processing, transport, finance and other services.

Contribution of Industrial and Commercial Growth to Economic Growth

The \$1.0 billion of commercial and industrial benefits identified above will make a substantial contribution to Australia's economic growth. Agriculture is highly integrated with the rest of the economy, and so additional growth will also be induced in the manufacturing and service sectors that provide inputs to agriculture. For example, those farm-dependent industries account for 12 % of GDP²¹. Significant economic growth will be contributed to regional economies, with a substantial impact on local employment. For example, across half of Australia's 425 statistical labour regions, agriculture accounted for 25% of total employment in 2001²². The increased growth will occur in industries which have a high export intensity; based on an estimated 70% export intensity for the affected industries, the CRC will generate exports worth \$710 million directly. In addition, the increased productivity will feed into other exporting manufacturing and service industries. This is substantiated by analysis that exports from the manufacturing and service sectors based on value-adding to agricultural products almost triples the total value of exports from the whole agricultural sector (based on UN Standard International Trade Classification)²³.

²¹Productivity Commission 2005, as above.

²²Productivity Commission 2005, as above.

²³Productivity Commission 2005, as above.

Robustness of Estimates - Application principles

Analysis of the proposed CRC was conducted using standard economic methodology, fully consistent with Appendix F of the application guidelines. Sensitivity analyses based on different assumptions about adoption, market prices, technical parameters and discount rates are reported in Selection Criterion 4. Experienced economic consultants conducted the analyses, with oversight by a committee chaired by one of Australia's leading agricultural economists, and reviewed in detail by an external consultant with high-level expertise in the area. Consequently there is an exceptionally high degree of rigour and sophistication in the final analysis. A detailed explanation of how the principles of Appendix F were followed is in Selection Criterion 4.

Outcomes that the CRC will achieve and the scale (quantity and value) of each outcome

<i>Outcome</i>	<i>Quantity and value</i>
Productivity growth in existing industries: Additional commercial growth in businesses from higher productivity in meat, grain and wool industries.	An estimated Present Value (PV) of benefits of \$490 million through adoption of new perennial plant-based farming systems on 7.4 million hectares (mha) of agricultural land.
Profitable new regional industries: Commercial growth in on-farm production and regional manufacturing sales and exports of services and technologies.	An estimated PV of \$160 million from farm production and manufacturing industries, generated from 100,000 ha of farm plantings to woody perennials.
Salinity damage reduced: Mitigation of risk for farm businesses and reduced impacts of dryland salinity on land, biodiversity, water resources and other community values.	An estimated PV of \$350 million. It is assumed conservatively that 1.6 mha of agricultural land will have onset of salinity delayed or prevented, which is 25-30% of the likely salt-affected area under a 'business as usual' scenario.
Other environmental benefits: Land use changes contributing to ecosystem services including biodiversity and water supply.	Unpriced benefits including enhanced habitat values and ecosystem services, protection of off-site biodiversity values and management of weed risk.
Capacity building: Better informed public policy and investment of public funds, drawing on the advice and decision tools of the FFI CRC; education and training to build capacity for commercial growth of agribusiness, and to foster the next generation of professionals in CRC participant organisations.	An estimated \$360 million PV attributable to more effective government policy and national/regional investment programs.

Key contributions of the outcomes to specific National Research Priority Goals

<i>National Research Priority Goal</i>	<i>Contribution</i>
---	----------------------------

<p>Transforming existing industries (Environmentally Sustainable Australia)</p> <p>Promoting an innovation culture and economy (Frontier Technologies for Building and Transforming Australian Industries)</p>	<p>An estimated \$1.3 billion <u>net</u> present value in commercial and industrial growth. To achieve this through more profitable farming systems based on perennial plants, including new production from native plants, requires innovation, new investment and risk management. Enterprises in existing agricultural industries will be more intensive and fundamentally different because Profitable Perennials™ will be involved. New companies will enter agriculture and commercial service providers will gain new business opportunities.</p>
<p>Other priority goals</p> <p>Overcoming soil loss, salinity and acidity</p> <p>Sustainable use of Australia's biodiversity</p> <p>Water – a critical resource (Environmentally Sustainable Australia)</p>	<p>The proposed research will fully integrate economic drivers for change with sustainability principles and a systems approach. New farming systems and industries will be developed and promoted for adoption where they meet standards for conservation of natural resources, reducing the risk of dryland salinity, and improving conservation of biodiversity and water resources.</p>