Australian Government
Rural Industries Research and Development Corporation

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Secretariat
Standing Committee on Agriculture and Water Resources
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Canberra ACT 2600
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Inquiry into Water Use Efficiency

Dear Secretary

On behalf of the Rural Industries Research and Development Corporation (RIRDC), I provide this submission to the inquiry into water use efficiency as it applies to the Australian rice industry. In response to the terms for the inquiry, I address the four criteria as advertised.

The Rice Research, Development & Extension (RD&E) Program and its research partners have delivered many successes for the rice industry including rice varieties with high yields and qualities demanded by premium paying export markets. Even more importantly these yields have been achieved through research that has also delivered improved water use efficiency – rice yield per megalitre of irrigation water applied has increased from 0.5 tonne per megalitre of water applied in 1991 to over one tonne per megalitre applied in recent years. The key driver of future research direction emerging from the rice industry outlook, risk assessment and program review conducted in recent years is the need for the rice industry to make major and immediate inroads into further improving water use efficiency.

A dramatic improvement in water use efficiency will provide resilience to drought, climate variability and increasing competition from other irrigated crops. Dramatically improving water use efficiency delivers economic benefits for growers as well as environmental and social benefits for the Australian community. Consequently, the goal of the Rice Program RD&E Plan 2017 – 2022 is to: **Invest in RD&E to improve rice industry water use efficiency.**

1. Adequacy and efficacy of current programs in achieving irrigation water use efficiencies

RIRDC is engaged in research programs focused on irrigation water use efficiency either directly managed or under collaborative research partnerships. RIRDC has 11 current or recently completed projects and work activities in this theme area.

RIRDC has commissioned plant breeding research in trait selection that has resulted in significant irrigated water savings. For example, rice varietal selection for short growing season characteristics has resulted in lower crop water use that equates to up to 50 percent less water requirement than traditional temperate varieties.

Current rice crop forecasts for the 2016-2017 rice season include:

- 4,255 hectares of variety YRM70 estimated to yield 44,100 metric tonnes; and
- 2,100 hectares of YRK5 estimated to yield 18,800 metric tonnes.

In total, these two short season rice varieties, grown over 6,355 hectares in the Murrumbidgee, Coleambally and Murray Irrigation areas, are estimated to result in water savings of two to four megalitres per hectare or 12.7 to 25.4 gigalitres in total. Assuming a 2016-17 irrigation water cost for General Security allocation of $20 per megalitre, this offers an economic benefit of $254,000 to $508,000 per annum. At $200 per megalitre (as per Table 1) the economic benefit is $2.5 to $5.0 million per annum.

2. How existing expenditure provides value for money for the Commonwealth

Under the current funding model for levied industries including rice, the matching Commonwealth contribution is up to 50 percent of the industry contribution. The most recent economic evaluation of the Rice R&D Program (*Hardaker, T. & Chudleigh, P. (2016) An Economic Evaluation of Investment in the Rice R&D Program, 2012-2017. Agtrans Research*), includes a current impact assessment process addressing a population of projects completed, or due to be completed, within the life of the Rice Research and Development Plan 2012-2017. The 44 projects in this population demonstrated a wide range of industry impacts, a number of which are valued in monetary terms in the impact assessment. Total funding from all sources for all 44 projects totalled $38.7 million (present value terms). Of the 44 projects, the impacts from 28 of the projects were valued. Funding for the 28 projects where impacts were valued totalled $33.6 million (present value terms) and produced aggregate total expected benefits of $254.7 million (present value terms). This gave a net $221.0 million, and a benefit-cost ratio of 7.6 to 1. The 28 projects valued represented approximately 87% of total funding for the 44 projects in the project population. When the benefits for the impacts valued ($254.7 million) were compared to the total investment in all projects in the population ($38.7 million), this lowered the investment criteria. The total investment in the 44 projects produced a net present value of $216.0 million (present value terms), and a benefit-cost ratio of 6.6 to 1.

