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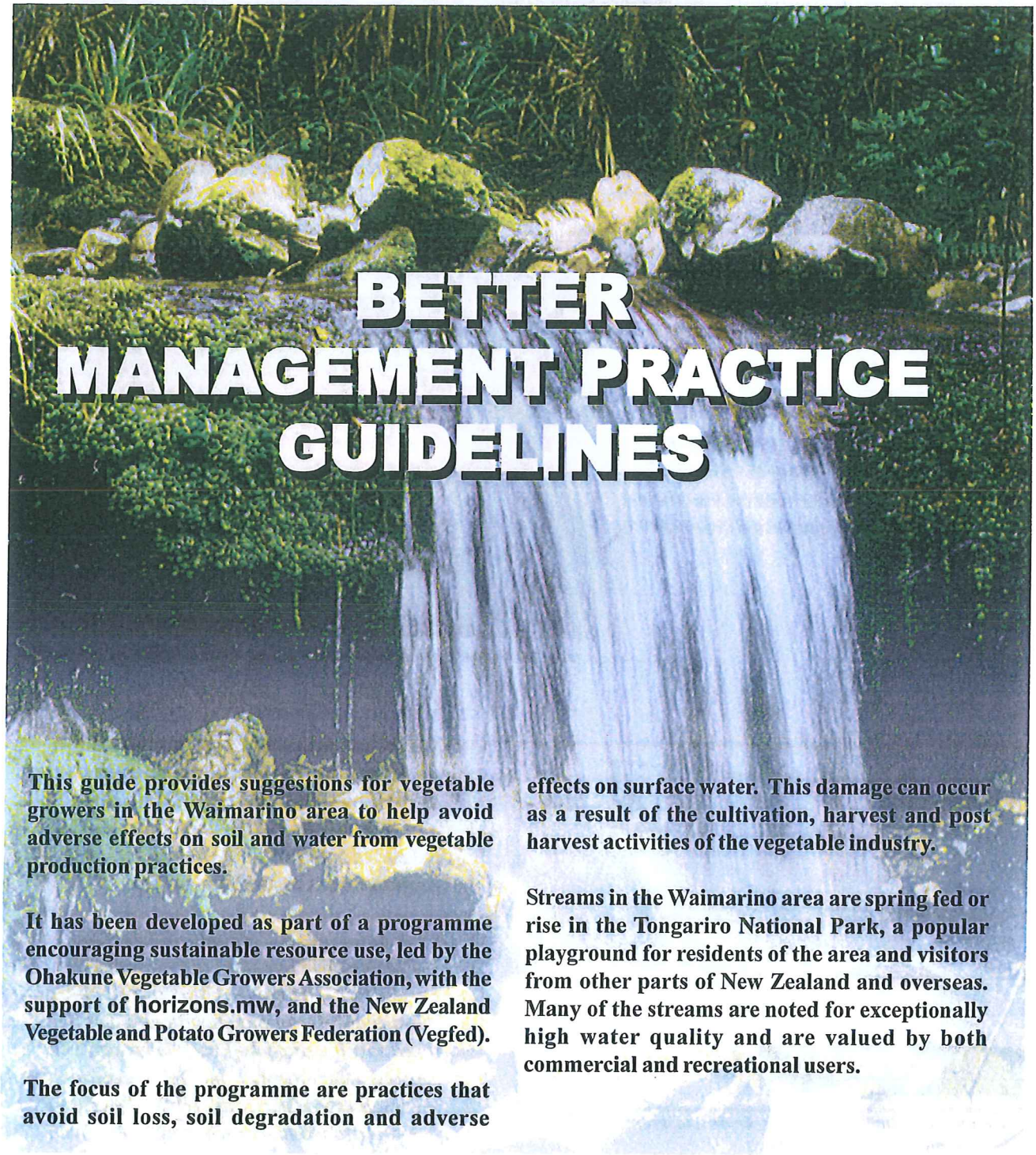
SOIL AND WATER MANAGEMENT WAIMARINO DISTRICT



BETTER MANAGEMENT PRACTICE GUIDELINES

This guide provides suggestions for vegetable growers in the Waimarino area to help avoid adverse effects on soil and water from vegetable production practices.

