

# FARMLETS AS LEARNING PLATFORMS: A NATIONAL APPROACH TO FARMING SYSTEMS RESEARCH, DEVELOPMENT AND EXTENSION IN THE AUSTRALIAN DAIRY SECTOR

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## Abstract

Farming systems researchers in the Australian dairy sector have been developing a nationally co-ordinated research, development and extension system over the past two years that has a capacity to anticipate and respond to the environmental, social and economic challenges of the next decade. This paper outlines an approach in the Australian dairy sector to farming systems research, development and extension (FSRDE) that has arisen from this work. Research on learning and change associated with this project is proving to be one of the most demanding areas of work in terms of sector needs and complexity of task. We conclude with a discussion of learning and change issues, and outline current and pending work.

Keywords: Farming-systems, national co-ordination, learning-platforms

## Background

The Australian dairy sector is one of Australia's leading rural industries, with an annual farm gate value of approximately AUD\$3 billion (ADC, 2000). Production is predominantly based on the use of improved pastures, although supplementary feeding with cereal grain is common. The sector is a cost-effective producer of high quality milk, with Australian dairy farmers constantly increasing on-farm productivity through improved pasture, feed and herd management techniques (ADC, 2000).

Deregulation of the dairy sector, along with market forces, have applied pressure on dairy farmers to remain competitive (ABARE, 2001). Australian farms have generally become larger and more efficient in response to these competitive pressures. Farm numbers have rationalised from 30,630 in 1975 to 12,888 in 2000. Average herd size increased from 77 cows, to an estimated 170 over the same period (ADC, 2000). There are many farms with herds greater than 250 cows. Dairy farms have seen an average annual yield per cow increase from 2750 litres to 4943 litres over the same period (ADC, 2000). These performance increases were due in part to the contribution of Australian dairy research, development and extension (RD&E). The primary focus of this RD&E was to improve herd genetics, advance pasture management, and develop supplementary feeding regimes.

## Challenges to Australian Dairy Production

In recent years, the Australian Federal Government has emphasized a need to address rural and regional development initiatives in terms of a *'triple bottom line'* that accounts for the economic, social and environmental impacts of change (AFFA, 2001). The dairy sector has responded to this by using an inclusive approach to planning, design and evaluation of new project proposals. The extent of this consideration can be gauged from Table 1, which is adapted from a recent development project involving a team of farmers, researchers, extension agents and investors. The team recognised the need to embrace community, sector

and farmer expectations in relation to economic, social and environmental outcomes (Table 1).

### The RD&E system

The Australian Dairy Research and Development Corporation (DRDC) is responsible for managing the sector's farmer-paid research levy and matching government funds. The DRDC invests around AUD\$25-30 million each year in research conducted by research providers, such as government departments of agriculture, universities and other research institutions (DRDC, 2001). Regional Development Programs (RDP's) have been established by the DRDC in all major dairy regions of Australia to coordinate and manage research on a regional basis to improve sector productivity, prosperity and sustainability (DRDC, 2001). Local dairy communities are involved in setting priorities and implementing research and development activities in their region. Funded research covers all areas of the sector, from on-farm production to manufacturing, economics and marketing.

**Table 1: An example of multi-level outcomes required of a development project in the Australian dairy sector.**

Outcomes	Economic outcomes	Social outcomes	Environmental outcomes
Community outcomes	<ul style="list-style-type: none"> <li>- A profitable dairy sector contributing to regional, state and national economic growth.</li> <li>- Targeted growth of exports</li> </ul>	<ul style="list-style-type: none"> <li>- Informed &amp; resourceful communities.</li> <li>- Effective community engagement in decision making</li> </ul>	<ul style="list-style-type: none"> <li>- Dairy farming seen as environmentally (including ecologically and socially) responsible.</li> </ul>
Sector outcomes	<ul style="list-style-type: none"> <li>- Dairy sector maintains sustainable competitive advantage on export markets</li> <li>- Cost of producing milk (c/l) maintained relative to NZ</li> </ul>	<ul style="list-style-type: none"> <li>- Confidence in the future of the dairy sector</li> <li>- An active and empowered dairy farm sector.</li> <li>- Active participation by dairy farmers in tackling sector, regional and catchment issues</li> <li>- Dairy farmers attracting and rewarding high quality and productive employees and contractors.</li> </ul>	<ul style="list-style-type: none"> <li>- Capacity to develop and implement environmental management systems for dairy farms, dairy processors and dairy products.</li> </ul>
Farmer outcomes	<ul style="list-style-type: none"> <li>- Achievement of targeted rate of return to capital.</li> <li>- Cost of producing milk (c/l) maintained relative to NZ</li> </ul>	<ul style="list-style-type: none"> <li>- Positively confronting opportunities and challenges of dairy farming</li> <li>- Satisfying lifestyle for farming families</li> <li>- Rewarding career for farm employees</li> </ul>	<ul style="list-style-type: none"> <li>- Socially responsible use of dairy cattle</li> <li>- Productive capacity of dairy farm maintained (enhanced?)</li> <li>- Off farm environment impacts minimised (reduced?)</li> </ul>

