FARM ENVIRONMENT PLAN GUIDE

FOUNDATION FOR ARABLE RESEARCH

FAR®

Canterbury Guide

Farm Environment Plan Guide

Use this guide to assist you with filling in your Farm Environment Template

Background

What is a Farm Environment Plan?

A Farm Environment Plan is a plan for managing the soil, water and nutrient resources on your farm in a sustainable way.

The plan is specific to your farm and is developed by you or your farm consultant to reflect the environmental risks associated with your farm and farm business and how these will be managed.

It is valuable to your business because it enables you to identify and manage soil, water and nutrient losses which cost you money.

The key aims of a Farm Environment Plans are:

- To maintain the productive capacity of the soils on the farm
- To support the responsible use of soil, water and nutrients
- To minimise the loss of nitrate-nitrogen to soil drainage water
- To minimise any loss of sediment, phosphorus or nitrogen to surface waters
- To minimize the spread of weeds, diseases and insect pests between properties

The plan will include an assessment of the risks and management practices associated with:

- The soils on your farm
- Nutrient and sediment losses from point and non-point sources
- Irrigation
- Grazing
- Biosecurity

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The plan also includes supporting documentation for audit purposes.

Depending on your farm system, a comprehensive Farm Environment Plan may also include other plans for activities relating to the environmental management of your land. Examples include: an agrichemical plan, an effluent management plan, a biodiversity plan, and stock and grazing management plans.

The development of a Farm Environment Plan leads you through the process of:

1. Risk assessment - locating the likely farm sites or management practices that have environmental issues or risks.
2. Implementing change – responding to the identified risks with a management change.
3. Developing the action plan – ranking priorities, identifying cost and developing a time frame.
4. Collation of documents to support your plan and provide evidence that you are delivering on your planned objectives.

Why do I need a Farm Environment Plan?

New Zealand's wealth is in its climate, land and water resources and our economy and environment depend on the success of our land-based industries. The role of Regional Councils is to manage these resources through the implementation of the Resource Management Act and the National Policy Statement for Fresh Water.

To achieve this, there is a legal requirement in many regional plans for farmers to develop and use farm environment plans to show that they are aware of and are managing the environmental impacts of their farm systems.

There is no option, farmers must have an active Farm Environment Plan.

Your plan is a way of demonstrating that your management practices are having a positive impact on the environment.

Who will see this plan?

The Farm Environment Plan is an auditable document which provides evidence that you are managing your farm resources efficiently in a way that minimises the environmental impact of your farm business.

Auditors will visit from time to time to assess the effectiveness of your farm plan. You will be given prior notice of an auditor's visit and will need to supply a copy of your plan and nutrient budgets to the auditor before the visit. Your plan will demonstrate that you have assessed the environmental risks on your farm and have developed an action plan for continual improvement.

During the audit there will be:

- An assessment of performance against the objectives, targets, good practices and timeframes in the plan.
- An assessment of the robustness of the nutrient budgets.
- An assessment of the efficiency of water use (if irrigated).

The auditor will be an accredited FEP auditor, who is independent of the farm and has not been involved in the preparation of the plan.

A farm environment plan is often required as part of a consent application, if this is the case, then your plan will be seen by a regional council staff members.

When do I use this template?

Use this template if your farm is mainly an arable cropping enterprise. This template enables you to assess the environmental risk of all the activities that are occurring on the farm, including crop harvesting, vegetable, grain and seed production, stock finishing and dairy grazing.

But…

If your farm is primarily a pastoral enterprise; either sheep/beef or dairy, use a Farm Environment Plan template developed for that pastoral system. The cropping component of your farm will be included in the pastoral template.

And…

If you are a member of an irrigation scheme, your scheme is likely to have a template that you may choose to use.

How do I develop a Farm Environment Plan?

This template will enable you to tailor a personalised farm environment plan for your property.

This template has nine sections; each focused on a different part of your farm environment plan.
The sections are;

- Property details and farm maps
- Cultivation and soil structure
- Irrigation and water use
- Nutrient management
- Animal effluent and solid waste
- Point sources for nutrient and contaminant losses
- Biosecurity management
- Documentation

Each section has an easy to use plan template and instructions on how to fill it out. The technical notes to support the template are in this guide.

Your completed plan consists of the sections that are relevant to your farm. The information in some of these sections will not change very often but you will need to revisit the plan, at least annually, to review and revise your objectives.

The template is designed to be filled in electronically. If you are not comfortable doing this you may print-off the information sheets and fill them in by hand.

