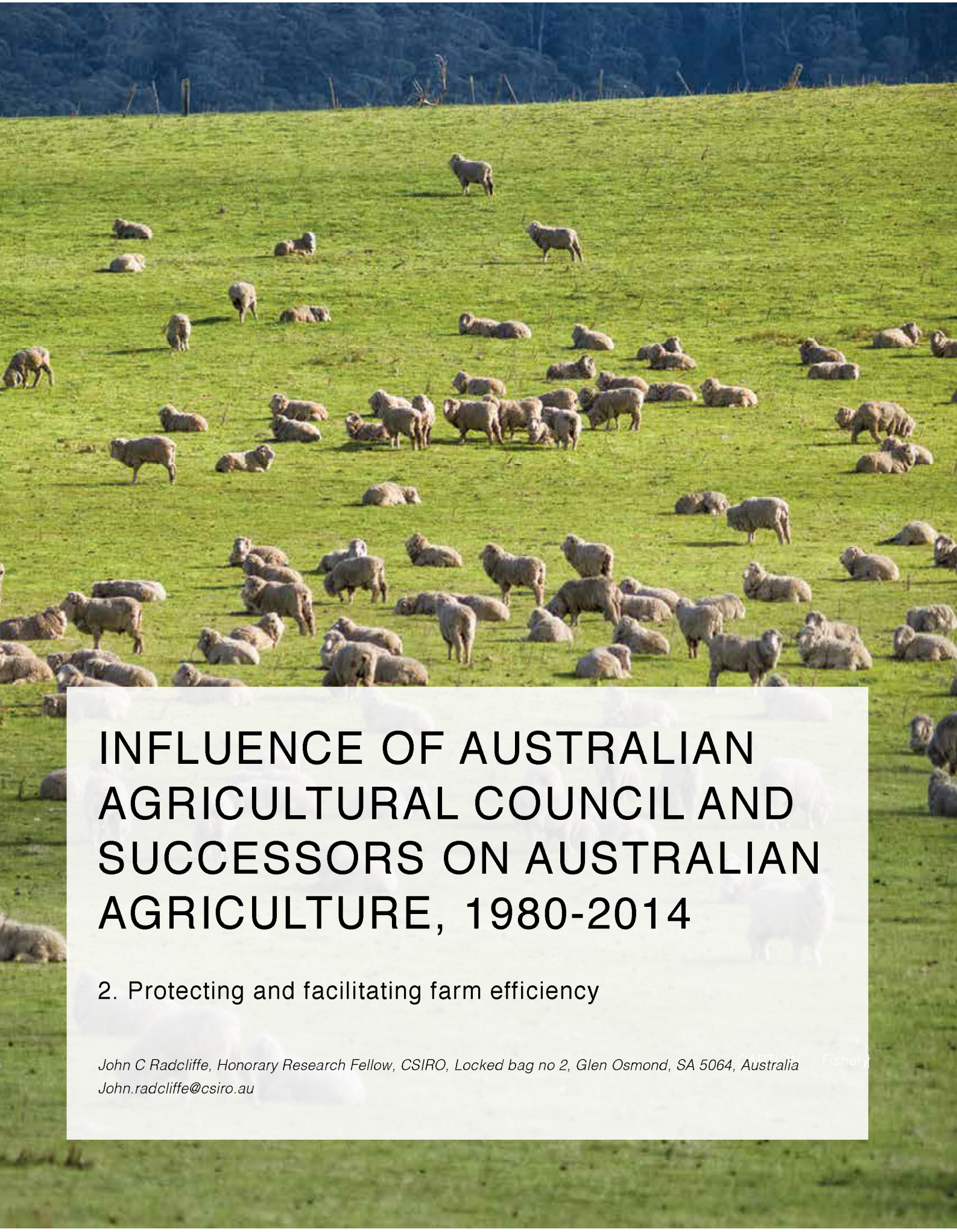

INFLUENCE OF AUSTRALIAN AGRICULTURAL COUNCIL AND SUCCESSORS ON AUSTRALIAN AGRICULTURE, 1980-2014

2. Protecting and facilitating farm efficiency

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ABSTRACT

In 1927, the permanent heads of State and Commonwealth Departments responsible for agriculture and the Chief Executive of the then Council for Scientific and Industrial Research (CSIR) met as the Standing Committee on Agriculture (SCA) to define priorities and methods for cooperation in agricultural research. In 1935, the role of SCA was extended to quarantine, pests and diseases, the improvement of agricultural products and maintenance of high export grade standards as well as research and development and to generally promote the welfare and development of agricultural industries while advising the newly-created Australian Agricultural Council (AAC) of Ministers. For the first half of the 20th. century, agriculture's contribution to GDP generally hovered between 20% to 30% of GDP, but by the 1980s, was down to between 4% and 5% of GDP. By 1980, SCA and AAC were meeting conjointly every six months to deliberate by consensus on a wide range of policy issues. AAC was progressively changed by the full membership of New Zealand in 1991 to become the Agricultural Council of Australia and New Zealand (ACANZ), soon afterwards becoming the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ), in 2001 changing again to be the Primary Industries Ministerial Council (PIMC) and finally becoming the Standing Council of Primary Industries (SCoPI) before being summarily abolished from within the Council of Australian Governments (COAG) subordinate Ministerial Councils structures in 2014. An Agricultural Ministers' Forum (AGMIN) was later established informally outside of COAG, with an Agricultural Senior Officials Committee (AGSOC) subtending it. CSIRO and the Bureau of Meteorology were subsequently excluded from the structure in October 2015. CSIRO was no longer a regular member of the system whose origins dated back to its establishment by CSIR in 1927.The Ministerial Councils were responsible for developing policies that guided the evolution of Australian agriculture to complete on the world stage. This paper describes the processes used and the outcomes reached from discussions from 1980 onwards encompassing Animal and Plant Health risks and their management, Agricultural Chemicals, Agricultural Research, Development and Extension, Australia's Genetic Resources and Animal Welfare.

INTRODUCTION

After their establishment, the Australian colonies were responsible for any regulation of agriculture Having established colonial legislatures, their consequent policies developed independently of each other. Ultimately, their controls reached the colonial borders and they established customs posts in the interests of protecting their commercial interests. The federation of the Australian colonies in 1901 became a defining moment in natural resource management and agriculture. The *Commonwealth of Australia Constitution Act* provided for trade between the states to be free [s. 92). The Commonwealth was to have powers for "Trade and commerce with other countries and among the States" [s. 51 (i)] and "external affairs" [s. 51 (xxix)], while section 107 *inter alia* provided for powers previously vested in colonies to continue with the States unless specifically vested in the Parliament of the Commonwealth. Powers relating to agricultural production rested primarily with the states, while the main areas of accepted Commonwealth responsibility included border quarantine services in respect of imports, health and quality standards with respect to exports However, the Commonwealth could influence a number of agricultural matters primarily of state responsibility by providing finance to the states (Cottingham 1985), a mechanism that became increasingly important in the latter part of the 20th century

COORDINATION OF POLICIES AT FEDERAL AND STATE LEVEL

The creation of the Council for Scientific and Industrial Research (CSIR – later becoming the Commonwealth Scientific and Industrial Research Organisation - CSIRO) in 1926 resulted in a need to bring the Commonwealth and States together to identify roles, responsibilities,

priorities and methods for cooperation between them for agricultural research. A meeting of State Ministers of Agriculture on 23 May 1927 approved the establishment of a Standing Committee on Agriculture (SCA) comprising the Permanent Heads of the states' Departments of Agriculture plus the Chief Executive Officer of CSIR. This was extended in 1935 with a broader remit covering quarantine, pests and diseases, the improvement of agricultural products and maintenance of high export grade standards as well as research and development and to generally function as a national body to promote the welfare and development of agricultural industries. It became responsible to a then newly-created Australian Agricultural Council (AAC) comprising the Federal Minister for Commerce and the State Ministers for Agriculture with the power to co-opt other Commonwealth or State Ministers as necessary. Until around 1950, agriculture represented about 20 to 30 per cent of Australia's GDP, but then declined fairly consistently to between 4% and 5% of GDP from the 1980s onward (ABS 2005, graph S13.2). In 1921, about 26 per cent of "breadwinners" were employed in primary production, but by 1980, agriculture, fisheries and forestry primary industries employment had fallen to 6 per cent, and to 3 per cent by 2010. The Australian Agricultural Council served as a forum for developing Australia-wide internal agricultural policies which were consistent with the objectives of the Commonwealth and States/Territory governments. The structure, which had no statutory basis, operated by consensus and continued as the main vehicle for Commonwealth-States policy coordination in agriculture (Cottingham 1985). New Zealand and Papua-New Guinea had observer status, but New Zealand became a full member in 1991 to form the Agricultural Council of Australia and New Zealand, (ACANZ). In subsequent years, it underwent further changes in the formation of the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ) with the subordinate standing committee structure becoming the Standing Committee on Agriculture and Resource Management (SCARM) (ARMCANZ 1993). In 2001, agricultural policies were taken into a more specific Primary Industries Ministerial Council (PIMC). In April 2010, further reform led to the creation of the Standing Council on Primary Industries (SCoPI) (Lundie 2011). The *modus operandi* of the various agricultural ministerial councils has been described by Radcliffe (2020). However, most of the revised structure was swept away on 13 December 2013 when the Council of Australian Governments (COAG), comprising the Prime Minister, State Premiers, Territory Chief Ministers and a

Australian Local Government Association representative, abolished fourteen of the Standing Ministerial Councils including that for Primary Industries, noting a keenness to focus on a few national priorities and that too much bureaucracy and red tape had grown up around COAG (Abbott 2014). An Agricultural Ministers' Forum (AGMIN) was later established informally outside of COAG, with an Agricultural Senior Officials Committee (AGSOC) subtending it. CSIRO and the Bureau of Meteorology were subsequently excluded from the structure in October 2015. CSIRO was no longer a regular member of the system whose origins dated back to its establishment by CSIR in 1927. This paper describes the endeavours of agricultural ministers to protect the agricultural industries from incursions of pests and diseases that might threaten their productivity and market viability, ensured that chemicals were responsibly used in agricultural systems while maintained the quality of their products, supported research, development and extension initiatives that encouraged innovation and increasing productivity and economic efficiency, ensured the availability of genetic material to underpin continued agricultural improvement while also meeting increasing community expectations for animal welfare in production systems.

