

▶ Development-led innovation

A new model for operationalising RD&E

HP13550

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Contents

Executive summary	2
Background	3
Terms of reference.....	3
RD&E in the dairy industry now	4
Development-led innovation	5
Terms used in the model	5
Learning from looking back.....	8
Why Program Development can be underdone	9
Putting Program Development into practice	10
1. Establish a dynamic Program Development team	10
2. Locate program activities on the RD&E spectrum	12
3. Develop a business case for Extension and Education	12
An example of development thinking using AMS.....	14
The enabling environment for Program Development	15
Dairy industry capacity in Program Development	15
Setting programs of work for RD&E.....	16

Appendices

- Program Development checklist
- Position description - Program Development Leader
- Glossary



This work (HP13550) is a Dairy Australia initiative funded by the Dairy Service Levy and the Australian Government. It describes a new model for operationalising RD&E. Dairy Australia commissioned the content in November 2009 to contribute to the design of the third module of Dairy Moving Forward.

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Executive summary

Dairy Australia invests in the long-term success and sustainability of the dairy industry through its RD&E strategy. This strategy and industry capability is under review through an initiative known as Dairy Moving Forward. Ideas in this paper were developed to contribute to the push to increase the efficiency and effectiveness of RD&E.

In any industry it is people who make innovation happen. New technologies provide the raw materials (knowledge, services or products) to innovate - to act creatively and adapt the resource to improve our situation.

This report introduces a new way of thinking and acting around RD&E where development leads the innovation process.

The new model highly values 'Research' (as the way of establishing the true potential of new technologies) and 'Extension and Education' (as the way technology reaches its target audiences). In contrast with existing industry models, it makes development of a '**route to change**' an explicit and necessary component of RD&E. The emphasis here is on 'Program Development' (as opposed to product development) and 'route to change' (not just 'route to market').

Program Development seems a natural focal point for any RD&E effort when the primary objective is to achieve widespread practice change. By definition development draws upon the existing body of knowledge in planning the 'route to change', identifies important knowledge gaps and prioritises what is needed to progress the situation.

The quality of Program Development provides for the cohesion and effectiveness of activities in a domain. The challenge for the new way of acting is to put it into practice.

The Development-led innovation model requires strong leadership of the development process, the commitment of organizations with commercial interests in the domain to ongoing, joint action and effective group engagement.

If the dairy industry is interested in the new approach to RD&E the authors recommend it:

- ▶ actively develops its Program Development capacity; and
- ▶ makes the development task highly visible (reporting against outcomes of Program Development).

Advantages of adopting the Development-led innovation model

- Establishes a 'route to change'
- Builds a good understanding of the fit of the technology with farming systems and the enabling environment
- Aligns activities with the intention and worldview of farmers
- Promotes integration of new technologies with existing ones
- Encourages research around practical aspects of applying innovation in the commercial world
- Opens opportunities for businesses to fund aligned activities within their sphere of interest
- Provides a way for industry to work "across silos" (across different technical platforms and integrating RD&E activities)

Background

Dairy Moving Forward is the dairy industry's response to the Primary Industry Steering Committee (PISC) and Primary Industries Ministerial Council (PIMC) request for governments and industry to act in unison around several issues of national importance for Australia. The interest for dairy (and some other agricultural industries) is around improving the delivery of RD&E.

Funding agencies have been increasingly questioning the efficiency and effectiveness of current approaches to RD&E as the extent of adoption and diffusion of industry technologies and recommendations in farming communities is very variable and often low. However there is no clear, coherent or widely accepted alternative to the *status quo* (Lawrence 2006).

The benefits of improving RD&E are:

- ▶ the production of better RD&E outcomes for dairy farmers; and
- ▶ the potential to be able to attract government support and funding for any initiatives.

Dairy Moving Forward aims to establish national priorities, streamline delivery, align investment and reduce duplication in pre-farmgate RD&E.

Part of the Dairy Moving Forward review focuses on practice change to build capability for the future. While the pathway anticipated for this was initially through improved extension, the authors believe taking a greater leadership role in the development of industry programs will deliver more benefits to dairy farmers, more effectively.

Terms of reference

This body of work was commissioned to describe what the concept of development embodies and help “codify” what is critical to innovation. It started in Nov-2009 and was completed in Mar-2010.

The terms of reference were:

- ▶ To get to a better position around how to judge success and progress in the way the industry drives innovation (ie the effective conversion of ideas to practice change on farm and within industry).
- ▶ To make the parameters of the development task more specific and describe the principles underlying successful development.
- ▶ To recommend ways to embed development in the industry.

The model and its underlying principles emerged by brainstorming experiences and lessons learned in delivery of RD&E in the dairy industry over the last 10 years. This was done in a spirit of continuous improvement: assuming that it is possible to do better and exploring how.

The model was refined following feedback from Dairy Moving Forward working groups and the steering committee (on 12-Feb, 18-Feb and 12-Mar 2010). Final comments were incorporated following presentation of the content to the Dairy Moving Forward committee (on 16-Mar-2010).

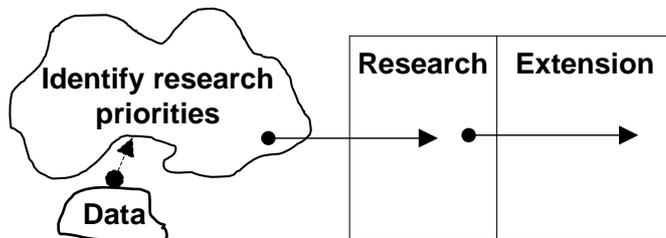
RD&E in the dairy industry now

The dairy industry has agencies dedicated to research and to extension, yet the development process is not well understood by either and usually receives cursory attention. Project designers and leaders have been operating intuitively around what is needed for development, and some people are better at this than others. This is likely to be a major limitation to practice change, innovation and resilience on Australian dairy farms.

Models of innovation have evolved over time and there are many of them (some examples are given below). The dairy industry tends to use traditional approaches such as the technology-push (which has a focus on research) or need-pull (where the market is a source of ideas). More recent models are increasing in sophistication and aim to integrate RD&E systems and co-develop new technologies through strong network linkages.