A farmlet is a small grazing unit that simulates production conditions on commercial farms. On-farm production research has been conducted in Australasia for the past four decades using farmlets (McMeekan, 1966; Fulkerson, 1980; Thomas and Matthews, 1991). Traditionally trial designs have arranged these grazing units following conventional experimental protocols according to treatments, control and replication requirements. Historically a farmlet approach to systems RD&E has been focused on productivity gains, given less consideration to environmental issues, and neglected the social dimension to FSRDE. Consideration of the triple bottom line now requires a more inclusive approach (in terms of stakeholders and issues) to the design and evaluation of systems projects that use farmlets. There are currently seven farmlet studies spread throughout six states of Australia (see Fig. 1), each established at different times with separate objectives and research designs.



**Figure 1: Dairy farmlet project locations in Australia.**

Several changes have accentuated the need to improve the use of farmlet facilities including: a need to increase return on investment in RD&E; the reduction and restructuring of government funding for extension; and an overall requirement to adopt a triple bottom line perspective to systems work.

#### **Exploration of the role and opportunities for Australian dairy farmlets**

An initial three-day workshop (February 1999), involving 40 participants from farming, research, extension and funding organizations, defined farmlets and determined their role in RD&E. A second workshop (November 1999), involving a similar group of participants, focused on the challenges and opportunities for developing a national network of farmlet projects. Expectations among participants at the workshops revealed that there was considerable uncertainty towards the role, value and possibilities for using a farmlet approach. Participants also questioned the potential role of farmlet projects for communication purposes and as “centres of creativity and partnership learning”<sup>1</sup>

Results from the workshops included the identification of themes that could link farmlet projects across the nation using a systems-based approach with a focus on learning outcomes. The workshop concluded that farmlets are most appropriate when research questions cannot

be answered using lower cost component research studies. Several suggested roles for farmlet projects were to:

- provide a final evaluation step for research and a method for integrating research and development;
- develop research models and provide a process for validating decision support systems (DSS);
- be a risk taker for the farming community and demonstrate best practice farming systems;
- provide credibility and professional development for extension and research people; and<sup>1</sup>
- provide a platform for action learning by researchers, extension officers and farmers.

(adapted from DRDC National Farmlets Workshop, Nov. 1999).

The workshop catalysed a move towards a FSRDE approach to farmlet projects, and called for a national program that coordinated FSRDE issues in the dairy sector. One aspect of this move was to develop the use of farmlet projects as learning platforms - physical sites where different disciplines (including farming) interact to improve their understanding of farming systems. A first step in moving towards this more comprehensive systems approach was to review the various perspectives on FSRDE as a way to position existing and proposed projects. The remainder of this paper will discuss the contribution of these workshops and subsequent activities towards the development of a national capacity for dairy FSRDE.

### **Perspectives on the role of Farming Systems Research Development and Extension**

The introduction of FSRDE to Australia has seen the evolution of a holistic approach involving farmers, specialists and policy makers (Petheram and Clark 1998). The origin of FSRDE projects have typically been from researchers (agronomists, animal scientists) and tend to acknowledge that farmer management strategies and decisions can only be understood in the context of the whole farm system (van Willigen 1992). There is however a lack of agreement in the literature on the definition of farming systems research and extension. Waugh *et al.* (1989) describes FSRDE as applied, farmer-orientated, agri-biological research, supported by the socio-economic sciences. He states that the principal product is technology and the primary clients are farmers. An alternative and widely cited definition of farming systems research and extension is that of Shaner *et al.* (1982) who state that:

*“farming systems research and extension is an approach to agricultural research and development that views the whole farm system and focuses on 1) the interdependencies between the components under the control of members of the farm household and 2) how these components interact with the physical, biological and socio-economic factors not under the household’s control. Farming systems are defined by their physical, biological and socio-economic setting and by the farm families’ goals and other attributes, access to resources, choices of productive enterprises and management practices”* (Shaner *et al.* 1982).