The AAC, its Committee structure and successor bodies, worked towards establishing an harmonious national legislative and regulatory framework as issues arose, enabling the private sector farming industries to flourish and expand with significant economic benefit to all Australians.

Animal and plant health risks and border quarantine

Quarantine had been a states' responsibility until 1906, albeit primarily oriented to human health. The states' Premiers handed it to the Commonwealth, leading to the *Quarantine Act 1908 (C'wealth).* With global travel and trade progressively increasing, the risks of incursions also increased. Over the past forty years, numerous potential or actual new exotic animal, insect and plant pests and diseases have been recorded. Those referred to the Australian Agricultural Council have included Argentine Ants *(Linepithema humile),* Asian honey bee *(Apis cerana),* Asparagus rust *(Puccinia asparagi),* Avian influenza , Black Sigatoka disease of bananas *(Mycosphaerella fijiensis),* Bluetongue, Branched Broom rape *(Orobanche ramosa),* Chalk brood of honey bees *(Ascosphaera apis),* Chestnut blight *(Cryphonectria parasitica),* Citrus canker *(Xanthomonas citri subsp. citri),* Citrus greening *(Candidatus Liberibacter asiaticus),* Cocoa pod borer *(Conopomorpha cramerella),* Electric ant *(Wasmannia auropunctata),* Equine influenza, Eucalyptus rust *(Puccinia psidii* complex*),* European Foulbrood of honeybees *(Melissococcus plutonius),* European house borer *(Hylotrupes bajulus),* Fireblight of apples *(Erwinia amylovora),* Foot and Mouth Disease, Four tropical weeds *(Clidemia hirta, Limnocharis flava, Mikania micrantha* and *Miconia* spp.*),* Green snails *(Cornu apertus [syn. Cantareus apertus, Helix aperta]),* Hendra virus, Kochia *(Bassia scoparia),* Marine organisms in ballast water, Myrtle rust *(Austropuccinia psidii),* Newcastle disease (virulence of various strains), Old world screw worm fly *(Chrysomyia bezziana),* Oriental fruit fly *(Bactrocera dorsalis),* Papaya fruit fly *(Bactrocera papaya),* Poinsettia / Silverleaf white fly *(Bemisia tabaci),* Potato cyst nematode *(Globodera* spp.*),* Potato spindle tuber viroid *(Pospiviroid; PSTVd),* Red fire ant *(Solenopsis invicta),* Russian wheat aphid *(Diuraphis noxia),* Siam Weed *(Chromolaena odorata),* Strawberry angular leaf spot *(Xanthomonas fragariae),* Stripe Rust *(Puccinia striiformis* f.sp. *tritici),* Sugar cane smut *(Sporisorium scitamineum),* Swine influenza (H1N1 virus), Varroa mites of honey bees *(Varroa destructor* and *V. jacobsoni),* Warehouse Beetle *(Trogoderma variable)* and Western flower thrips *(Frankliniella occidentalis).* Preparations had to be made in advance of the possible detection and subsequent responses to such exotic threats. The Animal Health Committee (AHC), Plant Health Committee (PHC) and their subordinate subcommittees were responsible to Standing Committee on Agriculture and Minsters for advising on such issues.

Independent reviews of quarantine policies and practices have been conducted on at least three occasions since 1980. Lindsay (1988) recommended the development of a partnership between governments, industry and the general public. Nairn *et al.* (1996) observed that in the risk analysis process, the general public needed a greater opportunity for having their views considered and the process should be conducted in a way that was transparent, scientifically based and with a mechanism for appeal on process. Beale *et al.* (2008) noted the impacts of globalisation, potential agroterrorism, increased global movement of genetic material, climate change and exchanges in the courts and before the World Trade Organisation. Assessments involving the potential import of products such as pig meat, apples, prawns and prawn products, bananas, salmon and chicken meat were undertaken to assure Australia's Appropriate Level of Protection (ALOP). These assessments as described in its Import Risk Assessment Handbook (DAFF 2009) were to provide a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not necessarily to zero and were subject to the independent Eminent Scientists Group (ESG) examining final drafts of Import Risk Analysis reports prior to their

release. The ESG evaluated whether Biosecurity Australia had properly taken account of all technical issues in submissions received in response to the circulated draft assessments.

Some animal diseases threatening Australia's livestock industries loomed large. Defence against Foot and Mouth Disease (FMD) has always been a major priority and has involved Commonwealth and States/Territories veterinary officers in simulation exercises. Veterinary officers, and emergency management personnel from several jurisdictions gained experience by participating in overseas FMD control campaigns, notably in Britain in 2001 and 2007. A major review of Australia's FMD preparedness by Matthews (2011) resulted in Ministers progressing a National Foot-and-Mouth Disease Action Plan to improve Australia's management of the threat of foot-and-mouth disease, including the strategic use of vaccination which had previously been eschewed. "Stockstill" exercises have been conducted to practice halting all livestock movement in Australia while responses to a disease emergency were determined. The effective control of the Equine Influenza incursion in 2007-08 provided an excellent first hand opportunity to examine emergency management practices that would be required in the event of an outbreak of FMD in Australia.

Bluetongue incursions were detected through running sentinel sheep in the Northern Territory. Eight bluetongue serotypes have been identified. Though devastating to sheep, which are prohibited in the NT, they have no impact on cattle health, but restrict cattle exports from specific areas. SCA's Animal Health Committee (AHC) oversaw a CSIRO contract in preparing for old-world screw-worm fly *Chrysomya bezziana* , initially in Loloki, PNG through potential use of the Sterile Insect Release Method (SIRM). Later in Malaysia at the Institute Haiwan, Kluang, Johor, under a memorandum of understanding between the Governments of Australia and Malaysia, CSIRO developed innovative mass-rearing technologies and confirmed the technique as a viable eradication option. (Spradbery 1991). From 1991, the Australian Veterinary Emergency Plan (AUSVETPLAN) was initiated and has since been updated on three occasions (AHA 2019). It covers thirty animal diseases including African swine fever, anthrax, avian influenza, bovine spongiform encephalopathy (BSE - "mad cow disease"), Hendra virus, Foot and Mouth Disease, Newcastle Disease and rabies. Responsibility for contributing to emergency disease management was extended from Commonwealth and states/territories agencies to also include representatives of the livestock industries. Animal Health Australia became the responsible organisation with membership from the Commonwealth and States, representative livestock industry organisations and service providers. The livestock Industries include those covering Alpacas, Chicken Meat, Dairying, Duck Meat, Eggs, the Horse Industry, Lot Feeders, Pork, Cattle, Equestrians, Goats, Harness Racing, Sheep Meat and Wool. Service providers include the Australian Veterinary Association and CSIRO which operates the Australian Animal Health Laboratory (AAHL) recently renamed the Australian Centre for Disease Preparedness (ACDP) at Geelong. A Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses (Emergency Animal Disease Response Agreement; EADRA) defines financial obligations. The development of these arrangements was progressed through AAC and its successors.

Similarly, Plant Health Australia (PHA) was promoted by both governments and plant industries as an open and accountable partnership to be a national coordinating body for plant health policy making and direction setting. It was established in April 2000 to address issues such as access to plant health information and expertise, national surveillance and monitoring, allocation of scarce resources, forward planning for incursion management and compensation schemes for farmers adversely affected by national plant health policy. The Commonwealth and states/territory governments are members, represented by the departments under their Ministers of Agriculture/ Primary Industries. Other members are from organisations representing producers of Almonds, Apples and Pears, Avocados, Bananas, Blueberries, Canned Fruit, Cherries, Chestnuts, Citrus, Cotton, Dried Fruits, Forest Products, Ginger, Grains, Grapes and Wine, Hazelnuts, Honey, Lychees, Macadamias, Mangos, Melons, Nursery and Garden Plants, Olives, Onions, Passionfruit, Pistachios, Raspberries and Blackberries, Rice, Strawberries, Sugar, Summerfruit, Sweet Potatoes, Table Grapes, Tea Tree Oil, Tomatoes, Truffles, Vegetables and Walnuts. Plant Health Australia is the custodian of the Emergency Plant Pest Response Deed (EPPRD). This is a formal legally binding agreement between PHA, the Australian Government, all state and territory governments and national plant industry bodies' signatories. It covers the management and funding of responses to emergency plant pest (EPP) incidents, including the potential for reimbursement costs for growers.

An Intergovernmental Agreement on Biosecurity (IGAB) between the Prime Minister, Premiers and Territories' first ministers, for agriculture ministers' agreement, was signed in 2012 to enhance Australia's biosecurity system. The agreement strengthens the collaborative

approach between the Commonwealth and state and territory governments to address Australia's broad range of biosecurity issues and improve the government-to-government and government-to-industry governance of the national biosecurity system. The first five year period of the IGAB was reviewed by Craik, Palmer and Sheldrake (2017), and they reported *"..a strong and healthy working partnership between all governments, and the development of sound national policy principles."*

The partnerships with industries are built on the relationships established in Animal Health Australia and Plant Health Australia. While Animal Health Australia and Plant Health Australia can facilitate engagement between government and industry, they do not directly represent those industries to government and vice versa. A National Biosecurity Committee (NBC) comprising representatives from the Australian, state, territory and New Zealand governments provides strategic leadership to develop and oversee implementation of national approaches and policies for emerging and ongoing biosecurity matters. Animal Health Australia and Plant Health Australia are included as observers. National Biosecurity Committee is supported by the long-established Animal Health Committee and Plant Health Committee dating back before the 1980s as part of the earlier SCA/AAC structure. The Intergovernmental Agreement on Biosecurity is supported by the National Environmental Biosecurity Response Agreement (NEBRA) which establishes the national arrangements for responding to significant pest and disease incursions where there are predominantly public benefits.

