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**New South Wales Government**

Department of Premier and Cabinet

Submission No: 106

- 7 NOV 2008

Ms Maria Vamvakinou MP
Chair
House of Representatives Standing Committee on Industry, Science and
Innovation
PO Box 6021
Parliament House
CANBERRA ACT 2600

Dear Ms Vamvakinou,

I write in relation to your request for submissions to the Inquiry into Research in Australian Universities which is being conducted by the House of Representatives Standing Committee on Industry, Science and Innovation.

I understand that the Committee intends to report on 24 November 2008, but that submissions are still able to be considered at this stage.

A NSW Government submission is attached for your consideration.

Yours sincerely

A handwritten signature in black ink, appearing to read 'John Schmidt', written over a horizontal line.

John Schmidt
Deputy Director General (Policy Development)
Department of Premier and Cabinet

Research Training in Australia

**Inquiry into research training and research workforce
issues in Australian universities**

**The House of Representatives Industry, Science and
Innovation Committee**

June 2008

EXECUTIVE SUMMARY

Primary industries are important to the economic, environmental and social wellbeing of Australia.

Research plays a key role in the competitiveness and environmental sustainability of primary industries.

The importance of research is likely to increase as Australia faces major challenges such as climate change, energy and food security, and health issues.

The Australian university system plays a central role in supplying well trained postgraduates who become the primary industries researchers of the future.

The supply of postgraduates with skills relevant to primary industries appears to be declining as do the skill levels they possess.

These issues are not unique to primary industries but reflect a broader pattern in science and engineering in general.

It is likely that a wide range of circumstances are contributing to the situation with an undervaluing of science by society being at its heart.

Recommendations

- 1) That the value of Ph.D. scholarships be increased so that they at least match graduate employment levels.
- 2) That the length of Ph.D. scholarships in primary industries be extended to at least four years to enable a high quality thesis to be generated.
- 3) That limits are placed on postgraduate student numbers per academic to protect the quality of supervision.
- 4) That greater science awareness and promotion be undertaken at a school level.

INTRODUCTION

The NSW Department of Primary Industries (NSW DPI) welcomes the committee's inquiry into research training in Australia.

Research plays a key role in delivering Australia the standard of living – intellectual, material and environmental – to which it is accustomed.

Primary industries are important to the economic, environmental and social wellbeing of Australia. They directly account for a significant proportion of non-metropolitan employment (14% in NSW) and about one-third of NSW's and nearly a half of Australia's export income.

In NSW, the primary industries sector account for 80% of NSW land area and significantly contribute to the maintenance and improvement of the natural resource. In addition they have major flow-on effects for other businesses and provide significant amenity, environmental and social value for society.

The sector will play an essential role in assisting both the NSW and Australian community to face major challenges including climate change, energy supply, food security and human health issues.

Primary industries are deeply dependent on research based innovation and have a very impressive record of achievement in research. Productivity growth in primary industries has been greater than most sectors of the economy and there is strong evidence that at least half of this growth has been due to research and development (Mullen 2007). Likewise, the significant gains in environmental sustainability have been driven by research and development.

Given the central importance of research to primary industries, it is clear that the supply of well trained research scientists is critical to the sectors future and in enabling the NSW and Australian community to address major challenges of national significance.

RESEARCH AND PRIMARY INDUSTRIES

In absolute terms, real agricultural, forestry and fisheries output has more than doubled since the mid 1960's and exports from these sectors collectively have almost trebled in value since the mid 1970's (Productivity Commission 2005). The productivity growth rate in these three sectors is more than twice the rate achieved in Australia's market sector as a whole (Productivity Commission 2005).

In NSW - for the agriculture sector where data are most complete - productivity has been rising at the rate of about 2.5% p.a. which compares

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favourably with most other sectors of the economy (eg manufacturing 1.3%, construction 0.4%, retail trade 1.0%, finance and insurance 0.8%). This strong and sustained productivity growth in NSW's agricultural industries has been worth \$438 billion to the State since 1953 (Mullen 2003).

Between 70% (Mullen and Crean 2007) to 100% (Productivity Commission 2005) of the current real value of Australian agricultural output can be attributed to productivity growth that has occurred since the early 1950s. The Productivity Commission observed that while the agricultural, forestry and fisheries sectors accounted for less than 7% of gross domestic product in the market sector, its contribution to the growth in Total Factor Productivity for the economy as a whole was 16.4%, behind only the manufacturing sector.

The impressive productivity growth achieved in the primary industries sector has been in response to trends in the sector's terms of trade and the ability of the sector to quickly respond through research driven innovation. The Productivity Commission highlighted that "a key source of productivity growth in agriculture (and forestry and fisheries) has been the generation and adoption of new knowledge or technologies". In NSW almost half of the value of agricultural output can be attributed to new technology generated by domestic research since 1953 (Mullen 2007).

Most economic analysis to date has focussed on economic benefits to industry. However, there are also strong benefits from research to the environment in the form of improved air, soil and water quality and to the community. Community benefits in addition to inexpensive, safe food and fibre products and increased incomes and employment include a greater stock of scientific knowledge and skill, an ability to respond to pest and disease incursions, and reduced risks to human health from improved food safety, reduced risks from pests, diseases and chemicals used to control them. It has been estimated that the environmental and community benefits from primary industries research are at least equal to the industry benefits (Pardey and Alston 1995).

