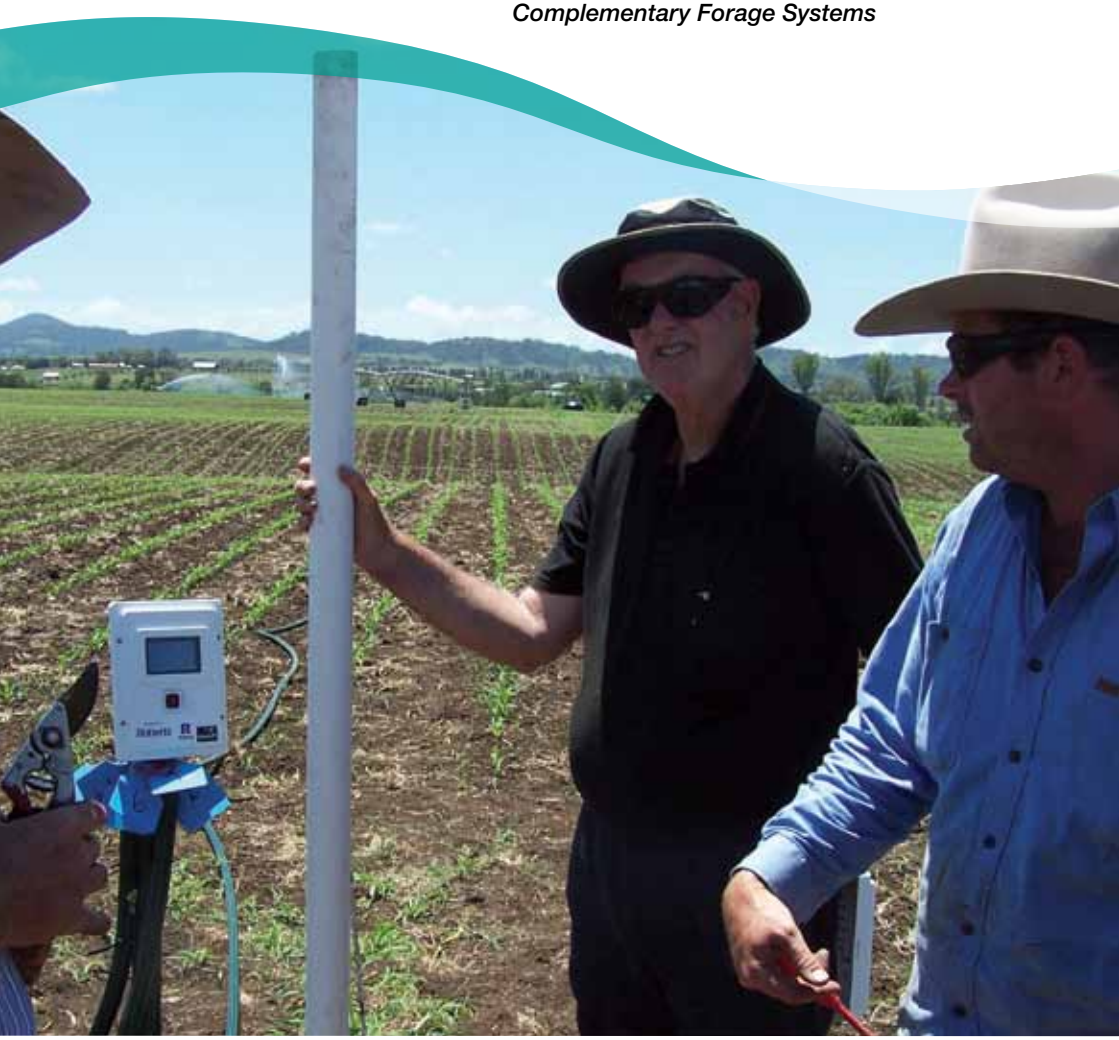
FUTUREDAIRY

Complementary Forage Rotations in commercial farms

Producer experiences of implementing Complementary Forage Systems



NSW Department of Primary Industries

THE UNIVERSITY OF SYDNEY

DeLaval

Dairy Australia
Your Levy at Work

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The six cooperating farming families and their staff:

The McDarmonts of Wyvern Park

The Simpsons of Denman

The Butlers of Denman

The Richardsons of Gresford

The Allens of Scotts Flat

The Williams' of Vacy

The FutureDairy project in the Hunter Valley

FutureDairy is an industry-driven national project investigating alternative systems to increase on-farm productivity and innovations that have the greatest potential to impact on dairy farmers' economic well-being and lifestyle. Specifically, the feed base goal of the FutureDairy project is to sustainably intensify home-grown feed on farm, to enable more efficient use of land, water and grain. The main investigation has been a complementary Forage System (CFS), involving triple cropping up to 35% of the farm area, with pasture covering the remaining 65%. Six farmers in the Hunter Valley agreed to collaborate with FutureDairy's research team and NSW DPI's dairy extension group to better understand how a CFS could benefit commercial dairy farms.

This booklet outlines the journeys of these six dairy farmers in implementing Complementary Forage Systems.

Five of the milk producers selected felt that they had almost reached the highest dry matter yield from pasture that would be sustainable on their farms, and were looking at new ways to improve dry matter production on farm. One farm was included in the project as a control comparison.

For more detail on the FutureDairy project and its research outcomes, see www.futuredairy.com.au

Contents

Executive summary

Six farmers in the Hunter region have been central in a project that monitored the decision making processes and efficiency outcomes of implementing Complementary Forage Systems (CFS) on their farms. Five farms implemented various pieces of information from the FutureDairy research results in ways that fitted with their existing farm management goals, and one farm was monitored as a control comparison. All six farms increased their home-grown feed utilisation throughout the two years of monitoring; all six farms reported increased confidence in making feed-based decisions, and farmers reported that use of the CFS principles had placed their businesses in a lower risk position due to the planning processes inherently involved. The farms achieved the results without significant capital expenditure or increased infrastructure. There have been a number of benefits to farms identified, both in technical areas and in social or learning benefits to farmers.

Terminology

Complementary Forage System (CFS) refers to the whole farming system—that is, the combined pasture and forage cropping area.

Complementary Forage Rotation (CFR) refers to the area allocated to double or triple cropping.

Making the decision to implement CFS on your farm

When deciding whether a Complementary Forage System is for you, there are some key points to consider. A separate TechNote addressing Planning a CFS, produced by FutureDairy, is available to help you in more detail, at **www.futuredairy.com.au**

In summary, there are four key points to consider prior to making any decisions.