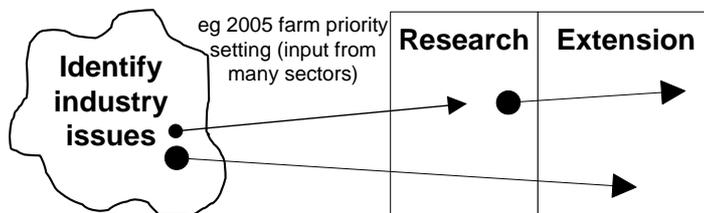
Current RD&E approaches and the risks

Approach 1. Research priorities leading RD&E

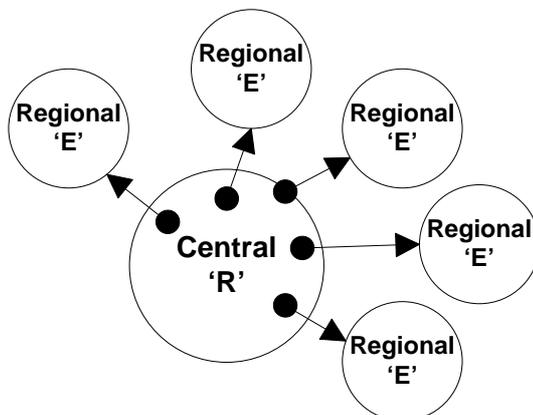


Risks of moving directly from 'R' to 'E':

Approach 2. Industry issues leading RD&E



Approach 3. Central research, regional extension



- Industry may be working on solutions without properly defining what the issues are in the commercial environment.
- A new technology that works well in a controlled environment (where technical testing is a priority) may have unforeseen consequences when used in the intended systems.
- Extension of research findings relies on the ingenuity of individuals to adapt the scientific principles to fit their practical knowledge and values.
- The onus of adaptation fully on farmers and advisers without developing systems that support farm decision-making and advisory capacity.
- It does not establish a 'route to change'.

Development-led innovation

The Development-led innovation model aims to co-develop new technologies through stronger linkages between players. It comes into play when industry has identified a program of work and wants to develop interventions to achieve a particular objective.

Terms used in the model

The terms RD&E can convey very different meanings for people in different disciplines and industries. The way they are being used in this model are described below.

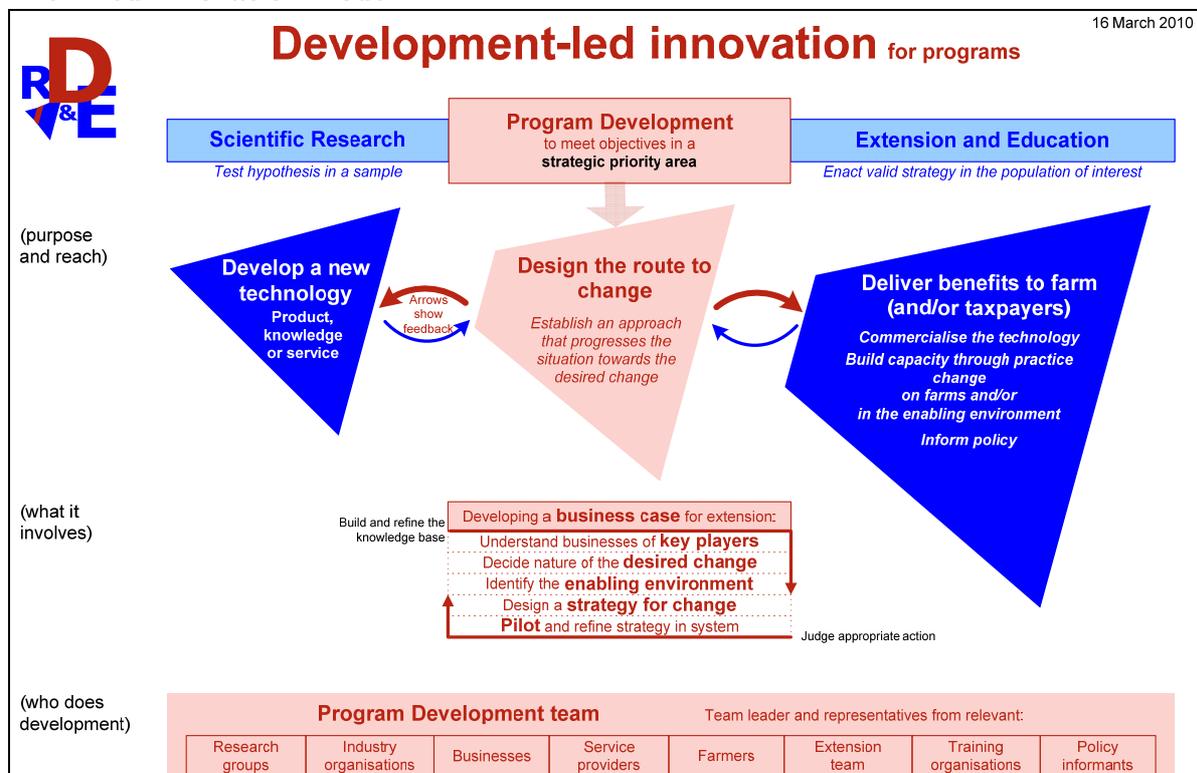
‘R’ is necessary to ensure new technologies (products, knowledge or services) are scientifically sound and have significant potential to improve the farm situation.

‘D’ refers to Program Development: designing the ‘route to change’ that sets the scene for widespread uptake and innovative use of new technologies by target audiences. It is essential to build the business case for the delivery phase.

‘E’ is about commercializing the technology and building capacity (including training) that enables individuals, networks and communities to meet their own potential. This can manifest as practice change on farms and/or in the enabling environment. Sometimes the route to change is best mediated through policy changes (of a government, industry or organization).

Some features of RD&E are described in the next couple of pages.

