



# Timerite – control of redlegged earth mite in Australian pastures

## Introduction

The redlegged earth mite (RLEM) is a major pest of pasture legumes in the winter rainfall regions of Southern Australia – a total of 20 million hectares supporting an estimated 60 million sheep are affected by RLEM. Pasture legume seedlings and particularly subterranean clover (sub clover) are particularly susceptible to attack from RLEM but the mites also feed on lupins, canola, field peas, as well as some vegetables. Up to 80% of seedlings, and a similar amount of spring dry matter yield may be lost on infested paddocks of sub clover.

AWI and its predecessors supported CSIRO research on RLEM from 1990-1995. The project originally focussed on the ecology of RLEM and on how plant resistance could be used in managing them. CSIRO discovered that the onset of diapause could be predicted and it became evident that mite abundance in autumn could be well controlled by spraying in spring just before the adult female mites produce their eggs. From 1995-1997 CSIRO fully funded the work developing a model predicting diapause at 18 sites in south-western Australia.

The optimal time to spray varies significantly by location and in 1998 the Australian Wool Research and Promotion Organisation (AWRAP) decided to fund a five year project to develop a package predicting optimal timing for a single spring spray using farm demonstration sites across the country. By 2003 the model had been trialled at another 37 sites.

Timerite is a trademarked decision support system which provides farmers with the optimum spray date for their pastures. The Timerite package also provides farmers with further information on RLEM and their management. The latest available figures show that the Timerite package was taken up quickly by farmers. Table 1 shows that the total number of spray dates provided could be as high as 10,102; however, it is not clear how many of the visitors to the 'Find your spray date' website actually downloaded a spray date; secondly, AWI Helpline staff have found that some people call to confirm that the date is the same as advised the year before. With the potential number of adopters estimated at around 23,000, the current rate of adoption is therefore on balance estimated at 30%.

Table 1 **Timerite – spray dates provided (1999-2006)**

| Delivery Mechanism  | Sales of Timerite |      |       |       |       |       |               |        |         |
|---------------------|-------------------|------|-------|-------|-------|-------|---------------|--------|---------|
|                     | 1999              | 2000 | 2001  | 2002  | 2003  | 2004  | 2005          | 2006   | 2007    |
| Kondinin #          | 411               | 471  | 262   | 147   | 119   | 2     | -             | -      | -       |
| Timerite Website ## | -                 | -    | -     | -     | -     | 2,575 | W             | Y*     | 2,795** |
| AWI Helpline ##     | -                 | -    | -     | -     | -     | 1,120 | X             | Z      | 62      |
| Total               | 411               | 471  | 262   | 147   | 119   | 3,697 | W+X           | Y+Z    | 2,857   |
| Cumulative Total    | 411               | 882  | 1,144 | 1,291 | 1,410 | 5,107 | 5,107<br>+W+X | 7,245* | 10,102  |

# Timerite cost \$55 to producers

## Timerite provided free of charge to producers

\* Includes website numbers up to March 2006 only

\*\* Total number of hits to "Find your spray date" page for the 13 month period ending January 2008 was 3028 – may not equate to spray dates provided

Source: AWI Ltd and ACIL Tasman estimates based on figures provided by AWI

## Rural Research Priorities

The Rural Research Priority on which this project focussed is 'Productivity and Adding Value', although it may be argued that in controlling RLEM the project also made a contribution to 'Biosecurity'.

## Costs

Known costs include \$398,859 identified by AWI as spending since 1998. Previous AWRAP records could not be accessed but from 1990-1995 the contribution made by AWRAP would have been \$150,000 a year of which perhaps 10% was relevant to Timerite, i.e., around \$15,000 per annum. The total commitment from AWI is on this basis estimated at around \$0.5 million.

In addition to AWI, CSIRO, Bayer Australia, and farmers also incurred significant costs in developing and demonstrating the benefits of the Timerite model.

