

Evaluation of the Agricultural Resources Management Program

June 2015

This publication is part of a series summarising program evaluations to enhance the accountability and transparency of NSW Trade & Investment activities. The completed program evaluation template is attached.

The Agricultural Resources Management Program

The Agricultural Resources Management Program delivers three research and development (R&D) sub-programs in the area of soils, water, and climate. The major emphasis of the program is on the development and evaluation of more sustainable agricultural practices and technologies, which are assessed through on-ground R&D trials across major production regions of NSW.

Objective

In the absence of government intervention, market failure can occur in the use of natural resources by agricultural industries in the form of 'externalities', where deterioration in the quality of land and water resources frequently spreads beyond individual farms to a catchment or basin-wide scale. As a result, the full social costs of degradation associated with an agricultural practice are not borne by individual farmers or even the agricultural sector alone. Furthermore, due to the public good attributes of R&D, attempts to remedy this situation through research, for example, would likely result in investment below socially optimal levels by agricultural producers because they would be unable to recover sufficient benefits from doing so (as many of the benefits accrue to others elsewhere in the catchment). While industry levies have a role to play in reducing the 'free riding' incentive that results from the public good nature of R&D aimed at generating both private and public benefits, the Productivity Commission¹ has found that public funding of rural R&D is still required to achieve efficient outcomes.

The objective of the Agricultural Resources Management Program is, therefore, to ensure the provision and adoption of socially desirable agricultural resource management R&D that would not be supplied by the market. This objective is consistent with Goal 3 in NSW2021 to drive economic growth in regional NSW. A priority action under this goal is to deliver research, development and education programs to improve water efficiency, reduce greenhouse gas emissions and reduce the impact of agriculture on the environment and natural resources.

Options

The alternative options for pursuing the objective that were considered in the evaluation of the Agricultural Resources Management Program included:

- the existing Program with an annual budget of approximately \$12.1 million (55% from Consolidated Revenue); and
- services delivered by a separate Agricultural Resources Research agency with a focus towards undertaking research for various funders, including the NSW Government. These services would be provided under a commercial business model and would be likely to require marginally lower Consolidated Revenue funding than option 1;

Assessment

NSW Trade & Investment program evaluations compare the efficiency and effectiveness of alternative options with that of the existing or proposed program. This involves an assessment of the costs and benefits of each option relative to the base case of 'no program' and, where these benefits and costs have been quantified, a comparison of the net benefit and benefit-cost ratio (BCR) of each option.

¹ Productivity Commission 2011. Rural Research and Development Corporations, Report no. 52, Final Inquiry Report, Canberra.

A qualitative assessment of alternative options to achieve the objective of improving the management of natural resources that underpin the sustainable production of food and fibre in NSW was undertaken. The preferred option was the existing Agricultural Resources Management Program, which provides agricultural R&D to enhance long-term agricultural productivity and the sustainable use of natural resources and was assessed as providing a net benefit. The alternative option identified to achieve the objective, although less expensive in the long term, was deemed to provide net benefits of a lower magnitude than Option 1.

Cost recovery

The evaluation assessed the existing program pricing arrangements relative to the cost recovery principles outlined by the Productivity Commission in its 2001 Inquiry Report on Cost Recovery by Government Agencies. The evaluation found that the program produces a mixture of industry and public benefits. As such, 45% of program funding comes from Rural Research & Development Corporations and the remaining 55% through NSW Government budget allocation.

Application of the Productivity Commission's cost recovery principles to the existing program indicates that the cost of agricultural R&D that results in benefits to producers should be recovered via a levy set at avoidable cost (which is deemed to be already incorporated into the external funding model). Alternatively, R&D that results in public benefits is appropriately funded by the NSW or Australian Governments with no cost recovery.

Performance Measures

Key performance measures and indicators measure program performance and progress towards meeting government policy objectives. They demonstrate how effective a program is in producing the required outputs and achieving the desired outcomes.

A number of output and outcome performance measures are proposed for the Agricultural Resources Management Program. These measures are based on reducing the externality market failure occurring through the deterioration in the quality of land and water resources as well as the public good market failure of under-investment into agricultural R&D. Examples of this Programs outcome measures and indicators include:

- level of adoption of NSW DPI developed efficient water technologies/practices;
- level of adoption of NSW DPI developed soil carbon management practices; and
- reduced greenhouse gas emissions per unit of agricultural production (reduce emissions intensity).