The D-led innovation model



Scientific research

Scientific research helps explain the nature of things and prompts ideas for practical applications. It justifies the resources put toward integrating a new technology into dairy farming systems by showing they are scientifically sound and have significant potential to improve the farm situation.

Activities that test a null hypothesis using systematic, reproducible methods in a sample of the population of interest are regarded as scientific research ('R') in the new model. They can be conducted in any setting (in laboratories, on farms or as computer modelling) and employ different methods (quantitative or qualitative) depending on the issues being explored.

This definition helps differentiate lines of enquiry followed as part of the development task from research questions that emerge during the development phase.

Extension and Education

The Extension and Education arm of RD&E is where the new technology is introduced on a large scale to the target audience: it is where the gains in efficiency and effectiveness of the new approach become manifest as practice change on farms and/or in the enabling environment.

Assuming a strong development presence (where the mechanism for change has been proven in the system of interest), extension and education is responsible for commercialising and delivering the technology.

The extension team is also responsible for program evaluation. Formative evaluation is necessary in the early stages of rollout to refine the approach (for example customising delivery to match regional situations). It's also important that gaps in knowledge limiting program implementation are identified and communicated to those involved in research and development.

Ultimately a summative evaluation is conducted to assess the success of the program. Ideally this would be after delivery has finished so the extent of the desired change can be measured, rather than primarily measuring the mechanics of delivery or the contribution of the technology to a particular system as is often the case.

Extension programs should measure the extent of change in their target audiences to account for the industry investment

Program Development

Program Development is the design of the route to change that sets the scene for widespread uptake and innovative use of new technologies by target audiences. It is the people-focused dimension of innovation.

Programs need to have a mastery of the domain for which they are responsible, to invest appropriately and effect the desired change.

Development is an iterative process that involves key players working together to transform the technology into something of value to the target audience.

A method well-suited to designing the 'route to change' is the plan-do-review nature of action research. Not only does it provide for exploring unknowns and refining approaches, the questions it raises are likely to encourage new research around the practical aspects of applying innovations in the commercial world.

The importance of piloting development strategies cannot be understated. Because of subtle interdependencies among so many variables in dynamic systems, Christensen (2002) believes that building successful business models is unlikely to ever be perfectly predictable and that "a real world experimentation approach increases the chances of market success".

It's best to prove a concept on a small scale before applying it on a large scale

Advantages of committing to Program Development are:

- ▶ it has built-in go/no go nodes;
- ▶ the delivery mechanism is proven before applying it on a large-scale; and
- ▶ it opens opportunities for businesses to fund aligned activities within their sphere of interest.

The quality of Program Development provides for the quality of action

Features of quality Program Development

- Key players are participating in Program Development activities
- The fit of the technology (products, knowledge or services) with farming systems and the enabling environment are well understood
- Projects have a strong sense of where they are going (the vision and reach)
- There is a lot of questioning around the application of the new technology
- New technologies are being integrated with existing ones
- There is 'proof of concept' of the route to change
- Relevant research around the practical aspects of applying technology in a commercial setting are identified earlier
- Program outcomes measure the extent of change in the target audience and not just delivery activities

Learning from looking back

The following are some observations that may provide pointers for the future.

- ▶ ***The current RD&E funding ethos tends to drive activities from research to delivery, bypassing development.***

When proposing new work, researchers are asked to describe the extension outcomes and return on investment even though the most appropriate options would only be a guess at best.

Consequently the proposed routes to market often lack detail. It is not uncommon for “delivery by the NCDEA” or “a series of seminars” to be suggested as the primary path for technology transfer (with little or no guidance to NCDEA in the first example).

Locking onto a course of action before the research findings have been put into context may drive program activities toward less than appropriate outcomes.

- ▶ ***Program Development is not the task of a single person or organization.*** Establishing and refining the most appropriate course of action requires input from the key players and an understanding of their worldviews and values.

An individual or organisation acting alone diverts attention away from the best course of action and increases the risk of a program not being able to deliver. (For example a “Project Development Officer” is unlikely to succeed if they represent the whole of the development effort.)

- ▶ ***Program Development requires leadership.*** Leadership ensures progress continues to be made: that stalling points are articulated and worked through and

activities contribute to the program vision. Without a good leader, the development process is inherently vulnerable.

- ▶ ***Development is not a ‘once-off’ task.*** It requires ongoing cycles of review and planning to make effective use of the growing body of knowledge in the domain. The development task (leading innovation) continues throughout the RD&E effort but at a much lesser level once the widespread delivery begins.

- ▶ ***Programs need to guard against the development effort finishing once the knowledge gap has been identified and filled.*** Part of development invariably involves getting more information. It is not uncommon for development funds to be spent on setting-up data streams and analysis without continuing to scope and plan ensuing development activities.

Programs are only moving into a true development phase when they move into an action framework. By this point the industry knows what it is trying to achieve but not necessarily how to go about it.

- ▶ ***Programs often succumb to the ‘seduction of acting’.*** Business and coverage are things that can be reported to stakeholders as activities roll out and used as proof of progress. Unfortunately action does not automatically translate to wise investment.

Constructing outcomes for the business case that are ‘real’ and correctly pitched is a development task. Outcomes that are too broad, unable to be measured or don’t fit the planned activities are all symptoms of poor development.

- ▶ ***During the development phase, activities may run the risk of being controlled by the tools they have on offer.*** To avoid this, Project leaders need to keep a focus on what is trying to be achieved. Development thinking comes up with activities that will really make the difference (and sometimes they come from left field).
- ▶ ***Programs have a strong foundation when their key messages and principles represent a good worldview for the domain and help people make sense of the recommended way of acting.*** It usually takes time for the driving principles to emerge, although this is not always the case.
- ▶ ***It's easier to communicate and build on an effort once the conceptual framework has been articulated.*** Paradoxically, this only becomes interesting (a) to people in the doing and (b) when its implications are explained by respected individuals.
- ▶ ***There is a real risk of exhausting service providers as a major delivery arm for industry programs.*** Much of the current delivery of dairy programs occurs through competent service providers who have an interest in the area. Programs tend to compete for their input and interest as the same people tend to be drawn upon again and again.
- ▶ ***When a development effort stalls for too long (due to inaction or inappropriate action), the money invested to date will be lost.***

Why Program Development can be underdone

One of the biggest hurdles to 'D' is that organisations need to have experienced participatory technology development in order to value it

Reasons for bypassing Program Development may be that:

- ▶ The importance of Program Development is not understood and there is no clear process for doing it.
- ▶ The dairy industry currently has limited capacity in Program Development.
- ▶ Doing 'D' well means a delay between having the research findings and the start of widespread delivery.
- ▶ Program Development requires significant resourcing.
- ▶ 'D' deals in uncertainty: the challenges and final business model are not known at the outset.

