

Agricultural extension policy in Australia: public funding and market failure[†]

John D. Mullen, Don Vernon and Ken I. Fishpool*

Trends in public expenditure on agricultural extension are examined for Agriculture Departments in four States. There is little evidence that the share of public resources going to extension has declined. However, new demands have meant that the nature of extension has changed. A strategic approach to examining issues, such as land degradation, for the source of market failure may better guide the use of scarce public resources than the traditional focus on the public goods characteristics of research and extension. The case for evaluating broad functions such as research and extension is becoming more questionable as these functions become more diverse.

1. Introduction

In their accompanying paper, Marsh and Pannell (2000) noted a number of changes over the last decade in agricultural extension in Australia. Hone (1991) writing about the 1980s identified almost the same set of changes in extension as Marsh and Pannell. These changes included:

- an apparent reduction in the public support for agriculture and, in some cases, the introduction of fees for service with an offsetting growth in the funding and provision of extension services in the private sector through both consultants and Research and Development Corporations (RDCs);
- a shift to group extension methods;
- an increased interest in extension related to community concerns about the management of natural resources such as land and water.

[†]The views expressed here are those of the authors and do not reflect the views of NSW Agriculture. We have benefited greatly from the insights of many in the four State Departments of Agriculture reviewed here. We are particularly grateful for helpful comments from David Pannell, Garry Stoneham, Helen Scott-Orr, David Harris and Tony Gleeson.

* John Mullen is Principal Research Scientist, Don Vernon is Senior Economist (Project Development) and Ken Fishpool is Assistant to CDPI, NSW Agriculture, Orange, 2800.

Marsh and Pannell proposed that while other factors were at work, many of these changes in agricultural extension were largely consistent with meeting the concerns of economists about the role of government in the agriculture sector based on market failure. They did, however, note that the traditional focus on the public goods characteristics of research and extension as a source of market failure was not a particularly discriminating test for government involvement.

Marsh and Pannell (2000) defined agricultural extension 'to include public and private sector activities relating to technology transfer, education, attitude change, human resource development, and dissemination and collection of information. It includes off-farm as well as on-farm players in agricultural industries' (p. 607). We would qualify this definition only to the extent of expanding the audience for extension to the broader community. Because of increasing concerns by the community about the environmental impacts of agriculture and other issues such as biotechnology and food safety, there is an important audience for extension about agriculture and the environment beyond the traditional agricultural community.

The article begins by reviewing trends in public resources available for extension and research and the contribution of the RDCs. An important focus of later sections of the article is the role of government in providing extension services to agriculture. The appropriate role for government depends on the objectives of government. When these objectives focus largely on economic growth and efficiency, the market failure paradigm is a useful tool to guide the role of government. Historically governments have seen the agriculture sector as a major contributor to economic growth and the main rationale for the public sector support of research and extension in agriculture has been based on excludability and rivalry problems limiting private investment in an atomistic industry. However, in recent years, with the growing demand by the community for the protection of environmental resources, market failure in the form of externalities arising from attenuated property rights is arguably attracting greater attention and requires different responses. We conclude by arguing that in this more diverse setting, public institutions should carefully examine the source of market failure rather than rely on research and extension solutions alone.

2. Trends in the funding of agricultural extension in Australia

In this section, we present information on trends in real spending on research and extension, and on the role of the RDCs in funding this spending.

2.1 Total expenditure by State Departments

Mullen, Lee and Wrigley (1996) assembled a dataset on expenditure in Australia from 1953 to 1994 by the major public institutions involved in agricultural research in Australia.¹ For most of this period nearly all traditional research and extension services in production agriculture were provided by the State Departments of Agriculture, CSIRO and the agricultural faculties of universities. Mullen *et al.* (1996) used published financial statements to estimate expenditure by these institutions. Budget share information, only available for short periods,² was used to estimate expenditure on the major research, extension and regulatory functions by the State Departments because these types of data were otherwise unavailable.

For this article, the data series has been extended until 1998 and the budget shares to research and extension have been re-estimated. However, departmental amalgamations and the integration of production and resource management functions make us less confident in the accuracy of these data than for the earlier years. The effect of these changes has been to exacerbate problems of distinguishing expenditure on activities pertaining to production agriculture from that relating to other industries or the broader community.

Mullen *et al.* (1996) experienced these difficulties in identifying public expenditure in production agriculture and had advised that, at least from 1994, the ABS series on research should be used. Our reason for persisting has been to facilitate more informed discussion of the total support to agriculture by a number of states and the relative importance of research and extension. We were unable to obtain adequate data for Queensland and hence the data below are from NSW Agriculture; Department of Natural Resources and the Environment, Victoria; Agriculture Western Australia; and Primary Industries and Resources South Australia. Following Mullen *et al.*, our focus has been on production agriculture and activities associated with it, forestry, mining, energy, rural finance, etc. have not been included.