Progress with incursion management was regularly reported to the Agricultural Ministers' Council. Some eradications such as the cocoa pod borer (cost $125,000) and equine influenza ($110m but which significantly understates the costs to the community) were successful. Other programs, after achieving area freedom through eradication in some areas, continued pursuing infestations elsewhere. By 2011, red fire ants had been eliminated from infestations in the Port of Brisbane and at Yarwun, but four other incursions were being pursued, by which time $245m had been spent on eradication since 2001. On 26 July 2017, the national Agriculture Ministers' Forum approved funding of $411.4 million over 10 years for the Queensland Government to coordinate an expanded national response to eradicate red imported fire ants. By March 2018, 84,000 hectares was in the treatment zone with a ten-year predictive budget of $411 million (Queensland 2018). The 2017-18 predictive budget was $38 million, employing 99 permanent staff and 120 contract staff.

The four tropical weeds in Queensland had incurred expenditure of $2.4m (PIMC 21, October 2011). Other eradications were eventually adjudged by the National Management Group to be unachievable and were converted to a policy of containment and management. Examples of the latter included European house borer, Warehouse beetle, Asian honeybee, broom rape (after spending more than $23m), myrtle rust ($3.53m) and Siam weed (expenditure exceeding $8m).

The example of Papaya Fruit Fly highlights the difficulty of quarantine decision making. Bellas (1996) noted that the withdrawal of fruit fly surveillance traps from Cairns in 1988 and the refusal to reinstate them in 1992 at an annual cost of $200,000, despite the recommendation of the Horticultural Policy Council, was a likely precursor to the major 1995 Cairns Papaya fruit fly infestation which was successfully eradicated at a cost of $35m by 1999. According to Cantrell *et al.* (2002), the incursion lasting 5 years had cost the horticultural industries approximately $100 million. The *Long-term Containment Strategy for Exotic Fruit Flies in Torres Strait* was established following the 1995 papaya fruit fly incursion. Costing $200,000 per annum, if one assumes a 5 per cent probability of eradication if a major infestation occurs, the response component of the Torres Strait Fruit Fly Strategy returns a benefit:cost ration (BCR) of 339:1 compared to 63:1 for a 95 per cent probability of eradication of a quickly identified incursion. This showed that the investment in the strategy is more attractive when there is large uncertainty that an incursion detected late can be eradicated (Hafi *et al.* 2013).

Australia's greatest biosecurity success is the Brucellosis and Tuberculosis Eradication Campaign (BTEC). Driven by very real concerns that international trade, initially to the USA, would be threatened, a coordinated national campaign commenced in 1970 to eliminate both brucellosis and tuberculosis from the national cattle population. The campaign was funded and managed under tripartite agreement by State/Territory and Commonwealth governments and Industry, managed through the SCA/AAC system. Ministers received regular reports and confirmed budgets. From 1984 onwards, industry also played a significant role in BTEC decision-making, through the national BTEC committee, on state and regional advisory committees, and on teams tasked to review approved property programmes. Australia achieved 'TB Free Area' status in December 1997 after the expenditure of about $840m. The trust built between government and industry played a key role in the establishment and ongoing operation of animal health programmes and Animal Health Australia. There was an

additional, but unintended, benefit from BTEC, both to the industry as a whole, and to individual producers, as a result of substantial improvements to cattle productivity in northern Australia. These were achieved through improved husbandry (for example, two annual musters rather than one, controlled mating, removal of feral bulls, enforced weaning, mineral supplementation) and cattle controls through improved fencing. Reproductive rates improved and mortality decreased, allowing heifer selection and the slaughter of cull cows for beef. To illustrate, similar output from the Australian beef cattle population was achieved in the early 1990s with around 24 million cattle whereas the same level of output in 1974 to 1975 took 32 million cattle (More, Radunz and Glanville 2015).

Other quarantine principles had to be adopted when biological control techniques were being proposed for the management of various species that had been introduced in the nineteenth century under the enthusiasm of acclimatisation societies but had become pests. Examples included blackberries *(Rubus* spp*)*, to be controlled by blackberry rust *(Arthuriomyces peckianus* and *Gymnoconia nitens)*, Salvation Jane or Patterson's Curse *(Echium plantagineum)* by the leaf mining moth *(Dialectica scalariella)* and rabbits by strains of calicivirus following earlier success with myxomatosis. These processes required complementary Commonwealth and states biological control legislation and significant research to ensure that the control agents would not threaten other species as had occurred when cane toads *(Bufo marinus)* were released by the by the Meringa Sugar Experimental Station, Queensland, in 1935 to control native beetle pests of sugar cane (Shanmuganathan *et al.* 2010).

Numerous analyses by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) have established the economic benefits of Australia's protection against a variety of potentially threatening pest incursions (Department of Agriculture 2019a). After discussions with Ministers, industry and the community, extending over four years from 2011 the *Biosecurity Act 2015 (C'wealth)* replaced the 1908 *Quarantine Act*.

Agricultural Chemicals

The SCA/AAC structure had a Coordinating Committee on Agricultural Chemicals (CCAC). In the early days, interest was primarily oriented to the compositional purity and labelling of fertilisers. Management of chemicals was seen as a States/Territories matter, with regulations varying between states, often requiring different state-based labels on products. By the 1980s, aerial agriculture was developing. Ministers were becoming aware of the environmental problems of spray-drift and the social and economic risk of continued use of 2,4-D and 2,4,5-T herbicides. Proposals were considered for an aerial application research unit within either the Australian Plague Locust Commission or the Victorian Department of Agriculture but were not progressed. Oestrogens in animal feeds, led to the "Johnson case" where a grower was awarded compensation against the State of South Australia for advice that resulted in low lambing percentages on pastures sown with oestrogenic Yarloop and Dwalganup subterranean clover varieties for prime lamb production (Zelling 1980, Mitchell, Mohr and Matheson 1980). Australia played a strong role in international groups such as the Codex Committee on Pesticide Residues (CCPR) and Collaborative International Pesticides Analytical Committee (CIPAC), the latter discussing the ability to detect chemical residues in products at much lower level then previously possible. Attendance at these meetings was jointly funded by the Commonwealth and States through AAC. There was some lack of confidence in the competence of those applying chemicals and Pest Control Operators' training was developed, later becoming the basis for *ChemCert*, the industry-led training and accreditation program for primary producers.

The risks inherent in persistent organochlorine pesticides initially arose from concerns about dieldrin residues in wool and wool grease (lanoline). From the CCAC involvement with veterinary drugs arose awareness of the European Economic Community concern about hormones and veterinary drug residues detected in animal products in trade. Internationally, residue limits were being adopted. A market basket survey was in place looking for chemical residues in foodstuffs, with new chemicals being added in addition to organochlorines. Arsenical sheep dips were prohibited from December 1986. Agricultural Ministers ensured that agricultural chemicals and pesticides which were already assessed by the states, would remain separate from the new Chemical Notification and Assessment Scheme being developed by the National Occupational Health and Safety Commission. In 1986, Ministers agreed in principle to initiate the harmonisation between the states of scheduling, labelling, and packaging requirements for agricultural chemicals and veterinary drugs. By 1987, the United States was testing meat imports from Australia for pesticide contamination violations and found five in a short timeframe, though the overall violation rate of 0.4% had changed little over the previous 20 years. In response to the immediate threat of losing a major export market, the States and Commonwealth forthwith banned all uses of organochlorine chemicals except to control termites. A national program was established to monitor organochlorine residues in meat. In many

cases, the residues came from livestock grazing stubbles from pesticide treated crops as well as ingesting contaminated soils from termite treatments around abandoned houses, sheds and power poles. A nation-wide program coordinated across the states collected 1900 tonnes of the then unwanted chemicals, 75% of which were organochlorines. The exercise was repeated ten years later under the auspices of the Environment and Protection Heritage Council and a further 1700 tonnes of assorted chemicals were received (EPHC 2004).

Prior to registration of chemicals for sale, assessment of safety and efficacy had been done nationally under the oversight of the CCAC, but in November 1988 the Commonwealth enacted legislation to bring the clearance process under control of the new Australian Agricultural and Veterinary Chemicals Council (AAVCC). A Special Premiers' Conference in October 1990 had focussed on identifying areas for Commonwealth-States harmonisation. The need for ongoing reforms of farm chemicals regulation was singled out as a priority area, and Agricultural Ministers were tasked to implement a national system for registration of farm chemicals, preferably within 12 months. This resulted in the development of the new administrative framework in parallel with maintaining the existing coordination and registration systems. The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) was established as a statutory authority in December 1992. It immediately removed the last remaining use of organochlorines for termite control. The NRA was later renamed as the Australian Pesticides and Veterinary Medicines Authority (APVMA). Subsequently, an industry-led initiative resulted in the *drumMUSTER* program for the collection and destruction of unwanted pesticide containers and the *ChemClear* program to collect and dispose of unwanted registered chemicals.

Spray Drift had been a continuing concern from the 1980s, and CCAC undertook a review in 1992 which resulted in a National Code of Practice for Aerial Spraying, and the later publication Spray Drift Management – Principles, Strategies and Supporting Information (PISC 2002). The AVPMA subsequently assumed responsibility for spray drift and issued management principles (APVMA 2008), since upgraded. As a result of concerns about the impact of drifting chemicals on the natural environment, it has since terminated use approvals for some, including endosulfan.