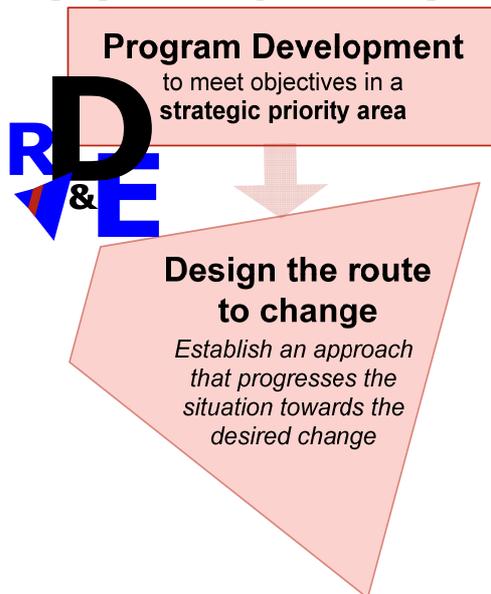
Yet properly resourcing the development effort (with time, money and strong leadership) is likely to deliver more cost efficient and effective outcomes for industry.

Putting Program Development into practice

The D-led innovation model helps align extension and education activities with the intention, action and worldview of farmers, as well as encouraging research around practical aspects of applying innovation in commercial practice.

The goal is to “design a route to change”, establishing an approach that progresses the situation towards the desired change. It assumes the broad program objectives and priorities are a good fit with the industry vision.

The purpose of Program Development



This section describes the machinery for putting Program Development into practice. There are many possible approaches - the one described below is (again) based on a critical review of lived experience. It provides for feedback and flexibility in design, which are both necessary for working through complex issues.

1. Establish a dynamic Program Development team

The diverse interests, worldviews and powerbase of multiple stakeholders are both the challenge and opportunity for a new technology. Gaining understanding of the perspectives of others will provide insight into the fit of the technology in farming systems and the enabling environment.

The aim here is to enable collective action: a way for organizations to work together, pool resources and achieve something of benefit beyond individual action.

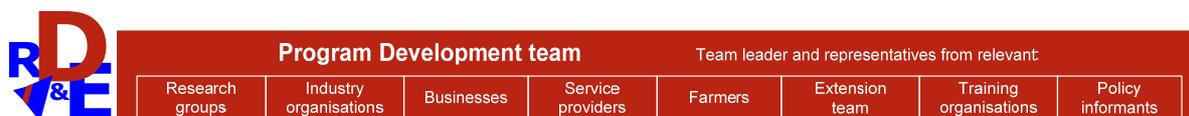
Having an industry development team for each program or project provides a formal forum for interaction.

Getting the relevant stakeholder groups represented is important. A risk of ‘casting the net too narrowly’ is that those involved will be trying to innovate within an established knowledge-base and the thinking will revisit the same places.

Depending on the task at hand the Program Development team could have representatives from the relevant industry organizations, businesses with an interest in the technology, research groups, service providers, the extension team, dairy farmers and possibly expert consultants.

Design of strategies that are likely to be commercially feasible relies on people working with their business and professional interests at heart, be they public or private. This model enables agencies already involved in RD&E (such as CSIRO, universities and state governments) to focus on their area of speciality rather than trying to operate independently across all parts of the RD&E continuum.

The Program Development team



The role of the development team is to decide and articulate positions which all stakeholders can understand and ‘buy’ into as well as taking the lead on where best to allocate resources and effort (see the boxes on this page).

The attributes of individual group members are important. Ideally the Program Development leader would be an accepted authority (domain expert or leader) who has the capacity to analyse situations and establish the true state of affairs, and inspires the confidence and approval of stakeholders. (An example position description is included in the appendix.) For other members, the level of interest in the area and reputation for following through on matters is probably as good a guide as any to the value of their contribution.

Group members should have the authority to act on behalf of the businesses they represent with a view to champion the program activities within their businesses and sphere of influence. They will be able to do this most comfortably if the program aligns with the objectives of their organization.

The quality and significance of the engagement between stakeholders directs the program’s success. An edict to work together does not automatically build the sense of connection and develop the trust necessary for a truly collaborative effort.

Role of the Program Development team

- To develop a good understanding of the commercial environment of the new technology (knowledge, service or product)
- To decide the ‘major planks’ to focus on as a joint effort to drive change
- To reach agreed positions on a program’s objectives and outcomes
- To identify strategic opportunities
- To interpret the available information, identify knowledge gaps that limit progress and plan targeted action
- To design the strategy for the ‘route to change’
- Risk management of emerging issues and troubleshooting.

Role of the Program Development leader

- To decide and articulate clear objectives for the program vision and a development path
- To coordinate and evaluate development activities
- To promote exchange of observations and ideas across the RD&E communities
- To make linkages and realize synergies with other programs
- To enforce timelines

Relationships between group members determine the type of knowledge exchanged, whether discussions are honest and productive, and ultimately the effectiveness of the development (the quality of the ‘action research’).

In a mature group that is operating well:

- ▶ people are willing to be part of the network
- ▶ individuals are truly listening and responding to others
- ▶ members are comfortable to say what they really think
- ▶ their contributions cut through to key issues and inform the direction of what happens
- ▶ dealing with differences has the potential to strengthen (rather than weaken) relations.

