



# Erosion Economic Calculator

*Estimating the farm's financial losses that may be caused by erosion.*

*The loss of fertile topsoil, its nutrients, and a reduction in depth to subsoil can incur significant costs to farm productivity that haven't traditionally been accounted for and don't appear on balance sheets.*

## **Why was this calculator created?**

The Erosion Economic Calculator has been developed to enable members of the agricultural community to understand the financial risks of erosion, and the potential costs of inaction.

## **What costs are calculated?**

The calculator estimates the cost of lost carbon and nutrients, lost future yield potential, and the combined cost over a 10-year period.

## **Where do I find it?**

Download the Excel spreadsheet from the Hillslope Erosion Project webpage at the NRM North Website:

<https://nrmnorth.org.au/land/hillslope-erosion-project/>

Follow the instructions on the “instructions” tab on the spreadsheet.

## **How do I use the calculator?**

1. Enter data or make the appropriate selection in the green cells.
  - a) Enter average mm depth of soil loss from an event or period of erosion.
  - b) Select soil type in a drop-down list by clicking on a little ‘down arrow’ box next to the green cell.
  - c) Enter the number of hectares that experienced the erosion. Values less than 1 can be used, i.e., 0.5 for half a hectare.
  - d) Select option for topsoil fertility level from the drop-down list.
  - e) Select the farm enterprise category from the last drop-down list.
2. Note the results calculated in “the cost of lost yield potential”, and “the cumulative cost over 10 years from the erosion event” cells.

Users will note that different inputs will generate considerably different results reflecting differences in soil nutrient status and potential income from different enterprises.

## BACKGROUND

NRM North's first hillslope erosion trial at Weetah in 2019 included a simple financial analysis of erosion costs by environmental and agricultural consultancy, RMCG. This financial analysis generated interest from the local farming community and NRM North saw benefit in creating a detailed, adaptable all-purpose calculator to understand the potential costs of erosion.

*The Excel format Erosion Calculator has been developed to not only support the ongoing hillslope erosion work undertaken by NRM North but as a resource for the broader agricultural community to understand the financial risks of erosion better.*

### What data does the calculator use?

The data underpinning the calculator includes a list of bulk densities of common soil types used in Tasmania for agricultural production; optimum soil fertility levels for different farm enterprise categories; fertiliser needs and costs to achieve those fertility levels; and average farm returns per hectare for different farm enterprises. This information has been 'locked' and 'hidden' within the spreadsheet to make it easy to use.

### What are the assumptions and limitations of the calculator?

**Soil fertility:** For simplicity, there are only three categories for soil fertility: vegetable crop/milking platform (high fertility); broadacre crop/improved pasture (medium fertility); and low-input pasture (low fertility). The calculator also assumes that soil fertility is kept at recognised industry 'optimum' levels for each category. The 2020 price is used for fertiliser, but it ignores additional costs involved with fertiliser haulage and spreading. The calculator results address soil carbon, nitrogen, phosphorus,



*Loss of soil was measured at the Deloraine trial site using a series of bamboo sticks.*

potassium, and sulphur only. Other lost soil nutrients are not included in the results.

**Lost future yield:** This is a simple calculation based on the reduced volume of topsoil available after erosion and the average yield returns for that broad enterprise category (2018). The more topsoil lost, the less volume of soil per hectare available for holding nutrients and water in spaces easily accessible to plant roots – therefore reduced potential for high agricultural yields due to increased moisture stress, disease risks etc.

*The calculator assumes that 30cm of topsoil depth was available prior to erosion. Where topsoil is shallower, the percentage loss due to erosion is likely to be higher.*

Depending on soil characteristics and enterprise type, erosion can create additional costs, such as de-stoning operations. As these only occur in certain situations, they were not included in the calculator. In some cases, soil eroded from production areas can be recovered from dams or roads with completely different costs including degraded soil structure. In these cases, the calculator results do not apply. Off-site costs of erosion such as public costs are not included.

## Measuring erosion



*Sediment plumes are a powerful visual indication of the loss of soil into the ocean after rainfall events.*

During NRM North's hillslope erosion trial near Deloraine in 2019, project staff measured the erosion by inserting a grid of narrow bamboo pegs in the soil at the start of the trial in early winter, then measuring by hand the varying height of soil compared to bamboo pegs across the grid in late spring. A total of 555 measured pegs provided reasonably reliable results.

This is just one method that can be used to measure erosion; it is inexpensive and accurate, though time-consuming. Other methods may involve flumes to capture soil at the bottom of a paddock, counting the number and extent of rills, or alternatively changes in soil height can be measured relative to a raised, level bar above the soil.

The NRM North project measured an average of 6mm loss in a bare fallow plot. The loss was during a particularly dry winter/spring on moderately sloping ground and a cloddy, uneven soil surface.

Although an average 6mm loss occurred in that situation, losses are highly variable. High levels of ground cover can significantly reduce erosion losses. Bare soil, steep slopes and high- and/or intense rainfall can produce much higher losses and subsequently much higher costs to future farm productivity.

## Who helped to make the calculator?

NRM North would like to acknowledge those who contributed to the development of the Erosion Economic Calculator. While Adrian James (NRM North) was the lead developer, others contributed valuable data, knowledge and experience. These include:

- Dr Bill Cotching
- Tasmanian Department of Primary Industries, Parks, Water and Environment
- Lee Menhenett (Incitec Pivot Ltd)
- Dr Doris Blaesing (RMCG)
- Frank Mulcahy (Simplot Australia)
- Peter Heading (NRM North)



*Productive soil recently eroded by intense rainfall.*

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