

FUTUREDAIRY

In Brief
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**A national investigation into
Forages, Feeding and Innovations
for future dairy farming systems.**

Investigators:

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SUMMARY

FutureDairy is a national study to evaluate technologies and farming systems aimed at improving productivity of Australian dairy farms in the future. It addresses the predicted challenges of increased cost and reduced availability of land, water and labour, while recognising the importance of lifestyle-related issues.

FutureDairy looks at:

Forages – concentrating resources (water, fertiliser, management) onto less, but more productive, land with a target yield of 40t DM/ha/yr;

Feeding – comparing the benefits of using more bought-in feed to increase stock numbers or production/cow when the aim is to increase enterprise size; and

Innovations – assessing implications of on-farm adoption of innovations that will either save labour and/or allow more precise farming in a future farming systems context. A major innovation to be adapted to Australia’s pasture-based farming system is automatic milking.

FutureDairy is unique in that it is multidisciplinary (recognising the importance of technical, extension and social research), has formed partnerships with farmers to make results more applicable on-farm, and has a strong focus on issues of sustainability (economic, social and environmental).

Social Research is studying the interactions/communication between technical research, extension and farmers to identify the factors farmers consider to be important when deciding on whether to adopt new technology. These studies will contribute to the development of more effective RD&E programs.

BACKGROUND

A 2004 survey commissioned by Dairy Australia indicated that dairy farm productivity had only improved by 1.6% per annum over the past several decades. This small incremental increase in productivity was despite relatively large investment in research, development and extension.

In response to this revelation, the industry wanted to explore ways of obtaining a ‘quantum’ leap in productivity. To focus research on meeting future needs, one approach is to ‘predict’ what the future farm may look like. However, this is difficult and it is probably more relevant to identify the pressures that will forge future farm systems. The two obvious pressures are resource competition and labour management/lifestyle issues.

To address these ‘pressures’, FutureDairy’s activities are based around three priority areas – Forages, Feeding and Innovations.

Resource Competition

Land and water will be the key resources to come under increasing competition from other agricultural pursuits, urban development and environmental demands. As a consequence, the cost of land and water will inevitably rise and their availability will fall.

The response to this will be to produce more from each hectare, either by *growing more* (the **Forages** module), or to *bring-in more feed* (the **Feeding** module).

FutureDairy’s Forages and Feeding modules both address the issue of increasing enterprise size in order to spread overhead or fixed costs over more litres of milk, therefore sustaining or improving terms of trade. In the past, farmers have opted to buy more land to increase herd size, but suitable land is often not available in close proximity and herds are now so large that it is often not energy-efficient to walk cows to and from the large areas of pasture required.

Labour management/Lifestyle

The issue of lifestyle is becoming increasingly important for dairy farmers and often rivals profitability as a criteria for investment. The critical labour issue is of course the ‘anti-social’ conditions of milking cows twice-a-day, very early mornings under relatively poor working conditions.

This situation becomes worse as herd size increases. As a consequence management often suffers and there is just no time to contemplate more precise farming.

In fact, reasons for not adopting new technology and practices shown to increase profitability, are often due to the extra work or management complexity. These lifestyle issues impinge on the quality of employed labour and also the willingness of young people (including the farmer’s children) to enter the industry, hence threatening the future growth and sustainability of the industry.

FutureDairy’s **Innovation** module addresses this labour issue by investigating/testing innovations that improve labour efficiency – (automatic milking, video imaging of farm locations) or allow precision farming without more labour needs – (remote sensing of animal and pasture status).

SCIENCE

Our science program is based at NSW Department of Primary Industries' Elizabeth Macarthur Agricultural Institute (EMAI), at Camden, 70km south west of Sydney and is led by Dr Yani Garcia.

The three components comprising the technical research part of the study are outlined below – Forages, Feeding and Innovations.

➔ Forages

Our objective is to produce more than 40t dry matter (DM) /ha/yr of acceptable quality forage for dairy cows in a sustainable way (both economically and environmentally) through a 'complementary forage rotation' as follows.

- a bulk crop (eg maize);
- a legume for nitrogen fixation (eg Persian clover); and
- a forage to provide a pest/disease break and to aerate soil (eg a brassica).

The target yield of 40t DM/ha/yr has already been achieved in the initial 36 months using this complementary forage rotation. However, this is a long-term study with the practices and forages used likely to change with experience. Four paddock-scale replicated plots are grazed or harvested where appropriate and compared to a more typical grazed kikuyu/short rotation ryegrass system. This pasture system has produced more than 17t DM/ha/year in the past 3 years.