Total real expenditure by the four Departments (table 1) has risen from A\$115m in 1953 to A\$572m in 1998 (in 1998 dollars, where years refer to financial years). Generally the trend has been upwards, although it appears

¹ Their interest was in broadacre agriculture and hence they did not collect data from the Departments of Agriculture in Tasmania or the Northern Territory. This dataset was used to estimate the contribution of research to productivity growth in broadacre agriculture (Mullen and Cox 1995). The dataset was also used in a review of R&D policy in Australia in Alston *et al.* (1999).

² ABS have collected data on research expenditure since 1969. Mullen, Lee and Wrigley (1996) found that their estimate of expenditure on research was reasonably close to the ABS estimate in those years for which ABS data were available. We are not aware of a similar series on extension.

Table 1 Real expenditure on extension and research by State Departments in NSW, Vic., SA and WA

	Total spending A\$,000	Research spending A\$,000	Extension spending A\$,000	External funding %	Nominal intensity %	Real intensity %
1953	115419	50402	29718	3.5	0.39	1.22
1954	130675	57685	34389	3.6	0.46	1.41
1955	162124	72144	43992	3.0	0.60	1.69
1956	160371	70676	42417	4.8	0.60	1.60
1957	149104	65875	39192	5.4	0.58	1.61
1958	156242	68738	40594	5.0	0.62	1.58
1959	162976	71192	41804	8.1	0.63	1.49
1960	159588	70004	41121	8.8	0.63	1.48
1961	166317	72808	42749	9.7	0.64	1.53
1962	183589	80387	47172	10.0	0.71	1.54
1963	197811	86928	51096	9.4	0.74	1.65
1964	222524	98075	57946	10.7	0.81	1.88
1965	219581	96318	55911	11.9	0.76	1.67
1966	241855	106599	61860	14.3	0.84	1.86
1967	295271	130796	77375	14.4	1.00	2.14
1968	318469	141764	84152	17.2	1.11	2.20
1969	343032	152912	90852	17.6	1.21	2.31
1970	371083	165681	98257	17.8	1.34	2.38
1971	402711	179557	106429	16.4	1.51	2.43
1972	425792	190269	112966	15.3	1.71	2.78
1973	436498	194648	115459	14.6	1.76	3.59
1974	442010	196823	116307	14.3	1.79	3.80
1975	476103	210956	123808	12.2	2.09	2.38
1976	476469	209692	122207	11.3	2.16	3.05
1977	463465	201204	114896	11.5	2.08	2.91
1978	495089	217573	125374	10.4	2.29	3.10
1979	483876	212549	121460	10.1	2.18	3.32
1980	492358	217081	124759	7.6	2.12	3.45
1981	497933	219467	125588	7.5	2.09	3.26
1982	522382	226440	127993	5.3	2.10	2.97
1983	554257	239115	134488	5.8	2.25	3.01
1984	540915	235373	132699	5.7	2.17	2.86
1985	552935	241878	135025	7.8	2.22	2.82
1986	557575	242819	134845	8.4	2.23	2.68
1987	529541	230589	128013	8.1	2.14	2.57
1988	539702	234805	130244	9.8	2.11	2.76
1989	542716	238492	133675	9.4	2.15	2.89
1990	569575	251317	141182	10.2	2.21	2.73
1991	544158	239381	134235	12.3	2.06	2.16
1992	515601	227522	126397	13.0	2.00	2.04
1993	501082	220418	122532	15.7	1.95	1.92
1994	526582	232511	129029	15.9	2.06	2.11
1995	526024	231292	128097	17.6	2.07	2.43
1996	550064	240289	132602	22.3	2.05	2.35
1997	537682	233551	127643	20.0	1.85	1.91
1998	572157	250420	137117	21.9	1.93	1.93