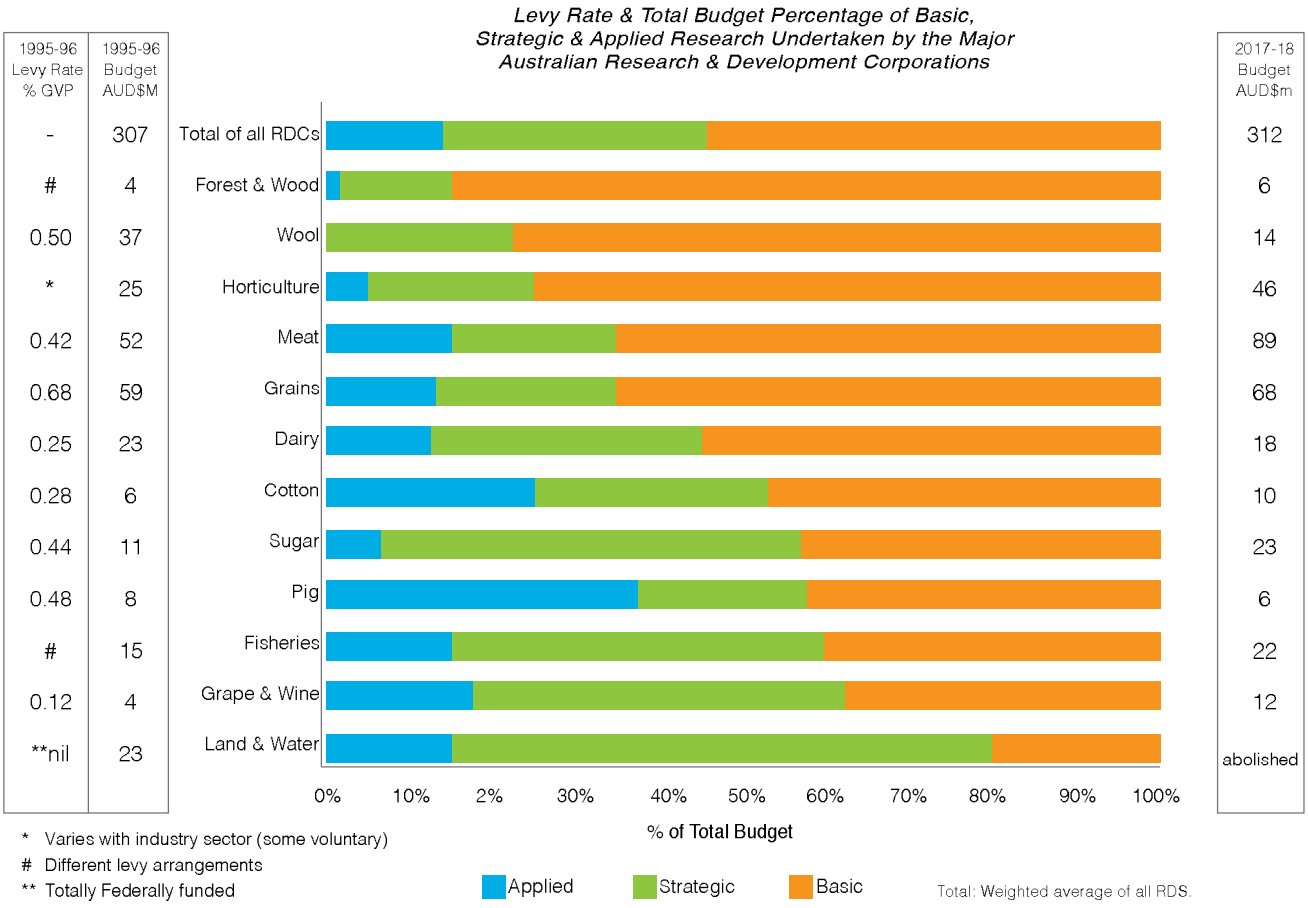
Research, Development and Extension (RD&E)

Commitment of producers to research and development through payment of levies commenced with the tobacco industry in 1955 and the wheat industry in 1957, leading to industry-specific research councils set up under specific acts. The wheat industry also had separate state-based research committees in the wheat-producing states. In 1978, the Commonwealth established the Commonwealth Council for Rural Research and Extension (CCRRE) (Commonwealth of Australia 1979). Membership included the Directors-General of Agriculture but also other external appointees. This short-lived body commissioned several reviews, some in association with SCA, the most notable being that by Edwards and Freebairn (1981) who sought to measure the benefits for Australia from its investment in agricultural research and extension. A subsequent SCA Working Party on Priorities in Rural Research and Extension identified the following priorities:- Conservation of energy; the production of liquid fuels; leguminous crops and pastures; integrated control of diseases, pests and weeds; efficient mechanisation of farm processes; base pastures for ruminants; farm business management and decision-making performance; new farming systems; product quality and acceptance in trade; markets; and research into extension and communications technology. Such objectives would still be largely appropriate today, though the technologies involved have advanced considerably. The working party was transformed into the Advisory Committee for Priorities on Rural Research and Extension (ACPRRE) which was convened in the morning before the commencement of SCA meetings. ACPRRE established an inventory of Australia's agricultural research and extension and a compendium of research in progress. It also oversaw studies perceived to be of increasing topicality, including application of pesticides by air and on the ground; effective communication of pig and poultry research results to industry; a review of research priorities in crop/animal/pasture systems; alternatives to organochlorines for control of soil insects; training needs in agricultural extension; and identification of viruses in perennial fruit tree crops. Prior to each Council meeting, it also reviewed proposals to hold technical conferences and workshops under SCA/AAC auspices. However, ACPRRE never quite came to grips with identifying national agricultural research priorities and was terminated in 1988 as that function was being increasingly assumed by the Rural Research and Development Councils.

In the early 1980s, a communication revolution had begun. By 1984, the NSW Minister advised that the NSW government had established a digital network to regional offices. A working party was set up soon afterwards by SCA/AAC to establish standards for videotex after a pilot trial had been conducted in Gippsland in 1982, but the group was abolished before completing the task as computing advances bypassed the technology. By August 1997, all agricultural offices in the country were to be digitally connected.

Following discussions at Australian Agricultural Council, the various research funds were re-established under an omnibus *Rural Industry Research Act 1985 (C'wealth),* which defined the responsibilities of the councils, the levy collection processes limited to a maximum of 0.5% of the gross value of production, the commitment of the Commonwealth to fund half of the cost of their research investments and the process for nominating research council appointees by the Federal Minister for Primary Industries upon the advice of a selection committee. These committees comprised a Ministerially appointed independent Chair, a nominee of Australian Agricultural Council (usually a member associated with Standing Committee on Agriculture) and a National Farmers Federation nominee who was conventionally drawn from the relevant levy-paying industry. The selection committee was asked to recommend a board whose expertise encompassed commodity production; commodity processing; commodity marketing; science; technology, and technology transfer; economics; administration of research and development in respect of any goods; finance; and business management. The predecessor organisations and their legislation were listed in Schedule 1 of the Act. Provision was also made for a Special Research Fund, fully Commonwealth funded that was, in essence, for new and emerging industries. Four years' later, the following *Primary Industries and Energy Research and Development (PIERD) Act 1989 (C'wealth)* allowed for the creation of research and development corporations. The mostly smaller R&D Councils who had not moved to the corporation model, operated under the aegis of the Rural Industries R&D Corporation. The fully Commonwealth-funded Land and Water Research and Development Corporation (later Land and Water Australia) covering industries concerned with the conservation, sustainable use and management of land and water resources was also established at this time. (Amid widely expressed disappointment, it was abolished as a budgetary saving in 2009.) In 1995-6, the total expenditure by R&D Corporations had reached $307 million (Figure 1). Total expenditure in 2017-18 was little increased,

Figure 1. Levy rates and Basic, Strategic and Applied research expenditure by Research and Development Corporations 1995-6 and research expenditure 2017-18



representing a reduction of investment in real terms. Annual investment is very much influenced by levy collections which can vary widely dependent on seasonal conditions and market returns.

A review of the benefits of 32 randomly selected projects from a portfolio of 600 funded by the Rural Industry R&D Corporations showed they would deliver an average return of $11 for each dollar invested (Rural R&D Corporations 2008). Individual R&D Corporations have also undertaken benefit : cost analyses of many individual projects.

By 1990, the approach by research organisations had become more collaborative, recognising the need for a national approach toward the topic and that Australia was competing in an international arena. In February 1992, proposals were suggested by the Chief Executive of CSIRO that AAC should consider developing a national strategy for agricultural research, an idea that met with mixed responses. The same meeting also discussed closer R&D relations between Australia and New Zealand, but this idea was soon impacted on by the New Zealand government decision to restructure its government-sponsored research agencies into corporatised Crown Research Institutes operating on a commercial "purchaser:provider" model. Following a workshop in November 1992, a committee was established by AAC to develop a National Agricultural Research Strategy for Australia. An issues paper was prepared by a government/industry/universities steering committee. Responses were considered in developing a draft strategy which in turn drew a further 85 responses. The outcome was debated at a 200-participant National Roundtable jointly convened by the Minister for Primary Industries and the Chair of the National Farmers Federation in August 1995. The result was the directions paper *Innovation in Agriculture* (McGauchie and Anderson 1996). It was intended that the NFF would measure progress in its implementation.

During this period, several departments established formal internal purchaser:provider mechanisms for the allocation of state research funds. These did not appear to work very effectively when the purchasers were within the same agency as the researchers but were less familiar with the underlying science. However, some joint ventures were set up. On the Waite Campus in Adelaide, capital works were jointly completed in 1993 for the collocation of staff members with similar skills from the University of Adelaide, the state-funded South Australian Research and Development Institute (SARDI) and CSIRO. The Tasmanian Institute of Agricultural Research (TIAR) was formed in 1996 between the Tasmanian government and the University of Tasmania. The Queensland Alliance for Agriculture and Food Innovation (QAAFI) was a later venture established as a research institute of the University of Queensland (UQ), supported by the Queensland government with Department of Primary Industries research staff. Ministerial Council members were kept abreast of these successful developments. Similar collaborative efforts were attempted in other states, while relationships were established between CSIRO Food Research and the Victorian Department of Agriculture and between CSIRO Division of Forestry and Forest Products and the New Zealand Forest Research Institute. These arrangements did not persist though less formal scientific collaborations may have been continued.