Whichever way you choose it is a good idea to file all your plan documents in the one place. A ring-binder folder with partitions for each plan section is a good idea. This makes the job easier when it is time to update your plan and for when an auditor calls.

Supporting evidence for your plan

You will need to provide supporting evidence that your plan and management practices are effective.

Evidence of effectiveness can be demonstrated with an Overseer nutrient budget. In many regional council plans this is a requirement.

Other documentation you should collate and keep are:

- Copies of any consents relating to your farm.
- Fertiliser recommendations, purchases and application records
- Audit and maintenance records for your irrigators
- Irrigation application dates and rates.
- Crop records: Plant and harvest dates, yields and residue management.
- Stock records: Purchase and sale dates. Breeding records.

It is a good idea to file all this information in one place along with your farm environment plan.

Property Details and Farm Maps

Refers to pages 3 and 4 in the template

Property Details

GPS co-ordinates for the farm location can be found on Google maps. Find the farm location using the search function and the farm address. Hover the mouse over the entrance to the farm, right click the mouse and select the "what's here" function. The co-ordinates will appear in a box adjacent to the marker. These co-ordinates are also used in your Overseer budget to access the weather information for the farm.

Include a brief summary of the main enterprises on the farm. For example: Irrigated grain and seed production. Lamb finishing.

Maps

A farm environment plan has a number of maps. Use the maps to draw areas where there are known risks for environmental losses and areas where you are planning specific management practices.

You may have an existing farm map or you can make a new one with Google Earth or a similar tool e.g. ProductionWise. Copy it several times, so that you can add specific information relating to different parts of your plan.

Leased land

If you are farming blocks of land under short term leases the best option is to prepare individual plans for each block. Follow the same planning process.

Farm maps are an important component of your farm plan.

Map 1 An overview of your farm

The map or aerial photograph must be at a scale to show:

- The boundaries of the property or the land areas comprising the farm enterprise.
- The location of permanent or intermittent rivers, streams, lakes, drains, ponds or wetlands.
- The location of riparian vegetation adjacent to water bodies.
- The location of waterways where stock access or crossing occurs.
- The location of any areas within or adjoining the property that are identified as "significant indigenous biodiversity".

Mark in these farm features and add the map scale and orientation to north.

Some regional councils are using a **land use capability (LUC)** approach for classifying land and setting nutrient limits. If you are in one of these regions you will need a LUC map for your farm. (LUC) maps provide a useful insight into the productive capability of your soils.

LUC maps are available on the regional council websites.

Map 2 Farm buildings , tracks, management blocks, irrigators and offal pits

A map that shows where the management blocks are on the farm is a useful reference for you and the auditors that will be visiting your farm.

The environmental risks on your farm may only be on part of the farm and some management blocks. It is important that you can identify where these areas are and you will need to refer to specific management blocks throughout the plan.

Management blocks might be as small as a single paddock or the aggregation of a number of paddocks that are managed in the same way.

Blocks are defined by differences in soil type, irrigation and dry land management. Blocks with differing crop rotations, stock management and nutrient losses can be set up.

ProductionWise and a number of other mapping programmes provide the facility to draw in your management blocks.

ProductionWise is freely available to all FAR levy payers.
http://www.productionwise.co.nz/

Map 3 Critical Source Areas "Nutrient and Sediment Loss Hot-Spots"

Use a map marked with paddocks, suitable for drawing on.

On the map, and with reference to the soils on your farm and the risk of N, P and sediment losses, mark the locations where there is a potential risk for environmental losses. (Refer to the Guidance notes to assess potential risk).

Draw in:

- Areas or zones where there is risk of Nitrogen losses relating to the soils, topography ans managemnt practices on the farm.
- The location of any critical source areas for phosphorus or sediment losses. Indicate if land is within the phosphorus risk zone.

The summary of Farm Risks and Actions

Refers to page 8 in the template

Use this table to record the environmental risks and planned actions identified in the following management sections.

Management Area
Cultivation and Soil Structure

Refers to pages 9-11 in the template.

Objective: To maintain or improve the physical and biological condition of soils on the farm in order to minimize the movement of sediment, phosphorus and other contaminants to waterways.

Notes

The soil management plan provides an overview of the soils on your farm and their associated environmental risks.

Details relating to relationship between your soils and irrigation and nutrient management are covered in the irrigation, phosphorus and sediment and nitrogen modules of the plan.