Benefits of effective group engagement for technology development

- Increases relevance and legitimacy of activities in the domain for stakeholder businesses
- Promotes mutual understanding and learning across organisations
- Helps clarify thinking or affirm values within organisations
- Achieves a better alignment of effort across agencies
- Ensures the practicability of technology
- Allows for pooling of resources (knowledge, people, money and technology)
- Builds reputation and credibility of the program

2. Locate program activities on the RD&E spectrum

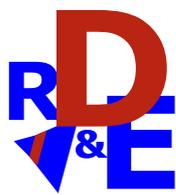
RD&E is a continuum and it is possible to be working on the different parts of the spectrum in parallel. The aim here is to know how activities in the domain contribute to the collective effort and have observations from each stage inform the thinking of others.

3. Develop a business case for Extension and Education

Ideally the Program Development effort manifests as a business case for ‘Extension and Education’ that is commercially feasible and pre-tested, the way of delivering program benefits to a greater reach of farmers.

The approach (outlined over the page) considers the context in which the technology is to be used, the nature of the desired change, its value to the key players, and an understanding of the commercial challenges and environment that will enable the change to happen.

Developing a business case for Extension and Education



Build and refine the knowledge base



Judge appropriate action

1. **Understand the businesses of key players.** The aim here is to grow the knowledge-base of the domain sufficiently to make good decisions.

An accumulation of knowledge about how agencies operate, collaborate and the issues they truly face is as much about enlightenment as it is about immediate action. As well as placing the technology in context of its users, a knowledge-base built by development groups ultimately results in fewer uncertainties, provides industry with a rich source of ideas for future directions and enables accelerated action.

2. **Decide the nature of the desired change.** The aim here is to develop program outcomes that represent the change and the benefits to farmers.

Usually the objective for a program of work is stated in broad terms. It is entirely appropriate to have a “plausible promise” that is imperfect and incomplete as it provides more scope for stakeholders to form something consistent with their situation and ideal (Douthwaite 2006).

3. **Identify features of the enabling environment** to establish what capacity is needed by the people and systems involved.

4. **Design a ‘route to change’ strategy.** The design must consider the roles of the people involved and aim for simplicity in implementation. Some program developers aim to keep the design simple and flexible so it is robust enough to work well even when not perfectly optimized (Douthwaite 2006).

5. **Pilot in the target audience and refine the approach.** Testing the design in the ‘real world’ enables it to be refined according to how well it “meshes in” to existing systems. It is also valuable to observe how the fitness of the technology improves through the adaptation and learning that takes place (Douthwaite 2006).

The challenge here is to keep a balance between being honest and overly optimistic, and knowing when to let go.

The above outlines some of the components and principles - but refining the details of the approach will be a task for industry should they choose to go down this path. (The start of a checklist for this process developed by the authors has been included as an appendix.)

Questioning is usually iterative, combining coarse information from relevant network linkages to set the 'big picture' and seeking more detail to develop a well-pitched strategy. Knowledge about the component parts usually accumulates in parallel.

Experience of both Harris Park and the Rural Innovation Research Groups is that during successful development there is a shift from chaos to understanding, and from complexity to simplicity.

Program Development continues to direct activities for the life of the program but has a much lesser role once implementation of the business case begins.

An example of development thinking using AMS

In the following example the strategy design of a current industry project is viewed through the new development 'lens'.

Automatic Milking Systems (AMS) technology has been around for a long time. The concept is attractive because it holds the promise of "reducing labour requirements on farm".

Box systems have been available overseas for many years and widely used in housed dairy herds. Boxes are unlikely to be feasible for most Australian dairy herds because of their high capital value and low throughput, and there is little international experience of using AMS in pasture-based grazing systems.

One manufacturer, DeLaval, has a strong commercial interest in this technology and has been developing a 'new concept' system with a capacity to milk 240 cows.

There is an underlying assumption that AMS will be a commercially feasible proposition for many Australian dairy farms.

Given this information, the types of questions in the first steps in Program Development are:

What is the industry objective? It has been expressed as "having AMS used by one-third of industry by 2026" (which equates to 2000 dairy farms) or "having AMS used on 200 dairy farms" over the next few years. To work this through more it would be good to know more about the client-shaping factors for the different farming systems. Starting to pin down the nature of the desired change would also help focus thinking: for example it has been suggested that an appropriate industry intervention might be to help "X% of dairy farms make a good decision about whether AMS suits their farming system or not".

Where does AMS sit on the RD&E continuum and in which domain does it best belong? It seems the 'new concept' is still in the research stage (commercial-in-confidence). Exploring ways to fit the technology with different farm systems and profiles is likely to be a valuable part of the research in terms of Program Development as it may open opportunities to tailor the technology for delivery.

Who should be part of the program development team? Are all those likely to be integral in the use of the technology in the commercial arena represented? Should there be representatives from the relevant financing sector (if farms need to attract capital), farm consultants (as a source of 'independent advice'), machine technicians etc...

And how do DeLaval's goals (which potentially have an international perspective) compare with those of the Australian dairy industry? Are their interests primarily in selling boxes, selling the 'new concept', servicing machines or something else? And how do they regard their development task?

The enabling environment for Program Development

This report describes supercharging development ('D') to improve effectiveness of the RD&E spectrum, where development operates at a program (domain) level.

The development team would be regularly making decisions on what is needed for overall success: the component parts and the balance of activities (research, extension, education, service provision and policy).

But does the dairy industry have sufficient capacity to support this level of program development? And which programs of work should take priority?

These questions will need to be further explored if the industry is going to embrace the development-led innovation model. Some preliminary thoughts are presented below.

Dairy industry capacity in Program Development

The dairy industry currently has limited capacity for program development as described by the new model. While some projects have experience in development-led innovation, the mega-task for the dairy industry will be to 'develop its development capacity'.

Some challenges ahead

- A change in culture: where resourcing joint action across agencies to develop programs and pretesting of the 'route to change' are part of the landscape
- Getting the right person as development leader: only a handful of people in the industry currently have the right skill set and experience

This is a large task and will require industry leadership, a strategy, dedicated resources and articulated outcomes if it is to happen.