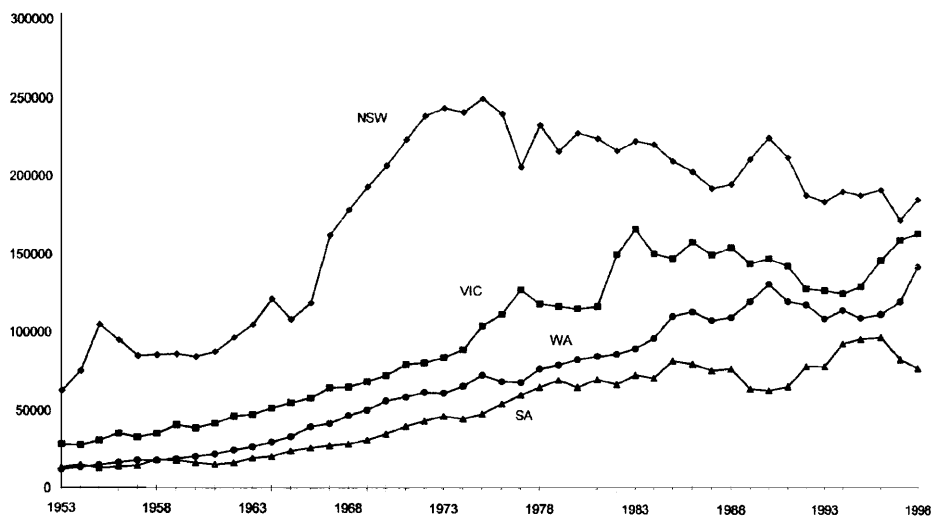


Figure 1 Real total expenditure in four State Departments of Agriculture

that expenditure contracted for several years in the early 1990s. The experiences of individual Departments have not been uniform — see figure 1. Real expenditure by NSW Agriculture, traditionally the largest department, rose more quickly than the other States between 1965 and 1975 and has since drifted down. There was negligible growth in all States from 1985 to 1995. Since then, Victoria and Western Australia have recorded strong growth while South Australia has drifted down. However, it would be unwise to identify changes in recent years as long-term trends.

2.2 Expenditure on extension and research

To identify expenditure on research, extension and regulation, Mullen *et al.* (1996) estimated budget shares from management accounting systems introduced but discontinued at varying times by the Departments in the late 1970s and 1980s (table 2). On these estimates, the Departments in Western Australia, New South Wales and South Australia devoted about half their budget to research activities and 20–30 per cent to extension, while the Department in Victoria has had a much stronger regulatory focus. By applying these budget shares to total expenditure, real expenditure on research and extension by the four Departments to 1998 was estimated (table 1). The data follow a similar trend to total expenditure because of the application of these fixed budget shares.

Table 2 Allocation of funding in State Departments of Agriculture (%)

	Research	Extension	Regulatory
NSW	47	32	22
Vic	33	15	52
SA	44	21	35
WA	52	26	22

We have attempted to test the view from other studies, cited in Marsh and Pannell (2000), that the share of the public budget to extension has suffered relative to research and regulation. As noted, the early management information systems, the basis of table 2, are no longer in use. Hence we have been unable to estimate current budget shares in the same way. Our estimates of current budget shares rely on unpublished data and personal communication with financial and science policy staff within the Departments. For each State a different approach was used. Hence any apparent changes in budget shares must be interpreted cautiously reflecting a degree of uncertainty and subjectivity.

For the NSW Department, an estimate was made of the numbers of research and extension staff in 1998 and the average cost of employing representative research and extension officers. By this method the estimated budget shares for research and extension were 52 and 26 per cent, suggesting a small shift in favour of research.

For the WA Department, Annual Reports from 1986 to 1992 reported expenditure by function. There was no apparent trend in budget share over this period. The average budget shares over the seven years were 50, 28 and 22 per cent for research, extension and regulation, very similar to Mullen *et al.*'s earlier estimates. Senior management at the Department suggest that there has been little change in these budget shares in more recent years.

For DNRE Victoria, we were provided with expenditure in research institutes and regions and equating this with expenditure on research and extension, we estimated the budget shares in 1998 to be 43 and 24 per cent. Hence there does appear to have been a significant shift in resources towards research and extension in Victoria in recent years, bringing that State in line with how the other States use their resources. If these revised budget shares are correct, expenditure on research and extension by DNRE has been underestimated in table 1. This means that for DNRE, research intensity and the share of expenditure funded by RDCs have changed to 1.8 and 17 per cent in 1998 rather than 1.3 and 24 per cent as estimated in the tables and figures here using the earlier budget share estimates. We were unable to re-estimate budget shares for the South Australian Department.