Much more successful was the creation of Cooperative Research Centres with a seven-year Commonwealth contribution to their funding. They were introduced from 1991, requiring joint venturing between industry and research providers, at least one of which was to be a university. The first two were the CRC for Soil and Land Management and the CRC for Plant Science. Although states' agricultural research agencies have participated in many of these endeavours funded by the Commonwealth, the respective Agricultural Ministers' Councils were not directly involved.

The relationship among agricultural research organisations and with the Ministerial Councils as extant in 2004 is shown in Figure 2.

In 2006, the Primary industries Ministerial Council (PIMC) endorsed the development of a National Research Development and Extension Framework for Australian Agriculture. At the same time, an Australian Agricultural and Natural Resources Online (AANRO) database was developed. A workshop was convened in 2007 to discuss opportunities and impediments to national collaboration in RD&E. It was attended by State and Territory Government representatives, senior officials from most research and development corporations, CSIRO and a representative from university agriculture faculties. It recognised the unique and complementary research capabilities held by the Primary Industries Standing Committee agencies. These are summarised in Figure 3.

Figure 2. The Australian National Agricultural Research System (including New Zealand) as at 2004 showing line structural relationships. Blue arrows show funding flows from research purchasers to research providers. Research providers are shown in yellow. Dotted arrows show CRC investments

AUSTRALIAN NATIONAL AGRICULTURAL RESEARCH SYSTEM (including New Zealand links).

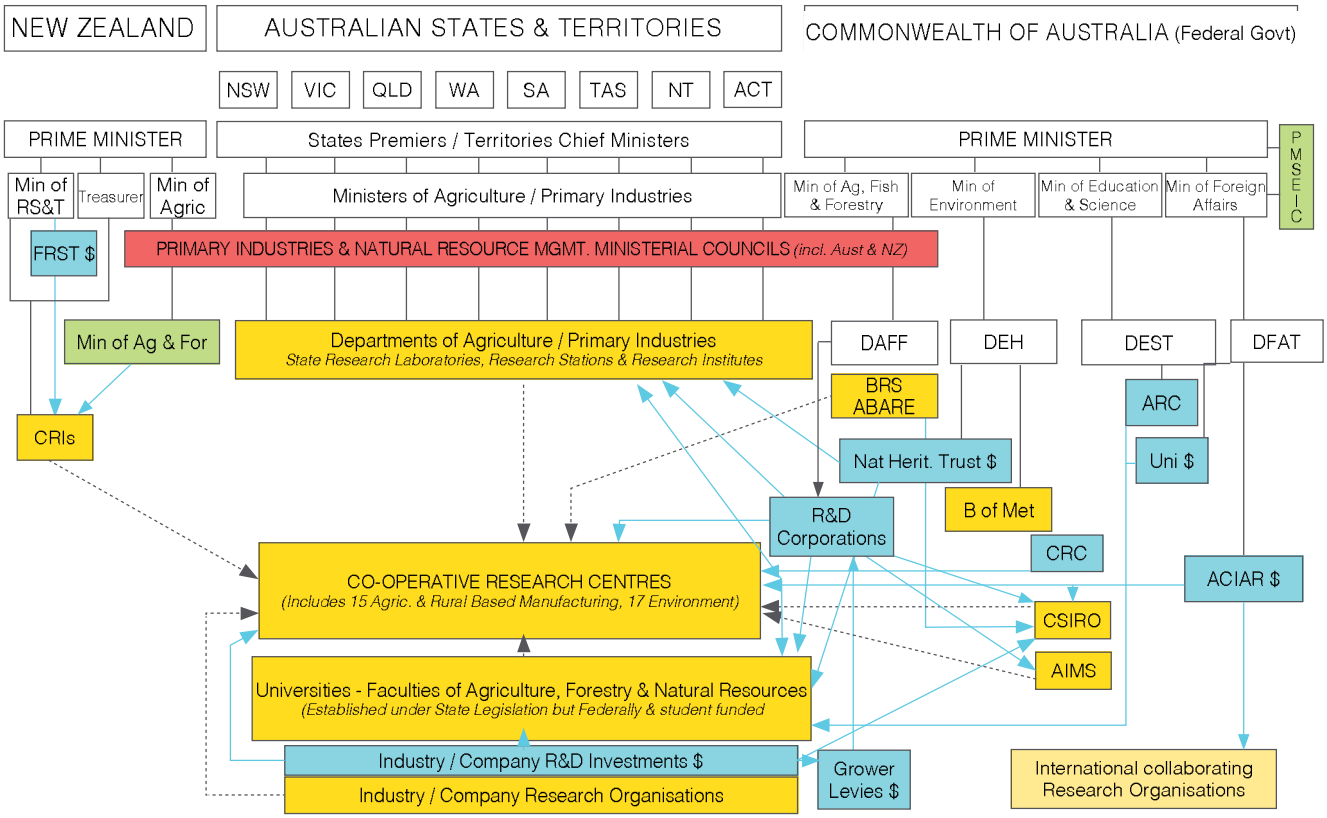


Figure 3. Distribution of Major (M) and Supporting (S) research roles among PISC agencies, 2008 (PIMC 13)

		QLD	NSW	NT	VIC	TAS	SA	WA	C/W CSIRO
INDUSTRY									
Meat	Beef	M	M	M	S	S	S	S	M
	Lamb		M		M		S	S	M
Wool			M			S		M	S
Grains	Pulses	M	M		M			M	S
	Cereals	S	M		S	S	M	M	M
	Oil seeds		S		M			S	S
Horticulture	Tropical	M						S	
	Sub-tropical	M	S					S	
	Mediterranean		M					M	M
	Temperate		S		M	M		S	M
Cotton		S	M					S	M
Sugar		M							S
Dairy		S	S		M	M		S	M
Seafood	Wild	S	M	M	S	M	M	S	M
	Aquaculture	S	S	M	M	M	M	S	S
Poultry		S					M		S
Pigs		S	S				M	S	
Forestry	Tropical	M							S
	Temperate		M		S				M
Wine & viticulture			M		S		M		M
CROSS-INDUSTRY									
Water use in Agriculture		S	M		S	S	M	M	M
Climate Change and Variability		M	M		M	M	M	M	M
Food Science		S	S		M	S	S	S	M
Animal Biosecurity		M*	M		S	S	S	M	M
Plant Biosecurity		M*	M		M	S	M	M	M
Animal Welfare		S			M				M
* = Integrated tropical pest management									

Agreement was reached for fourteen potential industry sector strategies and seven cross sector strategies, along with their respective PISC and Research and Development Corporations/industry lead agencies. These strategies were *Climate Change research strategy for primary industries; Pork; Wine; Dairy; Beef; Sheep Meat; Poultry; Fishing & Aquaculture; Forest & Wood Products; Grains; Horticulture; Sugar; New & Emerging Industries; Animal Welfare; Cotton; Biofuels & Bioenergy; Wool; Water Use in Agriculture; Food & Nutrition; Plant Biosecurity* and *Animal Biosecurity. Soils* was later added as an additional strategy. All drafted strategies were endorsed by the Primary Industries Ministerial Council or its successor, the Standing Council on Primary Industries. A website was provided for the strategies at http://www.npirdef.org. Participating organisations, including all states and territories except the ACT, signed a Statement of Intent which covers the adoption and evaluation of the strategies (Department of Agriculture 2009).

The PIERD Act model evolved until by 2011, there were six statutory R&D Corporations and nine industry-owned companies, all being funded by industry levies. The Australian Government matched research expenditure up to 0.5 per cent of the gross value of production (GVP). The industry-owned companies were also able to conduct marketing activities funded by their industry levies. The Productivity Commission (2011) argued that industry should take on greater responsibility for funding industry-focused research, and that the cap on government matching contributions should be gradually reduced to 0.25 GVP. The government did not adopt the Productivity Commission's recommendation

Genetic Resources

Australian agriculture is dependent on the continued improvement of its genetic resources. For many years, Ministers supported programs that ensured access to a diversity of resources essential to the nation's agriculture, the costs usually being shared between the Commonwealth and states, with progressively increasing input from the Rural R&D Corporations.

The Fruit Variety Foundation had been established in 1971 and covered the costs of maintaining trees at Tatura, Victoria as a source of bud wood for new plantations. In 1988, it was suggested that an on-line database be developed for fruits and vegetables, the first suggested use of such technology. Pome fruit and grapes were withdrawn from the scheme in 1989 but a database was established in the Commonwealth's office of Plant Variety Rights. Following a review, the remaining funding ceased in June 1991, with industry thereafter paying for any budwood it required.

By 1985, only 100 breeders were accessing the National Beef Recording Scheme which had been operating for 13 years. Ministers with encouragement from the Federal Treasury, required it to be self-supporting within three years. The more widely supported National Dairy Herd Improvement Scheme was similarly to move to self-sufficiency. There had been a long history of supporting the University of Sydney's Australian Inoculants Research and Control Service. When it was suggested that cost recovery might be sought from inoculant manufacturers, they suggested it would no longer be economical to produce the small sachet packs used by farmers, but the scheme subsequently achieved 30% cost recovery within two years. State departments also maintained microbiology reference collections including bacteria at Rydalmere (NSW), nematodes at Burnley (Victoria), viruses at Indooroopilly (Queensland) and fungi at all three.

South Australia's Parafield Poultry Research Station, originally established in 1904, held a diverse collection of poultry breeds together with lines selected for meat production. Efforts over several years to attract joint Commonwealth/States funding to support a National Poultry Stock Conservation Program were ultimately unsuccessful and the stock were dispersed to poultry fanciers. In the meantime, the commercial chicken meat industry had achieved remarkable gains in the growth performance and feed efficiency of its broiler flocks. Furthermore, the industry was now able to legally import fertile eggs through a newly established quarantine facility at Torrens Island, South Australia.