3. Possible improvements to programs, their administration and delivery

Wherever possible RIRDC attempts to seek collaboration between research investors and providers in order to increase the benefit across the agricultural sector. For example, PRJ-010083 'Maximising On-Farm Irrigation Profitability in Southern Connected Systems', is a cross sector project that looks at delayed permanent water, irrigation design layout and water delivery to improve irrigated efficiency.

4. Other matters, including, but not limited to, maintaining or increasing agriculture production, consideration of environmental flows, and adoption of world's best practice

There are a range of mitigation methods which can be used to reduce the effects of changes in climatic conditions and shallow groundwater regimes including cultivating crop varieties with reduced transpiration in high evapotranspiration (ET) environments, the development of non-ponded rice systems, improving the timing/ durations of rice crops to match reduced evaporative demand periods, minimising ponding through delayed permanent water and flushed finishing rice crops, increasing intensity of rice growing, targeting better rice soils for production and modifying irrigated soils.

Weed control

Research into weed control has led to improved weed management by increasing adoption of the herbicide combination Clomazone plus Pendimethalin. It was found that this herbicide combination gives superior residual control of grass weeds (in particular, barnyard grass) which has enabled growers to confidently apply delayed permanent water strategies to increase water use efficiency.

The water savings that occur through the use of delayed permanent water strategies in rice farming is the impact valued in the following analysis. Impacts identified that are not valued include:

- The increased use of Clomazone plus Pendimethalin in herbicide rotations may slow the rate of increase of resistance to other herbicides.

Specific assumptions used are provided in Table 1.

Counterfactual

Without these projects it has been assumed that increased adoption of the Clomazone plus Pendimethalin combination would not have happened and hence the impacts would not have occurred.

Table 1: Specific assumptions for valuation of increased adoption of Clomazone plus Pendimethalin for control of grass weeds

Variable	Assumption	Source
Average area of rice grown	91,800 ha	Average for past 20 years from ABARES (2015)
Average yield	10 tonnes per ha	Average for past 5 years from ABARES (2015)
Average value of rice	$305 per tonne	Average for past 20 years from ABARES (2015)
Water saving	1.0 ML per ha	Conservative estimate by Agtrans Research based on discussions with Malcolm Taylor, 2015
Value of water	$200 per ML	Agtrans Research based on Wilks Water (2016)
Additional area subjected to delayed permanent water as a result of improved weed control using clomazone plus pendimethalin	1% of total rice area	Conservative estimate by Agtrans Research
First year of impact	2013	Based on completion of first project PRJ-002854 in year ended June 2013
Years to max. adoption	3 years	Agtrans Research

Source: Hardaker & Chudleigh (2016)

Current Projects

The following Table 2 details current RIRDC projects directly or indirectly covering research into water use in agriculture and demonstrates a research investment of approximately $1.9 million.

Table 2: Current research and projects in Australian irrigated rice completed in 2016-17

Project ID	Project title
PRJ-010697	Contribution Towards the Cost of Implementing Water Use in Agriculture Strategy Dairy Australia Lead Agency
PRJ-010524	International Temperate Rice Conference 2017. Australia played host to more than 250 delegates from major rice producing nations across the world. The exchange of scientific knowledge and practical skills in water management in rice was presented.
PRJ-010400	Changes in Rice Water Use - Scoping Study
PRJ-010198	Northern Australia Rice Industry
PRJ-010083	Maximising On-Farm Irrigation Profitability - Southern Connected Systems
PRJ-009908	An Economic Evaluation of Investment in the RIRDC Rice R&D Program 2012-2017
PRJ-009296	Rice Extension Coordination
PRJ-009271	Developing and Testing Tools for Measuring and Managing Variability in Rice
PRJ-008483	Implementing Precision Agriculture in the Australian Rice Industry
PRJ-008173	Assess Degradable Polymer Film Use in Early Planting of Aerobic Rice Varieties

Notes: Total RIRDC investment includes grower levy funds as well as Australian Government matching funds. Budget allocation amount reflects total cost of the project unless significant work is yet to undertaken. Some projects have a timeframe that exceeds one year.