Research intensity has been another measure of public support for agricultural research. It is estimated by relating spending to the value of agricultural production. Here we have related spending on both research and extension by the four Departments to a five-year moving average of the gross value of agricultural production for these States to get a nominal measure of intensity (table 1). This nominal measure of intensity has risen fivefold from 0.4 per cent to 1.9 per cent and was as high as 2.3 per cent in 1978.³

The nominal intensity series may be misleading (as noted by Pardey and Rosenboom, 1989, p. 23), since the price of farm products received by Australian farmers has been falling in real terms (owing to research-induced technological change, among other things) while the prices of research and extension services have more likely risen in real terms. A 'real' measure of intensity is obtained when both series are deflated — research and extension expenditure by the GDP deflator and the value of agricultural gross domestic product by ABARE's index of prices received by farmers. Real intensity rose from 1.2 per cent in 1953 to 2.4 per cent in 1995 before falling to 1.9 per cent in 1998 after peaking at 3.8 per cent in 1974 (table 1).

By even the most conservative measure, public support for agricultural research and extension in these four Departments at least doubled between 1953 and 1998, outstripping the growth in the public sector in general, although the rate of growth was much slower in the 1980s and 1990s. This trend in funding in Australia is similar to that in the public sectors of other rich countries (Alston, Pardey and Smith 1998).

At a State level, Victoria has had the lowest level of intensity of spending (figure 2). Intensity in NSW was more than 3 per cent in the mid-1970s and has since drifted down. In the 1990s WA has had the highest level of intensity.⁴

In summary, there is little evidence to support the view that public resources to agriculture have been reduced or that they have been switched from extension to research and regulation. However, we note an increasing interest in some States in explicitly redirecting funds to areas of high community interest in the form of special purpose grants or budget enhancements.

We would also agree that the nature of extension activities has changed significantly towards activities related to the sustainability of agriculture, as identified by Marsh and Pannell. We did attempt to estimate how much the public sector is spending on environmental R&D related to agriculture using

³Note that the R&D literature usually refers to research intensity rather than research and extension intensity as used here.

⁴The State measures of intensity do not include the expenditure by CSIRO and the universities. They measure support by the main State agricultural institutions.

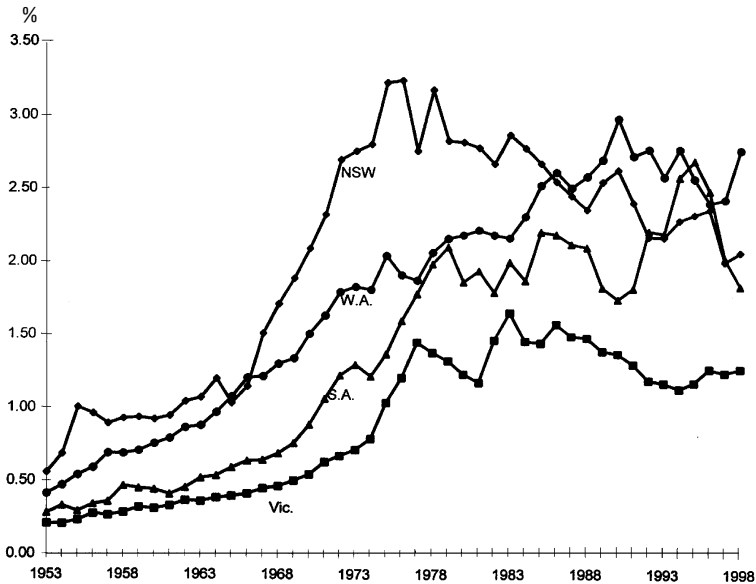


Figure 2 Nominal research and extension intensity

ABS statistics. Total spending on environmental R&D in all sectors of the economy by State and Commonwealth authorities has risen in nominal terms from A\$225.9m in 1990–91 to A\$412.4m in 1996–97, roughly two-thirds of what was spent on R&D on plant and animal production in 1996–97. However, there does not appear to be any consistent means of identifying expenditure on environmental outcomes related to agriculture.

2.3 The contribution from the research and development corporations

There is a long history (reviewed in Alston *et al.* 1999) of industry contributing to the funding of research in public institutions through what are now known as research and development corporations, RDCs. As Marsh and Pannell (2000) note, extension programs are increasingly seen as essential components of comprehensive technology packages. The State Departments also received significant support from the Commonwealth Government for extension through the Commonwealth Extension Services Grants, CESG, and the Dairy Extension Services Grants. These grant schemes operated from 1948 to 1982 and their purpose was to fund the continued development of rural extension services. They were used to fund staff and specialised research and extension equipment; to produce publications and reference material; to organise study tours and conferences; and to oversee the herd recording scheme.

The share of spending on research and extension by the four Departments funded by the RDCs and the CESG is presented in table 1. The share of funding grew from 3.5 per cent in 1953 to a peak of 17.8 per cent in 1970, largely because of the influence of CESG grants which at that time exceeded RDC funds for most Departments. The share of external funding then fell to 5.3 per cent in 1982 with the cessation of the CESG scheme and reductions in funding by the precursors to the RDCs before funding was increased to 22.3 per cent in 1996 after the RDCs took their present statutory form. Because the RDCs receive about half their funds in the form of a matching grant from the Commonwealth Government, the contribution of rural industries to the four State Departments of Agriculture is less than 12 per cent.

