Irrigation Management Made Easy

Application Note

Aquaflex Dairy Farm Irrigation Management

"AQUAFLEX has allowed us to achieve greater efficiency in our irrigation management. The result is a more sustainable and profitable business"

Jilly Reesby, Farm Technician, Synlait Limited

The Dairy Industry is moving into a new era in terms of the impact of Environmental Awareness on the way Dairy Farms operate. While many eyes are on farmers and their environmental stewardship, it is widely acknowledged that many aspects of improved environmental practices have positive benefits for both profitability and the long terms sustainability of the farming venture.

Improved water and effluent management is most certainly an area where improved efficiency generates both positive monetary and environmental returns.

It is most certainly a **WIN-WIN** situation.

AQUAFLEX provides the following benefits:

- **S** Enhanced pasture quality
- **S** Increased production
- **S** Reduced energy consumption
- **S** Reduced water consumption
- **S** Increased effectiveness of fertilisers
- **S** Time and labour savings
- **S** Reduced water management risk
- **S** Demonstrates quality environmental management

The above list is just a broad overview of what improved water management with AQUAFLEX can allow you to achieve.

Why do we have irrigation?

The simple answer is to mitigate the effects of insufficient rainfall and soil available water on production. Irrigation is primarily about managing the risk of reduced pasture access to water.

A Dairy Farm is basically a pasture production facility and managing the risks associated with access to the raw materials is a key to the success of the operation.

We can easily measure rainfall, but it is certainly more difficult to estimate soil water reserves, especially under varying pasture demand as the season progresses.

How does AQUAFLEX assist in managing risk and increase financial returns?
AQUAFLEX is a key irrigation tool which measures two primary variables that control pasture production:

- **S** Soil Water
- **S** Soil Temperature.

In the shoulders of the season soil temperature is the main limiting environmental variable. It is important to keep the soil dry enough so it can be warmed easily – note that a lot of energy is required to increase the temperature of water.

AQUAFLEX enables you to balance the soil moisture and soil temperature to minimise the time until the soil temperature increases to the point where pasture growth rate increases. At the same time the soil must not be so dry as to limit growth – a delicate balancing act only possible with the correct data.

During the peak of the season you want to maximise production by optimising your irrigation management – maintaining soil moisture between ***Full Point*** or ***Field Capacity*** and ***Refill*** (see graph below). You also want to minimise your risk should you lose irrigation (eg. loss of access to water via restrictions or equipment failure) by maximising the time before pasture becomes stressed

Maintaining deficit at safe levels in the shoulder of the season allows you to take advantage of any rain that does fall as there is storage in the soil to hold on to it. Should you have the water contents up near full or field capacity you have to give up the free irrigation that is rain, as it will drain from the root zone as the soil cannot hold on to it.

Ian Allen of Whitestone Pastures retrieving AQUAFLEX data

"AQUAFLEX is one of the best investments we have made to complement our irrigations systems. It has paid for itself several times over in the first season"

Ian Allen, Whitestone Pastures

Installation

For a standard Ryegrass based pasture system the typical installation is:

- **S** A sensor sloping through the profile from about 50mm below the surface down to 400mm (Fig 1).
  This sensor then provides a very good characterisation of the water contents in the main root zone of the pasture.
- **S** A second sensor is often installed horizontally at around 500mm depth to act as a check sensor. This is especially important on light soils or longer rotation irrigation systems that apply large volumes of water infrequently (eg. guns).
  This sensor lets you identify over-watering as drainage of water past the root zone as well as giving guidance to the level of stress the pasture is under.
  Should the water content in the root zone lower to levels where the plant needs to try and extract water from depth, the 500mm sensor will start to show significant extraction.

