To determine the value of pasture renewal to a dairy farm system in the 2009-2010 Season.

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Abstract

Information was gathered from dairy farms in four regions in New Zealand for the season ending May 2010. The regions used were Waikato, Taranaki, Canterbury and Southland. Two farms were selected from each region, one that had undertaken regrassing on a regular basis for at least five years (Modern Varieties) and the other had not undertaken any regrassing in the previous decade (Traditional Varieties). A computer simulation tool (UDDER) was used to model the effect of regressing on these farms. In all regions, Modern Varieties allowed an increase in stocking rate, generated more milksolids/ha and a greater net farm margin. The use of computer modelling allows farmers to make a decision based on the data from their own property rather than rely on data that is sourced from different growing conditions.

Introduction

There has been several publications outlining the about the impact and value of the new pasture varieties on the whole farm dairy system (Stevens and Knowles 2011, Brazendale et al 2011). At a strategic level the report commissioned by the Pasture Renewal Trust (BERL 2009) has placed a value of pasture renewal on dairy farms at $6.629 billion. It is difficult for the farmer on the land to extrapolate this number to the impact it would have on a particular property or to appropriately apply monitored research station data to another district. This paper attempts to quantify the benefits an individual farmer would receive on their farm with their own data using the established research relationships if they were to undertake a planned pasture renewal programme on a sustainable basis.

One of the realities of farming in the current economic environment is that famers are looking for strategies to improve their profitability from a given amount of grazing area. One of the outcomes to these comments was the symposium set up by the NZ Grasslands Society to discuss

issues surrounding the persistence of the new varieties in a whole farm system. The factors affecting persistence of the modern varieties can be managed by having appropriate management decisions at the critical periods of the season when the pasture is under stress (Macdonald *et al.* 2011). It is important that a farmer has confidence in a pasture renewal programme so that the maximum value can be obtained from the investment in regrassing.

There have been numerous grass production trials that show the benefit of the new varieties compared with other varieties in a pure sward.(Hume et al 2007, Westwood and Norris, 2000, 2001) However, if a farmer is only regrassing 5% of their farm what value does this contribute to the total farm system. Kelly (*et al*. 2011) reported on a survey in the Waikato and Bay of Plenty to assess farmer attitudes to pasture renewal. The outcome of the survey was that while the farmers were confident in carrying out the actual regrassing process and obtaining a successful result, they were unsure of the improvements made in the selection of the variety and the benefits of having this variety in the pasture after grazing it for several years.

There has been monitoring of a dairy farm south of Te Awamutu (Glassey *et al*. 2010) and reported on the increase dry matter yield and increased digestibility measured in pastures over two years. The results showed that these new pastures outperformed pastures that had not been renovated at the same time.

Dairy Base is a data collection process of dairy farms financial reports throughout New Zealand. When actual on farm spending on pasture renewal was compared with farms of similar feeding systems it appeared that on the whole farms undertaking pasture renewal were less profitable than those not carrying out any pasture renewal. The reason for this outcome is likely to be multi-factorial including poor management skills and lack of understanding implementing an intensification of a whole farm system to increase financial returns.

The work that this paper is based on was commissioned by the Pasture Renewal Trust who are interested in assessing the value of a pasture renewal program on a whole farm system that is sustainable. Farmers are looking for strategies to improve the performance of their businesses while exploiting the natural advantages of the local environment.

Personal experience using the UDDER modelling programme has indicated that the key to any intensification of the dairy system has to be driven by maximising the superior pasture quantity and quality to milking cows.

Material and Methods

The central process to reporting the conclusions reached is able to be obtained through using the UDDER programme. UDDER is a computer simulation tool that predicts response to changes in management strategies (Larcombe 1999). It has been used in the New Zealand dairy industry for the last twenty years allowing users to answer the questions such as "what happens if the stocking rate is changed from 3.5 cows per hectare to 2.5 cows per hectare and what economic change can be expected ?."