Future Evaluations

This is the first evaluation of the Agricultural Resources Management Program as part of the regular Departmental cycle of evaluations informed by the NSW Government Evaluation Framework. As such, the evaluation concentrated on the qualitative aspects of 'formative' evaluation to build the capacity of program management to monitor program's performance in the future – problem identification, program logic and performance measure design. Data collection will now commence to enable quantitative 'summative' evaluation of the Program when it is next scheduled for evaluation under the Framework.

More information

Further information on the Agricultural Resources Management Program can be obtained from:

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (June 2015). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the NSW Department of Trade and Investment, Regional Infrastructure and Services or the user's independent advisor.

Attachment: Program Evaluation Template

Division:	Agriculture NSW
Program (Current):	Agricultural Resources Management

Step 1 - Issue or Challenge and Objectives

- a. *Describe the issue or challenge that the program aims to address. That is, why should the department intervene? What would happen in the absence of the program?*

Sustainable agricultural production is critically dependent on, and changes, the natural resource base. While farmers face strong incentives to steward their resource bases, there are well-recognised externalities that produce 'downstream costs' and significant limitations on what we know about long term impacts of some practices. In the absence of intervention, farmers are often unable to recognise the effects of their management practices on others and/or to recoup the costs of discovering more sustainable management practices. In either case, costs are incurred to by both industry and the broader community through externalities. Consequently, socially desirable sustainable management practices will often be undersupplied by the market.

- b. *Identify the groups that would be affected by the issue or challenge without departmental involvement (individuals, industry or community).*

- Farmers – around 70,000 people are employed on farms in NSW, with many more working in areas supplying inputs and transporting and processing outputs.
- Non-agricultural water users – impacted through externalities related to management practices in agriculture and forestry (water quantity and quality effects).
- NSW community as a whole through:
 - environmental externalities related to less sustainable land management practices, or to practices that affect wider amenity, landscape or complementary uses;
 - less efficient policy settings related to water, climate and soils, especially environmental regulation that entails higher net costs than might be achievable with the development of smarter, more appropriate, farming systems; and
 - increased primary industries reliance on other forms of public support (e.g. drought assistance because drought impacts are intensified by changes to the resource base).

- c. *Quantify the impact of the issue in the absence of departmental involvement - the severity of the issue should be demonstrated with quantitative data where possible on the significance and consequences of the issue or challenge in the absence of departmental involvement. If no such 'cost' estimate exists, proxy information can be provided to give an indication of potential 'scale', such as industry value of production.*

Agriculture is dependent on the sustainable use of natural resources including soil and water. In the absence of departmental involvement², we would expect to see a less productive and

² In this template, the term 'in the absence of departmental involvement' actually refers to the absence of the program being evaluated. Other organisations can influence how resources are used in the agricultural sector through regulation and extension (as noted in 1e), but the focus here is on the Agricultural Resources Program.

sustainable agricultural sector in NSW that imposed greater externalities on the community because of the use of more degrading land and water management practices. Whilst it would be very difficult to quantify the impact in the absence of departmental involvement, the following information provides an overview of the extent of the issue as it currently exists and what would be at risk in the absence of involvement.

Greater demands are being placed on natural resources in NSW to meet growing food and energy demands whilst the area of arable land and the availability of water resources decline. The agricultural sector in NSW is a major user of natural resources and generates significant economic returns. The gross value of agricultural production in NSW was \$10.76 billion in 2011-12 (ABS 2013). With around 60 million hectares, or 75% of the total area of land in NSW, managed for agricultural purposes, agricultural practices are a key determinant of the status of natural resources. An overview of problems related to soil, water and climate management is provided below:

Soils

- Soil resources in NSW are in fair condition overall, both on a state-wide basis and at the regional scale. Significant land degradation issues still remain. Increasing pressures on soil resources are a result of growing populations, increasing intensification of agriculture and degrading vegetation conditions (NSW SOE Report 2012).
- According to DECCW (2010) significant specific land degradation concerns are apparent across the state. Of the state's 124 soil monitoring sites, 74% were rated as poor or very poor for at least one degradation hazard. Conservation farming practices such as reduced tillage have helped improve soil condition generally – soil structure in particular – and also control erosion. The extent to which they improve organic carbon levels and prevent acidification is less clear and these remain issues. Wind erosion is an ongoing concern in the western parts of the state, resulting in soil loss and occasionally costly impacts on major urban centres, including Sydney.
- A key factor constraining the sustainable use of soil is that it is essentially a non-renewable resource, as soil formation is an extremely slow process. Soil renewal rates are very slow and beyond human time frames (Bui et al. 2010). The consequences of some types of land degradation, such as soil loss from accelerated erosion, dryland and irrigation salinity, and subsoil acidity, are long term and often irreversible.
- The recycling of organic and inorganic wastes on agricultural land can also lead to contamination from particulates (glass, metal plastic), chemicals, heavy metals and pathogens. Recycling of wastes is becoming increasingly prevalent due to the global decline in economically recoverable sources of phosphate and the high (economic and environmental) cost of producing nitrogenous fertilisers.