1. The economic implications of any change on all aspects of your farm.
    - For example, if you plan to increase herd size to utilise the extra feed, how will you fund this? Will you need to invest capital into machinery or facilities? Initially, will you need to purchase extra feed in order to grow the first crops of a CFR cycle? Will you need extra labour at different times of the year and will cashflow month by month allow you to pay for this?
2. Potential factors that may limit the implementation of CFS on your farm.
    - If you need to irrigate, do you have a reliable and cost-effective water supply? The maximum benefits of the CFR and CFS concepts will be obtained where at least some irrigation is available to secure crop yields.

- Access to suitable cropping areas—are they able to be grazed for some of the year, or will you need to conserve all the complementary forages on this area?
- Access to contractors and good agronomic advice.
- Weed burden.

3. The impact of CFS on your farm management.
    - Timing and availability of contractors.
    - Cow flow—will you need to change cow movements to secure the cropping area?
    - Grazing rotation of forage crops on the CFR area and fitting these in with other parts of the farm.
4. Factors associated with crop selection.
    - Cow ration requirements.
    - Crop nutrition factors—soil type, fertiliser regimes, weed control issues.

The six Hunter farmers needed to consider these issues too, and you can see these highlighted like so in their case study pages:

Major considerations on this farm:

- **Economic implications.**
- **Potential limiting factors.**
- **Impact on farm management.**
- **Crop selection.**

Wyvern Park Dairy

The McDarmont Family and manager Tim Freeman

Increasing milk production with same area

The big ticks for Wyvern Park:

- ✓ **Use of brassicas as early autumn high-quality feed.**
- ✓ **Mixing species more strategically, resulting in a more balanced forage component year round.**
- ✓ **Supplying milker quality feed every day of the year.**
- ✓ **Lowered risk.**
- ✓ **Scheduling irrigations according to soil moisture monitoring data.**

Background

Ross and Cheryl McDarmont own and lease a total 112ha of irrigated milking area. Ross, with manager Tim Freeman, has for many years aimed to maximise turnover through litres produced per hectare, utilising as many low-labour options as possible. Centre pivot irrigators, use of liquid fertilisers through the pivots, and the use of natural mating in strategic batch calving are all examples of this less labour-intensive management.

To maintain the cashflow required, the farm was supporting high stocking rates all year round on the milking area. The pasture base, while performing well under high nutrient input and tight grazing rotations, was providing only 55% of the milk over a year. Ross and Tim had used maize silage before in small amounts. Summer and early autumn had traditionally been times of feed shortage.

Initial farm goals

- Increase total milk produced per hectare.
- Produce 30,000L/ha and 8,000L/cow.
- Increase yield of maize crop to 25t DM/ha.
- Increase area sown to maize.

Farm overview

- 112ha milking area.
- 400 milking cows, calving in two batches.

<table>
<tr><th colspan="3">2009</th><th colspan="2">2010</th><th colspan="2">2011</th></tr>
<tr><th>Jul–Sep</th><th>Oct–Dec</th><th>Jan–Feb</th><th>Mar–Jun</th><th>Jul–Sep</th><th>Oct–Dec</th><th>Jan–Feb</th><th>Apr–Jun</th></tr>
<tr><td>Annual ryegrass</td><td colspan="2">Maize</td><td>Brassica and annual ryegrass</td><td>Annual ryegrass</td><td colspan="2">Maize</td><td>Brassica and annual ryegrass</td></tr>
<tr><td>Yield t DM/ha</td><td colspan="2">21</td><td colspan="2">14.8</td><td colspan="2">20.1</td><td></td></tr>
<tr><td>Cumulative yield</td><td colspan="6">November 2009–October 2010: 35.8t DM/ha
March 2010–February 2011: 34.9t DM/ha</td><td></td></tr>
</table>

- Pasture base a mix of perennial and annual ryegrasses, lucerne, clover and forage sorghum over summer. Kikuyu being introduced across much of the farm.
- Seven people work on the farm.

Fitting complementary forages into farm system (CFS)

Ross and Tim had already planned to increase the area sown to maize, from 12ha to 17ha. In the second year of the project, this area increased again to 20ha. Sowing brassica in with the short term annual ryegrass after the maize produced a high-quality feed with quick establishment, adding to the production of the Complementary Forage Rotation (CFR) area.

Other complementary crops were also sown for the first time, increasing the quality of forages across the year and reducing the pressure on ryegrass pastures. Continued reliance on contractors for sowing and harvesting suited the farm management system.

Major considerations on this farm:

☑ **Impact on farm management**
- A larger CFR area has placed pressure on remaining grazing areas over the summer period.
- Availability of contractors is vital.

☑ **Crop selection**
- Selecting maize varieties that supply both quality and yield.
- Selecting best paddocks to add brassicas into species mixes.

"Increasing the CFR area has worked well."

Comments from the project team

Ross and Tim are both competent managers, and had a successful pasture management system prior to entering the project. Over the two years, we have seen a much broader range of thinking when planning forage options, with the two considering a broad array of information from different sources, to make the right decisions for the business.

Achievements on farm

- In the first year, forage utilisation across the whole farm increased by 15%, while home-grown feed costs ($/t DM) decreased by almost 8%.
- Brassica and ryegrass combination on the CFR area yielded 14.8t DM/ha of exceptional quality feed in just eight months.
- Soil moisture monitoring equipment was critical. It showed there was a significant proportion of the maize growing period when the soil moisture tension was less than 10 centibars, indicating waterlogging and lack of oxygen availability to the roots.

Where to from here?

Ross and Tim will once again dedicate 20ha to the CFR area, with maize being followed by brassica and annual ryegrass. Brown Mid Rib sorghum (BMR) and brassica will be utilised again, with a higher sowing rate of brassica (2–3kg/ha) and a decreased rate of BMR (15kg/ha) to make better use of the brassica quality.

Tim hopes that more attention to irrigation scheduling on the CFR area will prevent waterlogging and achieve a higher maize yield. The McDarmonts would dearly love to put in a concrete feedpad with shade cover to prevent heat stress, but with uncertainties around milk pricing in the short term, they are unwilling to make the capital investment just yet. While no plans are in place for increasing milk production, less reliance on purchased feed will further reduce feed costs.

"They'll graze the good stuff and then fill up on the rubbish—so we're trying to make it all good stuff."

The CFS experience on Wyvern Park

November 2009
An area of 18ha of maize was sown under centre pivot irrigation. Weed control and plant denisities were excellent and crop nutrition was planned with agronomist.

January 2010
Pasture base was not providing for the herd, so there was a heavy reliance on forage sorghum and purchased feed for summer.