CSIRO costs included 90% of salary for Celia Pavri plus 10% of James Ridsdill-Smith for the ten years from 1995 to the delivery in 2004, as well as small further amounts in 2005 and 2006 Including on-costs the total CSIRO contribution came to just over \$1.5 million.

Bayer Australia was part of the project and supplied Omethoate for free (one litre of Le-mat to collaborating farmers) as well as offering a cash back scheme once Timerite was released. Bayer offered \$15 cash back on every 10L bottle purchased if the customer had subscribed to Timerite. Bayer also ran some of the trial sites in South Australia and New South Wales. The total cost incurred by Bayer during the period 1998-2003 could not be ascertained as

documentation was not available to current staff at Bayer Australia. However on the basis of the current list price of around \$273 per 10L bottle of Le-mat, the contribution in terms of lost revenue for Bayer Australia would have been in the region of \$25,000 for chemicals only. In the absence of detailed information, we also attribute a nominal value of \$10,000 per annum during the trials phase for assistance provided with the sites in SA and NSW. Bayer Australia's contribution is therefore valued at a total of \$85,000.

CSIRO estimated the cost to farmers of having a demonstration site on their property at \$2,000 a year. With 87 sets of annual data collected from participating farmers, the total cost to farmers of participating in the demonstration phase has been estimated at \$174, 000.

A number of farmers also incurred costs in obtaining spray dates during the early trials phase. The decision to make the Timerite model available in Western Australia as early as in 1998 was because some of the spray dates being used at trial sites had been passed on and used on farms where this was not the optimal date. In order to protect the reputation of the effectiveness of Timerite, CSIRO and AWI contracted Kondinin to deliver Timerite in Western Australia at a cost of \$55 per site (date) which was charged to the participating farmers to cover the costs to Kondinin of delivering this package.

The reason it was only released in Western Australia in 1998 was that the model was based on work undertaken in WA and the model had not been tested in the Eastern States and required further development there.

A total of 1,412 Timerite dates were sold from 1998 until 2004 through Kondinin, at a total cost to farmers of \$77,660. Whilst this cost was not essential to developing the Timerite package, if farmers had not borne this cost the benefits discussed in the next section would not have materialised.

Table 2 **RLEM project costs (nominal \$)**

|  | Costs (est.)       | Share | Description                       |
|--|--------------------|-------|-----------------------------------|
| AWI & predecessors                     | \$500,000          | 21%   | 1993 to date                      |
| CSIRO                                  | \$1,500,000        | 64%   | 1993 to date                      |
| Bayer Australia                        | \$85,000           | 4%    | 1998-2003                         |
| Farmers                                | \$250,000          | 11%   | 1998-2003                         |
| <b>Cost of project, to date</b>        | <b>\$2,335,000</b> |       |                                   |
| <b>Future costs (20 year estimate)</b> | <b>\$200,000</b>   |       | Timerite website & helpline (AWI) |
| <b>TOTAL COST</b>                      | <b>\$2,535,00</b>  |       |                                   |

Data source: ACIL Tasman estimates with input from AWI, CSIRO and Bayer Australia.

## Future costs

The Timerite package was effectively launched in 2004, and since then AWI has borne the cost of managing the website and running and staffing the helpline. Timerite calls to the helpline have averaged some 11 minutes each. At a cost of around \$2 per minute, this implies a typical cost of around \$20 per call. Future call volumes are difficult to anticipate but are expected to level out at 50-100 calls per year. The cost of running the website is not recorded separately by AWI but does require some maintenance and administration. Key researchers may also be called upon from time to time (as during the preparation of this cost-benefit analysis) for review and clarification of issues relating to the Timerite package. On balance, this CBA projects forward costs at a notional rate of \$10,000 per annum.

