**Winter**

Clover root weevil adult numbers decline and larval populations rise.

- Pugging is the bane of clover over winter – avoid at all costs
- Clover root weevil population levels will be dictated by clover levels and summer survival of the weevil. Numbers will be high if the previous summer was moist and clover levels good.

“After clover root weevil hit my farm in 1997 my production dropped. A 30% decline in grass growth in 3 years equates to $196,000-00 a year loss to a 200 cow Dairy Unit (at 360c Payout). But I don’t need bloat control!”

**Where clover root weevil research is heading**

Current research is seeking to develop an integrated approach to keep CRW numbers at a level low enough that they wont impact on farm profitability. The research is focused on 3 areas:

(i) Understanding the biology of CRW needs to be ongoing as it spreads throughout NZ. As regional climatic conditions vary so will the impact of the pest, and optimal management strategies.

(ii) On-farm evaluation of clover varieties seeks to better identify agronomically well-adapted cultivars that will cope better with the additional stress applied by CRW.

(iii) Evaluating Bio-control options:

(a) CRW disease - A disease of clover root weevil has been identified and is currently being formulated to enable it to be applied to pasture. The disease does not affect man or animals and once introduced to a pasture may provide long term suppression of clover root weevil numbers allowing clover to survive with less stringent management.

(b) CRW parasitoid - A wasp that attacks clover root weevil is currently going through a screening process that may eventuate in its release within a few years.

**Waikato Clover Management Group**

In the meantime the Waikato Clover Management Group is a farmer driven and on-farm focussed group formed in response to the need for immediate solutions to maintaining pasture production in the presence of CRW. Management techniques need to be found to supply N in ways other than via clover fixation for both pasture production and clover growth. The group proposes to evaluate the response of pasture production and clover growth to a range of rates and timing of application of Nitrogen. It will also seek to identify systems to successfully establish clover in pasture in the presence of CRW, and identify clover friendly ryegrass varieties that enable clover to be more competitive in pasture with CRW.

This pamphlet is the first project of this group. It is about farmers helping farmers to better manage a potentially crippling pest that is spreading inexorably throughout the country.

“Contact with researchers at Mystery Creek in 2002 made me realise we needed answers to some of the questions to do with managing clover and clover root weevil in pasture. It was daunting at first to find myself convenor of the Waikato Clover Management Group. However the co-operation and enthusiasm from the NZ Landcare Trust, researchers, the ag-industry and farmers alike has been inspiring. We believe we can get the answers we need.”

Lorraine Bilby – convenor of the Waikato Clover Management Group.
**Clover Root Weevil (CRW)**

Clover Root Weevil has been around in the Waikato since the mid 1990’s. It has now spread throughout the Bay of Plenty and into Hawkes Bay, Taranaki and Northland. Feeding exclusively on clover, CRW eats the leaf, roots, stolons and root nodules. It has a major impact on clover production and survival and reduces the ability of clover to fix nitrogen. Clover can be totally removed from the system – and with it the valuable contribution to feed quality clover makes in it is own right. Farmers in the Waikato and Bay of Plenty, with input from researchers and the wider farming sector (especially ag-chem and fertiliser industries) have identified on farm practices that give clover a better chance to survive and remain productive in the presence of clover root weevil.

**Know Your Enemy**

**Clover root weevil adult**
- Lives on the soil surface, feeding on clover leaves mostly at night.
- Causes “U” shaped notches on leaf edges.
- Present throughout the year but more abundant in spring and autumn.
- Prefers the leaves of white clover but will feed on leaves of other clovers. Because clover is bred for defoliation the adult feeding alone will not kill clover, but is a good indicator of the presence of CRW.
- CRW adults can fly and they actively disperse when numbers are high and clover levels are low.
- CRW can survive in bailed hay. If you are free of clover root weevil do not take the risk of importing hay from a CRW infested area.
- Clover seedlings are particularly vulnerable to the CRW adult. As a general rule, sowing clover into a clover root weevil infested pasture is money wasted.