March 2010
Maize silage was fed back very soon after harvest *(10MJ ME/kg DM, 8% crude protein, 43% NDF)*, allowing cows to be fully fed while pasture establishes.

April 2010
Six weeks after sowing, the brassica and short term ryegrass on the CFR area was grazed for the first time *(12.9MJ ME/kg DM, 36.6% crude protein, 36.6% NDF).*

"Sowing the brassica is the best thing we've ever done."

June 2010
Changes to milk supply contracts halted plans for expansion, but efficiency gains are still the target.

Annual ryegrasses were once again the major component of winter grazing, but establishment was better due to cows being fed on the maize silage and the brassica mix early in autumn.

November 2010
CFR area was increased to 20ha, soil moisture monitoring equipment installed

December 2010
Forage sorghum and brassica were sown together to improve quality.

Summer 2010/2011
Soil moisture monitoring equipment showed periods of significant overwatering on maize crop. Waterlogging has probably limited yields. Maize crop yielded 21t DM/ha at high quality *(10.2 MJ ME/kg DM, 7.3% crude protein, 41% NDF).*

April 2011
Sowing rates of brassica were varied as an experiment. Slow establishment due to dry, overcast weather, however plant population was good and high yields were expected.

Were initial farm goals achieved?

- Both production targets were met, with an increase in milk from home grown feed and less reliance on bought in feed.
- Best maize yield was 21–22t DM/ha, when wet weather during summer led to some waterlogging. Silage quality has been very good, perhaps a trade-off on yield.
- Area has been increased from 18 to 20ha.

George and Elizabeth Allen

Reducing costs of production

The big ticks for the Allens:

- ✓ **Cows are being well fed all year round.**
- ✓ **Increased yield across the farm without capital investment.**
- ✓ **The potential of the farm is being realised.**
- ✓ **More confidence to push the farm system.**

Background

George and Elizabeth Allen have leased the Singleton property since 2007, and while they had plenty of experience across a range of dairy properties, the secure water and efficient irrigation on this farm provided management opportunities that have not previously been possible. After two years of good pasture management, George was looking for ways to reduce costs of production through increasing home-grown feed. George was keen to try maize and assess the fit into his system.

"…helped us to maintain body condition on the cows over winter very efficiently."

Initial farm goals

- Grow more home-grown feed by introducing maize into the system.
- Offer high-quality feed to cows all year round.

Farm overview

- Farm size 52ha, all milking area.
- Fully irrigated on alluvial flats of the Hunter River, some risk of flooding.
- Milking 120 cows, producing average 7,300L/cow, calving all year round.
- Good access to contractors and advisors.

2009			2010		2011		
Jul–Sep	Oct–Dec	Jan–Feb	Mar–Jun	Jul–Sep	Oct–Dec	Jan–Feb	Apr–Jun
Lucerne/ ryegrass	Maize		Volunteer maize, brassica and annual ryegrass	Brassica annual ryegrass	Maize		Brassica and annual ryegrass
Yield t DM/ha	19.5		14.4		20.2		
Cumulative yield	November 2009—October 2010: 33.9t DM/ha March 2010—February 2011: 34.6t DM/ha						

With a milking area of 50ha off an effective dairying area of 52ha, George's main concern was in reducing his grazing area over summer in order to grow maize. George was willing to try some new options to reduce the feed gaps that he usually experienced over winter and in the early autumn.

George planned to move the CFR area around the farm, following a CFR with lucerne or other perennial options, thus giving a three year cycle on any given block.

Comments from the project team

George has been an enthusiastic partner in the project, very eager to learn from others and willing to trial new forages and combinations across the year. George has successfully increased fodder production on farm and has shown increased confidence in making feeding and sowing decisions on farm, due to the planning that is integral with implementing a complementary forage system.

Major considerations on this farm:

- ☑ **Economic implications**
  - Having enough feed on hand to support the milking herd in the first summer.
- ☑ **Potential limiting factors**
  - The farm milking area is flood prone, and therefore rotating the CFR area is based on seasonal outlooks.
- ☑ **Impact on farm management**
  - Dedicating a CFR area has placed pressure on the already small milking area over the summer period.

Achievements on farm

- More than 33t DM/ha achieved on the CFR area for two rolling 12 month periods.
- The Allens have been able to offer cows high quality home-grown feed all year round through strategic planning and conservation.

Where to from here?

George feels that he is more assured of a good supply of feed all year round with the implementation of a CFS. He is now experimenting with different varieties of brassica, and mixing them with other species at different times of the year. Home-grown feed costs (per t DM) are being maintained with forage production across the farm increasing.

The CFS experiences on the Allen's farm

Summer 2009/2010

A 7ha area of maize was sown. Cows produced well from grazed lucerne, herbs and ryegrass, plus conserved fodder. Maize yielded *21t DM/ha* and a large amount of volunteer maize came back through.

Autumn 2010

Brassica, oats and ryegrass were sown into the CFR area. Volunteer maize was very competitive and shaded the forage mix. Feed quality was very high *(12.8MJ ME/kg DM, 33% crude protein, 38% NDF)* and utilisation is excellent. George resowed a lighter rate of ryegrass and brassica, and this established and yielded well.

"They say we'll lose one maize crop in ten around here (to floods)—that's not bad odds."

Winter 2010

Great quality ryegrass *(12.3MJ ME/kg DM, 28.3% crude protein, 43% NDF)* on remainder of farm was well managed as cows were fed maize silage from May through to August, in a low cost system of concrete troughs. These troughs needed to be built up with fill sourced from a local building contractor, as the area bogged heavily early on. The forage mix on the CFR area yielded well despite the delayed start. Pasture utilisation increases from *11.5t DM/ha to over 14t DM/ha* in just one year. Brassicas were valuable for maintaining early quality, but their persistence was disappointing. Cow condition has been excellent and components held steady all winter.

'I definitely plan to continue along this path."

Spring–summer 2010

A larger area of maize was sown into new area that was in need of renovation. Soil moisture monitoring equipment was installed, and deemed very useful in determining crop water demands.