Primary industries research is one of Australia's key research strengths. For example, Australia accounted for over 5% of the world total of research publications in plant and animal sciences, higher than any other Australian research area (Productivity Commission 2007). This compares with an average of less than 3% for all fields of Australian research.

Into the future, primary industries research is likely to play a significant role in helping the Australian community face major challenges such as climate change, the supply of energy, the efficient use of water, and address issues of human health and wellbeing. For example, in terms of climate change the management of soil organic carbon within the primary industries sector and the use of forestry provide the community with some of the most practical and proven ways of sequestering carbon. Likewise, primary industries are well placed to play an important role in addressing major health and wellbeing issues with the ability to develop foods with, for example, low Glycemic indices, low allergens and enhanced omega 3 and 6 oil profiles.

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A further challenge is the potential for food security to re-emerge as an important issue. The past year has seen food prices rise by one-third with *The Economist's* food-price index at its highest since it began in 1845 (*Economist* 2007) and world grain reserves at their lowest levels on record.

The drivers for increased concern around food security include:

- o emergence of new plant and animal diseases;
- o loss of arable land and water resources with increasing population pressure;
- o climate change with impacts on water resources and increased likelihood of episodic events including drought, flooding and bushfires;
- o declining genetic diversity reducing the resilience of current systems;
- o changing diets in developing nations increasing the demand for protein; and,
- o competing demands from industrial crops (eg biofuels).

The ongoing production of food and raw materials and the continuation of existing levels of productivity growth in Australian primary industries remain vitally important to the whole community and represent a significant challenge for society.

Research and highly skilled researchers will remain centrally important to society addressing these issues.

DPI RESEARCH WORKFORCE

NSW DPI currently employs over 300 scientists across 59 different disciplines (as defined by the ABS Fields of Research) the majority with doctorate level postgraduate qualifications. A similar number of technical support staff are employed with a minimum base level three year science degree, though many also have postgraduate qualifications.

The research workforce enables the Department meeting its overall goals as an organisation - playing a critical role in underpinning policy, regulation, biosecurity and industry development functions. The Australian university system is the major source of postgraduates employed by NSW DPI.

The age profile of the Department's scientific staff is such that a significant number are likely to retire in the next two years.

DPI AND UNIVERSITIES

There are eleven universities in NSW and NSW DPI researchers have some involvement with all of them except the Australian Catholic University.

Seven formal alliances have been established between DPI and four universities – the University of New England (UNE), Charles Sturt University

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(CSU), the University of Sydney (USyd) and Southern Cross University (SCU). The duration of these alliances ranges from 30 years to less than one year, and a further one is planned this year.

NSW DPI staff are actively involved in the co-supervision of postgraduate students and a number of staff hold adjunct or honorary positions with universities. A significant number of postgraduates are located at NSW DPI facilities. As such NSW DPI makes a substantial in-kind contribution to the training of the next generation of researchers.

SUPPLY AND QUALITY OF POSTGRADUATES

The supply of postgraduates with skills relevant to primary industries (and more broadly in natural resource management) is low and the Department has faced difficulty in attracting high calibre postgraduates. These issues are not unique to NSW DPI or the primary industries sector but reflect a broad undersupply of students undertaking sciences.

It is difficult to say with certainty what is driving the undersupply of postgraduates and the perceived declining quality of postgraduates. However the following are likely to play a role:

- Science is attracting less students at a senior high school level thereby reducing the numbers likely to undertake university training. This may be due to the perceived poor career structures available (short term funding) and relatively poor remuneration.
- The national underinvestment in science is discouraging Australia's brightest minds from pursuing careers in science.
- Most Ph.D.'s in the primary industries area take at least four years to complete given the seasonal nature of many primary industries and the need to collect data from a sufficient number of years for the work to be rigorous. Most Commonwealth Ph.D. scholarships are only of three years duration leaving one year unfunded.
- Research training stipends have failed to keep pace with the CPI and - given the strong employment environment - most university graduates with science based skills relevant to NSW DPI are going directly into employment rather than spending a further 3-4 years in undertaking a Ph.D. on relatively low paid scholarships.
- The number of Ph.D. students per academic appears to have risen driven by declining investment in the Australian university system. Close supervision is likely to be a key factor in skills development of students.
- Basic research design and analysis skills (including statistical analysis) appear to be weakening with many universities not teaching these at an undergraduate level and providing limited support to Ph.D. students in this area.

These issues are symptomatic of a wider underinvestment in science in Australia.

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INVESTMENT IN PRIMARY INDUSTRIES RESEARCH

Australian primary industries, along with the Australian community face a rapidly changing world that is fiercely competitive; full of uncertainty; and contains major challenges such as climate change. Therefore, the importance of research is likely to similarly increase.

Research and skilled researchers are central to primary industries addressing these issues - not only for the sector itself but on behalf of the community - and ensuring that the sector maintains social accountability and environmental sustainability.

Recommendations

- 1) That the value of Ph.D. scholarships be increased so that they at least match graduate employment levels.
- 2) That the length of Ph.D. scholarships in primary industries be extended to at least four years to enable a high quality thesis to be generated.
- 3) That limits are placed on postgraduate student numbers per academic to protect the quality of supervision.
- 4) That greater science awareness and promotion be undertaken at a school level.

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