Water

- Water resources are critical for many human needs, such as the supply of town water, and stock and domestic water, the irrigation of crops, and for mining and industry. The need to maintain a healthy environment (preservation of as well as securing water resources to enable future economic growth) depends on an adequate supply of good quality water. Water availability and quality are prominent public policy issues to the NSW community. Water is critical for agricultural production and ensuring balance between extractive use and environmental water requirements is a significant management challenge. Given the conflict across uses, there is scope for very high value to be attached to new ways of using water in agriculture that imply less severe and costly conflict.
- Long-term average water use in NSW is about 7,000 gigalitres (GL) per year but use is quite variable and depends on rainfall and flow conditions. Around 80% of this water

is extracted from regulated rivers and the remainder comes mainly from groundwater in the major inland alluvial systems with the balance drawn from unregulated rivers.

- Water resources are a key input for agriculture in both rainfed and irrigated systems. The agricultural sector is by far the largest user of water in NSW accounting for around 70% of total water use. The gross value of irrigated agricultural production in NSW in 2011-12 was \$3.154 billion (ABS 2013).
- Changing patterns of land use and water interception also have implications for groundwater levels and salinity, with potential to constrain agricultural production and cause substantial loss of environmental, amenity and landscape values.

Climate

- Climate is a major driver of large changes in agricultural and forestry production that occur from one year to the next. Climate is closely linked with sustainability issues because variability tends to exacerbate imbalances in the water cycle, to which many degradation issues like salinity and acidity are linked.
- The most pervasive climate effects occur in times of drought with reduced crop and livestock production, as well as an erosion of the productivity and resource base of farms. By contrast, projected increases in more extreme rainfall events and flooding can also exacerbate land degradation and reduce production.
- Climate change poses some additional challenges to agricultural industries and the natural resource base. There is already strong evidence of the influence of climate change in Australia. The mean temperature in Australia has increased by around 0.7°C since 1960. Over the last 50 years air temperature has been increasing, with every decade warmer than the decade before. All years in NSW from 1997 to 2008 were warmer than average, an unprecedented sequence in the historical record. Most climate models point to a future climate with more frequent and severe droughts and conditions in which some pests and diseases become more invasive and prevalent.
- Collectively, these trends imply some challenges for agricultural industries across NSW in the future if they are to remain competitive.
- DPI Agriculture also has substantial capacity to develop cost effective ways of reducing greenhouse gas emissions and sequestering carbon in agriculture and forestry, which could reduce the overall cost to society of meeting emission targets.

d. Describe who or what created the issue or challenge. Examples include specific industry participants (such as producers or consumers) and environmental factors (such as the effect of climate change).

- The problems relating to land and water degradation are a product of planning and land management decisions and climatic conditions. Economic development in the agricultural sector has led to a more intensive use of land and water resources for crop and livestock production. There has also been an expansion of agricultural production into more marginal areas and this intensification and expansion places greater pressure on natural resources.
- Inappropriate management has led to many soils being degraded through processes such as erosion, acidification, nutrient depletion, contamination, loss of soil carbon and soil structure, and mobilisation of salts. This degradation reduces the productive capacity of soils and can be difficult and costly to remediate. Similarly, past decisions relating to water infrastructure, over extraction of water resources and poor water management practices has led to problems with the availability and quality of water and degraded rivers and aquifers.
- The economic causes of soil and water degradation are well documented and are grounded in information failures and unpriced spillovers to downstream users. Often