This anthropological perspective emphasises socio-cultural factors that are salient features of farming systems and are currently often absent from farmlet project designs.

### **Developing a Nationally Co-ordinated Approach to Farming Systems RD&E**

To date, Australian dairy farming systems RD&E has generally been undertaken on a state-by-state basis, within a farmlet study context. Farmlet projects are traditionally led by the project leader (also known as the farmlet leader), together with a team of scientists, technical

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<sup>1</sup> Quote from participants (farmlet leaders, extension agents, industry stakeholders) of the Twin Waters workshop, 1999.

staff and farm workers. These projects usually have a consultative or reference committee who provide guidance, technical advice, and an industry perspective to the project.

Dairy farmer RD&E objectives are also represented in each dairying region of Australia through the Regional Development Programs (RDP's). The RDP's typically provide some funds to the local farmlet study, and take a keen interest in the project's progress. Dairy extension is usually conducted by the state agricultural agencies, and each farmlet project differs in their access to resources. For example, some states have one extension officer per eighty farmers, whilst in other states each extension officer may service up to two hundred and fifty farmers.

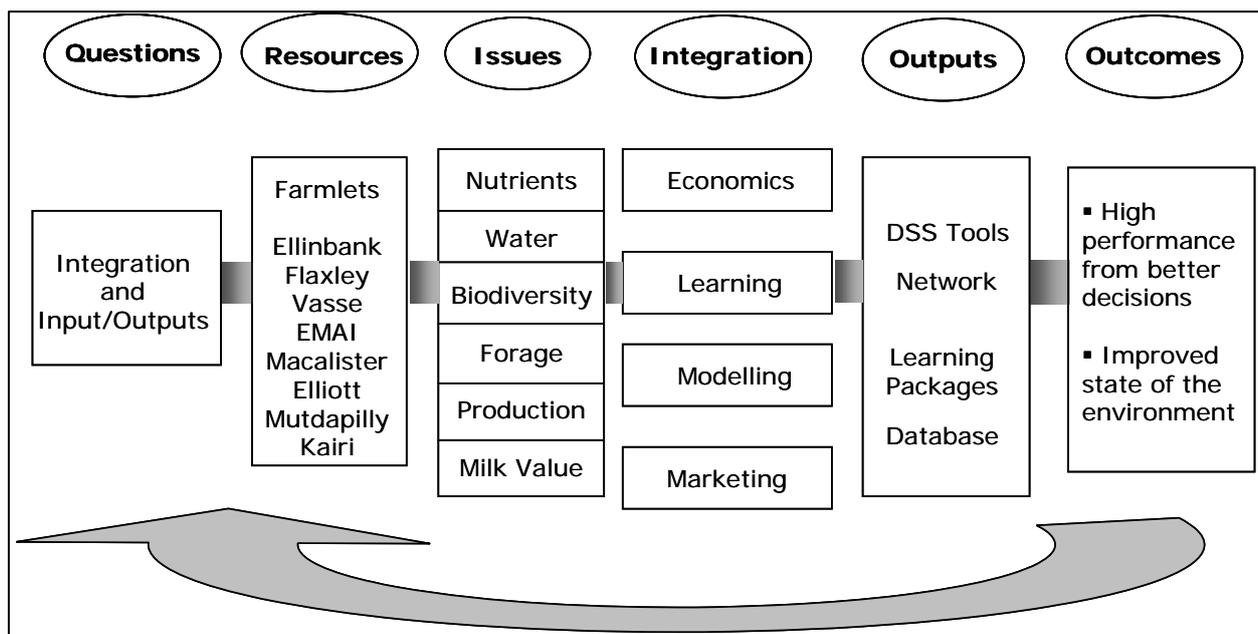
More recently a series of nationally-coordinated technical, environmental and extension research projects have been initiated to build on regional and state achievements (DRDC 2001). Agreement by independent state agencies to contribute to a national project depends in part on the benefits or value the project can create for that state or region.