The following project summaries provide further detail on the planned research activity and expected outputs.

Maximising On-Farm Irrigation Profitability - Southern Connected Systems

Broadacre irrigators are seeking alternative irrigation systems that are labour, water and energy efficient and are more profitable for each megalitre(ML) of water used. New systems are required that are more efficient and profitable for each megalitre(ML) used and are flexible to allow growers to change the crop type they will produce in response to changes in markets and water availability.

Improved surface irrigation designs are required to retain the advantages of existing systems (low capital and energy requirements) yet are faster watering (decreased accessions and greater water productivity) and better draining (decreased waterlogging and higher crop productivity). Investigation of reliable design, evaluation and management tools for optimizing hydrologic performance is required to provide clear evidence to identify, recommend and gain adoption of best practice surface design and associated irrigation management.

Rice Extension Coordination

The project is to be delivered over three years, from 1 July 2014 to 30 June 2017, and will establish a levy-funded extension system across the rice growing regions utilising modern delivery methods. The new extension system will coordinate relevant research, development and extension activities and best management practice information that incorporates natural resource management, and establish and manage a network of on-ground extension service providers. The project will ensure that relevant research and development information reaches growers in a way that can be readily understood and practically

implemented on farm, provide feedback channels to design more targeted research and development, and build grower and industry capacity.

Developing and Testing Tools for Measuring and Managing Variability in Rice

As the last decade has proven, drought and climate change are a serious threat to the rice industry. Consequently, irrigation water availability and input costs are critical issues for Australian rice growers. Understanding spatial variation and developing prescription tools for maximising production is a priority. To address these issues, improved understanding of crop physiology and yield responses to management and environmental factors such as irrigation, bay water depth and temperature, soil type and nitrogen status is required. Recent advances in remote sensing have the potential to provide key water management information to rice growers which will allow them to improve their water use and productivity and benchmark their water use productivity against others in the industry within and across regions. This is a particularly powerful tool, allowing assessment of the relative contributions of management and environment on rice productivity on a farm and regional scale. The project aims to utilise the platform of existing remote sensing technologies in the form of irrigation management tool IrriSAT, developed by the Commonwealth Scientific and Industrial Research Organisation. IrriSAT is a prescription tool for rice growers that increases grower understanding of their crop water use and yield variability and the factors driving spatial variability in yield across their farms. The project seeks to build on two main areas: (1) application of IrriSAT technology in determining variable crop water-use and farm-to-regional scale crop water use productivity benchmarking and (2) investigation of the environmental and management factors in driving yield variability and opportunities to manage variability in rice systems, using practical approaches.

Rice Partnership (breeding and quality)

The vision of this partnership project is to develop rice varieties and rice cereal technology to meet the needs of growers, industry and government to enhance economic activity, protect the environment and underpin regional development and stability.

Assess Degradable Polymer Film Use in Early Planting of Aerobic Rice Varieties

This project will assess the cost and benefits of a proposed new practice for producing aerobic rice using degradable film that offers the potential of sowing at an earlier stage (during cooler conditions) and reaching maturity during the ideal environment occurring in the first months of Autumn. The project will be hosted and managed by Rice Research Australia Pty Ltd (subsidiary of SunRice) and will involve small-scale trials in the first year followed by larger scale trials conducted over the following two years. They will determine the best time to apply the film, the optimal time it should remain intact and the best rice variety. The anticipated benefits also include water savings and a reduction in crop impacts by pests, particularly locusts and weeds.

I trust this overview of RIRDC research activity provides a valuable insight that supports the inquiry. Please do not hesitate to contact if you require further details or clarification of the information provided.

Yours sincerely

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