Background

Well managed soils are a key factor in profitability for cropping farms.

It is important to have a good understanding of the strengths and weaknesses of the soils on your farm as this is where good environmental performance starts.

Soil texture and structure are important. Soil texture affects soil structure and erodibility. Soil structure affects the soil's water-holding capacity and its resilience to drought, drainage and risk of ponding, runoff and erosion.

Soil erosion is a big issue for the environment and your back pocket, as soils that blow or wash away are lost from your farm for good. If soils and sediments end up in rivers, lakes and coastal estuaries they cause environmental damage that has serious impacts on invertebrate and vertebrate eco-systems and impacts on the public's perception of farming.

A consideration of the soil types on you farm can:

- Optimise the yields and quality of crops and pasture.
- Help to reduce the risk of compaction and erosion.
- Reduce the risk of environmental damage.

Environmental Risk Assessment for Soils

Consider the following characteristics of your land and its soils when assessing the environmental risks on your farm.

1. Topography

Soil erosion by run-off is a risk on any cultivated land that is sloping. Management practices that slow the rate of run-off down the slopes or collect silt before it leaves the farm are important.

2. Stream Bank Erosion

Soil erosion may be a problem on stream banks which don't have any vegetative protection, particularly if they are accessible to stock.

3. Soil texture

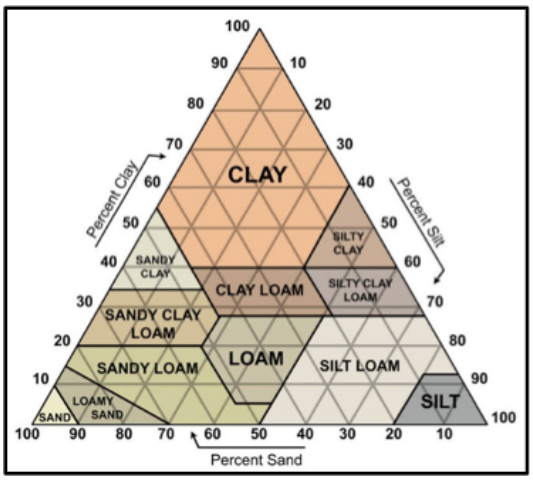
The texture of a soil affects its structure and the way it responds to cultivation and irrigation.

Most soils are of mixtures of sand, silt and clays and the proportion of each component changes the characteristic of the soil and the way that it behaves. The triangle diagram below illustrates the proportions of each texture component in the soil mix. For example a silt loam soil is: 70-80% silt and 20-50% sand. *(A loam is a rich, friable soil containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay).*

Sandy soils have poor structure and poor water holding capacity. They tend to dry out quickly and are highly susceptible to wind erosion.

Silty soils are fertile and easy to work but of all the soil types, silts, silt loams and loams have the highest risk of loss through water erosion especially on long or steep slopes.

Peat soils are fragile and the peat may be lost easily. They require drainage and care with cultivation and pH management to develop their productivity.



Clay soils are highly productive but they have characteristics that can cause environmental risks. These include:

- Soil surface crusting or sealing. This is a risk in soils that are over-worked and limits infiltration and increases runoff.
- Wind erosion under dry conditions, especially if they have been worked to a fine tilth.
- Compaction by machinery or animals especially under wet conditions. The compaction layer slows the rate of infiltration, increasing the risk of ponding and surface runoff.

4. Soil Profile

A soil profile describes the various layers within the soil. It is important to know how deep your soils are and what the characteristics of the secondary layers in the soil profile are.

The depth and nature of the secondary layers in the soil affect the water holding capacity and may affect rooting depth, especially if there are hard soil pans. *A pan is a well-defined layer forming in the soil. There are two common types; a 'plough pan' which builds up in-field just below plough depth, and an 'iron pan' which forms naturally by iron oxide accumulations deposited in acid gley soils.*

Shallow, stony soils drain quickly and nutrients can be easily leached.

5. Water holding capacity and drainage

Water holding capacity is a characteristic of the soil texture and is the total amount of water a soil can hold at field capacity.

Soil drainage refers to how much, and how quickly, water is removed from the soil. It is important because it affects the soil environment, both temperature and oxygen supply, which in turn affect microbial and plant root activity.

Drainage depends on three major factors:

- Water flowing into the soil; rainfall, irrigation, seepage and runoff.
- Flow rate through the soil (permeability).
- Outlet from the soil via field and natural drains into waterways.