The seven current farmlet projects (corresponding with the major dairy regions) are at various stages of development and have differing aims and objectives. This provides both opportunities and challenges for national coordination. Opportunities include:

- sharing of experience and data to learn from others;
- sharing resources (particularly extension materials) to minimise development costs;
- questioning and investigating '*triple bottom line*' issues at a different level;
- an ability to develop comprehensive exchanges with the New Zealand dairy sector; and,
- a capacity to coordinate dairy sector responses to national directives.

Several national developments are focused on the realisation of these opportunities. A national database is being developed to assist with the exchange of data between individual (state-based) projects. Standardised experimental protocols have been developed and agreed upon by researchers to enable aggregate analyses across farmlets. A joint Australia-New Zealand workshop has been organised to exchange concepts, methods and tools for FSRDE in dairying and other national projects that address topics such as herd reproductive management are being linked across sites.

'Theme teams' are being established to investigate issues that are beyond the scope of any one project (see Fig. 2). Water use efficiency provides an example, where a national approach combines trial results from different projects (eg. irrigations systems, riparian management and water allocation strategies) with modelling and economic analyses to devise risk management, environmental compliance and guidelines for profitable productivity, ie. a '*triple bottom line*' response at the farm level.



**Figure 2: Themes requiring a national approach FSRDE**

Challenges to implementing a national FSRDE framework include developing new ways of working with existing institutional structures, and traditional methods of research and extension. Indeed, some of the most difficult challenges relate to the extension dimension of national coordination.

Extension by regional projects currently includes discussion groups, research station farm walks and field days, newsletters and farmer participation in specific development topics like soil fertility or riparian zone management. In some states, extension may be located at a district office of the state agricultural agency as opposed to being located on the research farm.

Establishing strong linkages between research and extension can be difficult, with limited collaboration between the disciplines. Historically, extension practitioners rarely contributed to the design and management of research projects, however researchers may be involved in extension activities, contributing to newsletters, course design and presenting research results at field days. If extension is challenging for projects, it is the learning aspects of extension that are particularly problematic. The remainder of this paper will discuss how learning and change are being addressed at a national level in the Australian dairy sector.