It has been developed as part of a programme encouraging sustainable resource use, led by the Ohakune Vegetable Growers Association, with the support of horizons.mw, and the New Zealand Vegetable and Potato Growers Federation (Vegfed).

The focus of the programme are practices that avoid soil loss, soil degradation and adverse effects on surface water. This damage can occur as a result of the cultivation, harvest and post harvest activities of the vegetable industry.

Streams in the Waimarino area are spring fed or rise in the Tongariro National Park, a popular playground for residents of the area and visitors from other parts of New Zealand and overseas. Many of the streams are noted for exceptionally high water quality and are valued by both commercial and recreational users.

Vegfed | New Zealand Vegetable and Potato Growers' Federation Inc.

Ohakune Vegetable & Produce Growers Association

Cultivation

1. **When cultivating near streams or watercourses a strip of uncultivated land (a riparian strip or margin) should be left between the cropped area and the watercourse.**

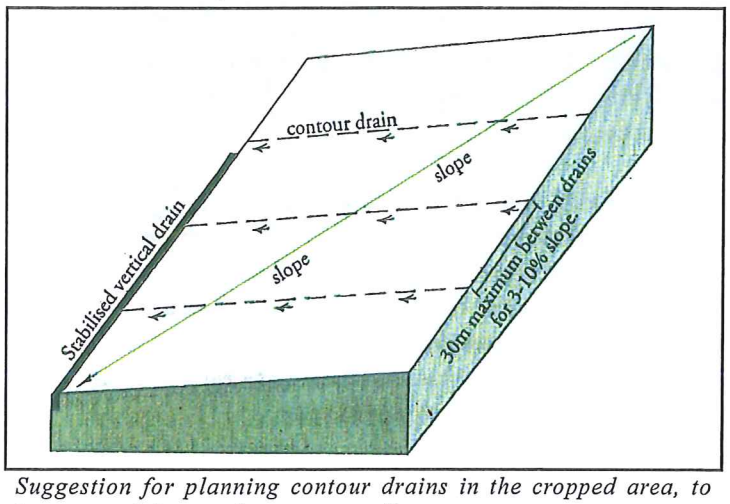
   Vegetation within this strip forms a filter that can trap sediment contained in runoff and prevent it entering the waterway. In some situations, cultivation can also create a depression that can act as a sediment ponding area, before the water filters through the grass strip.

Grassed margin between cultivation and drain channel can filter out and trap sediment in runoff. Lou Bird

2. **Where practical, cultivation and row orientation should follow the land contour across, rather than up and down the slopes.**

   This will slow down the speed that water runs off and reduce the volume of runoff by permitting more water to soak into the soil. The combination of these two factors can reduce the amount of soil moved off the cultivated area into drains and streams.

Cultivation across the slope slows surface water runoff. Lou Bird



Suggestion for planning contour drains in the cropped area, to intercept and divert surface water runoff.

3. **Where orientation of rows up and down slopes cannot be avoided, then contour drains should be established at periodic intervals across the rows. These drains catch and divert the water to stable drainage channels or land areas.**

   Contour drains should divert runoff to a stable drainage area rather than to another cultivated area of the paddock. It is difficult to give a specification of how far apart the drains should be spaced because this will vary with the degree of slope and the catchment area. Drains should be spaced and graded so that scouring within the drain channel is avoided. If they are spaced too far apart or on too steep a gradient, it can result in more damage than if the drains were not installed.

4. **Crops should be sown with a wind break of oats or turnips to minimise wind blow.**

Research has demonstrated that wind speed at the soil surface is one major determinant of when soil particles lift off the surface in windy conditions. Establishing wind breaks at periodic intervals across the direction of the prevailing wind can ensure that wind speed is kept below that critical point. Shelter can lower evapotranspiration rate, which can slow down the onset of drought effects and reduce the need for irrigation.