<p>there is considerable uncertainty about the links between particular practices and land and water degradation, while markets, including financial markets, are still fairly immature in their ability to capitalise the cost of long-term detrimental trends in soil condition.</p> <ul style="list-style-type: none"> • Poor information also acts as a barrier to landholders in ameliorating degradation and constrains the development and implementation of policies to prevent future land degradation. Again there is uncertainty as to what should be done and the individual incentives to do it can be severely muted. Research designed to provide such information may exhibit ‘public good’ characteristics and consequently be undersupplied by the market. • There has also been some history of government failure in the management of natural resources. Much of this failure can be attributed to insufficient information about important linkages between land use practices and environmental degradation. This highlights the importance of R&D in providing a sound evidence base to underpin policy development. 	
<p><i>e. List current programs or legal instruments (provided by industry or any level of government) which aim to address the issue or challenge. Could these be altered to address the issue or challenge?</i></p>	
<p>Other Programs</p>	<p>Able to be altered?</p>
<p>Soils</p>	
<p>State (e.g. Soil Conservation Act 1938)</p>	<p>Yes - the Soil Conservation Act could be modified and there is review currently underway. However, the effectiveness of regulatory approaches to address soil degradation remains limited and does not address the availability of improved management practices. Conversely, improved information arising out of R&D might be translated into improved behaviour in part through modifications to the Act.</p>
<p>Federal (e.g. Climate Change Direct Action Policy) policies address soil management issues.</p>	<p>No - while the Direct Action Policy may create additional incentives to improve soil management, particularly the enhancement of soil carbon, it is not able to fund R&D. Incentive payments would decrease the divergence between private and public interests and enhance the adoption of improved soil management practices.</p>
<p>Rural Research & Development Corporations (e.g. GRDC) fund some soil related research.</p>	<p>Yes - NSW could reduce its commitments under the Primary Industries Standing Committee National Soils RD&E strategy and rely on industry-based Rural RDC’s to enhance their funding of soils research. This would result in the funding of a narrower range of soils research focused on industry benefits rather than public benefits and the loss of specific research related to soils in NSW. However, the</p>

	<p>benefits of the research will not in all cases fall clearly to producers and there is likely to be insufficient commercial incentive for producers to fund an optimal level of investment.</p>
<p>Water</p>	
<p>Regulation: NSW Water Management Act (2000), including Water Sharing Plans, Murray-Darling Basin Plan (2012), Relevant bodies: NSW Office of Water, Office of Environment & Heritage, Murray-Darling Basin Authority, , the Sustainable Rural Water Use and Infrastructure program</p>	<p>Yes – a research function could be shifted to an alternative body that implements policy. However, there are some benefits of having primary policy responsibility separated from research related to independence and engagement with industry. While some of the R&D has benefits to irrigated industries and gains industry support, environmental issues related to water use are not addressed by industry funding bodies specifically. Some funding is offered through MDBA and NOW but the focus is around planning decisions rather than more sustainable water use practices in agriculture.</p>
<p>Rural Research & Development Corporations fund some water related research.</p>	<p>Yes - NSW could reduce its commitments under the Primary Industries Standing Committee Water Use in Agriculture RD&E strategy and rely on industry-based Rural RDC's to enhance their funding of water research. However, while some of the R&D has benefits to irrigated industries and gains industry support, environmental issues related to water use are not addressed by industry funding bodies specifically. If left to industry funding alone, there would be under investment in environmental research by definition.</p>
<p>Climate</p>	
<p>Policy: National Drought Policy, Clean Energy Act, Emissions Reduction Fund.</p>	<p>No - Improved climate projections and changes in policies could provide greater incentives for the adoption of more climate resilient on-farm practices. CCRSPI provides coordination of R&D across States but is not a supplier of R&D itself.</p>
<p>Relevant bodies: PISC Climate Change Research Strategy for Primary Industries (CCRSPI), Office of Environment and Heritage.</p>	<p>Carbon markets, made available through the introduction of an ETS or the current Direct Action Plan, where government is a buyer of abatement, can provide incentives for reduced greenhouse gas emissions in agriculture. This could create a framework in which the costs the community incurs in meeting emission reduction targets is reduced by virtue of</p>