DNRE Victoria and NSW Agriculture have received similar dollar amounts of funding from the RDCs and the CESG but because of their very different levels of public funding, they were generally first and last among the States in the share of spending funded externally (figure 3). In recent years, the Department in WA has received more external funding than both the Victorian and NSW Departments. There seems to have been little relation between the external funding a State receives and the gross value of its agricultural sector.

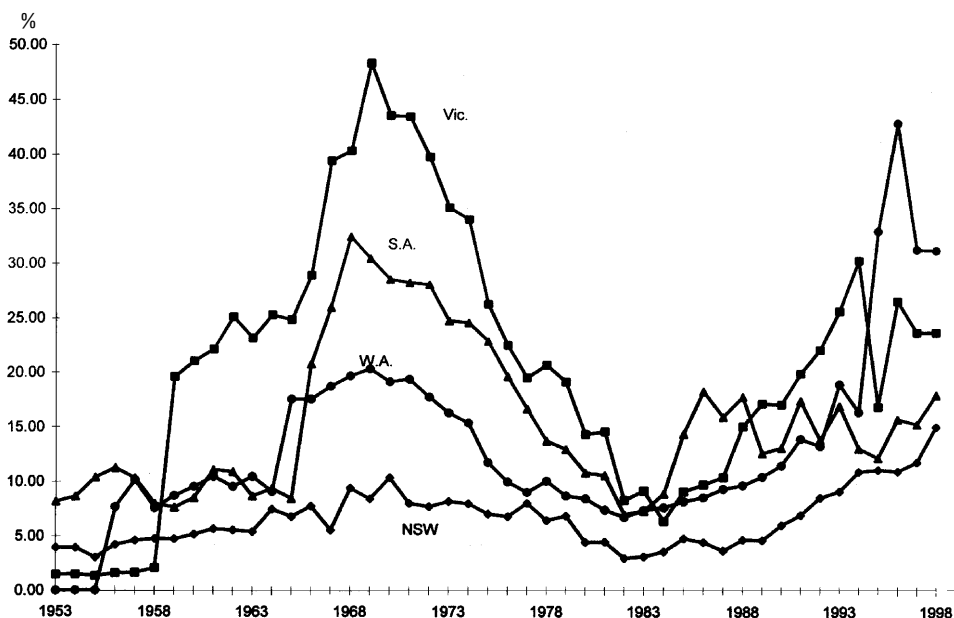


Figure 3 Share of expenditure from external funding

The establishment in Australia of RDCs which levy all industry members to fund research and extension, mitigates to a large degree 'free riding' associated with the non-excludable characteristic of research and extension information. The RDCs address the non-rival characteristic of information by making research information freely available to industry participants. In effect, 'public' goods are transformed into 'industry' goods and industry members act collectively to provide them, although still not at levels optimal for every individual.

As far as we are aware, there are no publicly available data classifying the activities of State Departments by the share of benefits to industry and the community, and hence we cannot test whether sources and uses of funds align in this way. Nevertheless it is likely that State Departments still fund a significant number of activities which largely benefit industry (producers, processors and consumers) reflecting political and institutional commitments to traditional services (and existing staff).

A further qualification pointed out by Marsh and Pannell is that the conjunction of public and private goods makes the market failure test difficult to apply. In practice, RDCs may fund projects that have significant public good components and State Departments may fund projects with significant industry good components. Hence the boundary between the private and public sectors in the provision of services to agriculture is subjective and likely to shift over time reflecting changing community attitudes to the role of government as well as economic, institutional and technological developments affecting industry's capacity to appropriate 'sufficient' returns from investments.

3. Market failure and the role of government in extension policy

As noted earlier, the main rationale for the public sector support of agriculture in the form of research and extension services has traditionally been based on public goods characteristics of information. Marsh and Pannell point out that market failure in the provision of information in agriculture is pervasive but that:

A practical problem . . . is that elements of market failure can be identified to support *all* types of agricultural extension. All extension is related to information, which almost always has public-good characteristics to some degree, and can always be claimed to be reducing uncertainty, ignorance and misinformation. (2000, p. 615)

Essentially, they have raised the issue of the existence of some market failure as a *necessary* but not always *sufficient* condition for government intervention. We agree with their observation and would argue further that such

market failures are pervasive across most sectors of the economy. The issue is the extent to which market failures constrain the capacity of the private sector to appropriate sufficient benefits from investments in research and extension, resulting in significant under-investment from society's point of view. When the private sector is constrained, there may be grounds for government intervention subject to the usual concerns about the tractability of the issue and the cost of intervention relative to the cost of market failure.