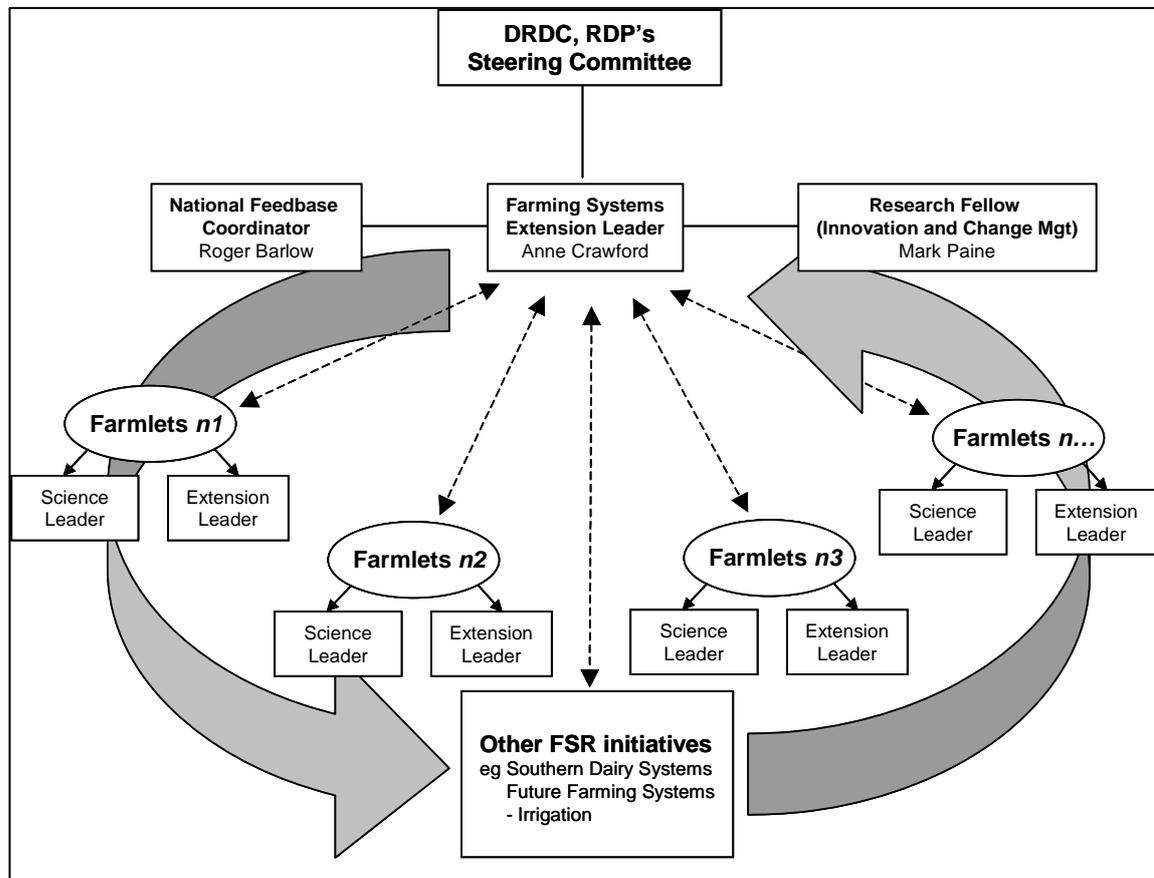
### **Farmlets as Learning Platforms?**

The two workshop events discussed earlier, identified three interrelated activities as critical for making progress with respect to learning outcomes from farmlets:

- national co-ordination, and regional integration of farmlet RD&E within local knowledge systems;
- research to improve learning experiences of actors associated with farmlets; and,
- design and evaluation of new farmer learning resources.

The national response to these three activity areas was to identify the generic needs of the various state projects. Development efforts focused on servicing these by interacting with the research and extension component in the relevant theme area and recognising that each state had unique local needs. The DRDC funded a new position to facilitate the national co-ordination and development of extension (see Fig. 3). Furthermore, a new PhD research

position was created to investigate learning processes within the context of the national program. This research brokered relations across two universities, thus attracting additional resources to investigate the issue of farmlets as learning platforms.



**Figure 3: National coordination of extension and learning associated with farmlets**

As work progressed it became clear that farmers were the ultimate beneficiaries, not the primary clients, of this national farming systems project. All national support to farmers operated through local extension teams, including private providers. This avoided duplication and minimised the risk of confusion from multiple and potentially conflicting messages. Farmer benefits had to be identified from the national linkage of local projects using an evaluation process that operated at the local level to determine the value added from the national project. A national farmlet workshop (June 2001) included participants from RD&E roles, who identified several initiatives to further develop farmlets as learning platforms. These included:

- **Protocol document**

A protocol document was requested to cover the design and evaluation of learning and change aspects of farming systems research projects. This will complement the experimental protocol. It will include a section on farmer decision-making to relate FSRDE to the farm business.

- **Support services to project managers**

Significant resources and expertise already exist within each of the farmlet teams. In order to capitalise on this nationally, an archive of learning resources (eg. training materials, case studies, workshop designs etc.) was requested to increase the ability of regional teams to access a variety of

'tried and true' materials that support farmer learning. This will also complement the development of the protocols for designing and evaluating learning and change processes (above).

- **Farming systems research stocktake**

A 'stocktake' of current national and international projects that are looking at dairy FSRDE was requested. The intent here was to use the national project as a resource to constantly innovate and learn from other project initiatives.

- **Professional development**

Workshop participants recognised that a national dairy farming systems project would provide opportunities for new learning at a number of levels. One might be new approaches to the use of traditional research tools, whereas another level of learning is associated with using new tools such as simulation models to investigate the decision rules used by farmers and others. Other development opportunities relate to 'training of trainers' for farm management applications from local projects. As a further example, extension professionals are participants in the development of the national database to ensure that this was not solely guided by the requirements of 'scientific research' – on the contrary, extension and extension research has a responsibility to ensure this resource supports the integration of the various issues and themes across disciplines.

- **Networking approaches and facilities**

The development of networks operates at a number of levels. New regional projects may use satellite farms (closely monitored commercial farms with systems linked to a broader project), to investigate new farming technologies and approaches at a whole farm level (including a more accurate examination of the social, economic and environmental impacts). Existing networks include:

- social networks;
- discussion groups;
- study groups;
- electronic networks;
- websites - farm reports, weather updates, key messages, industry news;
- dedicated pages in Australian Dairy Farmer;
- national farmwalks – theme-linked open days across the farming systems studies; and,
- development of 'tips and tools'.