**Clover root weevil larvae**
- Are the most damaging stage.
- Live in the soil. The larvae if present will be mostly in the top 5 cm of soil. Dig up several clover plants to see if you have CRW larvae in your pasture.
- Present throughout the year but most abundant from late autumn to early spring.
- Feed on the stolons, roots and nodules of clover. The small larvae damage the clover nodules affecting the plants ability to fix N. The larger larvae feed on the roots and stolons of the clover reducing production, persistence and sustainability.

**Strategies for clover survival**

Clover also requires nitrogen to maintain growth and survive. Nitrogen fertiliser management in the past has been directed at manipulating a grass response to suit feed requirements. CRW has changed that scenario. Even in the absence of a contribution to N fixation clover is a valuable pasture component in terms of feed quality. Where CRW is present farmers are not getting the full benefit of N fixation from clover.

Clover, particularly in dairy pastures, is subjected to many stresses that affect the ability of the plant to survive. Clover root weevil, particularly when new to a region, can serve as the proverbial straw that breaks the camels back. What we have outlined below are strategies that you as a farmer can adopt/modify to reduce the stress on clover to enhance its ability to survive in the presence of clover root weevil. These strategies are not aimed at killing the pest. The reduced ability of clover to fix N in the presence of CRW must be kept in mind when implementing them. It is important to ensure that fertiliser levels are not limiting to clover and that seasonal grazing management favours clover survival.

**Seasonal strategies to consider**

**Spring**

Adult CRW’s are starting to emerge in greater numbers from October onwards. Notching on the clover leaves is more obvious. The adults are laying large quantities of eggs into the pasture.
- Don’t let a pasture get rank – shielding the clover from the sunlight reduces its ability to grow.
- Consider upping the N inputs over this period to take advantage of the better growth conditions.
- Nematode and weevil attack mean that spring sowing clover for the most part will offer no return.

**Summer**

Adult egg laying and egg and larval survival are dependant on summer rainfall.
- During a dry summer CRW populations do not build up as the heat and dry conditions reduce egg laying and decimate eggs laid and the young larvae. This can lead to low populations the following autumn and clover resurgence.
- During wetter summers when the soil moisture levels are maintained CRW survival is good and the subsequent impact on clover growth and survival the following autumn can be devastating.
- Keep sufficient cover on pastures to protect the vulnerable clover stolons from direct sunlight.
- Reduce N applications particularly if conditions are dry.
- Clover in a pasture does not mean you will be getting N fixation.

“We had great clover after the wet summer in 2001. But next winter we saw the pasture yellowing and knew something was wrong. Despite clover being there it wasn’t fixing N because of clover root weevil attack."

**Autumn**

Initially CRW larval populations decline as they pupate and new adults emerge. Egg laying rapidly increases and larval populations begin to rise.
- Grass growth accelerates in the autumn months so care with grazing is needed to ensure that the clover is not out competed.
- Following a moist summer when CRW larval populations were very high, clover plants will still be under stress.
- Avoid over grazing pasture, particularly those with a tendency to pug or if conditions are dry.
- Use N application to grow grass for winter.
- If sowing clovers into a CRW infested pasture it is likely that clover root weevil adults will need to be controlled to ensure good clover establishment. Lorsban 750 WG insecticide is registered for this purpose.

“I thought that clover root weevil had gone away after the summer drought in 2000, but within a few years it was as bad as ever. We need to know what we have and take steps to eradicate what clover root weevil is doing to keep our crop.”

**Nitrogen (N) inputs for clover growth - Key Points**
- When clover loses its nodules it loses the ability to fix atmospheric N.
- Clover also needs N for growth.
- Clover N needs can be supplemented with bagged N. Applying “a little and often” is one approach to maintaining clover in the sward. Further work is required on how little, and how often. (Indications are that rates of 5-10 units of N applied after grazing may be sufficient.)