The presumption of widespread failure of research and extension markets in agriculture is reflected in the dominance of research and extension strategies in the strategic plans of agriculture departments. Associated with this preoccupation with information deficiencies are a number of other issues which we discuss in turn. First, there is the emphasis on group extension methods raised by Marsh and Pannell. Second, and more importantly in our view, attenuated property rights as a source of market failure in the form of externalities are considered.

3.1 The mode of delivering extension services

Whether the focus of extension is technology transfer or adult education has been a long-running debate in the extension discipline. An important consideration is that while mechanistic technology transfer can be successful in promoting simple change such as between varieties within crops, complex changes to farming systems are likely to require the development of stronger management skills through adult education techniques.

Lloyd (1986) pointed out that the mode of disseminating information has important implications for the role of government. Godden (undated) defined these modes as a 'consulting' mode in which farm-specific information is provided which may not require a change in skill on the part of the farmer, only adoption of the technology; and, an 'adult education' mode which is not farm-specific and aims to increase the problem-solving skills of the farmer. In an adult education mode it is more likely that information will be delivered in a way characterised by non-excludability and non-rivalry in consumption. In some instances the results from research can be delivered in a consulting mode either by the private sector or by the public sector. In the latter case there is an argument that this type of service should be charged for and, as Marsh and Pannell pointed out, there is a trend to cost recovery in public extension services.⁵ Marsh and Pannell also queried

⁵An issue here that may assume greater importance in the future is an expectation that the operations of State Departments in research and extension be consistent with principles of Competition Policy.

whether State Departments of Agriculture are best placed to undertake an adult education function or whether it is best left to Departments with a clear education focus.

The debate within the extension discipline about delivery mode seems to have been little influenced by any consideration of what is an appropriate role for government.⁶ Hence it seems that the growth of group activities has been driven as much by considerations relating to the discipline of extension and funding as by an ideological view of the role of government.

There are other points to be made here. Marsh and Pannell (2000) were not very specific in describing how groups operate. As Godden (undated) indicated, just delivering extension in a group context does not necessarily mean that the non-rival nature of information in an adult education mode is being preserved. Some types of groups focus on the particular situations of the members of the group and hence are really consulting activities. From the viewpoint of those outside the groups the service is rival or at least congested in that it reduces their access to extension services.

The second point that seems to have been ignored is that the way information is disseminated is only an issue when the market failure is an informational one. When the market failure is of a different nature, as may be the case for externalities, the community's interest may be best served by a more individual level of contact with those causing the externality. The role of extension in externality situations is discussed more fully below.

Marsh and Pannell (2000) observe that emphasis on group extension has increased recently in response to either budget restrictions or the market failure paradigm. We note that while the support of the RDCs for 'brand name' group activities is new and the emphasis on groups for extension on land degradation has greatly increased, the use of groups is not a recent phenomenon. In the 1960s and 1970s, groups such as the Agricultural Bureau, Junior Farmers/Rural Youth, and the more politically-oriented farmers' organisations were used extensively for group learning. Even the interest in 'benchmarking', which seems to be the basis of the activities of many current groups had its forerunner in the comparative analysis groups of the late 1960s and economists were expressing the same concerns then (Mauldon and Schapper 1971) as now (Malcolm and Ferris 1999).

4. Public sector extension when externalities are pervasive

So far we have followed Marsh and Pannell in focusing on market failure arising from the public good characteristics of information. Arguably exter-

⁶ A recent extension text (van den Ban and Hawkins 1996) makes no reference to the role of government in a market failure context.

nalities associated with attenuated property rights are at least as important as a source of market failure.

Land degradation is a prominent issue in Australia's agricultural sector at present. There are a number of reasons why farmers may allow degradation to continue. One reason is that they may be misinformed about the impact on their welfare of the alternative resource management strategies available to them. In this situation extension is an appropriate strategy to reduce the rate of land degradation by farmers to that consistent with their own interests. However, often land degradation is associated with externalities reflecting attenuated property rights and leads to a divergence in the interests of individual farmers and the broader community (possibly including other farmers).