Information was gathered from dairy farms in four regions in New Zealand for the season ending May 2010. The type of data collected includes milksolids produced, number of cows milked, calving and drying off patterns, supplements harvested and fed, grazing rotations and pasture information. The regions used were Waikato, Taranaki, Canterbury and Southland. Two farms were selected from each region, one that had undertaken regrassing on a regular basis for at least five years (Modern Varieties) and the other had not undertaken any regrassing in the previous decade (Traditional Varieties). It was attempted to get the farms in close physical proximity to each other so that the external factors such as rainfall could be minimised. The soil types and base fertility were accepted as being equivalent to the comparison within the region.

All of these farms were modelled with the UDDER model using the actual farm data. The results of the models were checked with the farmers to make sure that the relationships derived from the model's projections were very close to the reality that occurred on farm. A good farm model will have a strong relationship between the predicted outputs and the actual that occurred on farm.

Once this model was confirmed as being acceptable all external feed inputs were removed from the management strategy leaving pasture as the only source of feed for the cows that were on the farm. The types of external feed can be supplements made on the farm, brought onto the farm or Nitrogen applied to the farm. The removal of this feed will change the milk production and body condition score profile as feed inputs were removed from the critical parts of the season. Each farm was also scaled to be equivalent to 100 hectares.

Consequently each farm needed a new stocking rate that would allow the cows to have a similar body condition score at the beginning and end of each season. In this manner the long term energy balance of the strategy will be in balance. The changes in stocking rate and milksolids production between each district pair can be then attributed to the value of the pasture that the cows were grazing.

The predictions generated from UDDER are expressed in a combination of graphs and tables. The strength of UDDER as a management tool is its ability to predict the value of a management

strategy. This value is expressed as a net farm margin (NFM) and is calculated by subtracting from the milksolids revenue the direct costs of harvesting the milksolids.

Results and Discussion

In all of the strategies reported the milk price used is equivalent to $6.50 per kilogram milksolids (MS). This is assumed to be the expected range for the next period of time.

The summary of the modelling for the various districts are outlined in Tables 1, 2, 3 & 4.

Table 1: Modelled production and margin values for 2 farms in Waikato when Modern and Traditional Varieties of ryegrass are grown.

	Modern Varieties	Traditional	Advantage to Modern Varieties
Stocking Rate (cows/ha)	2.30	2.33	(1%)
Milksolids (kg/ha)	710	660	7.5%
Margin/ha @$6.50/kg Milksolids	$3570	$3300	8%

The Waikato Modern Variety farm undertakes the programmed approach to regrassing as described by Lane *et al*. (2009). This means that the interval between regrassing events is eight years. The advantage shown the modern variety is the impact on the whole farm. The Margin is defined as the residual milk income after accounting for all direct costs of obtaining the production. This will include animal health, breeding, shed expenses and staff to work the farm. The margin for a 100 hectare farm at the milk price used is $27,000 after all of the expenses have been covered.

The difference in the stocking rate between the Modern Varieties and the Traditional Varieties in Waikato (Table 1) is minimal but the milksolids production is 7% greater from the Modern Varieties. This advantage in milksolids translates to 8% improvement of the margin in favour to the Modern Varieties. The results of the survey (Kelly *et al*. 2011) to look at farmer attitude to pasture renewal indicate that farmers are confident about their ability to carry out the physical activities associated with regrassing. This is supported by results from the models' prediction,

that renewing pastures allows farmers to improve their performance using the skills that they currently have.

The grass growing characteristics for the 2009/2010 season in the Waikato were an average start to the season but a very dry autumn and very late autumn rains. The consequence of this was that the Modern Varieties out produced the Traditional Varieties at the start of the season. This allowed the pasture covers (kg DM/ha) to build up. Once the stress of the dry period started to have an impact on grass growth the stability of the Traditional Varieties maintained the pasture covers at a higher level compared to the Modern Varieties.

Figures 1, 2 & 3 show the predicted outcome of the various outputs that is observed on a dairy farm. The underlying pasture growth rate is what actually happened on each of the farms through the season. All of the inputs that were used to assist the milksolids production have been removed so that the only factor delivering the milksolids production is the underlying pasture growth.

Figure 1: Modelled average pasture cover for 2 Waikato farms with either Modern or Traditional varieties of ryegrass.