## Benefits

Average mite densities prior to spraying were 10,000 mites/m<sup>2</sup> at farms in the eastern States and 24,000 mites/m<sup>2</sup> at farms in Western Australia. At a density of 12,000 mites/m<sup>2</sup> RLEM use as much energy as one dry sheep equivalent per hectare (one DSE/ha). The elimination of RLEM infestations can therefore significantly enhance grazing capacity and reduce the need for supplementary feeding. The trials in fact showed a 40% increase in subterranean clover seed yield in summer and a 90% increase in subterranean clover seedling density in autumn. There was on average 95% mite control in autumn.

CSIRO collected information on the benefits of using Timerite from a number of demonstration farms. At Warrigal Park it was found that using Timerite provided an increase in income of \$55/ha (Table 3). This occurred because the sprayed paddocks had a greater lambing percentage and weight, and the ewes cut more wool. The sprayed paddocks did incur the cost of spraying, however the unsprayed paddocks required additional hay feed because of the decreased pasture availability.

Table 3 **Economics of Using Timerite – Fixed Stocking Rate**

|                           | Sprayed Paddocks | Unsprayed Paddocks |
|---------------------------|------------------|--------------------|
| Stocking Rate (DSE)       | 15               | 15                 |
| Net Wool Income (\$)      | 2,291            | 1,932              |
| Net Lamb Income (\$)      | 2,500            | 2,016              |
| Additional Costs (\$)     | 126 (Spray)      | \$60 (hay)         |
| Total Income - Costs (\$) | 4,665            | 3,888              |
| Income (\$/ha)            | 333              | 278                |

The trial at Warrigal Park was repeated the following year using a different approach, i.e., adjusting the stocking rate based on the amount of feed

available. The sprayed paddocks were able to carry 17.5 DSE whereas the unsprayed paddocks were only able to carry 14 DSE (Table 4). This resulted in an additional \$51/ha in income from the sprayed paddock compared with the unsprayed paddock.

The typical size of an Australian sheep or mixed farming operation in the region is 500 hectares. For farms of this size, a gross margin improvement of \$50/ha translates into a financial gain of \$25,000 per year.

Table 4 **Economics of Using Timerite – Variable Stocking Rate**

|                           | Sprayed Paddocks | Unsprayed Paddocks |
|---------------------------|------------------|--------------------|
| Stocking Rate (DSE)       | 17.5             | 14                 |
| Net Wool Income (\$)      | 1,639            | 1,366              |
| Net Lamb Income (\$)      | 2,962            | 2,381              |
| Spray Costs (\$)          | -140             | 0                  |
| Total Income - Costs (\$) | 4,461            | 3,747              |
| Income (\$/ha)            | 319              | 268                |

Benefits that were not estimated include losses saved in following crops, particularly canola which is susceptible to RLEM. Mite feeding causes yield losses to legume and canola crops. Mites can also cause sufficient loss of seedlings to require the crop to be resown. In self generating pastures the mites are part of the cause of pasture decline causing loss of productivity every year due to lower legume content and reseeding of the pasture earlier in the rotation.

It is also important to consider what might have occurred in the absence of the Timerite solution. The financial results based on the trials at Warrigal Park only compare sprayed (Timerite) and unsprayed paddocks. In reality, farmers faced with an infestation have the option to spray later in the year to contain the damage done by the mites. However this would not protect seed yield and seedling density. Current stocking/grazing and other farm management practices also reflect the way in which farmers have adapted to RLEM. The calculation of benefits attributable to Timerite in the discussion below therefore makes adjustments to take account of these considerations.

### **Adjusting the benefits estimate**

As discussed earlier, if a gain of \$50 per hectare can be realised by adopters of the Timerite solution, then for a 500 ha farm size this translates into a potential gain of \$25,000 per annum – however, the majority of Australian sheep farms are less than 500 ha in size. Conditions “on the ground” as well as differing management practices lead to significant variations in observed financial impacts across farms and in different types of operating environments. To

reflect this, Timerite adopters have been split into three groups for the purposes of this analysis:

- 1/3 of the total are those who have not sprayed before and who will get the full economic benefit of Timerite
- 1/3 are those who spray ineffectively and who will therefore get some of the benefits in terms of gross margins as well as reducing their cost of chemicals, and
- 1/3 are those who already spray effectively (Timerite does not affect their gross margins but they use fewer chemicals as they spray only once rather than twice)

Adopting a representative farm size of 300 ha in conjunction with the above distribution, the representative annual gain is estimated at \$8,000 per adopter. With over 7,000 adopters during 2006 the annual value of the benefits generated is therefore estimated at over \$56 million for Australia as a whole.