Some thoughts for the organisations who might lead the industry in 'learning by doing' are:

- ▶ Understand what it is you are investing in and be interested in the outcomes. Its only when the appropriate mix of key players engages effectively that significant breakthroughs in thinking are made.
- ▶ Make strong connections between program development leaders in different domains. Build a community of practice around program development so peers can talk to and learn from each other.
- ▶ Pick areas of work that have a good chance of success.
- ▶ Don't create impossibly tight timelines.
- ▶ Provide the resources - and make a significant investment in the capacity to make sense of how things worked and why.
- ▶ Value the outputs (which are sometimes learnings rather than 'runs on the board').
- ▶ Be able to talk to others about the outcomes of the effort.

What is required...

- Key players adequately resource their involvement (which assumes the program objectives are of specific interest for their business or organization)
- Being able to work through the development process until a point of clarity is reached - knowing 'the prize' and keeping it firmly in focus

Setting programs of work for RD&E

One of the major aims of the Dairy Moving Forward committee was to set national RD&E priorities - the industry's opportunity to identify major programs of work that would benefit from a collective effort.

To this end the committee has examined research priorities across the existing industry platforms as part of the first module. This provided insight into new technologies on the horizon and knowledge gaps. However it is risky to decide which domains of work take priority solely on the basis of research priorities as:

- ▶ The effort tends focus on “how do we take this research to market” rather than identifying the nature of the desired change and planning for it.
- ▶ It often results in several projects that then operate as independent satellite activities unless it is clearly established how they contribute to platform goals.
- ▶ It makes it more difficult for new and important issues to slipstream with the RD&E effort.

Consequently attention was turned to ways of broadening the priority setting process for future use. The working group mapped a process for collective industry RD&E priority setting action (see next page) with the following features:

- ▶ The process is cyclical and it has three main pushes: to identify industry issues; decide on the portfolio of work; and developed a plan of action.

- ▶ Those whose livelihood comes from dairy (including farmers and manufacturers and service providers) and those others who also fund dairy RD&E (taxpayers in the community) should have a voice in the priority setting process. Furthermore it's important to ensure the process seeks input from a range of farmers rather than locking on to certain farming segments.
- ▶ There is then emphasis on putting the issues into context before setting priorities. This involves having an understanding of the key shaping factors of different client groups so that the decisions are more client-centred.
- ▶ Portfolios of work are then based around the strategic priority areas. A new and significant step here is to set the ‘change’ objective: what the industry is trying to achieve in this domain - the nature of the change and the scope of the program.
- ▶ Another major shift when “deciding the portfolio of work” is to identify the organisations to be involved in the program development and specify their roles and responsibilities.
- ▶ The final push of this process - to ‘act’ - refers to the development of each program of work as described in the first section of this report and delivery of the effort to its target audiences.

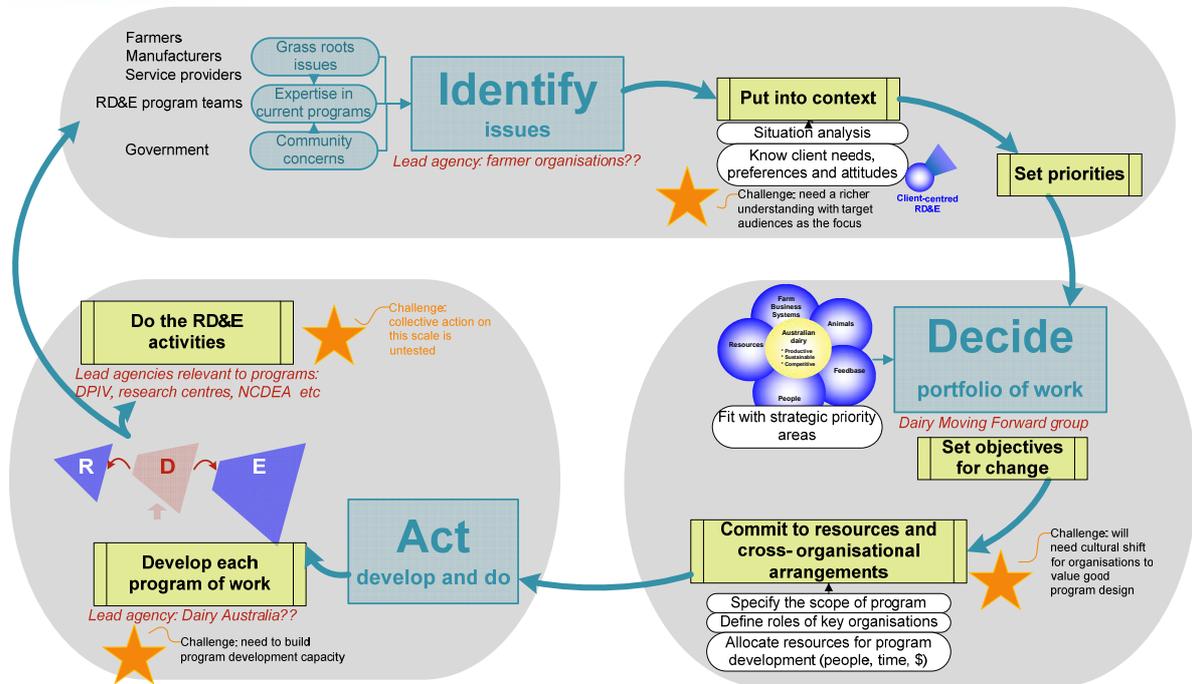
A map of Collective industry RD&E priority setting presented to the DMF committee



Joint RD&E priority setting & action

an enhanced process

12 March 2010



References

Christensen C. The Rules of Innovation, *Technology Review* 105 (5): 32–38, 2002.

Coats S, Phillips C, Noble C, Roche D. Dairy Moving Forward: a national research, development and extension strategy. Dairy Australia, September 2009.

Douthwaite B. Enabling Innovation: technology- and system-level approaches that capitalize on complexity, *Innovations*, Fall 2006.