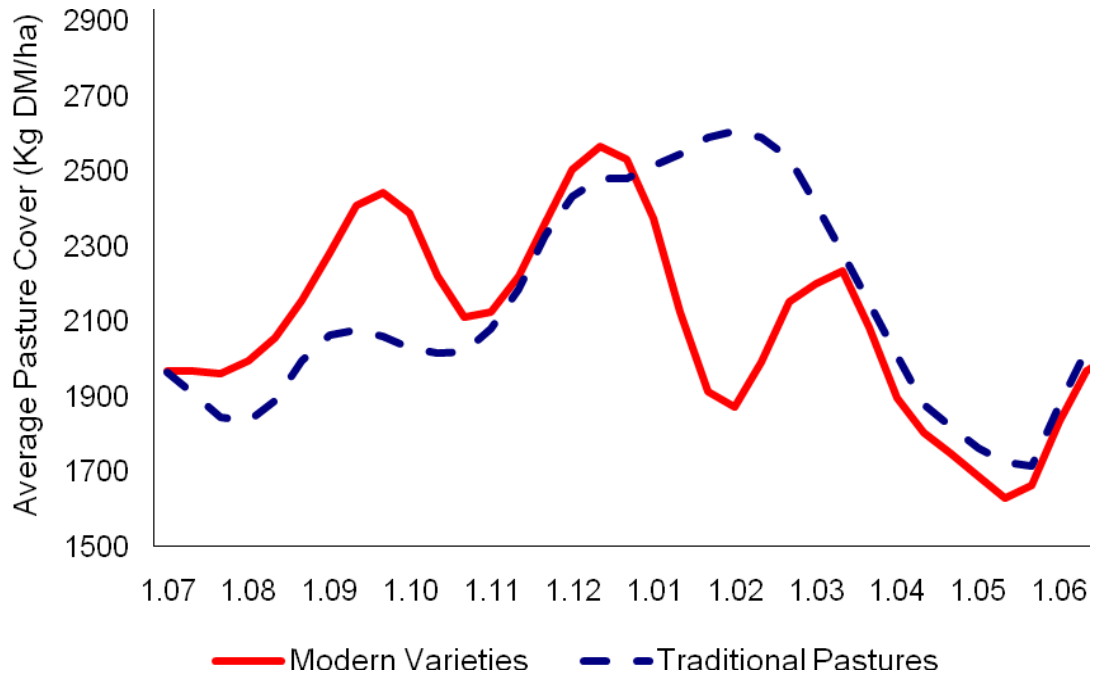
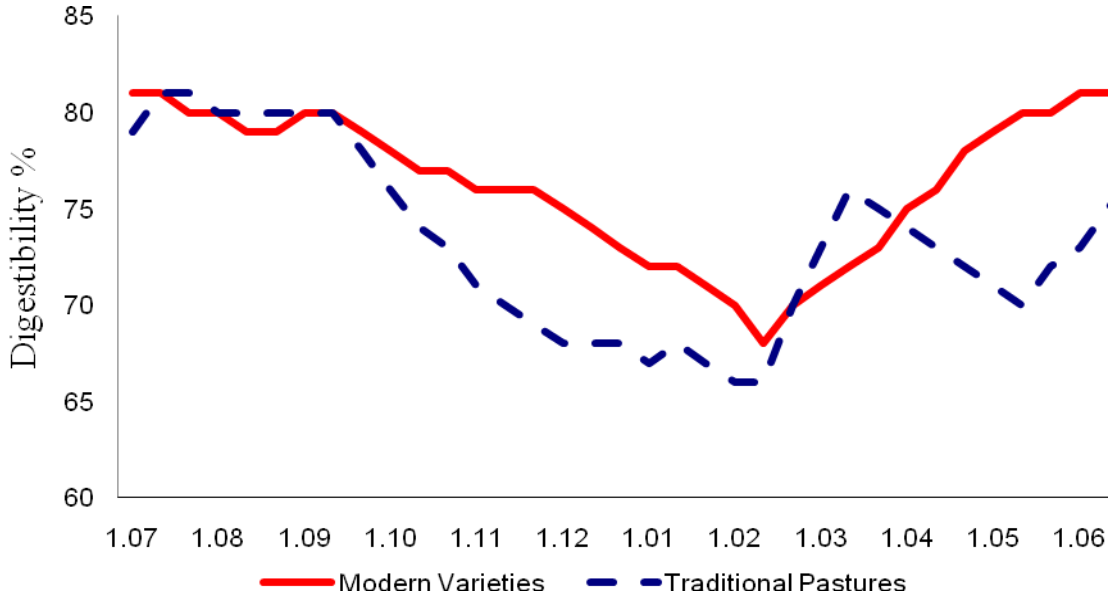


Figure 1 is the predicted average pasture cover (kg DM/ha) for the modelled Waikato farms over the 2009/2010 season. The Modern Varieties farm has undertaken the Programme Approach™ for over five seasons. The Traditional farm has not renewed the pasture for at least ten years.