Autumn 2011

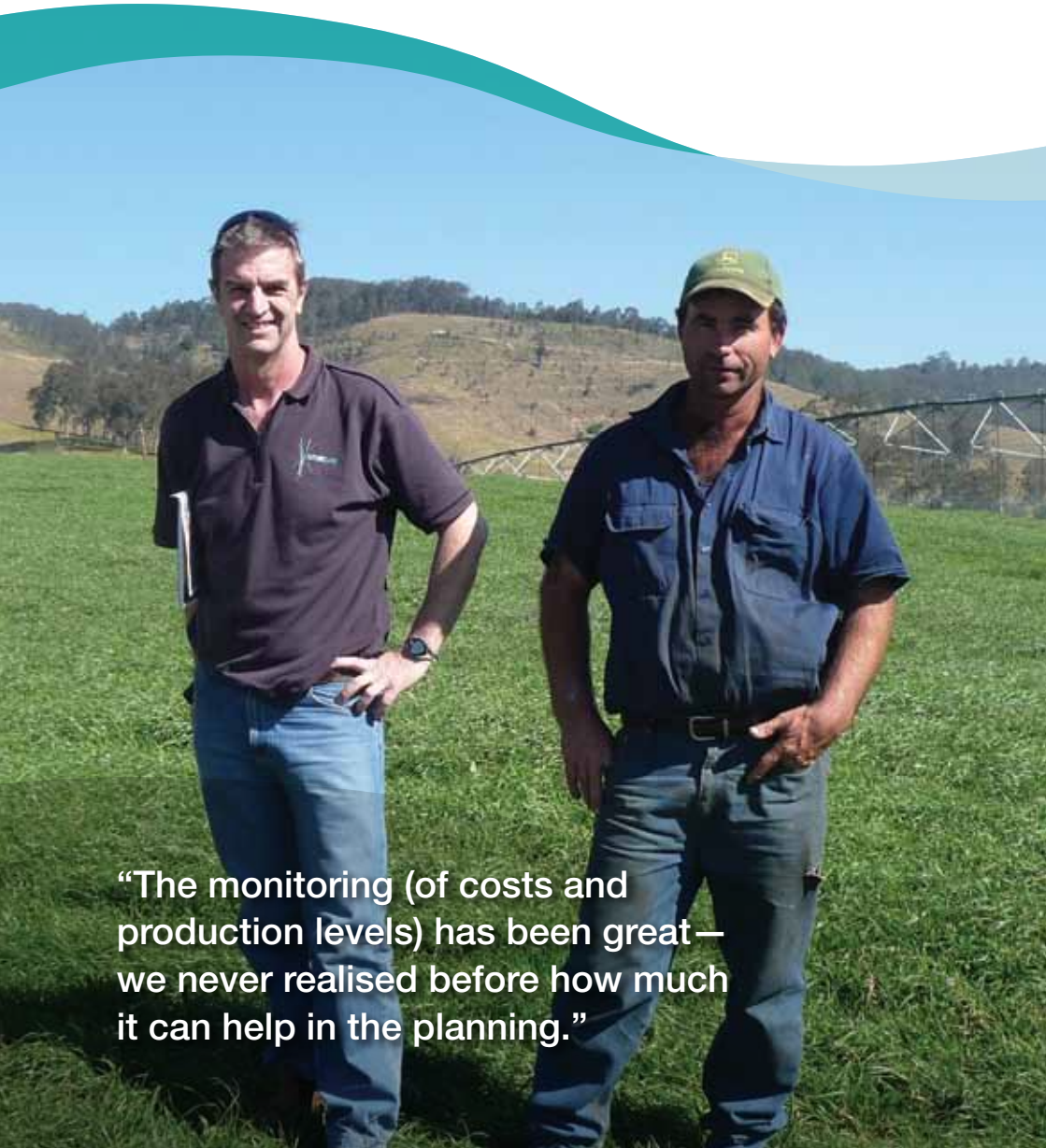
Maize crop again yielded well, with a total 12 month yield from CFR area of *34.6t DM/ha.* Cow fertility dropped in 2010, and George acknowledged that it was hard to keep up high levels of management across all areas of the farm business when introducing new technologies. Some herd health and family issues placed pressure on the system, however George has no plans to drop the Complementary Forage System, and is already planning ahead to the maize crop.

Were initial farm goals achieved?

- An extra 2t DM/ha across the farm was achieved, with maize crops producing 21t DM/ha, compared to pasture in previous years yielding 8–10t DM/ha.
- Maize silage was fed back to the milkers during late March to August, maintaining an even diet when pastures were limited.

The Richardson Family

Making a lease block pay its way



The big ticks for the Richardsons:

- ✓ **High fodder production per hectare is important to offset the cost of leasing a farm.**
- ✓ **Good planning is essential when aiming for high yields.**
- ✓ **Timing is everything when growing maize, especially sowing date and irrigation applications.**
- ✓ **A more consistent diet improves milk production and cow condition over the year.**

Background

Rodney and Stacy Richardson, along with son Brad, farm north of Gresford in the lower Hunter Valley. The home farm is partially irrigated, with varying topography and soil type. The area used for milk production can change over the year, depending on rainfall received on the dryland paddocks. A neighbouring lease block came up two years ago, suitable for cropping and with secure water, and even though the lease price was high, "we couldn't let it slip past us," said Rodney. Consequently, the Richardsons are keen to produce as much quality feed as possible from the area to ensure value for money.

"Not growing maize before, we now have a really good handle on the costs of production, and what we need to do to make it pay."

Initial farm goals

- Use CFS principles to increase dry matter production on 20ha lease block.
- Improve consistency and quality of feed offered to milking herd across the year.

Farm overview

The home farm has a kikuyu base oversown with highly productive ryegrass for winter feed. A covered feedpad was planned prior to the start of the FutureDairy collaboration, and is now being used at strategic times to supplement the cows with home-grown feed. A mixer wagon was also purchased previously to increase dry matter intake on sometimes variable quality feed. The family milk around 300 cows on average each year, steadily increasing per cow and per hectare production each year.

2009			2010			2011
	Oct–Dec	Jan–Feb	Mar–Jun	Jul–Sep	Oct–Dec	Jan–Feb	Apr–Jun
	Maize		Maize	Triticale, triticale + maple peas	Maize		Annual ryegrass
Yield t DM/ha	15.9		9.5	6.8	16.1		
Cumulative yield	October 2009—September 2010: 32.2t DM/ha March 2010—February 2011: 22.9t DM/ha						

Fitting the CFS into the system

Initially, the Richardson's main interest was in rotating high yielding, high quality crops for harvest on the lease block. Now, they are also incorporating different forages such as brassica into their home farm, increasing the quality of home-grown feed as much as possible. With the addition of the feedpad, utilising the maize silage and whole crop silages are more effective with less wastage.

Comments from the project team

The Richardson family are always keen for a challenge, and were confident that they could find a way to fit the lease block into their farming system. Throughout the project Rodney has displayed a greater awareness of the management practices that are vital for high crop production, as well as a better understanding of the costs involved in production. The Richardsons are now at a level of decision making where the whole farm system is taken into account when planning changes.