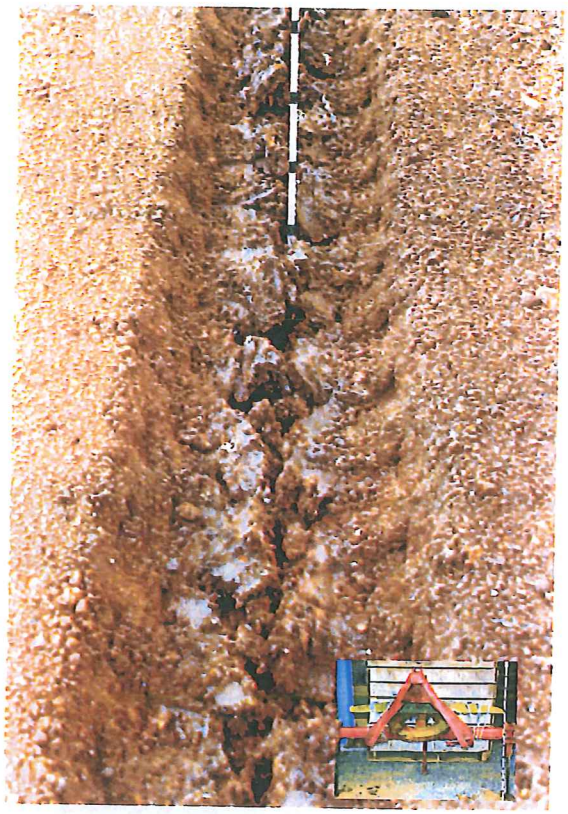
Oats have been planted between asparagus beds and across the direction of prevailing winds, to reduce wind erosion of the soil. Hawke's Bay Regional Council

5. **Paddocks should be ploughed in alternating directions in successive years to avoid moving whole fields downhill.**

The soil resource can take many years to rebuild once it is lost through erosion or other means such as ploughing. By alternating the ploughing direction the soil resource is largely kept in the same place in the paddock. This avoids the exposure of less fertile subsoils that can require higher inputs of fertiliser (added cost) to maintain crop productivity.

6. **Wheel marks should be ripped to allow water to percolate into the soil rather than flow down the wheel mark.**

Compacted wheel tracks can act as drainage channels Shallow ripping of wheel tracks, to just below the cultivation compaction zone, can reduce soil and crop loss. Often, the soil in the wheel marks is compacted to a degree that caps the surface, severely restricting the ability of water to soak into the soil. In Pukekohe, and in high rainfall events, water flowing down the wheel tracks undermined the adjoining crop beds leading to extensive crop and soil loss. Where the wheel marks had been ripped, water was able to soak downward into the soil with the result that little soil loss and no crop loss occurred (in the same rain event). However, the



The compacted surface in the wheel mark has been ripped and allows water to drain into the soil rather than run down the wheel track. Craig Ross-Landcare Research

Pukekohe experience also found that the wheel tracks in the rows used for spraying should not be ripped, as the resultant rough surface made efficient spraying difficult.

7. **Excessive cultivation with rotary hoes should be avoided.**

Maintenance of good soil structure can reduce the costs of cultivation – for example, the number of passes needed to achieve the desired seedbed. Good soil structure also protects the health of the soil by allowing better aeration and drainage.

Harvest

8. **At harvest, operations should be carried out in a manner that has least adverse effect on the soil and water resources.**

Working paddocks in wet conditions can lead to loss of soil structure and increased sediment loading in runoff. Additional to the environmental effects, it can also result in added cost through increased wear and tear on plant and machinery, reduced labour efficiency, increased pressure on washing systems and increased reject levels of product. Also, vehicles leaving muddy paddocks can foul the roads. This can create a safety hazard to other road users and can result in public animosity toward land users.

However, timing of harvest operations can also be dictated by the demands of markets or factory requirement (process vegetables). This makes it difficult for growers to always operate under good soil and climatic conditions.

9. **All weather facilities should be established for loading and marshalling areas.**

Marshalling and load out areas are points where impact on the soil is intensified and can result in severe compaction and break down of soil structure, as well as inconvenience to operations in wet conditions. Establishing all weather loading/marshalling pads can alleviate these effects.

Marshalling and loading out of product from the paddock concentrates vehicle movement. An all weather loading pad can reduce the adverse effects of those vehicles on the soil. Lou Bird

A. Post Harvest Field Management

10. **Paddocks that are harvested early should be sown with a cover crop (such as oats) to prevent soil erosion during the winter months.**

Bare soil surfaces such as those that can occur in paddocks following harvest, are vulnerable to erosion caused by wind and rainfall. Establishing a cover crop soon after harvest can protect the soil and provide other advantages such as enhancement of organic matter in the soil, slow breakdown of soil structure and provide a feed resource for grazing.