Until recently, State Departments of Agriculture have generally treated externalities as though their cause were related to the public good characteristics of information. The main approaches employed have been traditional research and extension programs which ignore the incentives facing farmers. For example, there has been an increasing reliance on the suasive power of groups such as Landcare groups to achieve community goals. As Marsh and Pannell point out, suasive extension strategies to combat land degradation are likely to fail where they attempt to address community concerns that require farmers as individuals to take actions that are not in their best interests. Marsh and Pannell go on to query whether such programs are ethical, particularly if they do not point out the costs farmers are expected to bear.

Randall (1999) used the term 'isolation paradox' to describe such situations where farmers acting alone have little incentive to consider their neighbours but where 'everyone can enjoy a net benefit from coordinated action' (p. 30).⁷ The attraction of expressing the problem in this way is that it points to a much broader range of responses that are incentive-compatible.

The isolation paradox concept, then, suggests an openness to solutions that invoke a variety of institutional forms: private enterprises, voluntary associations, and government from the most local to the national scale and beyond. Given the centrality of information and coordination, the array of feasible institutions is continually shifting as information, communication and exclusion technologies develop. (*ibid.*, p. 31)

The nature and methods of extension associated with these alternative responses to externality are likely to be different. It would seem that the

⁷ Marshall (1999) expressed similar views.

extension skills of an adult education nature would be particularly useful in helping groups define the nature of their 'isolation' and the collective action that improves their lot.

The divergence between the interests of the community and farmers may also be narrowed if the community becomes more aware of the costs of alternative land management strategies as a result of the opportunities provided by groups for public participation and collective action, to use Marshall's terminology. Hence an important new role for extension in State Departments may be to explain the interests of agriculture with respect to environmental issues that 'spill over' to the broader community. Other issues to which this may apply include food safety and biotechnology.

5. Implications for public institutions

In our view, the question of market failure is often examined from the wrong perspective. Most often it seems that broad functions like research or extension are scrutinised for their potential to have the characteristics of public goods such as non-excludability and non-rivalry. Because of the significant information component of these functions, these characteristics are easy to identify. This approach seems evident in the strategic plans of most Departments where the great majority of strategies have research and extension components.

While the approach may have worked reasonably well when the focus was on production agriculture, where the source of market failure lies elsewhere than in lack of information, solutions based solely on research and extension are inadequate at best. Underlining the importance of correctly identifying the source of market failure, Pannell, McFarlane and Ferdowsian (2000) argued that in a significant number of catchments in Western Australia, the incorrect diagnosis of salinity as an externality rather than as a local problem has led to inaction by farmers and inappropriate responses by government.

An alternative approach is to more critically examine the nature of market failure for the particular issues confronting agriculture and the community and to devise approaches that are targeted to the specific causes of market failure. Research and extension may only be small components of a broader strategy. In addition, a more critical examination of particular issues may lead to a greater appreciation of how the market responds and the avoidance of 'government failure' (Randall 1999). A further consequence of this issues-based approach may be that the links between the traditional research, extension and regulatory functions of Departments, often separated in the past, will be strengthened to the point where it will be even more difficult to distinguish them.

6. Conclusion

Mullen, Lee and Wrigley (1996) found that the growth in public expenditure on research, extension and regulatory activities in total in the 1950s and 1960s far outstripped the growth in the contribution of the agricultural sector to the economy. Since that time there has been little change in real resources allocated to these activities, at least in the four State Departments we have examined here.

With less confidence, we argue that there has been little change in the budget shares to research and extension with the exception of the Department in Victoria. However, we agree with Marsh and Pannell and with Hone that there have been significant changes in the nature of both extension and research activities undertaken by State Departments, reflecting a shift from a production focus towards a focus on sustainability issues.

Given relatively stable funding but demands for significant new services related to better environmental and food safety outcomes, State Departments face difficult resource allocation problems. They have responded by seeking more industry support for 'industry good' activities through 'fees for service' and RDC support. The contribution of the RDCs may now be in the order of 30 per cent⁸ (although more than half of this money comes from general taxation). It will be necessary and appropriate for this contribution to continue to grow if those key research and extension services which provide benefits almost exclusively to the producers, processors and consumers in particular agricultural industries are to be retained. The rapid growth in demand for new services is likely to result in more acute resourcing problems where State Departments are less committed, successful or politically constrained in attracting commensurate industry support for those activities which largely provide industry benefits.

We note the increasing capacity of the private sector to deliver services traditionally supplied by the public sector. This raises the question of the appropriate role for the public sector and the need to keep abreast of the drivers of change in the public/private interface. While market failure related to the public goods characteristics of information about production agriculture has always been prominent in rationalising the provision of research and extension services, this view of market failure has never been very discriminating as an aid to resource allocation and has been of little assistance in rationalising the change in service provision.