Although at first glance such a system may seem environmentally threatening, we believe it is exactly the opposite. It seems more sensible to concentrate inputs (water, fertiliser, drainage etc) on a smaller area to be managed well and allow the less favourable agricultural land to revert back to nature or other pursuits.

➔ Feeding

Our Feeding module is investigating if it is more profitable to use extra bought-in feed to more cows (ie increase stocking rate) or to increase production per cow.

The options to be tested at EMAI are as follows:

- increase stocking rates from 2.3 to 3.4 cows/ha (or \approx 50%) but retain per cow production;
- lift production/cow by 50%; and
- lift production/cow by 50% and increase stocking rate from 2.3 to 3.4 cows/ha (or \approx 50%).

We are using a closed farmlet system for each treatment (pasture blocks and cows matched between farmlets). The actual stocking rate used is based on predicted DM yields. This design means the results will be extrapolatable to areas with different productivity as the principles will still hold.

Within the treatment groups there will be a range of genetic merit for production for individual cows such that the influence of 'treatment' on genetic merit will also be able to be investigated. The adaptations to management needed, and the changes in performance (reproduction, production, pasture utilisation, animal behaviour) resulting from lifting production by 50% should be of great interest to farmers.

Innovations

FutureDairy's Innovations module involves testing and evaluating innovations that save labour and lead to more efficient farming, within future farm systems at EMAI.

INNOVATIONS WHICH SAVE LABOUR

Automatic milking systems (AMS) are the obvious labour saving technology. A robotic arm attaches the cups to the cow when she voluntarily comes up to be milked.

This is a whole new approach to dairy farming – the animals come to be milked when they get the urge, and this urge is primarily determined by hunger, rather than milk pressure in the udder.

The number of visits can be manipulated by type, amount and placement of feed and by rejecting the cow (auto-drafting) when not required. On a typical European farm 2.3 to 2.5 visits per cow per day are common.

Overseas results suggest that cows are less stressed and this is reflected in lower disease incidence (lameness etc.) and improved lifestyle for the farmer with a '9 to 5' job. The labour needs are reduced and skill requirements change from 'milking' to technician or to a person that now has time to focus on farm and herd managements.

There are about 3000 automatic milking units in the world and almost all are in feedlot situations or associated with systems of grazing where pasture utilisation is not that important. In contrast, Australian dairy farms need to retain a high rate of pasture utilisation which is pivotal to the economic viability of the industry. To become a viable option in Australia, and other broad acre dairy farming systems, the following issues associated with automatic milking need to be addressed:

1. maintenance of a high level of pasture utilisation
2. appropriate frequency of visitation to the AMS; and
3. adequate cow (or milk) throughput of the AMS.

Appropriate frequency of visitation

In feedlot dairies it is relatively easy to use a new feed source to entice cows to move through the unit to be milked. When cows graze it is more difficult, as they need to be enticed to walk a lot further to the unit and then return to pasture.

We are fortunate that we can use many different feed supplements to do this enticement; for example allocation of pasture (frequency and amount), supplement type, times available and where and shade and water. These are the variables we will be investigating in an attempt to optimise visitation and production.

Adequate cow throughput

The present automatic units can cater for about 60 cows for a capital cost of about \$200,000/unit (excluding associated facilities) and are not competitively priced with the costs of building a conventional dairy.

However, FutureDairy is collaborating with a major milking machine manufacturer to substantially improve cow throughput. The units were installed at Camden in late April 2006. A pre-requisite for undertaking research on automatic milking at Camden was to find a manufacturer of the equipment that had a similar vision to ours for adoption of AMS into the Australian dairy farm system and was willing to donate the equipment required.

After discussions with several companies, FutureDairy selected to work with DeLaval which approached us and indicated they were interested in working with us to develop a system around the voluntary milking units that would be appropriate to Australia’s pasture-based system with large herds. They agreed to provide us with two robots in view of the appropriateness of our systems research and resources, our association with, and knowledge of, the dairy industry in Australia and our ideas on a new concept for a AMS that would have far greater throughput than the existing units.