Achievements on farm

- CFR area production of 32t DM/ha in the first year of the project.
- Better cow nutrition through a more balanced choice of home-grown feed with which to mix rations.
- Whole farm pasture utilisation increased.
- Higher value use of limited water and arable land.

Major considerations on this farm:

☑ **Economic implications**
- All feeding decisions needed to maintain high cashflow across all months.

☑ **Potential limiting factors**
- Irrigation scheduling. Water needs to be ordered in advance, and the Richardsons rely on an external party to actually irrigate the block.
- Distance from the home farm means that all crops grown on the block need to be machine harvested and fed back in some form.

The Richardsons have learned a lot about non-pasture-based feed production throughout the course of the project, and have a better understanding of where different species and feed types can be adapted to fit into a system. They plan to utilise the new feedpad over summer to reduce heat stress, but also for the rest of the year when pasture is limited, to increase utilisation of feed. The timing of the double maize crop suits the leased area well, but the Richardsons are keen to overcome the water stress limitations and achieve higher yields into the future.

The CFS experience on the Richardson's farm

Summer 2009

With the lease block well prepared and looking at a good season, the Richardsons decided to attempt a double crop of maize prior to planting winter crops. Varieties used for double cropping can be expected to yield slightly lower than others, however the whole double crop produced 25t DM/ha in total, lower than anticipated. The main reason for this was most likely moisture stress, with the irrigation management unable to keep up with crop demand.

Autumn 2010

Triticale was sown for silage production, with some areas including maple peas for added quality *(9.3MJ ME/kg DM, 14.3% crude protein, 57% NDF).*

Winter 2010

The feedpad on home farm completed in time to make use of the maize silage over the winter period. The lease block performed well with less water demands over the cooler months, and Rodney was pleased with the germination of maple peas despite his concerns about herbicide residual from the maize crop.

October 2010

Planning once again for a double crop of maize, a short season variety was planted on the lease block. Establishment was excellent, and Rodney aimed for a higher overall yield than last season.

"We've pushed the block much harder than we thought we could."

Summer 2010

Installation of soil moisture monitoring devices on the CFR area confirmed that the maize crop planted was once again suffering moisture stress. In a system where water has to be pre-ordered, and irrigation takes around four days, the irrigation scheduling was an ongoing problem on this block. With a good supply of conserved feed on hand, and still some of last year's

maize left, Rodney and Brad decided not to plant the second maize crop, going instead with a lower risk, lower cost and lower water reliance crop of annual ryegrass.

"The CFR is flexible, it doesn't have to be a recipe—we didn't need as much feed this year, so we decided to take an easier option this year and not plant a second crop of maize."

Were initial farm goals achieved?

- They have almost doubled the amount of fodder harvested from the lease block as a result of the CFS project.
- They are feeding their cows a better balanced ration to supplement the available pasture.

Dave and Cindy Butler

Improving productivity of the herd

The big ticks for the Butlers:

- ✓ **Use of different species has increased quality of feed all year round.**
- ✓ **Cow production and condition has lifted and been maintained**
- ✓ **The potential of the farm is being realised.**
- ✓ **An already low cost of production has been lowered further.**

Background

Dave and Cindy Butler sharefarm 78ha of irrigated flats on the Hunter River at Denman. They milk around 190 cows, and do the majority of farm work themselves, with help from their children out of school hours. The herd and farm were producing at lower than district average levels when they entered the share farm agreement. Dave has had many years of experience growing pasture based forage for cows fairly cheaply, and was looking for ways to increase productivity on this farm.

Initial farm goals

- Increase herd production to 8,000L/cow.
- Conserve adequate feed for the herd's winter requirements.
- Better understand the cost benefits of various crops.

Farm overview

- 190 Holstein Friesian cows in milk.
- 78ha milking area on irrigated river flats.
- The farm had a history of low fertiliser input, however soil testing after the second year of Dave's sharefarming agreement showed adequate nutrient levels for dairy pastures.
- Secure water and virtually no flooding allows for a vast range of forage species to be grown.

"We have enough winter feed put away—that's where our money is."

2009			2010		2011		
	Oct–Dec	Jan–Feb	Mar–Jun	Jul–Sep	Oct–Dec	Jan–Feb	Apr–Jun
	Mega Sweet forage sorghum and cow peas		Chicory, annual ryegrass, lucerne				
Yield t DM/ha	12.5		10.1				
Cumulative yield	October 2009—September 2010: 22.6t DM/ha						

Fitting the CFS into the farm goals

Dave did not want to invest in machinery or expensive feedout systems, however he was keen to balance out the forage mix to ensure that cows were fed high quality home-grown feed all year around. While four of the other farms planned maize crops, Dave dedicated an area of 9ha to Mega Sweet, a variety of forage sorghum that is more often grazed but will also ensile. Dave was open to the idea of grazing the crop if needed, but was also keen to try a bulk crop and examine the cost benefits. With round bale silage being an important conservation and pasture management tool in Dave's farming practices, forage species needed to be suitable to ensile.

Comments from the project team

Dave is a competent and confident pasture manager, with excellent fodder conservation skills. He entered the project with an open mind, to see what the CFS principles could add to his plan of increasing home-grown feed on farm. Dave's willingness to try different combinations of forages has been refreshing and successful, and shows that he is another farmer who takes the principles of a program and adapts them to suit his farming system.

Achievements on farm

- CFR area production of 22t DM/ha in the first year of the project.
- Better cow nutrition through a more balanced choice of home-grown feed with which to mix rations.
- Whole farm pasture utilisation increased.
- Higher value use of limited water and arable land.

Major considerations on this farm:

☑ **Economic implications**
- All feeding decisions made needed to maintain high cashflow across all months.

☑ **Potential limiting factors**
- No investment in feedout machinery planned.

☑ **Crop selection**
- Crops were to be irrigated by travelling irrigators.
- Species mixed in spring and summer needed to have similar growth times to allow effective grazing.
- Wherever possible, species sown should be able to be conserved.

Where to from here?

Dave has not yet reached his goal of 8,000L/cow, and will continue to strive towards this. With uncertainty around milk pricing in the short to medium term, Dave needs to drive cashflow and therefore maintain his already low costs of production. He will consider another bulk summer crop for silage this year and will continue to mix brassicas in with forages for increased quality and add legumes where practical to further improve soil health and control fertiliser inputs.