There is still much to determine with respect to how learning is best achieved in relation to farmlets. This need for better understanding will require an iterative approach to improving the effectiveness of farmlets. Our research needs to capitalise on the considerable variation in approaches across states. It will need to contribute to improving the ways we identify local needs and the types of learning resources necessary to meet these needs. Future challenges for farmlets will relate to determining how farmlets can operate effectively within the burgeoning information market confronting farmers. We need to recognise the unique learning challenges and necessary support mechanisms required to realise the power of farmlets to deal with systems research problems.

### **The fate of FSRDE in the Australian dairy sector?**

Incorporating a FSRDE approach into the traditionally component research theatre of Australian dairy farmlets will be a challenge for both research and extension and the implementation of a FSRDE framework requires the current operating system to change dramatically.

Waugh *et al.* (1989) briefly discusses implementation of such a system and suggests that implementation of FSRDE may imply change in organisation, strategies, and methodologies. They propose that in cases where research and extension are poorly organised, major changes are likely to be required. Although the systems approach does not necessitate major changes, Waugh *et al.* (1989) suggest the changes which are likely relate to: (1) the philosophy, strategy, and methodologies; (2) the development of interdisciplinary activities, which can only be done by including these disciplines within the research and extension organisations; and (3) the establishment of on-farm research teams.

#### *The interdisciplinary requirement*

Since the FSRDE approach is based on the premise that biological, physical, social and economic disciplines can produce more relevant technology when acting as a coordinated effort than they can separately, it is important to have a consensus of objectives, strategies and methodologies. The process of defining team objectives and strategy involves not only co-ordination of the disciplinary teams, but multi-disciplinary action should produce an interdisciplinary result (Waugh *et al.* 1989).

A general lack of understanding of the FSRDE approach may cause resistance, especially if it is viewed as a substitution for current programs rather than as a new dimension supporting current programs. Given that many research personnel have been trained in commodity or discipline-specific ways, they may have little interest in understanding cultural-economic aspects of farming and see little reason for change (Waugh *et al.* 1989).

#### *The government agencies' position*

It is essential that if a FSRDE approach is to be implemented successfully, there must be an assessment of government and agency directions to discern potential conflicts and devise approaches that would overcome any constraints (Waugh *et al.* 1983; Norman 1983). Government institutions may have constraints to the implementation of a FSRDE approach (Norman 1983). Bureaucratic systems of government may be more interested in perpetuating bureaucracy than instituting changes to serve clientele. As a result, some of these systems may be highly resistant to change. Organisational structure may have placed much of the power and leadership and control of budgets and physical resources at major research stations that dominate the pattern of research. These stations may not only resist change but foil collaboration even when such would further their commodity or discipline-based research (Waugh *et al.* 1989).

#### *Evaluation requirement*

Periodic review and planning are central to the systems approach, and hence emphasis on means of updating, analysing and interpreting information and developing recommendations and plans of work, are required. This requires direction and management and the processes are themselves a management mechanism (Waugh *et al.* 1989).

### **Benefits to moving into an FSRDE framework**

The solution to move into FSRDE to deal with the challenges that the Australian dairy industry is facing, whilst a demanding process as discussed, aims to capitalise on the benefits that can be realised (Collinson and Lightfoot 2000). Through participating in the development of the national project, dairy industry RD&E stakeholders have recognised that a FSRDE framework will enable:

- stronger linkages to the target audience outside the farmlet study to identify improvement/change opportunities;

- development of a framework for priority setting, programming, resource allocation and assistance with the identification of resource constraints and evaluation criteria;
- participatory methods to be utilised, creating ownership and empowerment for community stakeholders, and also greater understanding of farm families' priorities through a replicable analytical process; and
- development of more relevant and appropriate tools for farm improvement through whole farm system modelling and analysis, bringing a new dimensions to diagnosis and evaluation.

### **Extension and learning challenges for dairy FSRDE in Australia**

Implementing a FSRDE framework is an interdisciplinary exercise. One of the justifications for FSRDE has been to forge better links between research and extension, yet there are very few examples of effective collaboration (Tripp *et al.* 1991). Either social or biological scientists dominate many FSRDE efforts. Internationally, the major impetus for the development of the FSRDE concept in some regions came from the social sciences and it is therefore seen as “*a social scientist’s invention*” (Chambers and Jiggins 1986). For Australian dairy farmlets, an FSRDE approach has been largely driven by farmlet leaders (usually agricultural scientists) and further encouraged by extension practitioners. This may have resulted in different developmental pathways to those seen in other national or commodity-related FSRDE projects.