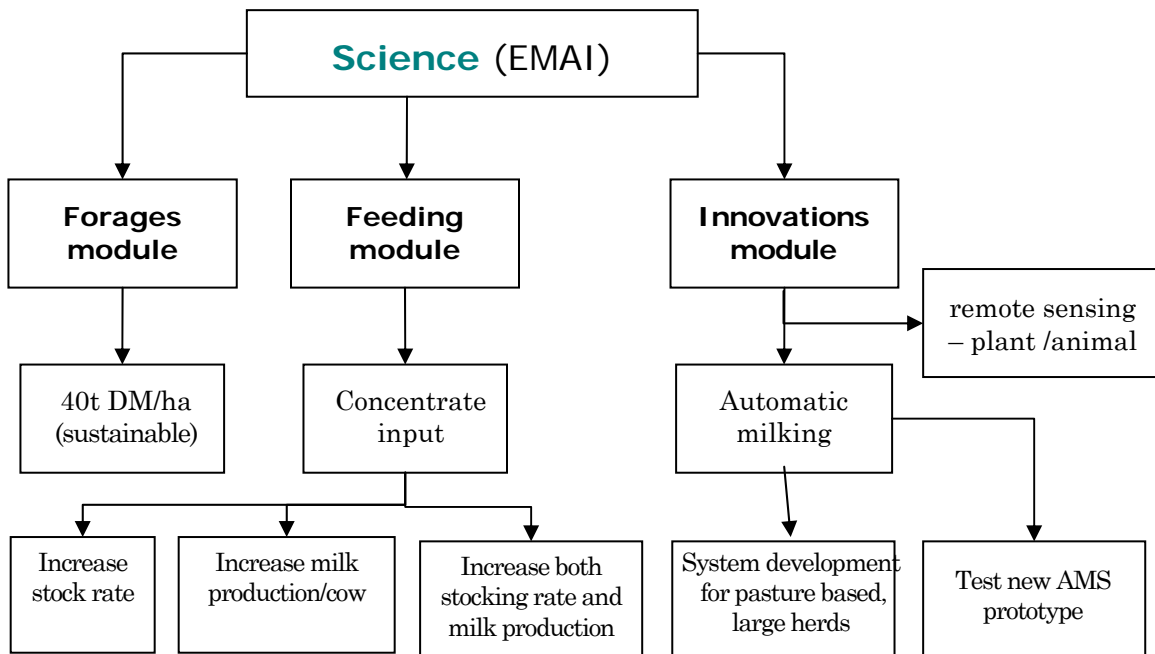
INNOVATIONS WHICH ALLOW MORE PRECISE AGRICULTURE

FutureDairy is evaluating other innovations that will allow farmers to more precisely manage their farms without more labour input. They include:

- remote sensing of rumen function, particularly pH;
- video imaging of key areas of the farm – e.g. calving cows; and
- remote sensing of pasture mass.

➔ Program structure

A schematic representation of FutureDairy’s science program and its various modules is shown below.



SYSTEMS (extension)

FutureDairy is taking a ‘farming systems’ approach. Our research is done in the context of a ‘holistic’ approach to the dairy farm business. Our multi-disciplinary team is interested in how technical research findings can be adapted to accommodate social, production, environmental and other issues that influence how new technology is adapted by commercial dairy farms. Such adaptation requires a better understanding of these non-technical issues and our Social Research program is addressing this.

In addition to conducting trials on the research farm (Science), we are exploring how our findings work on commercial farms (Systems). We also use social research to understand the social issues involved in taking on new practices and technologies (People). Partner Farms are at the heart of this approach because they provide the link between science, systems and people.

Partner Farms

While FutureDairy’s science program at EMAI can provide results on performance of various systems that have been evaluated under controlled conditions, the impact on management and lifestyle cannot be accurately assessed here. FutureDairy’s Partner Farmers provide the essential link between the research farm and commercial reality.

Partner Farmers are commercial dairy farmers who work closely with the FutureDairy team. They allow us to explore the practical implications of our research in Forages, Feeding and Innovations.

In Victoria, we have a ‘Forage’ farm in the Macalister district and links with an automatic dairy at the Warrens, the only farm using AMS in Australia. There is a second forage partner farm in South East South Australia and a Case Study farm on forages on the North Coast of NSW.

Extension

FutureDairy’s Extension Leader, Sean Kenny, is responsible for extension. In particular, he is the ‘conduit’ between the technical research team at EMAI, the Partner Farms and industry extension providers in NSW, Victoria and South Australia.

