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Economics of interceptor drains: a case study

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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.

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 enter­
prise, with some barley grown. The four pad­
docks 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 condi­
tions.

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.

If the probability of waterlogging is less than
six years in ten, there is a 10 per cent chance
that a loss of $500 or more could result from
constructing the drains.

There is a 60 per cent chance of breaking even
or making a profit.

However, stocking rate will probably increase
by more than 0.4 DSE/ha as a result of drain­
age.

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 continu­
ous 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
Salerian, J.S. and McFar­
lane, D.J. (1987). DRAINS: a
method of financially
assessing drains used to
mitigate waterlogging in
south-western Australia.
Div. Resource Management
Technical Report No. 54. W.
Aust. Dept. Agric.