Both farms have a similar soil fertility and soil type. The pasture growth rate of the Modern Varieties pastures allow the pastures to build up through the late spring and set up the summer milksolids production. This build up of cover is consistent with the results obtained from the data collected from the Otorohanga farm reported by Glassey et al (2010). The decline in cover through the summer could be expected as the newer established pastures will react to the stress of summer dry faster than a traditional established pasture.

Figure 2: Modelled predicted harvested pasture digestibility for 2 Waikato farms with either Modern or Traditional varieties of ryegrass.

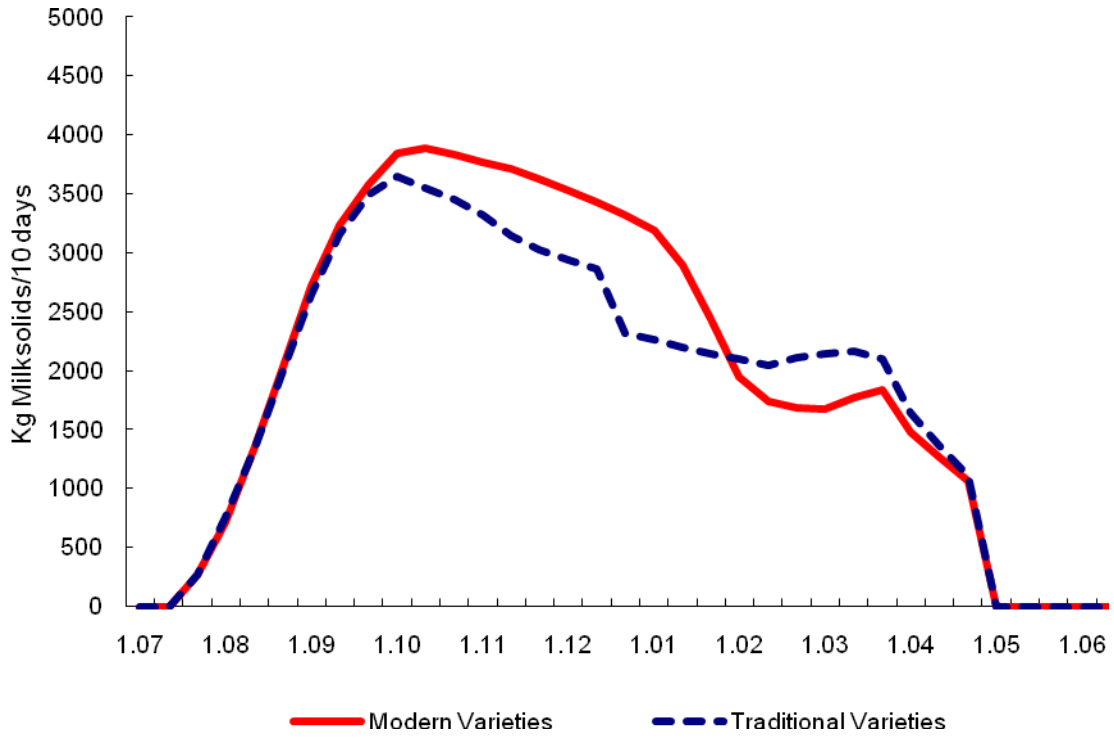


The predicted digestibility of the Modern Varieties is higher than the Traditional Varieties through the bulk of the season (Fig 2). This quality advantage combined with the extra pasture cover through the season will allow the cows to consume more energy and consequently improve milksolids production. The improvement in the digestibility of the Traditional Varieties is a response to the higher pasture cover at this stage of the season but drops away as the Traditional Varieties are grazed as hard as the Modern Varieties.

