# Centre Pivot Irrigation report, executive summary

*This Executive Summary is taken from the Final Report of the RIRDC and SENRCC funded research investigating centre pivot irrigation impacts on white clover seed production at Frances and Bool Lagoon in South Australia. The research was conducted by James De Barro, Alpha Group Consulting, and was completed in August 2009 and is RIRDC publication number 10/005.*

## What the report is about

This report summarises a three year research project conducted in the south east of South Australia investigating the impacts of irrigation on white clover seed production. In particular the research examined the impact of irrigation on soil structure and chemistry as well irrigation management on seed production. The report offers white clover producers suggestions of aspects of their management that, if altered, may improve seed production and reduce their irrigation outputs. In addition the report suggests areas that require more research that may assist with the longer term sustainability of their irrigated white clover seed production industry.

## Who is the report targeted at?

The report is targeted at white clover seed producers, including members of the White Clover Growers Association. In addition the research is targeted at allied researchers whom should be able to utilise this study in ongoing or future research into this topic or similar scenarios in irrigated pasture seed production or irrigated crop production in general. The report will be of benefit to agronomists servicing white clover seed producers as an impetus to initiate practice change and ideological positions regarding pasture seed production. This report will also serve as an excellent reference for water policy makers to enhance their understanding of the relationship between irrigation practices and soil health.

## Background

White clover seed yields have anecdotally been reported to be declining since the turn of the century in the area of the research. Why this has occurred is unclear but one belief is the impact of irrigation on soil structure. It has been suggested that the irrigation water applied is reacting with the soil to decrease permeability which in turn will increase salinity to the point that the sustainability of the irrigated white clover industry is in jeopardy. White clover seed producers in the research region have been alarmed by these suggestions and this resulted in the White Clover Growers Association initiating this research to improve their knowledge base.

## Objective

An objective of this research was to create a water balance model for white clover seed production. In conjunction with the water balance investigation, determination of $return/ML applied to assess water use efficiency would be studied. Overlaying this research was the aim of assessing current, as well as historical, impacts of irrigation management on soil chemistry and structure. The objective was to gain more understanding of how irrigation practices affect the soil and how this in turn impacts on white clover production both presently and into the future

## Methodology

A water balance model was calculated for white clover seed production. The model involved the use of local weather data calculated evapotranspiration, development of a crop calendar and calculation of crop coefficients and calculation of evaporative losses. The research used continual logging soil moisture probes to monitor crop water use patterns and assist in determining drainage and water logging events. This data was used to ground truth the water balance calculation.

Soil water was sampled by use of 'Full Stops' and hand built suction lysimeters and irrigation water was directly sampled from the centre pivots. All the water was analysed by the CSIRO. Sites for soil assessment were selected on the basis of electromagnetic survey and soil structure was assessed by soil pit study. A soil core study was undertaken for chemical analysis of the soil through the profile.

Production records were collected by the collaborators and used for the water use efficiency evaluation.

## Key findings

The key finding is that there appears to be a strong future for the irrigation of white clover. The research identified that white clover seed producers may be able to reduce irrigation output by 25-30% with no decline in seed yield and possibly an increase in yield. In addition the research findings suggested that current irrigation practices have not negatively affected the soil structure in comparison to non irrigated sites. Soil chemistry such as pH and salinity has been influenced by irrigation but it is not clear whether these are solely responsible for the anecdotal yield decline. In addition to these findings it is also hypothesised that the herbicide regime applied to the white clover seed production crops has a negative impact on seed yield. The research also suggests that irrigation and stock foot traffic is related to surface sealing that may be influencing clover production and water infiltration.

## Implications

The key findings of the research should permit white clover seed producers to review their irrigation practices with the probability of reducing applied irrigation and potentially improving seed yield. Additionally producers need to reassess their agronomic practices to mitigate herbicide use.

Both the irrigation industry and the water policy makers can utilise these findings to coordinate further research into salinity management and soil health improvement with the aim of maintaining irrigation sustainability in the region.

## Recommendations

Irrigators should be advised by policy makers in the strongest possible terms to utilise continual logging soil moisture monitoring in their irrigation management plans. Soil moisture monitoring should not be viewed as an optional extra in an irrigation system but rather as the control centre that determines when to irrigate and how much to apply. The role of irrigation for crop production and salinity management requires soil moisture monitoring to determine the optimal time and volumes to achieve measurable objectives. Further research is needed to qualify and quantify the use of salt leaching irrigations as well as the use of gypsum applications to manage surface compaction created by stock and irrigation impact. White clover seed producers need to improve their attention to irrigation efficiency and focus on the net $ return/ML of irrigation applied. They are also advised to review their agronomic practices including paddock selection and rotations to aid in mitigating their current high end herbicide use on the white clover seed crops.

# Better Forage Options

## ZULU II Arrowleaf Clover

- Excellent spring and early summer growth
- Erect, narrow stemmed variety
- Well adapted to loamy and deep acidic sandy soils
- Tap root can lower perched water tables
- High level of hard seeds ensures good regeneration

## CAPELLO Vetch

- Softer seeded than other Wolly Pod Vetches
- Offers a disease break in cropping rotations
- Suitable for grazing, hay and green manuring
- Highly efficient nitrogen fixation
- Can reduce black root rot in cotton rotations
- Resistance to spot rust and ascochyta

## DRUMMER Ryegrass

- Mid flowering, erect tetraploid type
- Very good seedling vigour and rapid early growth
- Excellent winter growth with high palatability
- Large dark green leaves with good rust resistance
- Rotational grazing will maximise dry matter production
- Ideal for silage or hay production

## GRAZA 51 Forage Oat

- Medium to late maturity
- Provides a quick winter feed
- Outstanding autumn and winter growth helping bridge feed gaps
- Vigorous establishment and excellent forage quality and quantity
- Rapid recovery after grazing
- Drought tolerance



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