### **How long will benefits be reaped?**

With the widespread adoption of minimum tillage in farming systems in the last 10-15 years there has been an increase in pesticide use. Attitudes to risk vary between farmers, with some using mixes in knockdown sprays, while others only spray after RLEM outbreaks. However no one method has so far replaced the need for chemical control, and no one spray timing will control all weeds and pests. The repeated use of a chemical treatment in the same paddock at the same time each year can lead to insecticide resistance and other adverse environmental responses.

After the early widespread use of Timerite, the current use is probably more focused – an indication of recent trends in adoption is given by the volume of calls to the Helpline which has dropped sharply since 2004 (see Table 1). This CBA assumes that adoption has indeed reached a plateau, with existing adopters likely to use their spray date somewhat more selectively over the coming years, and only small numbers of additional users coming on stream.

The Timerite package will remain to be a powerful tool for farmers to use in certain circumstances and provides far more reliable control of RLEM than other currently available spray treatments. It is particularly useful when susceptible crops are to be grown following a pasture with high clover content, or to protect seed production of pasture legumes, and subsequent seedling survival.

For the purposes of this CBA we have concluded that Timerite will remain to be in use in the foreseeable future, albeit at a lower level – the analysis assumes that 20% of adopters will be using the Timerite solution in any given year in future years.



### **Obsolescence & CBA time horizon**

Work on a range of possible alternative farm management options such as rotational grazing, cultural control, and biological control, has been carried out for nearly a century but none of these methods has proved as effective as a chemical spray in controlling pests. This means that such alternatives will in all likelihood at best permit farmers to reduce dependence on sprays rather than offering a complete replacement.

New surface coatings with chemicals will protect seeds, but these are more expensive and do not protect seed yield in self generating pastures. One possibility is that a breakthrough based on modern biotechnology produces a type of pasture that is resistant to RLEM. However this is not currently on the horizon and on balance it would therefore appear that the Timerite package will continue to play a role in the foreseeable future.

This CBA uses a time horizon up to 2020 which implies that benefits will accrue for 17 years since the launch of Timerite in 2004.

### **Environmental and social impacts**

It is impossible to fully evaluate the environmental impact of the Timerite package in the absence of detailed 'before-and-after' data from adopters. The Timerite package essentially allows the farmer to trade off one or more (uncertain) sprays later in the year against one definite spray up front. By making previously marginal paddocks more productive, there is also an incentive to bring new areas into production, to increase stocking ratios and/or to alter land management practices (with possible consequences for overall resource use and environmental impact).

Social impacts are easier to identify and are highly likely to have been positive. The managerial convenience of being able to schedule/bundle spraying on a fixed spray date reduces the incidence of stressful and potentially costly unscheduled spraying later in the year (difficulties of finding work force at short notice, etc.).

### **Conclusion**

The Timerite package has been very successful with farmers and even under the conservative assumptions used in this CBA yields a high benefit-to-cost ratio as well as a strong internal rate of return. The total investment estimated at \$2.3 million up to the launch date in 2004 produced benefits of \$31 million in the launch year along, rising to \$56 million in 2006. Our future projections suggest that with a 20% adoption rate, benefits will be in the region of \$37 million each year.



**ACIL Tasman**

Economics Policy Strategy

Based on its contribution to the costs of the project AWI will be able to claim around one-fifth of these benefits with most of the remainder going to CSIRO.