Lawrence DN. Learning as participation in grains research, development and extension in Australia. Thesis submitted for Doctor of Philosophy, Griffith University, January 2006.

Nettle R. The development of a National Dairy Extension strategy – a literature review. Final report to Dairy Australia, 2003.

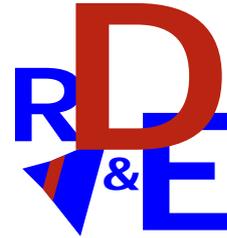
Program Development checklist

Draft 27 April 2010

Program Development considers the context in which a technology is to be used, the nature of the desired change, its value to the key players and features of the commercial environment that will enable the change to happen.

Use this checklist to grow the knowledge-base of the domain. Questioning is usually iterative: moving from the 'big picture' to specifics, testing understanding and adjusting the design accordingly.

Development-led innovation



Establish a dynamic program development team

Provide a formal forum for joint action that enables good strategy design by considering the diverse interests of multiple stakeholders.

- Are the relevant organizations participating in the program design?**
Does the program development team represent the various industry interests?
Do group members have the authority to make decisions and commitments on behalf of their organizations?
- Are the collaborating organisations sufficiently in the same space?**
To what extent does each agency want to achieve the industry objective?
How effective is the group engagement for technology development? Are discussions honest and productive? Are members comfortable to say what they really think?

Locate program activities on the RD&E spectrum

Have RD&E activities in the same domain inform the thinking of other efforts in that domain.

- What activities (nationwide) belong in this domain of work?**
Do the activities contribute to 'R', 'D' or 'E' in terms of the new model?
How do the activities contribute to the domain and to the specific program objective?

Understand the businesses of key players

Place the technology in context of its users and provide industry with a rich source of ideas for future directions.

- Who are the key players?**
Who is likely to be interested in the technology (farmers, service providers, organizations, industry sectors)? Are the groups segmented in any way?
- How many are there?**
How many people would this involve?
Where are they (geographical spread)?
- What is the nature of their businesses? (What interests them?)**
How do the businesses or organizations currently operate in this domain? What are their strategic drivers? What factors determine their clients' priorities and needs? Is there a seasonal influence?
How does the new technology fit with their business?
What is the business growth potential (with regards to the new technology)? How might they benefit from (using or aligning with) it?
Are there any competing interests?
- What are the key factors shaping the actions and intentions of target audiences?**
How well does the industry understand the factors that shape the way farmers or service organizations act in this area?
Are the reasons for making a change likely to vary for different segments (for example farmers with different attitudes and beliefs about farming)?
Are we able to track the key shaping factors?

Decide the nature of the desired change

Develop program outcomes which represent the benefits for the target audience (preferably in terms of the extent of the desired change).

- ❑ **What is the industry objective in getting the technology out there?**
- ❑ **What are appropriate outcomes for the program?**

By what pathway will the change come about? What are the assumptions here?
What are the leverage points?
Who is the most appropriate agency to enact the different interventions?
What are the benefits for each stakeholder (nature and size)?
What are the risks of participating?
Is there any timing for delivery of the program in the wider target audience that is more conducive to change?
What factors (government policy, regional interests, industry capacity etc) might affect the outcome being achieved in full? Which of these can be influenced? How?
- ❑ **Are the program outcomes appropriately pitched?**

How well do the proposed outcomes align with the industry objective?
Will all stakeholders regard achievement of the outcomes (the new position) as “success”?
How good a fit are the proposed outcomes with the businesses of the agencies involved?
Are the program outcomes SMMART? (specific, motivational, measurable, achievable, realistic, timebound)
- ❑ **What are the program’s key messages and principles?**

How well do the program principles represent the worldviews for this domain?
Do the principles help people make sense of the recommended way of acting?

Identify features of the enabling environment

Establish what capacity is needed by the people and systems involved.

- ❑ **How well does the technology fit with existing practices (and farming systems)?**

How does the program accommodate different levels of needs in the target audience?
Can the target audience readily assess the applicability of the technology to their situation?
How intuitive is it (will it be) to use?
How practicable is it?
What skills are necessary to be able to make the change? Are there currently pathways that people can take to develop these skills if they need to?
- ❑ **What is the current capacity in industry to support the desired change?**
- ❑ **What culture change is needed for the target audience (farmers or service providers) to think to use the technology at key times?**

Design a 'route to change' strategy

Design a strategy that fits with the roles of the people involved and is robust enough to work well even when not perfectly optimized.

- ❑ **What is the value proposition for key players?**
In what ways will the technology benefit their business?
How willing are stakeholders to actively contribute (or co-invest) to the program?
Why?
- ❑ **What are the potential routes to market?**
What are the possible points of entry for the technology into the market? How will the demand for the products and services be created? How might users access the technology?
Who is likely to advocate the technology?
How influential are they?
Are any organizations likely to act as gatekeepers?
How should the effort be branded?
- ❑ **What are the strategy options?**
What is the context in which farmers are making decisions about the issue? How might this context affect the design of the strategy?
What are the pros and cons (SWOT) of different strategies? (strengths, weaknesses, opportunities, threats)
How can the program development team increase confidence that the proposed approach will work?
- ❑ **Is the strategy design consistent with broader situation?**
How consistent is the strategy with other (legal, political and environmental) considerations?
How consistent is the strategy with recommendations from other programs?
Are there any competing or aligned programs?
Is the proposed approach a win-win for all involved?
- ❑ **How flexible is the strategy design?**
How effective is the strategy likely to be in different (eg regional) conditions?
How might the approach be affected by changes in the future?

Pilot the approach in the target audience

Refine the program design so it effectively achieves the desired change and outcomes.