These characteristics affect irrigation efficiency and nutrient movements through the soil profile. The higher the available water-holding capacity, the more suitable the soil for any type of irrigation.

6. Organic matter levels

Organic matter stabilises soil structure and increases the volume and size of soil pores which improves water infiltration and water retention. Organic matter also enriches the soil by supporting soil microbial activity. This impacts on nutrient cycles and nutrient management.

7. Management characteristics

Compaction: Compacted soils have increased bulk densities, poor aeration and reduced porosities because soil aggregates have been squashed together by management practices. Compaction can be caused by cultivation when the soil is wet, or by animal treading, and farm vehicles.

Excessive soil compaction restricts soil aeration, reduces plant growth and productivity, impedes drainage, reduces infiltration, and increases runoff generated during intense rains, leading to greater soil erosion losses.

Soil aeration: Soil aeration reflects the ability of soil to allow exchange of air (particularly oxygen and carbon dioxide gases) between the atmosphere and plant roots. Soils with poor aeration have a risk of becoming water logged and productivity drops and environmental risksincrease.

Good management practices for soils

Regular Assessments

Develop an assessment process for tracking the quality factors of your soils. Visual soil assessment (VSA) is one method of doing this.

- It is a simple tool to assess and monitor soil quality,
- It has an easy to follow guide which is self-explanatory,
- It doesn't require special training or technical skills.

For information about VSA, see
http://www.landcareresearch.co.nz/publications/books/visual-soil-assessment-field-guide

Remember to file your assessment sheets with your soil management plan.

To minimise the risk of soil erosion by wind

- Select a low risk cultivation technique such as direct drilling or minimum tillage if possible.
- Plan the rotation to enable timely sowing to maximise ground cover during the high risk period.
- Include pasture in the rotation to help restore soil structure.
- Minimise periods of fallow or explore inter-cropping techniques to reduce the area of bare ground as crops establish.
- Establish shelter belts in exposed areas.

To minimise the risk of soil erosion by water

- Assess where risk of run-off is highest.
- Mitigate run-off risk in these areas e.g. through cultivation techniques such as contour ploughing or furrow dyking.
- Protect stream banks with riparian strips.
- Exclude stock from water ways.

To reduce the risk of compaction

- Wait for the soil surface to dry out before driving on the soil.
- Restrict the number of cultivation passes across the paddock.
- Restrict heavy vehicles to the edge of the paddock.
- Fit dual wheels to reduce contact pressure and the risk of wheel slip.
- Decrease tyre pressures to reduce contact pressure.
- Reduce tillage intensity.
- Consider your grazing management; limit the number of hours animals graze on wet paddocks.

Information Resources for Soils

Traditional soil maps

Many of you will have soil maps for your farm based on soil surveys that were done in the past. These don't go out of date but soil names may have changed as soil classification systems have been updated. These maps are still are valuable guide for the soils on your farm,especially when they are backed-up with your personal experience.

Personal knowledge can be confirmed by digging soil pits. Document what you find with good photographs and measurements and descriptions of the soil profiles. File these with your soil plan.

If you have little or no information about the soils on your farm, **S-maps** is a useful and free tool to use to find out more. S-maps http://smap.landcareresearch.co.nz/home

What is S-map?
S-map is the new national soils database. It is a free on-line tool that provides detailed information about the soils on your farm.

S-map integrates existing reports and digital information and updates soil maps where existing data are of low quality. It is being updated regularly and it integrates existing soil reports and digital information. Note there are some regions that have not been updated. Information in these regions is minimal.

It allows you to:
- Explore interactive soil maps
- Learn about the soil on your farm
- View detailed information about a soil class or attribute.
- Create custom PDF maps for printing
- Download soil fact sheets for specific locations.
- Develop your soil plan

Definitions for terms in S-map factsheets

Bypass flow is related to the speed that water flows through the soil. Water flows downwards through the soil by two routes; slowly via micropores and quickly through macropores. By-pass flow is the rapid flow through the macropores, the spaces between the soil aggregates. It is an important soil characteristic because it relates to nutrient leaching. High-bypass-flow soils are strongly structured soils, or have extremely stony horizons close to the soil surface.

Nitrogen leaching vulnerability is related soil depth and the soil's capacity to store water.
Soils vary from low to very high leaching vulnerability according to soil depth and texture: deep loamy soils have a low vulnerability grade to very stony-sandy soils with very high vulnerability.
N leaching is reduced in poorly drained soils. These soils have the capacity to store water and nitrate is reduced to nitrogen gases by denitrification processes in the anaerobic conditions.

