Case study

Soil loss in vegetables

The use of cover cropping on fallow areas is one of the easiest and affordable options to reduce soil loss and for soil health benefits.

Key outcomes

Cover crops significantly reduced runoff and soil loss from vegetable fields with:

- Significant runoff evident in fallow areas compared with cover crop areas
- Significant soil lost from bare fallow areas (equivalent of 5t/ha) over Summer from rainfall and irrigation events.

Background

Soil loss is increasingly recognised as a significant issue in vegetable systems with negative impacts on waterway quality and a loss of productive resource. Cropping fields often show signs of washing after rain events.

However, the following is hard to deduce from these signs of wash:

- Has any soil moved off field?
- How much soil has moved?
- How effective is a cover crop in reducing erosion?

Objective

To monitor and quantify soil loss from fallow and cover cropped areas during irrigation and rainfall events.

Activities

A monitoring site was established over the 2018–19 Summer in the Lockyer Valley on a commercial vegetable farm. The soil type in this area is alluvial clays, undulating in topography *(Image 1)*.

A small area of a field with 15% slope was split into three treatments: 2 x commercial cover crops (lablab and a biofumigant Nemat) and a fallow area.

Sediment collection troughs were set up at the end of these treatment areas *(Image 2)*. The crop was irrigated by lateral irrigator which applied approximately 240mm. There was minimal rainfall in January and February, however, there were three events in mid to late March totalling another 240mm and the troughs were removed after this. The field was monitored for sediment loss from December 2018 through to March 2019.

Image 1. *Soil loss monitoring site prior to cover crops going in.*

Project title: VG16068 Optimising cover cropping in Australian vegetable production

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Results

This site revealed:

- Significant runoff was evident following irrigation events, with no runoff observed from the cover crop areas
- The equivalent of over 5 tonnes/ha of lost soil was captured from the fallow area over the Summer period from predominantly irrigation events
- The cover crop treatment did not lose any soil over the Summer period.

Figure 1. *Soil captured in troughs over the Summer period for the fallow and cover crop treatment.*

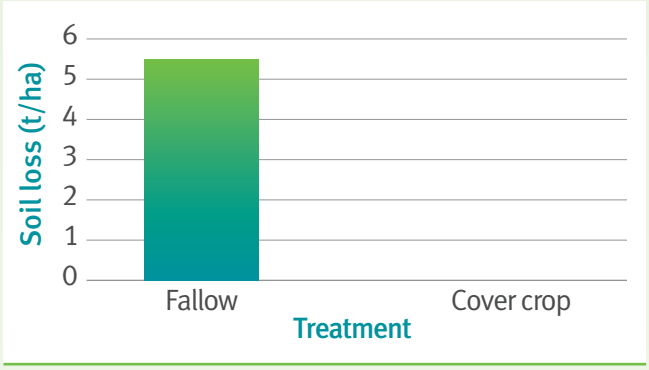

Image 2. *Soil loss site with travelling irrigator and soil loss troughs. Note the runoff evident from the fallow treatment compared with no runoff from the cover crop treatment.*

Cover crops protect soil from raindrop impact and also stabilise soil through its root system.

It also reduces runoff from the field with greater infiltration. In this case, the site had in place infrastructure such as grassed drains and grassed buffer strips to filter sediment and reduce any off farm loss from the bare fallow. However, this is not always the case and soil can move off farm.

Image 3. *Soil being removed from the fallow soil collection trough.*

The sediment collected was also analysed for nutrients.

- **Very little nitrogen was found in the sediment as it had most likely been leached or solubilised in runoff.**
- **The fallow area lost the equivalent of 0.8kg/ha of phosphorus and 3.8kg/ha of potassium in sediment over the monitoring period.**

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Cost benefit analysis

The costs for this site are presented in Table 1.

Machinery and labour costs are based on Queensland Government AgBiz gross margins. Other costs to be considered include:

- Loss of P and K may have to be replaced in the future
- Cost of moving and spreading soil that accumulates in drains and sediment traps.

Table 1. *Cost of biofumigant cover crop*

Field operation	Lablab cost ($/ha)	Nemat biofumigant cost ($/ha)
Cover crop seed	$80.00/ha#	$240.00/ha*
Planting *(FORM + labour)*	$27.49/ha	$27.49/ha
Spraying *(FORM + labour)*	$6.52/ha	–
Mulching *(FORM + labour)*	–	$24.27/ha
Incorporation – with rotary hoe *(FORM + labour)*	$119.49/ha	$119.49/ha
Total *(FORM + labour)*	**$233.50/ha**	**$411.25/ha**

 # The lablab was sown at 20kg/ha

** The recommended rate of sowing for the biofumigant cover crop is 8 kg/ha*

Challenges and benefits of cover cropping

Incorporating cover cropping into fallow management may present some challenges for vegetable growers. These include a dependence on rainfall, narrow cover cropping windows in some regions, possible impacts on commercial crops through pest, weed and disease issues and timing of operations for commercial crops.

These challenges are more than offset by the benefits of cover cropping.

- Stabilisation of soil structure and reduced erosion risk
- Improved infiltration
- Addition of organic matter
- Break crop for pests and diseases
- Suppression of soilborne pathogens by biofumigants.

On farm options to reduce soil loss

To reduce erosion risk, growers should consider the following:

- Protecting soil through cover cropping and inter-row cover. This is the most effective way to reduce erosion risk and add organic matter to your soil.
- Controlled traffic farming and minimised tillage systems will reduce erosion risk.
- Farm infrastructure such as sediment traps, grassed drains and filter strips will reduce soil loss off farm. These should be regularly maintained.

While infrastructure can be put in place to reduce soil loss off farm, any soil movement off field also removes soil, nutrients and organic matter – the most productive components of soil. Minimising soil loss off fields is the ideal management option.

Acknowledgements

We acknowledge the assistance and contribution of the participating landholder Wayne Keller.

Authors: Julie O'Halloran, Celia van Sprang and John Duff
Queensland Department of Agriculture and Fisheries, Gatton.

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This project has been funded by Hort Innovation using the vegetable research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

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