Advice was also sought on the import and export of livestock genetic material. Ministers' minds were exercised in the mid-1990s by proposals to import South African Mutton Merinos, South African Merinos, Boer goats and Damara and Dorper sheep, the latter two being of concern to woolgrowers because of their potential to contaminate the wool clip. Approval was eventually given. A reverse case was that of exporting emus. Federal legislation prohibited the export of native fauna, but if the emus were bred by farmers rather than being captured from the wild, they were eligible for continued farming and export. Emu farming enjoyed a short-lived enthusiasm in the mid-1990s with some going to the USA.

Crop cultivar registration schemes including for grain legumes, oil seeds and triticale, were approved in the early 1980s, with tobacco cultivars following in 1986.

Details of newly-registered cultivars were published in the *Journal of the Australian Institute of Agricultural Science* and later in the AAC-sponsored *Australian Journal of Experimental Agriculture.* During 1998-99, registration was approved of four oat varieties, two barley varieties and a bread wheat, while the Registrar of herbage plant cultivars registered four pasture cultivars, two grasses and two legumes. By this time, Plant Variety Rights were being adopted by breeders and the scheme became superseded.

The three major plant genetic issues faced by the Ministerial Council were the curation of Australia's Plant Genetic Resources, the introduction of Plant Variety Rights (PVR) leading to Plant Breeders' Rights (PBR), and the development of protocols to manage genetically modified organisms (GMOs).

A network of plant genetic resource centres had evolved by the 1980s, responsible for the conservation of the crop and pasture plant resources on which Australian agriculture depended. The network served as a source of material for plant breeders. The curators of collections strived to add new material, by international exchange or by plant collecting expeditions to the countries of origins of their collections. The centres involved were the Australian Winter Cereals Collection (Tamworth, NSW), Australian Temperate Field Crops Collection (Horsham, Victoria), Australian Tropical Crops and Forages Collection (Biloela, Queensland), Sugar Cane (Brisbane, Queensland), Australian Medicago Genetic Resource Centre (Urrbrae, SA), Australian Trifolium Genetic Resource Centre (Perth, WA), and the Australian Indigenous Relatives of Crops collection (CSIRO Canberra, ACT). The network was also linked to New Zealand through the Margo Forde Forage Germplasm Centre (Palmerston North). In 1985, the Commonwealth agreed to a capital investment program for the plant genetic resource centres provided the states assumed responsibility for operating expenses. Though capital improvements were made, funding their operation continued to be a problem. Cost-recovery of services was not a realistic option as the breeders operated within the departments which housed the collections. A series of reviews was conducted in the 1990s, one of which raised the potential for bioprospecting for pharmacologically active compounds that might be found within Australia's broader plant genetic resources. It also raised the rights of indigenous peoples to the intellectual property from any such plants. The future management and funding of the centres remained an intractable problem with some being partly supported by the rural industry research funds, notably the Grains R&D Corporation. By 2005, proposals had developed to create a single National Genetic Resource Centre. A report to Ministers in 2006 evolved into a two-node model, with field crops held at Horsham and pasture species in Adelaide. Victoria and the GRDC agreed to support the Australian Grains Genebank Collection at Horsham from 2008 as part of the National Grains RD&E Strategy. This centre contributed Australia's first accessions (field peas and chickpeas) to the Svalbard Global Seed Vault in 2011. In that year, it was finally agreed that the Pasture and Forage Genetic Resource Collections (PGRC) encompassing seed storage, documentation and distribution would be transitioned to one central node in Adelaide, hosted by the South Australian Research and Development Institute (SARDI). Seed multiplication and regeneration would be conducted regionally by state agencies in Queensland for tropical species, South Australia for alkaline species, Western Australia for acid tolerant pasture species and Tasmania for cool temperate species. Any non-core activities (such as collecting expeditions) would require separate funding on a project basis. Meanwhile, following Ministerial discussions, Australia had signed the FAO International Treaty on Plant Genetic Resources for Food and Agriculture which governs the international exchange of germplasm, coming into effect in March 2006.

In the 1970s it was suggested that a plant breeder's rights scheme was outside the legislative power of the federal government, and any implementation should be left to the states. Australian Agricultural Council's Standing Committee on Agriculture advised in 1972 that plant breeder's rights be left to the states. By 1981, AAC confirmed that Plant Variety Rights (PVR) be limited to ornamentals, horticulture and selected fodder and pasture species. There was considerable debate among the states within Agricultural Council and also within political parties as to whether Australia needed a PVR scheme (Lazenby 1986). It was not until 1 May 1987 that the *Plant Variety Rights Act 1987 (C'wealth)* encompassing all plant species, came into force. (Sanderson and Adams, 2008). In 1989 Australia became one of the member states acceding to the *International Convention for the Protection of New Varieties of Plants* (the UPOV Convention). Subsequently, the PVR legislation was revised to become the *Plant Breeder's Rights Act 1994 (C'wealth)* including a definition of "breeding", recognising new technologies and achieving consistency with the UPOV Convention. Following a review of the operation of the PBR Act in 1999 including Western Australian experience with end point royalties, the then Standing Committee on Agriculture and

Resource Management (SCARM) commissioned a report on clarifying the understanding of the legislation. The authors worked with the Plant Breeder's Rights Office and the plant breeding and biotechnology industries to clarify "essential derivation" and develop practical solutions to intellectual property management of essentially derived varieties (Dawson, Marshall, Stearne and Waterhouse 2002).

In 1988, Standing Committee on Agriculture became formally involved in the issues of genetically modified organisms (GMOs) when it requested a working group to advise on implications for their regulation and release. The Genetic Manipulation Advisory Committee (GMAC), a non-statutory body, had been established in September 1987 to oversee the development or introduction of novel genotypes produced via genetic manipulation that were unlikely to occur in nature or may pose a public health or environmental risk. Following advice from SCA, Ministers in July 1990 agreed that Australian agricultural industries should be able to capture the potential benefits from the use of genetically engineered organisms while protecting the environment and addressing consumer and general community concerns, but that protocols were urgently needed for the release of genetically engineered living organisms. It appointed a working party to advise. This group subsequently joined a meeting of representatives from other ministerial councils to develop a national approach to biotechnology regulation. Veterinary Chemicals Advisory Committee confirmed that veterinary chemicals that were genetically modified products already came under the *Agricultural and Veterinary Chemicals Act 1988 (C'wealth)* and their clearance must be obtained from the Australian Agricultural and Veterinary Chemicals Council. In 1996 CSIRO released cotton varieties which incorporated GM tolerance to insect attack, which with further development, has since greatly reduced pesticide use in the cotton industry. In April 1999, SCARM released a draft *Points to be Considered in Developing Genetically Modified Crops and Pastures for Agriculture* prepared and circulated by its Working Group set up to prepare guidelines for the agricultural use of GM crops. Following numerous consultations involving the Commonwealth's Agricultural, Environment, Science and Health departments, States departments and science agencies (Polya 2008), ARMCANZ Ministers were advised in August 1999 of the creation of the Office of the Gene Technology Regulator (OGTR), to be located within the Commonwealth Department of Health and Aging. During discussions on proposed legislation, GMAC advised it was not willing to approve general release of transgenic herbicide resistant

crops and pastures until there was a national strategy in place to integrate those plants into commercial farming systems. It was noted that in the absence of SCARM or similar body involvement, responsibility for oversighting the development of crop management plans for GMOs in regard to risks confined to farming systems was unclear. Following passage of the *Gene Technology Act 2000 (C'wealth)*, the OGTR was to be fully functional by mid-2001. It was clarified that the OGTR should not be responsible for assessing and managing the risks to agricultural productivity and/or sustainability posed by GMOs. There were important issues to be addressed including segregation of GM and non-GM crops and the management of GM crops to minimise the risk of breakdown of the efficacy of the genetically selected characters, particularly where only one gene change was involved. The OGTR was responsible only for managing unique risks to the environment or to human health posed by GMOs. States and industry were to be responsible for whole-of-chain strategies relating to the impact of GM and non-GM crops on domestic and world markets. Following discussions in the Gene Technology Ministerial Council, the establishment of GM-free zones and monitoring procedures were identified. Approval for the first release of a GM food crop, glyphosate-tolerant canola, was given in 2003, with commercial production being permitted by Victoria and NSW from 2008 (OGTR 2019).

Animal Welfare

A regular trade of exporting live sheep to the Middle East had developed from the 1960s. In the late 1970s, the animal liberation movement had developed and was pressing to halt the trade. The Australian Meat Industry Employees Union (AMIEU) had sought that all livestock products for export should be processed in Australia. It suggested that live sheep should not be loaded without inspection by the Royal Society for the Prevention of Cruelty to Animals (RSPCA). The Victorian RSPCA was pursuing a policy of seeking to ban all live exports. The Union was picketing ports in Victoria and South Australia to inhibit loading (Petrie 2016). Ministers discussed the issue and concluded that animal welfare had been regarded too lightly. They also noted that the RSPCA, seemingly inconsistently, allowed kosher religious slaughter of sheep in Australia but did not support Islamic killing, a topic which again came before Ministers twenty years' later. Ministers in some other states maintained a positive low-key relationship with their state RSPCA, with which there were few problems. Whilst live sheep exports were a Commonwealth responsibility, the Ministers determined to develop standard codes of practice for domestic livestock welfare that could be adopted across all the states. Ministers specifically declined to define animal welfare itself on the grounds that this would lead to endless argument. Meanwhile, Ministers also supported delegates of the Australian Council of Trade Unions (ACTU) visiting the Middle East to evaluate the potential market for meat and livestock.