Phosphorus leaching vulnerability is related to the combination of phosphorus retention and effective thickness of fine soil material in the whole soil profile. Soils with high vulnerability to phosphorus leaching are recent soils, stony or very stony Pallic soils, sand dunes, and shallow soils overlying rock.

Vulnerability to runoff relates to a combination of slope class, soil drainage, depth to an impermeable or a slowly permeable horizon, and permeability of soil above the impermeable or slowly permeable horizon. Land with high vulnerability to runoff occurs mainly on rolling land containing poorly drained soils with subsoil pans.

Management Area
Nutrients (N and P)

Refers to pages 12-14 in the template

Objective: To maximize nutrient use efficiency while minimizing nutrient losses to water

In long-term cropping rotations, even those with pastoral phases, nitrogen supply and crop demand are well balanced and losses are low. This is supported by FAR's benchmarking work with Overseer nutrient budgets which showed that 75% of arable farms had nitrogen losses to water of less than 20 kg N/ha/yr.

Most arable farmers are aware of the risks associated with nitrogen supply to the crop and are managing them appropriately.

The focus in your nitrogen management plan is only on the circumstances where there is a known high risk of nitrate leaching.

Background

The nitrogen cycle drives the supply of nitrogen to the crop. It is a dynamic process, dependent on soil conditions and microbial activity to breakdown complex forms of nitrogen into simple mineral forms (nitrate and ammonium) that are available to the crop.

The soil supply of nitrogen is one source for the crop, the other is from organic and inorganic inputs to the soil, from animals, crop residues and applications of inorganic and organic fertilisers.

Nitrogen losses from the soil are from leaching and denitrification.

- Leaching is the main process for nitrogen losses to ground water. It occurs when drainage water moves nitrates beyond the root-zone out of reach of the crop. Nitrate leaching is most likely to occur in winter, when crops are slow growing and rainfall is higher.
- De-nitrification is a microbial process where microorganisms convert nitrate, to nitrous oxide and nitrogen gas. These gases are lost to the atmosphere.

Risk Situations for Nitrate Leaching in Arable Rotations.

What Leaching Loss is a Risk?

The best approach for assessing the risk of nitrogen losses to the environment is to work to the nitrogen leaching loss limit or cap set by your regional council. Information about these limits can be found on the regional council websites.

If nitrogen limits or caps have not been set, you must be able to demonstrate that your nitrogen management is following industry good practice.

Risk Situations for Nitrogen Losses

1. Cultivation after long term pasture (more than 5 years)

Mineralisation of the organic matter from the breakdown of the grass roots following cultivation releases nitrogen into the soil. The rate that the organic matter is broken down to plant available forms depends on the climatic conditions following the cultivation. Often there is more nutrient available than the crop can use, even if no additional fertiliser is added, so it is wise to recheck soil levels before the second crop in the rotation is planted.

2. Intensive winter grazing

How do we define intensive winter grazing? Environment Southland uses this definition: "Intensive winter grazing is defined as the grazing of stock between May and September inclusive, on fodder crops or pasture to the extent that the grazing results in significant devegetation".

Significant devegetation is defined as removal of, or damage to, vegetation caused by stock access or grazing that results in the exposure of large areas of bare ground and/or pugging of the soil".

The risk of nitrogen leaching after intensive grazing comes from the nitrogen load deposited onto the soil from the stock urine and dung. Urine from the stock is broken down in the soil to ammonium and nitrate. Some is lost to the atmosphere through volatilisation, but there is a large supply available and the opportunity to capture it for the next crop.

The following ideas provide options for managing intensive grazing.

Strategies for mitigating negative impacts on soil and the environment

Paddock awareness

Some paddocks may need to be avoided completely. If parts of the paddock are known to be high risk to nutrient loss, compaction and pugging, or sediment loss, manage grazing so that these areas are only grazed in dry conditions. This may mean that at-risk areas are grazed early in the season and more resilient soils are grazed later when wet weather is likely. On sloping land, beginning grazing at the top of the slope and working downhill can result in less sediment loss from overland flow of nutrients. When near waterways, a buffer zone of at least 3 meters is required.

Shift the animals more than once per day

Poor weather results in higher demand for feed but lower utilisation. Offering smaller breaks twice a day increases utilisation efficiency and reduces the amount of feed trampling. When the soil gets wet, offer a new break before water begins pugging.