- ❑ **How well did the pilot test the design of the 'route to change'?**
How rigorously was the pilot process reviewed? What was the evaluation's primary focus?
How well does the program 'mesh in' to existing systems? How did users adapt the technology and did this improve its fitness? What were the changes in process?
In what ways was the pilot 'environment' different to the 'larger world'?
- ❑ **Should the approach (program design) be changed substantially?**
Does the strategy need a minor or major revamp as a result of the pilot? How will the program recognize it's on the "wrong bus"?
- ❑ **How confident is the development team that the approach is commercially feasible?**
Can the team now write a business case for 'Extension and Education' that:
 - States the program's objectives and the nature of the desired change
 - Puts the program into context (industry opportunity and strategic priority)
 - Outlines the 'route to change' and its rationale: noting key stakeholders, the value proposition for each and assumptions that have been made
 - Estimates the likely return on the investment and describes the benefits, required resources and costs, and risks (of proceeding and of doing nothing)
 - Describes delivery activities, deliverables and dependencies
 - Describes the evaluation strategy: how progress will be reported and outcomes will be measured and evaluation activities
 - States the program leadership and governance

Position description: Program Development Leader

Purpose of the position: To build the dairy industry's capacity to deliver benefits and innovation to farmers through leadership of collaborative RD&E efforts in the [program domain].

Position summary: The incumbent is a member of ...[*Dairy Australia's Farm Productivity Development Group for example*]... and is responsible to the group leader for managing change and innovation. They are primarily responsible for the design of a 'route to change' to deliver benefits of new technologies to farmers in the ...[*program domain*].

The work is highly collaborative and requires frequent connection with organizations that have interests in the ...[*program domain*]. It entails maintaining progress in the program's development, providing vision and direction to the effort and ensuring effective investment. The person in this role also has the responsibility for helping ...[*Dairy Australia*] set RD&E priorities for this domain.

Key challenges for this position are managing finite resources to achieve quality outcomes for stakeholders whose organizations will be at different stages in their own development cycle. The position will require participation in state and national forums, some out-of-hours work, and domestic and international travel.

Core responsibilities

1. Lead the core development group for ...[*program domain*]: articulating a clear vision, coordinating the effort, developing a full understanding of the context that the technology is to be released in, synthesizing feedback, determining priorities and shaping the strategy path, monitoring progress, enforcing timelines, and identifying new RD&E opportunities.
2. Create relevant network linkages and build cross-sector relationships at senior levels of industry to ensure stakeholder satisfaction with the level, quality and outcomes of the ...[*program*] and ...[*Dairy Australia*].
3. Broker industry agreement between key players, promote alignment of organizational teams and resource with new strategies.
4. Make informed contributions to priority setting in the ...[*Farm Productivity and Development Group*].
5. Manage the ...[*Dairy Australia*] budget and contractual agreements for the program development.
6. Advise on opportunities for new business and business partnerships.
7. Respond strategically to emerging issues.

Selection criteria

8. ...[*A relevant tertiary degree and demonstrated exceptional management expertise OR equivalent*]
9. Demonstrated leadership skills including the ability to recruit and unite team members to a common purpose and achieve high levels of performance in a complex environment
10. Track record in initiating and establish strategic partnerships with corporate and community organizations or advancing public policy at a regional or state level
11. Proven ability to exercise sound judgment in complex decision-making
12. Superior communication and interpersonal skills including the ability to present information clearly in person and in writing, persuade and negotiate, and interact effectively
13. ...[*An established professional reputation with an in-depth understanding of agricultural and/or livestock issues*]

Desirable attributes: High-level understanding of the change management; ability to attract resources to an effort.

Glossary

Action research is a collaborative method of testing ideas and implementing action for change that involves systematic cycles of planning, taking action, observing, evaluating and critical reflecting (Wikipedia).

Business case describes how a specified approach will meet a business need and why this investment is important.

Commercialisation refers to the process of transforming something into a product, service or activity that is of value to consumers.

Community of practice is a group who share a concern or a passion for something they do and learn how to do it better by interacting regularly. A community of practice has three defining characteristics: (1) commitment to a shared domain of interest; (2) the building of relationships that enable them to learn from each other; and (3) practicing within the domain (from www.ewenger.com/theory).

Innovation through people refers to peoples' capacity to adapt and behave creatively. This is important for internal improvement as well as survival. Learning, negotiation and facilitation all feature in innovative practice.

Marketing creates awareness helping generate opportunities for someone to test a product or service by increasing its visibility and name recognition (Wikipedia).

RD&E refers to Research, Development and Extension. Traditionally in agriculture:

Research helps explain the nature of things and prompts ideas for practical applications.

Development is creative work undertaken to increase the use of a stock of knowledge.

Extension (in agriculture) conventionally refers to the voluntary adoption of new practices through processes that provide information, opportunity and persuasion.

The meaning of RD&E in the "Development-led innovation" model is as follows:

Scientific Research ('R'): Activities that test a null hypothesis using systematic, reproducible methods in a sample of the population of interest.

Program Development ('D'): The design of the 'route to change' that sets the scene for widespread uptake and innovative use of new technologies (knowledge, service or product) by target audiences.

Extension and Education ('E'): Activities to (1) commercialise the new technology; and (2) build capacity to help individuals, networks and communities meet their own potential through practice change on farms and/or in the enabling environment.

'Systems thinking' considers a part in detail while keeping the whole in focus. The boundaries of the system and level of detail are subjective and value-laden judgments (Lawrence 2006).

Simple systems encompass basic issues (for example around technique and terminology) but once these are mastered following the "recipe" carries a high assurance of success.

Complicated systems usually imply larger, more involved domain constructs that have issues of coordination or specialised expertise. However, once successful, there can be a relatively high degree of certainty of outcome repetition.

Complex systems are based on relationships and their properties of self-organisation, interconnectedness and evolution. A formulaic approach has limited application.

From www.learningforsustainability.net
Example of a complex system: Raising a child provides experience but no assurance of success with the next. Expertise can contribute but is neither necessary nor sufficient to assure success. A number of interventions can be expected to fail as a matter of course. Uncertainty of the outcome remains. You cannot separate the parts from the whole. The most useful solutions to problems usually emerge from within the family and involve values.

Technology is knowledge, techniques, methods or products that people can use to adapt to their environment. In this paper technology encompasses new products, knowledge or services.