Codes were prepared in consultation with industry through the Standing Committee's Animal Health Committee which in turn was supported by its Sub-Committee on Animal Welfare (SCAW). By 1985, Ministers had agreed to animal welfare codes of practice for *The Care and Use of the Pig, Domestic Fowls* and *Road Transport of Livestock*. These codes were followed by codes for *The Care and Use of Experimental Animals in Australia*, then *Transport of Livestock by Air* and *Transport of Livestock by Sea.* A code for *Husbandry of Rabbits* followed, after NSW had sought to develop a domestic rabbit meat industry, a concept opposed by most states ingrained with many years' experience of trying to exterminate rabbits as a feral pest. Free range rabbit farming and vaccination against the myxoma virus were explicitly prohibited. Meanwhile, the universities, the Australian Research Council and the National Health and Medical Research Council (NHMRC) were developing the Australian Council for the Care of Animals in Research and Teaching (ACCART) which was later extended to New Zealand. After initially accepting observer status in its establishment phase, AAC Ministers declined an invitation to be represented on the Council.

An issue that particularly exercised Ministers' minds was whether there should be a curfew on access to water in saleyards. The debate revolved around the capital cost of fitting out water to all sale pens versus the loss of liveweight of stock deprived of water. The topic generated an especially vigorous debate between two Ministers from opposite sides of the country. Both had pastoral experience, one pointing out that he had first delivered a mob of cattle when eight years old to the Wyndham saleyards accompanied by his father. A further code for *The Scientific Use of Animals* was deferred when the question was raised as to whether cold blooded species (fish) could feel pain, some physiological responses in fish having been noted as similar to those recorded for warm blooded animals. The code was agreed at the following meeting as it already had been printed and only NSW had animal welfare legislation that encompassed fish. Other codes followed for *Destruction or capture handling and marketing of feral livestock; Sheep: Farming of Deer: The Goat; The Camel, Land transport of Horses,* and

“In February 2000, a NSW feedlot suffered a 12 hour mortality incident involving the deaths of approximately 1250 head of cattle from 35,000 on feed due to an unusual confluence of weather factors.”

Land transport of Pigs, followed by *Farming of Buffalo*. Revisions to the code *The Fowl* took account of changed community attitudes to the minimum size of poultry cages. A new model code was established for the *Land transport of Cattle*, intended to encompass both road and rail. This was followed by *The Model Code of Practice* for the *Welfare of Animals - Livestock (Including Poultry) at Slaughtering Establishments (Abattoirs, Slaughter-houses and Knackeries)*. Ministers also prohibited dog tail docking which previously had been done for cosmetic purposes.

In February 2000, a NSW feedlot suffered a 12 hour mortality incident involving the deaths of approximately 1250 head of cattle from 35,000 on feed due to an unusual confluence of weather factors. Further revisions were made to the *Animal Welfare Code for Feedlots*, encompassing shelter from excessive heat.

The live sheep trade continued to attract public attention. Ministers had banned the export of pregnant ewes in the live sheep trade in 1996. Ewes were to be pregnancy-tested within 30 days of shipment although later proposals to prohibit all live exports of ewes were not accepted. A consignment of sheep and one seaman died in 1996 when the *Uniceb* caught fire in the Indian Ocean and sank. By 2002, approximately 6 million sheep and 1 million cattle went to the livestock export trade. Overall, livestock exports generated over A$1 billion of export income for Australia in 2002-03 (Keniry *et al.* 2003). When the M.V. *Cormo Express* arrived in Saudi Arabia in 2003 with 58,000 sheep, the consignment of sheep was refused upon an asserted high level of “scabby mouth”. At that stage, 0.9 per cent of the sheep had died on the voyage. The ship was obliged to take to sea for a further 80 days seeking a port which would accept the sheep – eventually Eritrea – during which time a further ten per cent of the sheep died. A Ministerially-commissioned report by Keniry *et al.* (2003), was unable to confirm the level of disease asserted by the Saudis and the Saudi trade was again suspended, having previously been so for most of the 1990s. A new *Australian Code for the Export of Livestock* was developed. Media reports of animal cruelty in handling after arrival of sheep at Kuwait, cattle in Egypt and later Indonesia led to a total embargo of cattle exports to Indonesia for a month in mid-2011 (Petrie 2016). A report was commissioned by the Australian Government in pursuit of its objective of ensuring a sustainable export trade which included appropriate animal welfare standards to be implemented downstream of the animals disembarking in Indonesia. This was necessary for the acceptance of that trade by the Australian community (Farmer 2011). The report noted the improvements made following the 2003 Keniry report but that some protocols were still not being met. This is an on-going area of concern, as evidenced by the mistreatment of cattle in Vietnam as recently as 2016. Many of our trading partners do not place the same value on animal welfare as Australian farmers, and the broader Australian community.

Meanwhile, People for the Ethical Treatment of Animals (PETA) had become active in Australia, seeking a ban on the “mulesing” operation which was used on sheep as a mitigation against fly-strike. It also sought to promote free range production of poultry and pigs. Animal activism began to arise. In December 2014, the Standing Council of Primary Industries Ministers noted that the continuing incidence of farm invasions by animal activists, lack of prosecutions and new issues arising from increased use of new surveillance technologies (for example; unmanned drones) raised concern about the adequacy and efficacy of existing laws in providing sufficient deterrence. This was despite there being a robust system in place to address farm animal cruelty and welfare management that reflected and was responsive to changing community attitudes and farming practices. Ministers agreed in principle to a nationally consistent approach to addressing protection of animal industries from disruptive activities.

DISCUSSION

Rural industries no longer dominate the nation’s economy, although combined, the sector is still the fourth biggest income earner, behind education, tourism and mining. In 2017, the rural industries generating $51 billion nationally.

In the past forty years, farmers have achieved a growing range of choice of farm inputs such as genetic material and purchased chemicals to achieve specific outcomes and improve their economic returns. They have also been required to accept externally imposed safety standards

and animal welfare standards that has made farming a safer and more community-accepted activity. These changes have occurred in the context of a diminishing rural population, to the point where the proportion of the community now engaged in agriculture is only 3% of the Australian population.

These developments have been matched with the greater use of commercial advisory services and readier access to information through the internet. There has been a progressive shift in responsibility from the use of government-developed legislative and regulatory frameworks towards the sharing of responsibility for industry management with grower organisations and the growers themselves. This is exemplified by the involvement of producers in the management of successful exotic pest and disease eradication campaigns from the mid -1980s, albeit initiated and coordinated through the Ministerial Council structures. The incorporation of industry peak organisations into the creation of Plant Health Australia and Animal Health Australia are examples of governments sharing policy responsibilities with industry, albeit encouraged by Commonwealth and state funding. Government budgetary support for agriculture has reduced progressively and remains much lower than in most OECD countries, although government support for agricultural R&D remains a pillar of Australian agriculture while biosecurity remains a primary initiative of most state agriculture/primary industry departments.

Australia has achieved international recognition for the quality and integrity of its products. Decisions made by Ministers and subsequently implemented by governments across Australia, such as initiating the uniquely successful eradication of brucellosis and tuberculosis, keeping Australia free of BSE and the capability to trace products back to their point of origin through such initiatives as the National Livestock Identification System, have been important in establishing this product credibility. Biosecurity dating back to the *Quarantine Act* of 1908 underpins production systems both in terms of national policies and on-farm.

These underpinning legislative and regulatory arrangements, while not often appreciated or valued by the broader community, ensure a framework in which Australian producers prepare for international markets, products that are superior to many of our competitors.

However, the formal disbanding of the Primary Industries and Environment Ministerial Councils within COAG in 2014 has also resulted in loss of continuity for some earlier initiatives. The National Research Development

and Extension Framework website at http://www.npirdef.org advised in August 2019 that the last communique from the Research and Innovation Committee, which reports to the Agriculture Senior Officers' Committee (AGSOC), was in January 2016 and even that had been deleted by November 2019. *Dairy* and *Water for Agriculture* RD&E Strategic Plans were updated in 2015, *Animal Biosecurity, Animal Welfare, Grains* and *Sugar Cane* were revised in 2017, the sugar cane strategy noting that its previously approved strategy was never implemented due to changed structures in the industry. Most of the remaining 17 industry strategic RD&E plans date from 2009-2011.

While the Ministerial Council reporting directly to COAG has been disbanded, continuing meetings of Australian and New Zealand ministers responsible for primary industries have occurred on an irregular basis, as the Agriculture Ministers Forum (AGMIN), and the chief executives of primary industry agencies, as the AGSOC. Processes are now streamlined with the use of modern communication technology, but it is essential that the arrangement now in place continues, so that Australia's nine governments and the New Zealand Government can work collegiately, as they have in the past, to continue to provide a strong and coordinated legislative and regulatory framework for their nations' still financially significant rural sector. It is noted that in the Communique from their October 2019 meeting (Department of Agriculture 2019b), Ministers agreed to prepare reports to COAG on several significant topics, and this strengthened relationship back to COAG is to be applauded. Without this framework our rural industries will not be in a position to maintain the hard-won advantages that they have achieved in many international markets.

CONCLUSION

Despite some shortcomings, Australian Agricultural Council members and their successors have advanced the security and quality of the animal and plant genetic resources used in Australian agriculture, progressively shared those responsibilities with the respective rural industries and have maintained a commitment to industry-funded research and development programs while ensuring safety and animal welfare standards have continued to increase.