The predicted farm milksolids are solely derived from the ability of the cows to consume the pasture and convert it to milksolids. The predicted curve for the Modern Varieties show that this farm will outperform the Traditional Varieties up to the mid summer period. Once the pressure of summer growing conditions occurred then the Traditional Varieties were able to outperform

the Modern Varieties on a daily basis. However the amount of advantage was not sufficient to make up for the superior performance prior to Christmas.

Figure 3: Modelled predicted milksolids production (10 day periods) for 2 Waikato farms with either Modern or Traditional varieties of ryegrass



Taranaki

The predictions of the Taranaki farms follow the same pattern as the Waikato farms. The traditional farm was able to carry a higher stocking rate (Table 2) as the pasture covers through the critical times of the season allow all of the cows to be fed at an adequate level. The superior digestibility of the modern varieties allowed the cows in this farm model to produce more milksolids through the season. The majority of the margin comes from the extra milksolids production but the margin also includes the cost of carrying extra cows through the season.

Table 2: Modelled production and margin values for 2 farms in Taranaki when Modern and Traditional Varieties of ryegrass are grown.

	Modern Varieties	Traditional Varieties	Advantage to Modern Varieties

Stocking Rate (cows/ha)	2.68	2.78	(3.6%)
Milksolids (kg/ha)	940	880	7%
Margin/ha @$6.50/kg MS	$4890	$4455	9.8%

Canterbury

The Canterbury farm models again highlight the benefit of the pasture renewal. The base model for Canterbury assumes that the herd is grazed off the farm for the winter period and arrive on the farm at the start of calving. They farms are fully irrigated through the season. Both farms are able to start the season at the maximum sustainable cover but the advantage of the renewed pasture in terms of yield and improved quality allow a higher carrying capacity through the season and each individual cow carried is predicted to produce more than the ones in the traditional strategy. The advantage to Modern Varieties gave an increase of 21% in margin ($/ha)

The model predicts that the grass growth under irrigation through the late spring and early summer is superior for the Modern Varieties. It is this advantage that is translated into milksolids production.

Table 3: Modelled production and margin values for 2 farms in Canterbury when Modern and Traditional Varieties of ryegrass are grown.

	Modern Varieties	Traditional	Advantage to Modern Varieties
Stocking Rate (cows/ha)	2.73	2.55	7%
Milksolids (kg/ha)	1410	1190	18%
Margin/ha @$6.50/kg MS	$7270	$6010	21%

Southland

The Southland predictions were not as definite (Table 4). This was due to the underlying farm management programme in Southland where the majority of farms have a crop for the cows to winter on. This is equivalent to about 5% of the farm. Once the spring growth occurs the climatic conditions allows the cows to perform at an optimal level through the whole lactation season.

This environment also provides allows the pasture to grow with the minimum impact from factors that reduce performance. The farm modelled in this environment with the modern varieties had a 10% pasture renewal compared with the traditional farm where 5% was replaced.

The predicted responses indicate that the advantage to Modern Varieties seen where the summer grass growing environment placed the pasture under stress has been negated. A conclusion that can be drawn from this information is that regrassing more than 5% of the farm under Southland conditions is unnecessary. The pasture growth and quality on the farms are not subjected to the pressures experienced in the other regions reported.

Table 4: Modelled production and margin values for 2 farms in Southland when Modern and Traditional Varieties of ryegrass are grown.

	Modern Varieties	Traditional Varieties	Advantage to Modern Varieties
Stocking Rate (cows/ha)	2.33	2.38	(2%)
Milksolids (kg/ha)	1025	1060	(2.5%)
Margin/ha @$6.50/kg MS	$5050	$5110	(1%)

Conclusions:

The outcome from the modelling process was that a definitive answer can be determined about the value of implementing a regrassing programme into a whole farm system. The use of computer modelling allows the early adopting group of farmers to make a decision based on the data from their own property rather than rely on data that is sourced from different growing conditions. In all regions, Modern Varieties generated more milksolids/ha and a greater net farm margin due to the improved pasture quality at the critical milksolids production periods. In regions where grass growth patterns are subject to pressure, return of at least 8% on earnings before interest and tax (EBIT) on revenue generated can be attributed to the value of implementing a planned pasture renewal programme.

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