	options developed for agriculture
<p><i>f. Identify who might benefit if action [such as the program being evaluated] is taken by the department.</i></p> <p>Who are the primary beneficiaries?</p> <ul style="list-style-type: none"> • Agricultural industries benefit from more sustainable and resilient practices and farming systems that increase productivity and address consumers concerns about the environmental impacts of agricultural production. The impacts of changed practices on the resource base are likely to be heavily lagged and spread well beyond the individual landowner adopting different practices. • Other users of land and water resources benefit from a reduction in the land and water contamination and a reduction in the off-site movement of nutrients and agrichemicals. • The NSW Government benefits by having scientific evidence to underpin policy development related to land and water use by the agricultural and other sectors. <p>Who else might benefit?</p> <ul style="list-style-type: none"> • The broader community benefits from the adoption of more sustainable land management practises which conserve soil and water resources and reduce negative externalities. • Potentially, the research could support agriculture playing a valuable role in reducing the costs the community faces in pursuing strategies to limit greenhouse gas emissions. • The broader community also benefits from improved land and water practices that support the availability of low cost, high quality and safe food. • Taxpayers through reduced primary industries reliance on other forms of public support at times of extreme events including droughts. 	
<p><i>g. Statement of Objectives: Determine whether there might be a role for the department in addressing the perceived issue or challenge – i.e. what high-level objectives might a potential program achieve?</i></p> <p>Objective: to ensure the provision and adoption of socially desirable agricultural resource management research and development that would not be supplied by the market.</p> <p>Policy Alignment:</p> <p>The Agricultural Resources Management Program contributes to three NSW 2021 goals:</p> <p>Goal 3: Drive economic growth in regional NSW</p> <p>Target 3.3 Protect strategic agricultural land and improve agricultural productivity</p> <ul style="list-style-type: none"> • Priority Action 4 – Deliver RDE programs to: <ul style="list-style-type: none"> ○ improve water efficiency, reduce greenhouse gas emissions and reduce the impact of agriculture on the environment and natural resources, AND ○ improve productivity to make agriculture industries resilient to climate variability and responsive to international markets and policies <p>Goal 22: Protect our natural environment</p> <p>Target 22.1 Protect and restore priority land, vegetation and water habitats</p> <ul style="list-style-type: none"> • Priority Action 7 – Complete Water Sharing Plans for surface and ground water sources and report annually on environmental water use 	

- Priority Action 8 - Drive the Commonwealth to ensure they deliver a Basin Plan that protects the environment and regional, social and economic outcomes through investment in strategic water recovery, water efficiency and river health measures.

Target 22.3 Increase renewable energy

- Priority action 2 - Establish a Joint Industry Government Taskforce to develop a Renewable Energy Action Plan for NSW to identify opportunities for investment in renewable energy sources

Goal 23: Increase opportunities for people to look after their own neighbourhoods and environments

Target 23.6 Minimise impacts of climate change in local communities

- Priority Action 2 – work with government agencies and universities to deliver improved climate projections for NSW and the ACT

The Agricultural Resources Management Program contributes to three NSW Trade & Investment outcomes:

Result 1: Increased investment and jobs

Outcome 1.2: Improved performance of key industry sectors leading to growth in Gross State product (GSP)

Strategy: Support the sustainable development of the NSW mining, gas, agriculture, fisheries and forestry sectors to increase the value of production.

Result 2: Positive business environment in NSW

Outcome 2.2 Opportunities created to drive productivity through innovation

Strategy: Conduct science and research and deliver leading edge knowledge that underpins the productivity and competitiveness of NSW industries.

Outcome 2.3: Natural resources are sustainably managed, developed and shared to underpin current and future prosperity

- Strategy: Develop strategies, policies and plans to balance the productivity and growth needs of industry and community with the sustainable management of natural resources.
- Strategy: Increase the uptake of sustainable industry and community practices through research, compliance, extension and education programs.
- Strategy: Work with industry and landholders to deliver soil conservation services for improved catchment outcomes.
- Develop and implement initiatives to secure the health of the State's rivers and groundwater systems.

Market Failure:

The Agricultural Resources Management Program provides R&D to enhance **long-term** agricultural productivity and the sustainable use of natural resources. Agricultural productivity relies upon access to good quality land and water resources. Deterioration in the quality of land and water resources frequently spreads beyond individual farms to a catchment or basin-wide scale. As a result, the full social costs of degradation associated with an agricultural practice are not borne by individual farmers, or even the agricultural sector alone. The economic causes of soil and water degradation are well documented. A central theme lies in the characteristics of natural resources which results in them being more susceptible to misuse through the existence of market failure (primarily externalities).