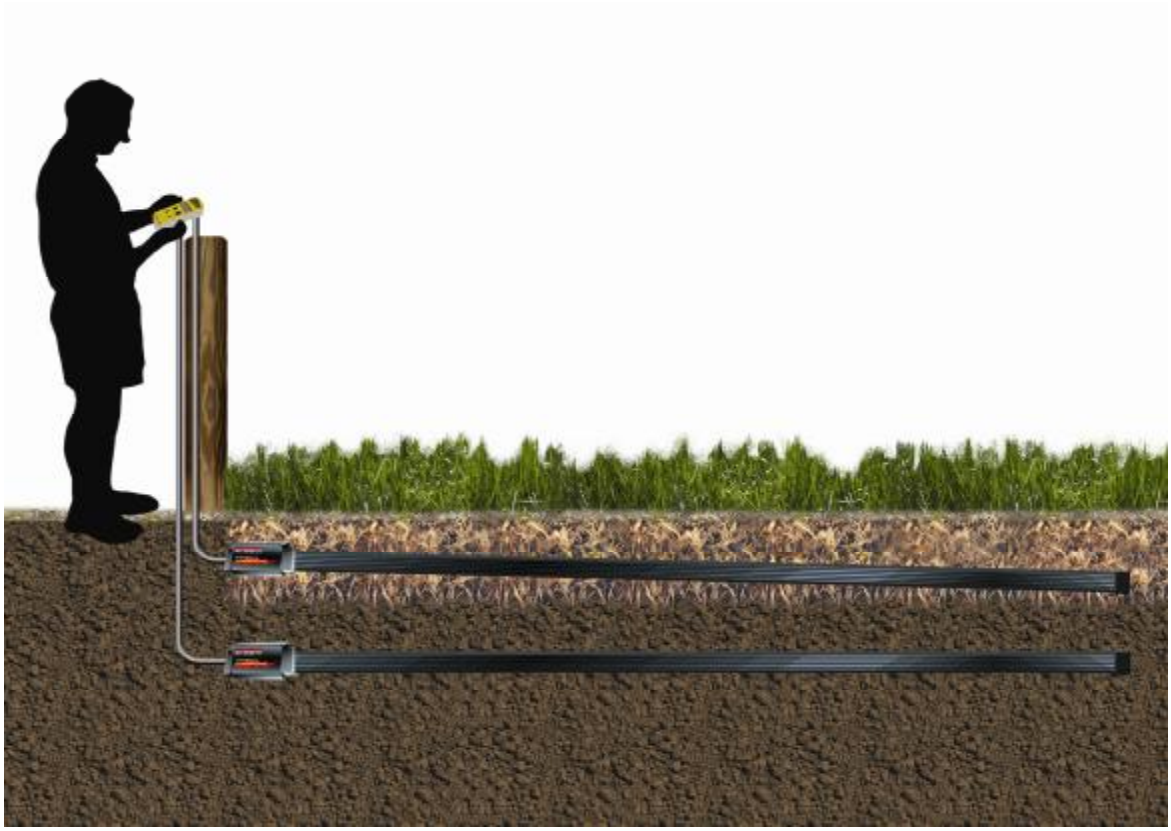

Figure 1: Example of 2 sensor installation in pasture with bottom sensor used to assess over and under-watering

AQUAFLEX Irrigation Management (AIM)

AQUAFLEX helps you tailor your irrigation to the actual soil and pasture requirement. Using AQUAFLEX data you can look at daily water use and determine the exact deficit so you do not apply excess water that will drain.

Improvements in efficiency can be quite dramatic. Figure 2 is a typical example of the improvements that can be achieved with little effort. Note after Active Management commenced the root zone stays between Field Capacity and Refill point with no water lost to deep drainage with the exception of high rainfall events.