11. Where a cover crop cannot be established following harvest, contour cultivation should be considered so that the soil surface is broken up and left in a condition that avoids erosion.

Contour cultivation can provide a similar effect to contour drains. Because crop management no longer needs consideration, there should be greater choice on where such cultivation occurs and whether the whole area is given a breaking up pass, or at intervals across the slope.

Contour cultivation after harvest, leaving a rough surface can reduce soil wash from the paddock, over the winter fallow period. Lou Bird

B. Post Harvest Washing and Packing

Soil is carried to the packhouse on root crop vegetables and is removed in the washing process. The actual amount of soil attached to the vegetable will be influenced by factors such as soil type, soil structure and soil conditions prior to and at time of harvest. The soil that is removed in the washing process can be considered as either reclaimed soil and fertility that can be reapplied to paddocks, or considered a waste product. Whichever way it is perceived, it needs to be considered, because if it is discharged to water in untreated form, it will have an effect on the watercourse. Washing operators can consider the following practices that will help avoid adverse effect of discharges, on water quality and in stream habitat.

Additional to environmental benefits, adoption of good water management systems and practices can have significant advantages in resource consent compliance monitoring costs.

12. Paddocks should be returned to pasture at regular intervals to build up soil organic matter and avoid the build up of pests, diseases and weeds.

Rotation of crops is well recognised as a good management practice. The length of the rotation and cropping practices will influence the level of damage to the soil as a result of repetitive cropping. Pasture can be an effective 'recuperation crop' in the rotation.

13. Adopt careful pasture management practices.

To gain the best recuperative effect from pasture in the crop rotation, the pasture needs to be carefully managed. Overgrazing, particularly at times when soil is vulnerable to pugging or drought, can negate many of the benefits that pasture can provide. When soil conditions are wet, overgrazing can result in pugging, erosion, and soil compaction, which in turn can lead to increased levels of soil loss through sediment runoff. Overgrazing during drought conditions can lead to soil loss through wind erosion and enhance the establishment of weed species.

14. Reduce water volumes to the minimum to achieve the necessary outcome in product cleanliness/presentation.

Every litre of water entering the cleaning process will require some form of treatment at the other end. Adopting cleaning technologies such as brush washing, can considerably reduce the volume of water needed to achieve cleaning.

15. Where possible water recycling should be adopted.

Perfectly clean water is not required at all stages of the washing process. Consideration of washing plant design can allow the use of 'grey' water in the initial stages where the bulk of soil is removed. Fresh water can then be applied in the final stage, as a rinse.

Norman Young, Horopito, pumps water from the last settling pond, which is re-used in the washing plant.
Lou Bird

16. Used wash water should be drained to settling ponds that are as large and numerous as practical to give sediment time to settle out before recycling and/or discharge.

There are some technical issues that need to be considered when designing a pond system, such as location of inlet and outlet points, surface area, storage capacity, shelter from wind disturbance and access for cleaning. Guidance should be sought where new systems are planned, or existing systems are modfied.

Discharge from the final pond is carried over the stream for 'filtering' through ungrazed grass.
Lou Bird

The water finally enters the stream at many points, with no visible effect on the receiving water.
Lou Bird

17. New washing plants should be located with a separation from water courses and should discharge to land.

The land area that the water is discharged to needs to be considered as an integral part of the water treatment system. Long grass on a gentle slope can provide effective final filtering that removes most of the colloidal suspension in the water that gives the brown discolouration. Short grazed pasture tends to be less effective in this process. Because of this, the discharge area should be fenced and retired from grazing. Establishment of trees within that area is not advised, as this can result in baring of the soil surface through shading, and loss of filtration effectiveness.

18. For washers located adjacent to streams and where it is difficult to meet discharge requirements through the methods shown above, other technology is expected to become available to separate suspended solids and colloidal suspensions.	*Site limitations mean it is difficult for some washing plants to achieve effective water treatment using pond systems. Other industries have adopted alternative water treatment systems to remove suspended sediments and colloidal suspensions. Trials of similar technology have been carried out with a carrot washing plant and it is expected that this technology will be available on a commercial scale in the near future.*

Notes

Contacts

For further information please contact the following people.

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