Rural R,D&E, including research into more sustainable agricultural practices, has been traditionally justified on the basis of the public good attributes of research, namely the characteristics of non-excludability and non-rivalry. The absence of government intervention in these circumstances would result in an under-investment in socially desirable research by

agricultural producers because they are unable to appropriate sufficient benefits. Although there are mechanisms by which government can address this problem (e.g. strengthening property rights, levy arrangements to capture industry benefits and limit free riding), such mechanisms are unlikely to fully correct for the under-investment. This is particularly the case of agricultural resources³. As a consequence, public funding of rural R&D is still required to achieve efficient outcomes (Productivity Commission 2011⁴).

The case for government involvement in agricultural resource issues is particularly strong due to information deficiencies. Often there is considerable uncertainty about the links between particular land use practices and land and water degradation. Poor information also acts as a barrier to landholders in ameliorating degradation and constrains the development and implementation of policies to prevent future land degradation.

³ The Productivity Commission (2011, pg XVIII) notes that industry levies *are much less likely to facilitate investment in research where the benefits are either spread thinly across a wide range of industries, or mainly accrue to the wider community. General research into climate change or environmental issues are cases in point. As well, there are several reasons why producers might not contribute a sufficient amount of funding through levies — or other collective industry contribution mechanisms — even to allow all worthwhile industry-specific research projects to proceed.*

⁴ Productivity Commission 2011. Rural Research and Development Corporations, Report no. 52, Final Inquiry Report, Canberra.

Step 2 – Program Options & Design

Identify all potential options for achieving the objective, including those that least impede business activity (refer to Step 2 of the Framework).

Option 1

Current
Agricultural
Resources
Management
Program

Description:

The Agricultural Resources Management Program has around 97 FTE's located across NSW. The bulk of staff are located at key research facilities linked to major agricultural production systems, exploiting the overlap and potential for size and scope economies with the Agricultural Productivity Program in terms of skills, capability, facilities and field trials and evaluation. The program sits within the Agriculture NSW Division and works with agriculture industries to develop and ensure delivery of solutions that share and sustain natural resources to build productive primary industries.

The Agricultural Resources Management Program delivers three research and development programs in the area of soils, water, and climate. The major emphasis of the program is on the development and evaluation of more sustainable agricultural practices and technologies that are still competitive in supplying agricultural markets. These are assessed through on-ground research trials across major production regions of NSW. The program contains the following sub programs and program components as described in SAP By Design⁵.

21.1 Climate – understanding the impacts of climate on agriculture, developing strategies to address those impacts; and developing options for agriculture to reduce emissions and sequester carbon

21.1.1 Climate impacts & adaptation – climate impact assessment; managing climate variability; adaptation options across agriculture systems

21.1.2 Climate mitigation – emission quantification in agriculture; options to reduce emissions and sequester carbon (including bioenergy)

21.1.3 Climate policy and planning

21.2 Water – water resources used sustainably to reduce environmental impact of agriculture production systems

21.2.1 Water and environment – management that minimises the adverse impacts of agriculture on the broader environment; managing waste water in agriculture

21.2.2 Water policy and planning

21.3 Soils – soil resources used sustainably to reduce environmental impact of agriculture production systems

21.3.1 Soils and environment – maintaining and protecting the soils resource base in production systems; reducing offsite impacts and enhancing the broader environment

21.3.2 Soils policy and planning

Resourcing requirements:

⁵ Descriptions from SAP By Design but with reference to Forestry removed given the planned relocation of Forestry to Land & Natural Resources announced by NSW DPI in 2014.

Total recurrent expenditure of the program is estimated at \$12.1 million, comprising \$6.6 million from NSW Government funding (55%) and \$5.5 million from external sources (45%), with the latter primarily from research funds provided by Rural Research & Development Corporations as well as the Federal Government. Approximately half of the staff are permanent employees and are funded from CR.

The Agricultural Resources Management Program has approximately 97 FTE's and a budget of around \$12.1 million. Around 60% of the program's staffing comes from the Agricultural Resources Branch, while the remaining 40% comes from Livestock and Plant Systems branches (see Table 1). This reflects the fact that many research projects have some component of industry and environmental benefit rather than being solely one or the other. Staff from the Livestock and Plant Systems branches primarily contribute to the climate sub program through livestock methane research and climate adaptation research.