In summary, the ongoing challenges for a successful move to FSRDE in the Australian dairy sector include:

- determining the appropriate relationship between component and systems research;
- developing national interdisciplinary RD&E skills;
- involving extension in a meaningful capacity in all phases of research development;
- extension improving its research capability (eg. on clients systems) to assist overall project aims;
- extension developing evaluation techniques that explain why, not just where and when change occurred; and,
- creating stakeholder awareness of the purpose and reasons for FSRDE using a national framework.

We expect a national framework managed through a process of continuous improvement will meet these challenges.

### **Conclusion**

Dairy farming systems RD&E is under transition in Australia. Stakeholders are questioning the role of farmlets as learning platforms as part of this transition process. The impetus for this change has come from increasing pressure on the dairy sector to better utilise its research and extension resources to cope with events such as sector deregulation and reduced government funding for extension. As stakeholders question the role of farmlets they are simultaneously questioning the role of dairy FSRDE and its relationship to component research as the sector addresses triple bottom line issues. This questioning process is itself creating a form of learning platform to empower all farmlet stakeholders to facilitate the coordination of resources associated with system inquiry processes. An outcome of this learning approach is a form of continuous inquiry into the role of systems RD&E in relation to constructing a viable future for dairy farming in Australia. Capturing and enhancing learning from farmlets is now a fundamental objective of many involved in funding and providing systems RD&E. Stakeholders expect this learning will provide a means to managing issues like water use efficiency, sustainable grazing or the reduction of nutrient

loss, such that farm businesses will prosper and people will lead fulfilling lifestyles on the land.

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### **References**

- DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY, AUSTRALIA (AFFA) (2001). Annual Report 2000-2001.
- AUSTRALIAN BUREAU OF RESOURCE ECONOMICS (ABARE) (2001). The Australian Dairy Industry. Impact of an Open Market in Fluid Milk Supply. ABARE Report to the Federal Minister for Agriculture, Fisheries and Forestry. January 2001.
- AUSTRALIAN DAIRY CORPORATION (ADC) (2000). Australian Dairy Industry in Focus 2000. Australian Dairy Corporation, November, 2000.
- CHAMBERS, R., AND JIGGINS, J. (1986). Agricultural research for resource poor farmers: A parsimonious paradigm. IDS Discussion paper. 220.
- COLLINSON, M., AND LIGHTFOOT, C. (2000). The future of Farming Systems Research. In: A history of farming systems research. Ed. M. Collinson. Food and Agriculture Organisation of the United Nations. Rome.
- DAIRY RESEARCH AND DEVELOPMENT CORPORATION (DRDC) (2001). The Short Report. 2000/01 Annual Report Snapshot. Dairy Research and Development Corporation, Melbourne.
- FULKERSON, W.J. (1980). A proposal to develop a dairy research facility at a Department of Agriculture Research Station. Internal Report, Department of Agriculture. Dairy Branch, Tasmanian Department of Agriculture, Launceston.
- MCMEEKAN, C.P. (1966). Grass to Milk. The New Zealand Dairy Exporter, Wellington.
- NORMAN, D. W. (1983). The farming systems approach to research. In: FSR background papers. 3. Farming Systems Research paper series. Kansas State University. Kansas.
- PETHERAM, R.J., AND CLARK, R.A. (1998). Farming systems research: relevance to Australia. Australia Journal of Experimental Agriculture. 38: 191-115.
- SHANER, W.W., PHILIPP, P.F. AND SCHMEHL, W.R. (1982). Farming Systems Research and Development: A guideline for developing countries. Westview Press. Boulder.
- THOMAS, G.W., AND MATTHEWS, G.L. (1991). Comparison of two management systems of dairy farmlets based on conservation of either hay or silage. Australian Journal of Experimental Agriculture. 31: 195-203.
- TRIPP, R., ANANDAJAYSEKERAM, P., BYERLEE, D., AND HARRINGTON, L.W. (1991). FSR: Achievements, deficiencies and challenges for the 1990s. Journal of Asian Farming Systems Association 1: 259-271.
- VAN WILLIGAN, J. (1992). Farming systems research. In: Application areas of cultural anthropology. Ed. J. van Willigan, A. Mahajan, Nath, S. 1-37.
- WAUGH, R.K., HILDEBRAND, P.E., AND ANDREW, C.O. (1989). Farming systems research and extension. In: The transformation of international agricultural research and development. Ed. J.L Compton. Lynne Rienner Publishers. Boulder.