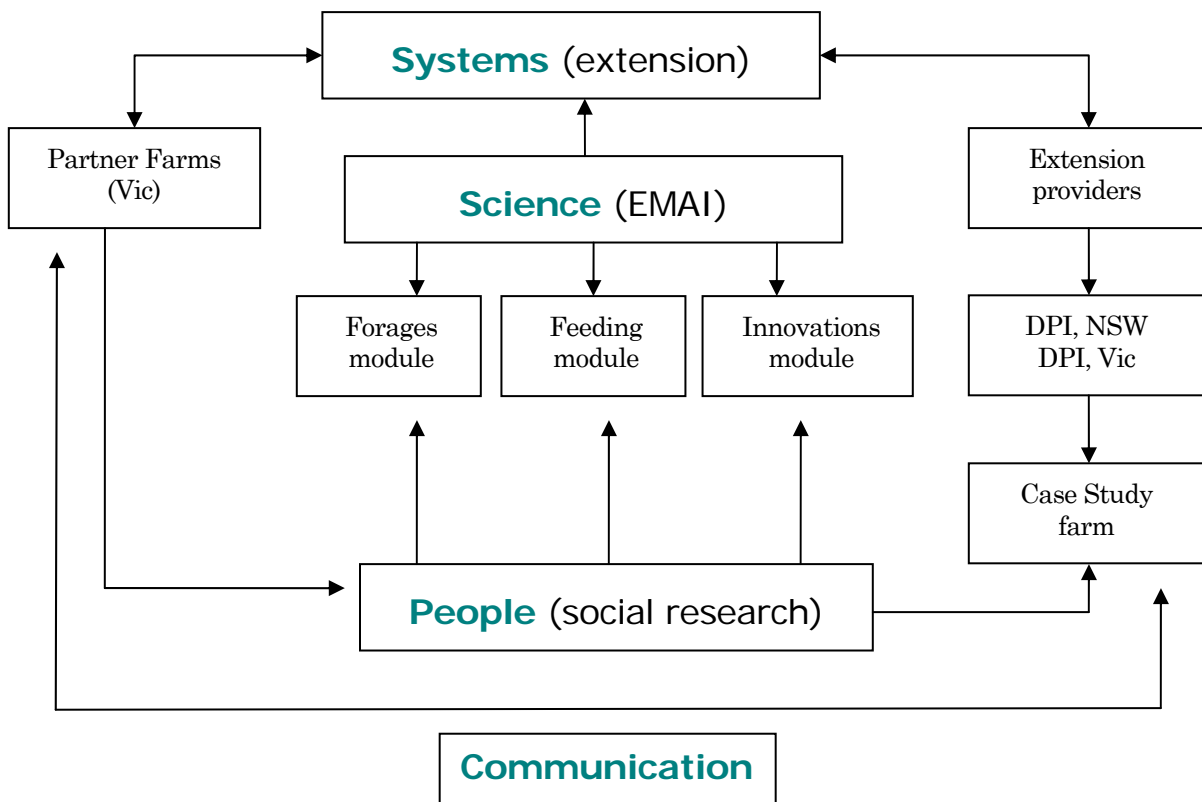
In NSW, the Department of Primary Industries’ (DPI) extension program, Dairy Pathways, is being developed to run in parallel with this study. Case study farms may also be set up by DPI NSW on farms that have adopted ‘systems’ similar to those being evaluated at EMAI. Monitoring on case study farms will be at a less intense level than on the Partner Farms.

PEOPLE (social research)

The interaction between the science research group at EMAI, Partner Farms, extension providers, case study farms and associated discussion groups will be studied by FutureDairy’s social research team, led by Mark Paine and Carolyn Kaboré from the University of Melbourne. They will study how farmers make decisions about adoption/adaption of new technology. This is particularly important for FutureDairy because most of the technologies being tested would have a major impact on management and lifestyle of dairy farmers. Feedback from the social research team to the other staff will be ongoing and should improve farmer awareness of the technologies and provide better mechanisms by which farmers can decide on whether or not to adopt.

PROJECT STRUCTURE

All the components of the project are shown schematically below.



OVERSEEING GROUPS

Because FutureDairy is a very large and complex project, a series of overseeing groups has been set up to improve coordination and evaluation.

➡ Steering group

The steering group represents stakeholders (in the broadest sense). Its function is to guide overall policy and direction and maintain communication at that level. We are fortunate to have four dairy farmers on this group representing dairy farmer organisations, Mr. Michael Perich (NSW Farmers Association), Mr. Peter Neal (DidCo), Mr Ian Zandstra (Dairy Farmers Supply Coop) and Mrs Shirley Harlock (Victorian Dairy Farmers), who is also the Chairperson.

➔ Management group

The management group, as its name infers, is responsible for operational management of the project and is the most direct line of accountability and coordination of the group, and consists of the key investigators, Bill Fulkerson, Yani Garcia, Carolyn Kaboré, Mark Paine, Kendra Davis and Sean Kenny. A broader Management Group meets less frequently and has representation from the National Farming Systems Project (Program Leader, Anne Crawford), Communications (Lee-Ann Monks), NSW DPI (Tim Burfitt) and DPI Victoria (Dan Armstrong).

➔ Farm group

The farm group comprises the research and technical staff involved in the science program at EMAI to ensure smooth operation of the project within the broader management of EMAI.

SPONSORS

The following organisations are major financial sponsors of FutureDairy:



NSW DEPARTMENT OF
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**University
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The following organisations also provide funding:



**Dairy Research
Foundation**