NZIAHS Forum
"Where do we want our dairy industry to be in 20 years time?"
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The dairy industry can be sustainable with its resource demands – but only if there are big changes

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Water is the critical resource in the Canterbury region for he dairy and many other sectors and the sustainability of water supplies is absolutely crucial. We are at the stage where our river takes are restricted, raising the issue of reliability of supply for farmers. We also are at the stage where many of our ground-water zones have reached their sustainability limits for supply purposes.

Another crucial consideration is the cumulative affects of water use. This relates to impacts on water quality of land-use intensification and the ecological health particularly of our lowland streams.

Pastoral land use accounts for around 3 million hectacres in Canterbury. Dairying has lifted its share from around 60,000 hectacres in 1995 to 240,000 hectacres in 2009. Lifestyle blocks have doubled from around 60,000 hectares to 120,000 hectares.

The non-irrigated arable area has declined while the irrigated arable area has increased, even though there was significant conversion from arable to dairying.

Our snow-fed alpine rivers provide the greatest volume – 88% - of our water. Lowland streams are the most sensitive to any catchment change.
Figures from January 2006, typical of a dry summer in Canterbury, show about half the flow in our lowlands streams were on partial or full restriction. Restrictions applied to about a third off foothill rivers and a quarter of our alpine rivers. The pressure clearly is greatest on lowland streams in relation to water availability.

Our groundwater systems are under pressure, too. Allocation limits have been reached in several zones.

Around 21% of the 222 wells we use for monitoring showed a significant increase in nitrates levels from 2000 to 2009. Decreases were showing in about eight wells.

The most sensitive part of the system is the aquatic health of our lowland streams. Measures from 1999 to 2009 show about 30% are in very poor health. One of the

major challenges we face with water management is the impact of a combination of climate variability and increased extraction. In 2005 we had our driest winter and it was the end of one of our driest five-year periods of winter rainfall, so we had the least amount of groundwater recharge and the least amount of ebb and flow in those streams.

Projections for climate change point to further decreases in winter rainfall as part of the picture predicted for the east coast of the South Island.

The growth in demand for water is one of the significant changes in Canterbury. Back in 1985 about 150,000 hectares were covered by consents for irrigation. That has risen to around 560,000 hectares, an increase of about 6.5% a year.

Not only has the irrigated area increased from around 200,000 ha to 560,000ha from 1990 up to 2008 but there has been a dramatic increase in use of groundwater, particularly in the past decade.

Dairy cattle numbers have burgeoned, too.

Water management in Canterbury above all needs a paradigm change. We need a system in terms of water allocation and availability which addresses sustainability limits and climate variability. We also need a system able to manage the cumulative effects of water takes and land use intensification. Key components of Canterbury's strategy accordingly looks at a shift from the fixed-based management of individual consents to integrated management based on water zones. This will be at the catchment level but needs to be of finer scales.

The strategic alternatives were put through a sustainability appraisal that addressed the environmental and economic impacts along with the social and cultural aspects.

Option A was business as usual, the current Resource Management Act approach which is effects-based and applicant-driven. But the sustainability appraisal found it did not meet the well-being test for any of the four categories. This suggests what we are now doing is not going to be sustainable in the long term.

Option B looked at stopping development and advancing environmental protection, then proceeding with any infrastructure development that was still within environmental limits.

Option C looked at reconfiguring consents to incorporate not just new projects, but also existing development to improve the reliability of water supply and enhance the environment. It amounts to a re-distribution for integrative water management.

Option D introduced storage and mitigation associated with that storage.

Only the third option delivers sustainability across all four points of consideration.

One of the strategic investigations undertaken was in relation to the impact of further land use intensification and water quality. But clearly we are at the limits now in many areas in terms of water quality criteria and in the case of groundwater for nitrates. Groundwater is still the dominant source of drinking water in rural Canterbury. One of the first tasks of our zone communities will be developing a biodiversity programme and finding the storage options that are most likely to be sustainable. We have looked at about 600 different options as part of that process and for further evaluation have identified seven with the greatest potential for offering sustainable forms of storage. We also have looked at efficiency and ecological enhancements through integrated water management and the integration of water for energy security and irrigation availability. Canterbury has 65% of New Zealand's hydro storage and is a major contributor to energy but summer peaks in energy demand have been coming from irrigation and must be reduced. Economic modeling of both production and ecosystem services is continuing and we have looked at some of the governance structures for achieving sustainable management.