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REFERENCES

Abbott, T. (2014). *Letter to the Hon Barnaby Joyce, Minister of Agriculture and Chair, Standing Council on Primary Industries,* 14 February 2014, Canberra

ABS (2005) 2005 *Yearbook of Australia.* Australian Bureau of Statistics, Canberra. https://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/E8B0AEE832A75948CA256F8F00710605/$File/13010_2005.pdf (accessed 17 November 2019)

AHA (2019). *AUSVETPLAN,* Animal Health Australia https://www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents/ (accessed 11 July 2019)

ARMCANZ (1993). *Agriculture and Resource Management Council of Australia and New Zealand - Record and Resolutions, First meeting, Alice Springs, 29 July 1993* (Department of Primary Industries and Energy : Canberra)

APVMA (2008). *APVMA operating principles in relation to spray drift risk Australian Pesticides and Veterinary Medicines Authority, Canberra.* https://apvma.gov.au/sites/default/files/publication/27941-spraydrift_op_principles.pdf (accessed 21 July 2019)

Beale, R, Fairbrother, J, Inglis, A.R. and Trebeck, D. (2008). *One biosecurity – a working partnership.* Commonwealth of Australia, Canberra https://apo.org.au/sites/default/files/resource-files/2008/09/apo-nid2926-1179116.pdf (accessed 18 July 2019)

Bellas, T. (1996) *The Papaya Fruit Fly - A Failure of Quarantine,* Research Paper 29 1995-96, Parliamentary Library, Canberra https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/RP9596/96rp29 (accessed 17 July 2019)

Cantrell, B, Chadwick, B and Cahill, A. (2002). *Fruit fly fighters, eradication of the papaya fruit fly,* SCARM Report no. 81, CSIRO publishing, Collingwood, Victoria, Australia.

Commonwealth of Australia (1979). *Year Book Australia No. 63, 1979.* Australian Bureau of Statistics https://www.ausstats.abs.gov.au/ausstats/free.nsf/0/3EE46EF08676AE33CA2573A9001E1B52/$File/13010_1979_chapter25.pdf (accessed 13 December 2019)

Cottingham, I. (1985) *Handbook to the Australian Agricultural Council (3rd edn),* Department of Primary Industry : Canberra

Craik, W, Palmer, D, and Sheldrake R, 2017. *Principles for Australia's Biosecurity System. An Independent Review of the Capacity of the National Biosecurity System and its Underpinning Intergovernmental Agreement*, Canberra.]
https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/biosecurity/partnerships/nbc/priorities-for-aus-bio-system.pdf
(accessed 27 November 2019)

DAFF (2009) *Update to the Import Risk Assessment Handbook 2007*. Department of Agriculture, Fisheries and Forestry, Canberra
http://www.agriculture.gov.au/biosecurity/risk-analysis/memos/2009/update_to_the_import_risk_analysis_handbook_2007

Dawson, I., Marshall, D., Stearne, P. and Waterhouse, D. (2002). *Clarification of Plant Breeding Issues Under the Plant Breeder's Rights Act 1994* - Report of the Expert Panel on Breeding. December 2002.
https://www.ipaustralia.gov.au/sites/default/files/plant-breeders-rights-act-report.pdf
(accessed 27 August 2019)

Department of Agriculture (2009). *National Primary Industries Research, Development and Extension Framework - Statement of Intent*. http://www.agriculture.gov.au/SiteCollectionDocuments/ag-food/innovation2/rde-statement-intent.pdf
(accessed 24 July 2019)

Department of Agriculture (2019a). *Biosecurity economics. 4* November 2019 https://www.agriculture.gov.au/abares/research-topics/biosecurity/biosecurity-economics
(accessed 28 November 2019)

Department of Agriculture (2019b). *Agricultural Ministers Forum, 25 October 2019*. https://www.agriculture.gov.au/about/media-centre/communiques/ag-ministers-forum-october-2019
(accessed 26 November 2019)

Edwards, G.W. and Freebairn, J.W. (1981). *Measuring a Country's Gains from Research: Theory and Application to Rural Research in Australia*. Australian Government Publishing Service, Canberra

EPHC (2004). *Final report of the National ChemCollect program National Environment Protection Council Service Corporation*, Adelaide, 44pp.
http://nepc.gov.au/system/files/resources/74b7657d-04ce-b214-d5d7-51dcbce2a231/files/cmgt-rpt-final-report-national-chemcollect-program-final-200404.pdf
(accessed 21 July 2019)

Farmer, B (2011) Independent Review of Australia's Livestock Export Trade. Department of Agriculture, Fisheries and Forestry, Canberra.
http://www.agriculture.gov.au/Style%20Library/Images/DAFF/__data/assets/pdffile/0007/2401693/indep-review-aust-livestock-export-trade.pdf (accessed 5 August 2019)

Hafi, A., Arthur, T., Symes, M. and Millist, N. (2013). *Benefit-cost analysis of the long term containment strategy for exotic fruit flies in the Torres Strait*, ABARES Report to client prepared for the National Biosecurity Committee, Canberra, October. https://portal.biosecurityportal.org.au/nffsac/Documents/BCA%20Containment%20strategy_140401_v1%200%200.pdf (accessed 17 July 2019)

Keniry, J., Rogers, M., Caple, I, Bond, M. and Gosse, L. (2003). *Live Export Review* - Final Report

A Report to the Minister for Agriculture, Fisheries and Forestry. Canberra, 23 December 2003
http://www.agriculture.gov.au/SiteCollectionDocuments/animal-plant/animal-welfare/trade/export-transport-review/keniry_review_jan_04.pdf (accessed 5 August 2019)

Lazenby, A. (1986) *Australia's Plant Breeding Needs*: A Report to the Minister for Primary Industry (1986). Canberra

Lindsay, D. (1988). *Australian Quarantine Requirements for the Future*: report of the Quarantine Review Committee (DPIE, Canberra)

Lundie, R (2011). *Reform of Ministerial Councils*. Parliament of Australia 8 March 2011
https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/FlagPost/2011/March/Reform_of_Ministerial_Councils (accessed 24 June 2019)

Matthews, K. (2011) *A review of Australia's preparedness for the threat of foot-and-mouth disease*. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra.
http://www.agriculture.gov.au/SiteCollectionDocuments/animal-plant/pests-diseases/animal-pests-diseases/footandmouth.pdf (accessed 16 July 2019)

McGauchie, D. and Anderson, J.A. (1996). *Innovation in Agriculture – a national strategy for innovation in Australian Agriculture*. National Farmers Federation and Agricultural and Resources Management Council of Australia and New Zealand, Canberra 23pp

Mitchell, Mohr and Matheson JJ (1980) State of South Australia vs Johnson, Full Court 1298 of 1977 Mitchell, Mohr and Matheson JJ on appeal for the Honourable Mr Justice Zelling, delivered 23 September 1980, judgment 5067, Adelaide.

More, S.J. Radunz, B. and Granville, R.J. (2015). Lessons learned during the successful eradication of bovine tuberculosis from Australia. *Vet Rec*. 177:8 224-232. https://veterinaryrecord.bmj.com/content/177/9/224 (accessed 17 July 2019)

Nairn, M.E., Allen, P.G., Inglis, A.R. and Tanner, C. (1996) *Australian Quarantine: a shared responsibility*. Department of Primary Industries and Energy, Canberra
http://www.agriculture.gov.au/SiteCollectionDocuments/aqis/about/corporate-docs/nairn/nairn_report.pdf (accessed 18 July 2019)

OGTR (2019). *Genetically modified (GM) canola in Australia*. Office of the Gene Technology Regulator, Department of Health, Canberra. http://ogtr.gov.au/internet/ogtr/publishing.nsf/content/9AA09BB4515EBAA2CA257D6B00155C53/$File/12%20-%20Genetically%20modified%20(GM)%20canola%20in%20Australia.pdf (accessed 29 August 2019)

Petrie, C. (2016) *Live Export: a chronology*. Department of Parliamentary Services, Research Series 2016-17.Parliament of Australia, Canberra, 18 July 2016, 30pp https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1617/Chronology/LiveExport (accessed 5 August 2019)

PISC (2002). *Spray Drift Management – Principles, Strategies and Supporting Information*. PISC (SCARM) Report 82, CSIRO, Melbourne. http://www.publish.csiro.au/ebook/download/pdf/3452 (accessed 21 July 2019)

Polya, R. (2008). *Chronology of genetic engineering regulation in Australia: 1953-2008*, Science, Technology, Environment and Resources Section, Parliamentary Library, 17 October 2008. https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BN/0809/ChronGeneticEngineeringA (accessed 28 August 2019)

Productivity Commission (2011). *Rural Research and Development Corporations – Inquiry Report no 52, 10 February 2011*, Canberra. https://www.pc.gov.au/inquiries/completed/rural-research/report (accessed 24 July 2019)

Queensland (2018). *National Red Imported Fire Ant Eradication Program, South East Queensland* Annual Report 2017–18, Government of Queensland. https://www.daf.qld.gov.au/__data/assets/pdf_file/0004/1447726/annual-report-2017-18.pdf (accessed 27 November 2019)

Radcliffe, J.C. (2020) Influence of Australian Agricultural Council and Successors on Australian Agriculture, 1980-2014. 1. Operation, Marketing and Responses to the Risks of Farming *Agricultural Science* 31(2):18-35

Rural R&D Corporations (2008). *Measuring economic, environmental and social returns from Rural Research and Development Corporations' investment.* Council of Rural Research and Development Corporations' Chairs, Canberra. https://www.frdc.com.au/-/media/fish-frdc/corporate-documents/rural-full_evaluation_report.ashx?la=en (accessed 28 November 2019)

Sanderson, J. and Adams, K. (2008). Are Plant Breeder's Rights Outdated? A Descriptive and Empirical Assessment of Plant Breeder's Rights in Australia, 1987-2007. *Melbourne University Law Review* 30; 32(3) http://www5.austlii.edu.au/au/journals/MelbULawRw/2008/30.html (accessed 8 August 2019)

Shanmuganathan, T., Pallister, J., Doody, S., McCallum, H., Robinson, T., Sheppard, A., Hardy, C., Halliday, D., Venables, D., Voysey, R., Strive, T., Hinds., L. and Hyatt, A. (2010). Biological control of the cane toad in Australia: a review. *Animal Conservation* 13 (s1): 16-23 doi.org/10.1111/j.1469-1795.2009.00319.x

Spradbery J.P. (1991). *A Manual for the Diagnosis of Screw-Worm Fly.* Australian Government Publishing Service, Canberra.

Zelling, J. (1980) Johnson v. The State of South Australia, District Court 1298 of 1977 Delivered 6 May 1980, Judgment 4851, Adelaide