Table 1: Agricultural Resources Management Program staff resources

Agriculture NSW Structure	FTE's
Agricultural Resources	
- Soils Unit	31
- Water Unit	15
- Climate Unit	11
Livestock Systems Branch (10% of the total Branch FTE's)	12
Plant systems Branch (10% of the total Branch FTE's)	28
Total	97

Governance arrangements:

Strategic decisions about the direction of the program are made by the Director in consultation with the Agriculture NSW executive team for approval by the Deputy Director General Agriculture. The program aligns to the NSW 2021 Plan, the NSW Trade & Investment Strategic Plan, and the NSW DPI Corporate Plan. The Research and Development function is undertaken in consultation with Government and Industry and informs a wide array of policy and planning activities. Projects submitted to funding bodies require alignment to the State Plan and NSW DPI's Strategic Plan.

Five-year forward research plans (FRP's) have been developed across all branches of Agriculture NSW. The FRP's provide a detailed stocktake of research projects currently funded, those projects under investor consideration and those planned for in the future (conceptual). Agriculture NSW is also introducing an expert panel approach to improve the allocation of resources across Agriculture NSW and provide greater accountability to internal and external stakeholders.

Consultation strategy:

The Agricultural Resources Management Program has developed partnerships

with a range of internal and external organisations to deliver on its objectives. Some of the key organisations are listed below.

Funders

- NSW Government
- Federal Department of Environment, Federal Department of Agriculture
- Rural RDC's – GRDC, CRDC, MLA, RIRDC, AWI, HA
- Murray-Darling Basin Authority
- Australian Centre for International Agricultural Research (ACIAR)
- Local Land Services

Research collaborators

- Development of PISC strategies
 - Climate Change Research Strategy for Primary Industries;
 - Soils RD&E strategy;
 - Water Use in Agriculture RD&E strategy;
 - Bioenergy Strategy
- CSIRO
- Universities – Uni of Sydney, CSU, UNE, Newcastle, Southern Cross
- Local Land Services
- Other state Department of Primary Industries – Vic DEPI, SARDI, DAWA

Policy

- Department of Premier and Cabinet
- Office of Environment & Heritage
- Murray-Darling Basin Authority
- Federal Department of Environment
- NSW DPI –Biosecurity NSW, Office of water

Consultation occurs at a PISC level through formal meetings of high level representatives of State and Commonwealth agencies involved in agricultural R&D. Other consultations with the Australian Government, NSW Government and Rural RDC's are frequently informal and can occur both at a management level as well as individual researchers.

Existing or proposed program pricing strategy:

The program produces a mixture of industry and public benefits, and identifiable beneficiaries include Australian agricultural producers, NSW residents and Australian residents. A sizeable proportion of program funding comes from Rural Research & Development Corporations, which are funded by a combination of industry levies and Australian Government contributions. In recent years a significant proportion of the program's external revenue has come from Australian government sources in respect to improved water use efficiency, soils, climate mitigation and adaptation.

Application of the Productivity Commission's cost recovery principles to the existing program indicates that the cost of agricultural research and development should be recovered via a levy set at avoidable cost. The pathway through the cost recovery decision framework is represented as 1, 2c, 3, 4, 9a, 10a, 10b, 11, 12, 13b, 14, 16, recommending a levy on beneficiaries set to recover avoidable costs (see Appendix A).

The ebb and flow of program activities over time makes it difficult to accurately attribute the split of benefits between beneficiaries. As a general guide,

programs under DPI Agriculture now aim to achieve external funding of program activities at the ratio of 2:1 (i.e. \$2 external funds to every \$1 provided internally by the NSW Government). As much of the external funding comes from Rural Research & Development Corporations, which are funded by a combination of industry levies and Australian Government contributions, the 2:1 ratio approximates a third funding each from industry, Australian residents, and NSW residents. The program currently achieves a ratio of 1.2:1.0 (55:45 split as per earlier resourcing description). The ratio would naturally be less for research with a greater emphasis on agricultural resource management relative to agricultural productivity given the incidence of spillovers. However, individual projects should, ideally, be assessed using the cost recovery principles, and funding arranged on a project by project basis rather than at a program level.

Key performance measures:

The Agricultural Resources Management Program provides R&D to enhance long term agricultural productivity and the sustainable use of natural resources. The key performance measures outlined below follow NSW Treasury guidelines that refer to 'result indicators' which are aimed at gauging whether services are making a positive impact on society. Relevant output indicators are also provided as examples of how the program contributes to higher level Key Performance Indicators (KPIs).