With further intensification of land use, our studies show, a substantial area of Canterbury groundwater could not be used for supplying drinking water. We would need to get a 40% reduction in the nitrate leaching now occurring because of land-use practices if we were to achieve acceptable groundwater standards. Practices that may be acceptable now may not be acceptable in the future. This is one of the critical issues to be addressed in terms of contaminants leeching into the Canterbury groundwater systems.

Water-use efficiency was another key issue we looked at, to determine if we are getting the best return – or resource productivity – from our water. An area between the Rangatata and the Raikaia was among those we looked at, to find what it would take to irrigate all of the potentially irrigable land. Initial studies in the early 2000 on the volume of storage that would be needed showed that water-use efficiency could halve the volume of storage required for further irrigation development, but an integrated management approach should be taken. There are certainly improvements that can be made to on-farm efficiency. Even high application sprays result in a lot of water seeping through without benefit for added production. By introducing piped distribution systems you could have increased water availability. For the most efficient forms of irrigation you would want to irrigate every three days, if there was a soil moisture demand but with low application rate systems. Integrative water management with water use efficiency to improve current practices and a different paradigm for irrigation, you could get a much greater return from the existing allocation and halve the volume of storage that would be needed to irrigate the entire area.
The diary industry is not alone in placing pressure on our water resources and the solutions will require agricultural and other water users to work together. Some improvements in water management are being made at the small-scale level and we are now moving to the larger-scale level with our zone communities and region

committees. But we have been able to get agreements with the farming community which have facilitated improvements in minimum flows.

We have also set up living streams catchments and working with groundwater clusters, involving people with similar types of groundwater hydrology trying to get an agreement on how they can maintain the sustainability of their water supply in the face of increasing demands for withdrawals in their groundwater zone.

At the larger scale we are establishing zone committees and region committees.

Algael blooms had occurred in the Hurunui mouth in the late 1990s. Surveys were undertaken to check on the causes. The Pahau catchment was the major contributor to bacterial, phosphorous and nitrate contamination.

We have been working with people in the sub-catchment and have had a good response from individual farmers, Many have installed barriers to stop surface water running into the Pahau directly. We also have had farmers working along stream reaches putting in filter strips, reducing stock access and establishing stock controls. Te irrigation company has changed several of its irrigation scheduling practices and other components so better use is being made of the available water.

From 2005 to 2008 a three-fold reduction in the bacterial contamination levels were recorded in the Pahau catchment. For phosphorous the decrease is around about two-fold but because the nitrate is associated with groundwater rather than surface water, we have not seen any changes in nitrate at this stage. We still anticipate some reductions will be achieved, because it takes longer to get improvements in groundwater results. But clearly working together as a group in a particular catchment has been important to get these improvements. We are now moving on to St Leonard stream and Dry Stream with similar approaches in those farming communities to try and reduce the total load on the overall system.

If you are looking 20 years ahead we need a new paradigm for water management in Canterbury for the dairy industry to be sustained. This certainly means integrated water management and reconfiguring existing uses as well as looking at future uses.

When we are talking about integrated water management there is a need for parallel development, not only of the production use of water but also of the environmental use, the recreational use and the cultural use. This has been incorporated into the Canterbury water management strategy.

One of the key findings from the strategy work is the incredible contribution that can be made in the mid-Canterbury area, in particular, from water-use efficiency gains from existing water allocations. That is our cheapest accessible water. Storage is very expensive water, although there is still the need to look at sustainable forms of storage, particularly in relation to the issues of reliability that come from climate variability and projections of where climate change is going. But we also need to

have lower water quality impacts from existing and future land use practices. Some major initiatives are going on with industry trying to develop paradigms that can achieve this.
Another key consideration is the way in which we manage water. We see the need for collaborative governance at multiple levels. It has to be at the individual farm property, it has to be at the small scale, it has to be at the catchment scale, it has to be at the regional scale and some matters need to be dealt with at the national level.

There are ways forward, although they require changes in behaviour from many people. And if this happens, then in 20 years we can still have a viable dairy industry and a viable environment. But it will not occur without significant change.