Marsh and Pannell, in reviewing in detail some of the difficulties to be confronted by public extension programs in responding to these changing

⁸ Including Commonwealth institutions such as ABARE and CSIRO who recover a high proportion of their salary expenses from the RDCs.

demands, identified similar issues but considered them from a traditional research/extension paradigm. In this article we have argued that some of these problems are best addressed by State Departments looking beyond the public good characteristics of research and extension as the source of market failure.

As the demand for environmental services rises and there is increasing recognition of potential sources of divergence between the interests of individual farmers and the community in the management of natural resources in some agricultural systems, other causes of market failure and related market and non-market responses deserve greater attention. For example, some forms of market failure cannot be addressed efficiently without attention to the question of property rights. Hence State Departments should examine, for particular issues, how and why the market outcome differs from that expected by the community and the diverse ways in which they could contribute to resolving underlying market failure, rather than confine their activities to traditional research and extension responses.

There has already been a switch in both research and extension resources from traditional agricultural production issues to sustainability issues. Further change may be required if market-based solutions to resource issues such as salinity, water quality, greenhouse gases and biodiversity become as prominent as expected. On the research side, the scientific basis of trading instruments will have to be established for credible markets to develop. Extension resources will be required to encourage buyers and sellers to enter markets in an informed manner.

The greater diversity in the nature of research and extension activities and in institutional responses required to reconcile the interests of farmers in productivity and those of the community in environmental outcomes, causes us to increasingly question the purpose and value of evaluating broad functions such as research and extension.

References

- Alston, J.M., Harris, M., Mullen, J.D. and Pardey, P. 1999, 'Agricultural R&D policy in Australia', in Alston, J.M., Pardey, P.G. and Smith, V. (eds), *Paying for Agricultural Productivity*, Johns Hopkins University Press, Baltimore.
- Alston, J.M., Pardey, P.G. and Smith, V.H. 1998, 'Financing agricultural R&D in rich countries: what's happening and why', *Australian Journal of Agricultural and Resource Economics*, vol. 42, pp. 51–82.
- Australian Bureau of Statistics various issues, 'Research and Experimental Development, All-Sector Summary, Australia', Catalogue No. 8112.0.
- van den Ban, A.W. and Hawkins, H.S. 1996, *Agricultural Extension*, second edition, Blackwell Science, Oxford.

- Godden, D.P. undated, 'Economic analysis of public provision of advisory services', NSW Agriculture, unpublished mimeo.
- Hone, P. 1991, 'Charging for agricultural extension services', *Review of Marketing and Agricultural Economics*, vol. 59, pp. 297–307.
- Lloyd, A.G. 1986, *Rural Economics Study, Report to the Minister for Agriculture and Rural Affairs*, Victorian Government Printer, Melbourne.
- Malcolm, B. and Ferris, A. 1999, 'Benchmarking benchmarking', paper presented to workshop 'Benchmarking — Facts and Fallacies', conducted by the Farm Management Society (SA) and the Australian Association of Agricultural Consultants, Waite Institute, South Australia, April.
- Marsh, S.P. and Pannell, D.J. 2000, 'Agricultural extension policy in Australia: the good, the bad and the misguided', *Australian Journal of Agricultural and Resource Economics*, vol. 44, pp. 629–45.
- Marshall, G.R. 1999, 'Economics and public participation in redressing agricultural land degradation', contributed paper to the 43rd Annual Conference of the Australian Agricultural and Resource Economics Society (AARES), Christchurch, New Zealand, 20–22 January.
- Mauldon, R. and Schapper, H. 1971, 'The sensitivity of interfarm comparisons to inaccuracies in measurement and valuation', *Review of Marketing and Agricultural Economics*, vol. 39, pp. 107–18.
- Mullen, J.D. and Cox, T.L. 1995, 'The returns from research in Australian broadacre agriculture', *Australian Journal of Agricultural Economics*, vol. 39, pp. 105–28.
- Mullen, J.D., Lee, K. and Wrigley, S. 1996, *Agricultural Production Research Expenditure in Australia: 1953–1994*, Agricultural Economics Bulletin 14, NSW Agriculture.
- Pannell, D.J., McFarlane, D.J. and Ferdowsian, R. 2000, 'Rethinking the externality issue for dryland salinity in Western Australia', paper presented at the 44th Annual Conference of the Australian Agricultural and Resource Economics Society, University of Sydney, 23–25 January.
- Pardey, P.G. and Roseboom, J. 1989, *ISNAR Agricultural Research Indicator Series*, Cambridge University Press, Cambridge.
- Randall, A. 1999, 'A new look at the old problem of externalities', *Choices*, 1st Quarter, pp. 29–32.