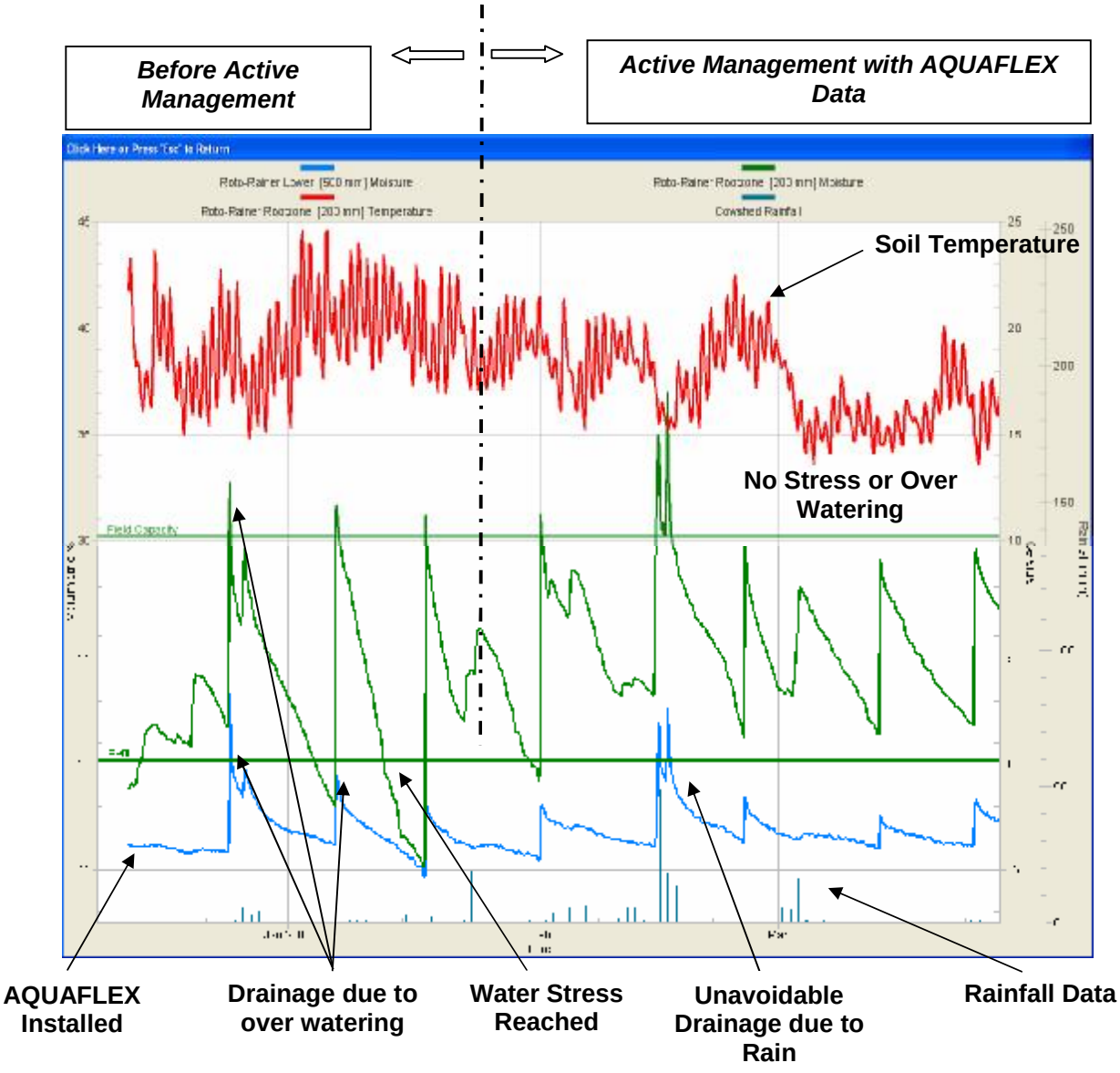

Figure 2: This example show significant gains in irrigation efficiency by using AQUAFLEX to tune application depth and return times

Data for the above graph kindly supplied by Synlait Limited

Use AQUAFEX to:

Avoid Over-Watering
Over watering wastes water, energy and soluble nutrients such as nitrogen which you have had to pay to apply.

As we move into a regulatory environment where consents are changing to seasonal allocations, water cannot be wasted or the result may be removal of the right to irrigate in the autumn if the allocation has been exhausted.

Optimise Pasture Production
Pasture production can be improved by allowing soil temperatures to increase as mentioned above, but also over-watering, especially on heavier soils can lead to pugging and anaerobic conditions when the soil is saturated which causes root tip die back and loss of production.

Assist with difficult Irrigation Management Decisions
Often in dry seasons irrigation systems cannot keep up and managers have to make the decision about is it better to water all paddocks poorly or fewer paddocks well.

Without accurate soil moisture data is almost impossible to determine how far behind you are and what the best course of action may be.

For example, using AQUAFLEX soil moisture data you may decide to reduce your rotation from 11 days to 9 by removing the paddock earmarked for renewal (as it is already producing poorly in the autumn) thus allowing proper irrigation of the remaining area with no loss of production.

"Our Radio linked AQUAFLEX system gives us up to the minute monitoring of Soil Moisture and Soil Temperature. This Season with the AQUAFLEX we have certainly grown more grass with periods of over 90 kg/day because we could manage our water levels to match demand. The system has certainly also helped us towards achieving our goal of increased water use efficiency."

Peter Hancox, Lincoln University Dairy Farm Manager

Environmental Stewardship

Putting the financial benefits to the side, the environmental stewardship issue is increasing in importance by the month.

Without going into the politics of it farmers need the mandate of the public to operate. This is now a fact and this mandate is controlled by proxy by both Central and Local Government with the regional councils holding the power to prevent your operation from continuing.

We already are seeing Regional Councils requiring Soil Moisture Monitoring to meet Resource consent conditions and more and more consents requiring some form of sustainable management plan to be in place before consents are granted or renewed.

Instigating a soil moisture monitoring system will help you prove your environmental management systems are robust when it comes time to defend your actions. If that time is not already here it is most certainly coming.

There is a wealth of experience with using AQUAFLEX in Irrigated Dairy farms in NZ. It's worth has been proven over and over. Please contact AQUAFLEX NZ or your local reseller who will be happy to discuss how the system can be implemented in your operation.

AIM

AQUAFLEX Irrigation Management
- Always on Target -

Spatial Averaging, Precision and Robustness
- three key attributes that put AQUAFLEX in a league of its own! -

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