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Andrew Bathgate

Ian Evans

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Economics of interceptor drains: a case study

By Andrew Bathgate and Ian Evans, Economic Analysis Branch

Adviser, South Perth
Regional Economist, Albany

This case study determines the most likely rate of return to capital invested in constructing seepage interceptor drains to reduce the effect of waterlogging on crop and pasture yields.

The analysis of a farm in the Denbarker region, west of Albany, determined what increases were needed in pasture growth to justify the cost of constructing drains across four adjacent paddocks.

The benefits of changing rotations to include lupins were also determined, as growing lupins was unprofitable before the construction of drains.

Benefits
The study showed that an increase in stocking rate of only 0.4 dry sheep equivalents (DSEs) per hectare was needed for interceptor drains to be profitable. This increase represents less than a 4 per cent increase in production.

Growing lupins after draining the paddocks further increased profits. The total benefit of constructing drains was $18/ha, resulting from the increased stocking rate and improved rotations.

A reverse bank interceptor being built in the Byenup Catchment, south-east Kojonup. Upslope is to the left.

The conclusions of the study were:

- Interceptor drains were likely to substantially increase the net return per hectare.
- Only small increases in stocking rates were needed to cover the cost of the drains.
- The ability to crop drained paddocks further increased profit as the farmer then had more flexibility to adapt to seasonal variation from year to year.

Description of the farm
The farm is located in an area with an average annual rainfall of 650 mm. The farm's soils are predominantly duplex (sandy topsoils over clayey subsoils) and very susceptible to waterlogging. Waterlogging is only apparent when the soil is saturated right to the soil surface and puddles are visible. However, these soils waterlog when water is perched on the clayey subsoil and is not visible on the soil surface. This reduces crop and pasture production.

Although much of the farm is susceptible to waterlogging, only four paddocks were examined for this analysis. The paddocks are adjacent to each other and total 65 ha. Three interceptor drains about 80 m apart were constructed across the four paddocks. The drains are about five metres wide and their...
total length is 1.8 km. At today’s prices the drains would have cost $400/km to construct.

Sheep production is the predominant enterprise, with some barley grown. The four paddocks examined in the analysis were used for pasture production before the drains were constructed. Lupins were not grown because of their high susceptibility to waterlogging, which occurred about six years in every ten before the drains were constructed.

Method and results

The analysis was done using a financial spreadsheet program called DRAINS, which was developed by soil conservation researchers at the Department of Agriculture (Salerian and McFarlane, 1987). The spreadsheet allows farmers and advisers to compare the costs and benefits of drains under a range of climatic and economic conditions. The net value of the drains was calculated over a 20-year period.

Although the probability of waterlogging on the paddocks studied is six years in every ten from previous experience, it is not possible to predict how often paddocks will waterlog. The analysis was repeated many times for each set of economic conditions, varying the years of occurrence of waterlogging events over the 20-year period. The average value of investing in drains was calculated for each set of conditions.

Different costs of constructing and maintaining interceptor drains were used in the analysis to determine what influence they had on the net benefit of reducing waterlogging.

Stocking rate had to increase by 0.4 DSE/ha over the four paddocks to cover the costs of interceptor drains. This is an increase of about 4 per cent on this farm. Increases in pasture production of 40 per cent have been measured in experiments which studied the effect of waterlogging on pasture growth.

When the probability of waterlogging is six years in ten, paddocks could be waterlogged less than 12 years in 20. If so, the net value of the drains will be lower than expected.

Given that increases in pasture growth of 40 per cent have been measured, stocking rates are more likely to rise by about 1 DSE/ha. With a 1 DSE/ha increase in stocking rate as a result of the drains, profit rose by $4/ha/year. This is an expected rate of return of 158 per cent to the capital invested.

Even with a low occurrence of waterlogging, there is virtually no chance of incurring a loss as there is a 90 per cent chance that the rate of return to the capital invested will be greater than 50 per cent. The investment, therefore, represents a very low risk. (The benefit of $4/ha/yr is lower than the gross margin because interest costs and depreciation of the drains have been subtracted.)

Assuming an increase in stocking rate of 1 DSE/ha, the construction costs of drains were increased from $400/km to $700/km to examine the effect on profit. The expected net return to the investment dropped to $3.50/ha/year. Despite the drop in value because of higher construction costs, drains were still profitable as the expected return to capital was 113 per cent. Increasing maintenance costs by 30 per cent to $100/ha every five years had little impact on profit.

The only benefit considered in this analysis so far is increased pasture growth. Before the paddocks were drained, cropping rotations were limited because waterlogging meant that lupins were a high risk crop. To determine the profitability of growing lupins, a rotation including lupins was compared with continuous annual pasture using net margins. The net margin is the gross margin net of depreciation of capital and ownership costs of capital.

The lupin rotation was three years of pasture: one year of barley: one year of lupins: one year of barley. The net margin was $139/ha compared with $125/ha for continuous pasture. The difference in profitability was $14/ha in addition to the $4/ha resulting from the increased stocking rate. The total net benefit of constructing drains to reduce waterlogging was $18/ha. This represented an increase in profit of 15 per cent a year.

The DRAINS program was a useful tool in this case study to determine the profitability of draining paddocks. It is designed to be used on-farm by farmers and advisers. It provides useful economic information which can help them make decisions before the drains are constructed.

Further reading