The CFS experience on the Bulter's farm

November 2009
Forage sorghum (9ha of Mega Sweet) was sown, with cowpeas underneath. The cowpeas were sown for a dual purpose, firstly to provide extra quality in case Dave decided to graze the crop, or alternatively to act as a green manure crop if (as actually happened) the crop was harvested for silage. In another paddock, brassica was tried for a quick summer crop, but germination was poor and the plants did not persist over the hot summer.

February 2010
Sorghum harvested as silage, yielded 12.8t DM/ha. Quality was measured at 9.1MJ ME/kg DM, lower than an average maize crop, but the cost of the energy was very low (1.06c/MJME) in comparison to maize (generally around 2c/MJME).

March 2010
The sorghum area was sown to a mix of oats, chicory, annual ryegrass and lucerne, with only a low rate of urea added—Dave credited the cowpeas with adding high levels of nutrient to the paddock. Brassica and ryegrass mixes were sown across the farm, with the ryegrasses ranging from short term annuals to longer term Italian biennial types.

Winter 2010
Cows adjusted very well to the high quality brassica/ryegrass mixes *(12.1ME, 27.6%crude protein, 36% NDF).*

Spring 2010
Rather than deciding to renovate or replace all ryegrasses with summer forages, Dave allowed some paddocks to go to seed and brought them back into the rotation, where they produced well for the spring and summer.

"Brassicas are new for me, and I'm trying lots of different combinations, some are working better than others."

November 2010
Sudax forage sorghum for grazing was sown with brassica producing excellent quality palatable feed *(10MJ ME/kg DM, 22.5% crude protein, 52% NDF)* at a time when feed quality is generally hard to maintain.

Summer 2010
With a large supply of conserved feed on hand, Dave decided not to plant a bulk silage crop for this summer, instead choosing to graze mixes of millet and herbs, with some lucerne and sudax forage sorghum

"Good to focus on growing more feed."

Were initial farm goals achieved?

- Cows are now producing at around 8,000L/cow, (up from 6,900L/cow prior to the project) with no increased grain intake.
- The extra production has come from better feed production. More silage and hay was made, and then fed out over autumn and winter, maintaining steady milk production.

The Simpson Family

Koondooloo, Denman

Growing the milking area

The big ticks for the Simpson:

- ✓ **Effective planning has made last minute decisions a thing of the past.**
- ✓ **Home-grown feed has become the focus.**
- ✓ **The potential of the farm is being realised.**
- ✓ **More confidence to push the farm system.**
- ✓ **More milk from home-grown feed across the year, and a more consistent margin over feed costs.**

Background

Ian Simpson and his wife Maria farm on the Bureen Rd in Denman, NSW. After buying the farm from Ian's parents in 2009, Ian and Maria set out to increase the milking area on the farm, at the same time as improving the farm's productivity. At the start of the project, there was a heavy reliance on bought-in feed, with herd numbers increasing and a large investment in body condition increases over two years. Staffing issues had made planning difficult, and life was very hectic for the family. Ian and Maria were both convinced that the herd and the farm had the potential for great productivity gains.

Initial farm goals

- Grow and utilise as much home-grown feed as possible.
- Produce 40,000L/ha across the milking area.
- Increase per cow production without increasing purchased feed.

Farm overview

- Owner operated.
- 210 Holstein Friesian cows milking.
- Irrigated milking area increased from 45ha to 82ha.
- Irrigation a mix of centre pivot and travelling irrigators.
- two full time staff employed.

"My crop management still needs work—but at least I know what I'm planning for 12 months out."

Fitting CFS into farm goals

New land was being developed for irrigation, expanding the milking area by around 40%. The existing staff structure had to be able to deal with this expansion. At the same time, effluent collected from the dairy was made available as fertiliser for the farm, altering the nutrients that had to be sourced off farm and increasing the need for better nutrient budgeting in order to make the process economically worthwhile.

A more sustainable feeding system needed to be set up—whilst a concrete feedpad was out of the question due to the business being in a "start-up" phase of increasing efficiency and tight cashflow, a formed dirt feedpad adjacent to the dairy was a good alternative.

Comments from the project team

Ian's confidence has increased remarkably over the project. He learnt a lot from other farmers and is very keen to experiment. Ian has put a lot of effort into gleaning as much information as possible for all sources—consultant, advisers, resellers, other farmers—and picking out the pieces that are of most value to him.

Achievements on farm

- 23% decrease in home-grown feed costs.
- Reduced reliance on grain
- More steady, less fluctuating margin over feed costs per cow each month.
- Increased understanding of the balance needed between summer forage crops and higher protein options such as brassica and perennial pastures.
- Longer term planning in place, reducing the reactionary nature of decision making.
- Better knowledge of maize crop requirements.
- Increased confidence in taking information from a variety of sources and adapting it to suit the farm goals.
- A better focus on the whole farm management, seeing the CFR as a part of the whole farm system, rather than the only important factor.

Major considerations that influenced implementation on this farm:

☑ **Potential limiting factors—**
- Weed burden and initial preparation of newly developed area;
- mechanical breakdowns at critical times;
- staffing availability and capability.

☑ **Impact on farm management**
- Effective utilisation of existing pasture base as area is expanded with no increase in herd numbers.

☑ **Crop selection**
- Effective use of herbicides and timely application of nutrients over growing season.

Where to from here?

- Continued use of brassica in conjunction with other species across the year.
- Better management of maize silage, with aims to produce over 35t DM/ha on the CFR area.
- Increased focus on herd fertility and joining programs to take advantage of high feed quality.
- Continue interacting with other farmers to learn more about their management practices.

"I will definitely be planting brassicas from now on to help cover a number of feed gaps."

The CFS experience on Koondooloo

November 2009

Spring time ryegrass finished up, with plans for a large amount of Brown Mid Rib (BMR) sorghum for summer forage and an opportunity crop of maize to be grown on the neighbour's farm. Initial feed budgets showed that cows would be heavily dependent on grain over the entire summer and autumn.

March 2010

Perennial ryegrass, along with maize silage and the remnants of BMR forage sorghum paddocks, are provided well for the milking herd. Ian realised that his proportion of forage sorghum was too high, so reduced the percentage of high protein feed available to the cows in late summer. Autumn plantings of annual ryegrass were well planned although off to a slow start.

"Learning by doing has been so valuable."

October 2010

Ian's focus on the feed management on farm took his focus off other areas—in-calf rates have declined, mainly due to lack of heat detection and therefore an increase in voluntary wait period. Ian had his new ground developed, waiting to sow maize.

"Seeing the other farms trying new crops and rotations has been a great experience."