KPI 1 – A reduction in the environmental impact of agricultural production systems

- KPI 1.1 Water
 - Output indicator – number of more efficient water technologies/practices developed by NSW DPI
 - Outcome indicator – level of adoption of NSW DPI developed efficient water technologies/practices
- KPI 1.2 Soils
 - Output indicator – number of soil carbon management practices developed by NSW DPI
 - Outcome indicator – level of adoption of NSW DPI developed soil carbon management practices
- KPI 1.3 Climate
 - Output indicator – number of GHG methodologies that NSW DPI provides a substantive contribution.
 - Output indicator – number of GHG friendly management practices developed by NSW DPI

Outcome indicator – level of adoption of NSW DPI developed GHG methodologies and GHG friendly management practices

<p>Option 2.</p> <p>Purchaser-provider model</p>	<p>Description:</p> <p>The objective of introducing this purchaser-provider model is to improve the efficiency of R&D efforts. The provider (a separate Agricultural Resources Research agency) would be a separate entity with a focus towards undertaking research for various funders, including the NSW Government. It would actively bid for work and would (over time) be fully cost recovered as it takes on a more commercial business model.</p> <p>The purchaser would undertake policy, planning, promotion and coordination activities, and fund the provider for NSW Government research. The purchaser would have similarities with the Commonwealth Rural Research and Development Corporation model.</p>
	<p>Resourcing requirements:</p> <p>Marginally lower CR resources compared to Option 1 once established. Initially there would be increased costs associated with establishing the necessary structures, legal arrangements, software and systems that efficiently met the business needs of the provider. The purchaser would need to clearly articulate the services it seeks and run tender processes to award discrete projects.</p>
	<p>Governance arrangements:</p> <p>The purchaser (NSW DPI) would need to retain some expertise in R&D related to natural resource management so that it was an informed buyer of research services. Given that there is commonly a mix of private and public benefits in many research projects, the purchaser would also need to liaise with industry bodies to consider joint funding opportunities and pathways for shared investment. Clear boundaries would need to be established around agencies with clear roles and responsibilities.</p>
	<p>Consultation strategy:</p> <p>The purchaser would need to consult extensively with industry to garner support for the change. The provider would routinely meet with NSW Government and industry stakeholders to discuss priorities and promote the skills of the group.</p>
	<p>Proposed program pricing strategy:</p> <p>The provider would need to address concerns about competitive neutrality by adopting a commercial business model that reflected the true costs of services supplied.</p>
	<p>Key performance measures:</p> <p>Same key performance measures as for option 1 and with additional measures around the quantum of funding gained.</p>

Step 3 – Options Assessment			
<i>Shortlist options by qualitatively listing below the benefits and costs of each option relative to the base case of 'no program'. If the program contains sub-components, it may be easier to consider the benefits and costs of each subcomponent.</i>			
	Benefits	Costs	Qualitative assessment of net impact
Option 1. Existing Agricultural Resources Management Program	<ul style="list-style-type: none"> • Industry and public benefits derived from R&D to improve the management of natural resources in NSW and promote more resilient farming systems. • In-house contribution to public policy related to natural resource management. • Flexibility to meet the changing priorities of government. • More efficient discharge of governments own responsibilities in the area of natural resource management. 	<ul style="list-style-type: none"> • \$12.1 million in total and \$6.6 million in CR. 	<p>Benefits of a responsive and strategic R&D program outweigh the costs of provision to NSW.</p> <p>Preferred option that provides higher net benefits than Option 2.</p> <p>Ranking 1</p>
Option 2. Purchaser-provider model	<ul style="list-style-type: none"> • Industry benefits derived from R&D to improve the management of natural resources in NSW and promote more resilient farming systems. • Public benefits but less than Option 1 because of less flexibility to purchaser. 	<ul style="list-style-type: none"> • Lower on-going costs than Option 1 in terms of delivery industry related R&D through expected salary savings. • Some initial start-up costs associated with establishing the provider. • Higher costs associated with research relevant to government priorities. 	<p>Net benefits to NSW but the magnitude is likely to be lower than option 1.</p> <p>As researchers would not be involved in priority setting, research would be less aligned to areas of public good and projects would not be linked over time to build a portfolio of research findings.</p> <p>While the purchaser-provider model has been implemented in some other States, these have focused on industry benefit R&D rather than public benefits.</p> <p>Other State Department's of Primary Industries have a Branch concerned with meeting the challenges of land and water management.</p> <p>Ranking 2</p>

Appendix A: Cost Recovery Decision Framework