February 2011
After introducing an extra 15ha of irrigated milking area, Ian had a better picture about the future use of different paddocks across the years, and in different seasons. Whilst feed purchases would still be variable across the year, Ian felt that land at home was being better utilised and all crops and pastures were better managed due to the longer term planning implemented. Breakdowns of the new irrigation system, the weed control on the cropped area, and a later than expected sowing date contributed to a lower than expected maize yield.

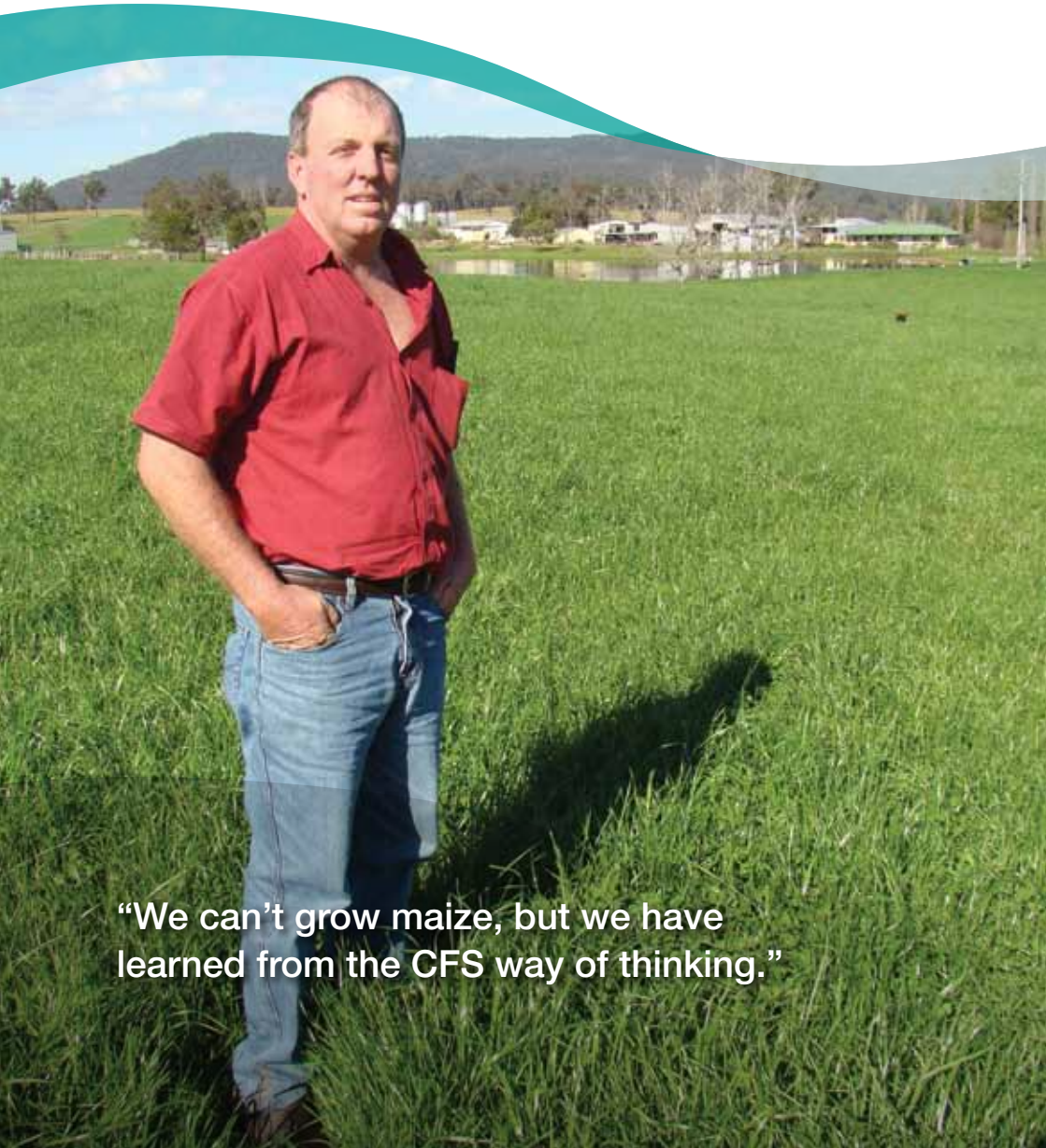
March 2011
Brassicas were sown with annual ryegrass to boost early feed, however forage sorghum still provided a fair percentage of the forage component of the herd's diet (9.8MJ ME/kg DM, 23.5% crude protein, 56% NDF). Perennial ryegrass pasture with clover (10.1MJ ME/kg DM, 22.3% crude protein, 41% NDF) started to come into the rotation and provided excellent quality feed. Knowing that the maize silage was available as feed in order to let new pastures establish, was a great confidence booster to Ian.

Were initial farm goals achieved?

- Yes, he grew a lot more feed, but had a bigger irrigated area to manage. He has increased his percentage of milk from home-grown feed from 52% to 62%.
- Per cow production has dropped over the last year, with a significant drop in grain fed per cow. Problems occurred over summer, with lower quality roughage fed during hot weather, and issues with stock-water supplies.
- 40,000L/ha was too ambitious a target whilst growing the farm area and cow numbers. Ian still wants to aim towards that target, but may take a couple more years to get there.

The Williams Family

Improving productivity from pastures



The big ticks for the Williams':

- ✓ **Increased focus on forage area has improved productivity.**
- ✓ **Applying the planning principles of complementary forage systems has been of benefit.**

Background

David and Heather Williams farm in partnership with his brother Peter and wife Helen, and parents Harry and Pat at Vacy, on the Paterson River. Over a period of many years they have transformed the farm, which has poor soil and undulating topography. They have established a very productive perennial ryegrass pasture, which is atypical for this area. Whilst the farm is not suitable for cultivation and cropping, David is interested is improving forage production. There is potential to increase the dry matter yield of forages over the summer, when traditionally the farm has struggled most for quality feed.

The Williams family were included in this project to provide a point of comparison to the other farms, and to explore whether the CFS principles could be applied on a farm where growing maize was not feasible.

Initial farm goals

- To achieve high levels of utilisation from permanent pastures.
- To increase home-grown forage production through growing a summer forage crop.

Farm overview

- 330–350 Jersey cows in milk.
- 250 heifers reared on home farm.
- Farm size 220ha, of which 140ha is irrigable milking area from the regulated Paterson River.
- Mostly poor soils—shallow sandy loam with gravel subsoil. Small area (25ha) of more alluvial type soils.
- Irrigation is with seven hard hose travelling irrigators, usually on a 10 day shift across the farm.

Fitting the CFS into the farm goals

The shallow rocky soils on much of the farm means that a CFR area involving cultivation and cropping were not an option, but David was still looking at ways of improving the productivity of his feedbase. He was interested in using a summer crop such as Brown Mid Rib (BMR) forage sorghum to increase the amount of forage grown over summer, when the perennial ryegrass growth slows markedly due to hot weather, and to provide a break crop and opportunity for weed control in the pastures due for renovation and resowing in the following autumn.

Comments from the project team

The Williams' business is quite mature, with well-established, management regimes that have worked well for some years. As a farmer who is somewhat sceptical about moving away from pastures when irrigation and climate are suitable, David has gained a new appreciation for where summer forage crops can fit into a pasture-based system. He has been a good "grounder" for the rest of the group, asking a lot of questions to clarify the value that bulk crops such as maize add to farming

systems, and has been very willing to take on the opinions of others in his own farm management.

Achievements on farm

David's initial plans were to bale the crop for silage to be used to feed dry cows over winter, but being part of the project encouraged him to graze the BMR with the milking herd, with better than expected results.

The Williams family have persisted with a perennial ryegrass system when most other farmers in the region have reverted to a kikuyu /annual ryegrass system, due to the difficulties in persistence of perennial ryegrass over hot humid summers. David has been able to successfully grow perennials because he is vigilant with management of irrigation, fertiliser and grazing, and has over time developed a highly productive pasture base, given the limitations of the soil and topography. He believes the perennial mix gives them a longer flatter pasture supply curve, rather than the peaks and troughs with the kikuyu/annual ryegrass system.

However, they have probably reached close to the production potential from their pastures, so David has used a modified CFR system to grow more feed over the fam. He uses a completely no tillage farming system, in fact they have sold all the tillage equipment they used to own. The paddocks due for renovation are earmarked for a summer crop, so after the last silage cut or grazing in spring, are sprayed out with Glyphosate and direct drilled with BMR forage sorghum.

Where to from here?

David will continue on his now established cycle of using BMR as the first crop in a cycle of forage, clovers, lucerne and perennial ryegrass sown in autumn. This rotation allows reintroduction of legumes into the paddocks and allow David to reduce the compaction that occurs on perennial pastures. David was very keen to try the moisture monitoring equipment to better understand his soil, and to more accurately determine irrigation frequency on the BMR over summer.

Overall utilisation of home-grown feed increased from 11t DM/ha to 11.5t DM/ha in year one of the project.

The farm management plan

Summer 2009 /2010

BMR sorghum was direct drilled into 9ha of old perennial ryegrass, sprayed out with herbicide. The BMR was grazed twice and then cut for silage in round bales, yielding 10t DM/ha in total in total (9.9ME, 18.55 crude protein, 55% NDF).

Autumn 2010

After the third cut of BMR, the 9ha was sprayed out and sod-seeded with a basic mix of Alto or Arrow perennial rye with Haifa white clover, Tonic plantain

and Aurora lucerne. No fertiliser was used at planting, and a topdressing of 100kgs/ha of urea was applied when the newly sown pasture was about 50mm high. Across the rest of the farm, any perennial stands that were two years old were usually starting to thin, so were oversown with annual shorter season ryegrass (usually Barberia or Bealy biennial types).

Winter 2010

After the first grazing, poultry litter was applied to the perennial ryegrass mix at 14m^3 /ha. Urea is then used strategically throughout the rest of the season. Silage is fed to the herd on a concrete pad using ring feeders. Rotation length during winter is around 30—35 days.

Spring 2010

Grazing of ryegrass mixes (11MJ ME/kg DM, 27.3% crude protein, 58% NDF) provided good quality feed for milking herd. Suitable paddocks for the planting of BMR were identified, sprayed out and sown as part of the four year rotation cycle.

This seasonal pattern was repeated in 2011.

Were initial farm goals achieved?

- They have achieved 11–12t DM/ha during last two years.
- The Williams now have a summer forage crop as a regular part of their pasture rotation, providing an extra 0.5 to 1.0t DM /ha across the whole farm.

Feed test data collation

An integral part of the FutureDairy Hunter Project was the collection of feed quality data on a regular fortnightly basis from each farm. The feed samples were analysed through the NSW DPI Feed Quality Service in Wagga Wagga and the collated data was sent to farmers on a monthly basis. The feed qualities were used in the analysis of farm data (using Milk Biz and MiniMilkBiz) to accurately calculate overall home-grown feed utilisation.

NSWDPI also plans to use this collated data to expand the Feed Library currently used in NSW decision support tools, in order to assist farmers in estimating quality of their own feedbase when creating feed budgets.

This table shows a sample of the feed quality data that was collected over the two years of the project in the Hunter. These are not average values of the whole data set.

Feed type	Date Sampled	Energy MJME/kg DM	Crude Protein % DM	NDF % DM
Perennial ryegrass	Spring 2009	11.1	27.9	49
Maize silage	Autumn 2010	10.2	7.4	44
BMR silage	Autumn 2010	9.9	18.5	55
Kikuyu and clover	Autumn 2010	11	26	56
Brassica and ryegrass	Autumn 2010	12.9	36.6	33
Maize silage	Autumn 2010	9.9	9.8	49
Brassica, oats and ryegrass	Winter 2010	12.1	27.6	36
Brassica and ryegrass	Winter 2010	11	29	47
Ryegrass/clover	Spring 2010	11	27.3	58
Maize silage	Spring 2010	10	6.5	43
Sudax and brassica	Summer 2010/2011	9.5	14.5	53
Ryegrass silage	Summer 2010/2011	10.6	17.1	40
BMR sorghum grazed	Summer 2010/2011	10.3	27.6	57
Short term ryegrass first grazing	Autumn 2010	12.2	26	37

A final word from the project team

The on-farm application of FutureDairy's CFS principles has been an invaluable experience for both farmers and extension and research staff. Whilst industry has been very impressed with the high yields achieved within the FutureDairy trial work, the far greater on-farm management implications of better planning and lowered risk may not have been truly realised without this level of "ground truthing" of the research.

NSW DPI's extension staff would like to sincerely thank FutureDairy's Associate Professor Yani Garcia and the rest of the research team for their approaches to collaborate in this manner. Both NSW DPI and FutureDairy extend a heartfelt "Thankyou" to the six farming families involved in this project, for their openness, honesty and willingness to expose their farming operations and financial data to the team. This is the only way that we can really learn from experiences in order to further increase industry efficiency. Thanks to you all!

Notes