Increase amount of supplement fed

When utilisation is low and crop is being trampled as stressed and underfed animals search for feed, increasing the availability of supplemental feed may be a good option. Supplemental feeding also enables the manager to contain the area of soil compaction by reducing walking traffic.

Back fencing and portable water troughs

If practical, use a back fence and transportable water troughs to ensure cows are contained and constantly moving onto fresh crop. This method reduces soil damage and compaction by eliminating the need to repeatedly walk back through previously grazed areas to access water.

Split the mob

Splitting the mob into two or more groups reduces grazing pressure and potential soil compaction. Lower cow numbers reduces the amount of hoof traffic in the grazing area and traffic to and from the water trough. This also allows the mobs to be managed separately if needed to achieve target body condition.

Lift root vegetables

Manually lifting or loosening root vegetables such as fodder beet and swedes before feeding can reduce the amount of energy and standing/compacting time spent by the cows in order to consume the feed.

Stand off paddock or stand off pad

In very wet conditions when pugging and animal health are at high risk, animals can be moved off the crop paddock and fed silage and supplemental feeds. Moving cows onto a sacrifice paddock of grass, a paddock with dense stubble, or even a feed pad takes pressure off of the bare soil in the winter crop and allows water to infiltrate the soil rather than pugging on the surface.

Manage the N load

After the cows have gone home there is a considerable supply of nitrogen in soil profile. Before planting the next crop, test the soil profile down to 60cm for AMN and/or mineral N tests. Supply the balance of the crop requirement as fertiliser.

3. An excess of fertiliser is applied
Fertiliser is supplied in excess of the crop demand and soil supply. Crop demand depends on two factors; final yield and how fast the crop is growing. Demand decreases during slow growth periods. Individual crops have different nutrient demands, this is well known by your fertiliser consultants.

4. Cropping and irrigation on shallow stony soils
Fertiliser is supplied in excess of the crop demand and soil supply. Crop demand depends on two factors; final yield and how fast the crop is growing. Demand decreases during slow growth periods. Individual crops have different nutrient demands, this is well known by your fertiliser consultants.

This risk relates to the frequency of drainage events on these soils. The soil water holding capacity on these soils may be good in the upper topsoil layer but is often poor in the lower stony layers. Drainage events are common and nutrients quickly move through the soil profile beyond the root zone. Irrigation management and more frequent applications of smaller doses of nutrient are the keys to reducing the risk of nutrient losses from these soils.

5. Management after crops that fail to achieve their planned yields
Crops under-perform for a number of reasons; including:
- Poor soil environment, e.g. soils that are compacted and poorly drained.
- Pest and disease pressure.
- Weather impacts.

When estimating how much nutrient might have been removed by the crop consider:
- How much the crop had grown before the damaged occurred. A crop that was damaged just before harvest will have used most of the available nitrogen in the soil.
- How much residue is being returned to the soil; this will contribute to the soil's nutrient supply in the future.

6. Fallow periods
No crop, no nutrient uptake

7. Legumes
The nitrogen fixing ability of legumes must be considered when planning their nutrient requirements. A healthy legume plant will have healthy, active nodules that fix sufficient nitrogen for the plant's needs. No nitrogenous fertilisers are required and soils with high levels of mineralisable N, may leach because the plant demand is lower than that of a non-legume.

Phosphorus and Sediment

Background
Phosphorus (P) is an important plant macronutrient and crops are unable to perform if the supply from the soil is limited.

In some soils the supply of phosphorus is limited, either because it has been depleted after many years of cropping or it is unavailable to the plant roots because it is bound strongly to soil minerals and clay particles. This is part of the normal soil chemistry process.

If cropping soils erode, through movement of wind or water, soil particles and sediments will carry the phosphorus off the farm at a cost to the farm and the environment. Sediments and phosphorus in our waterways cause problems by reducing light and stimulating algal (green-slime) growth. This in turn, depletes the dissolved oxygen in the water, degrading aquatic environments and spoiling the recreational value of the water.

Management practices to reduce sediment and phosphorus losses
The most effective way of managing sediment and phosphorus loss from the farm is to identify areas where there is a high risk of losses occurring and then to develop management strategies to reduce the losses.

Areas on the farm with a high risk for loss are called critical source areas. A specific focus on these areas is the most cost effective approach to managing sediment and phosphorus losses from the farm.

The following practices can help to minimise soil and P losses from the farm.

- Reduce the level of soil disturbance when you cultivate by adopting minimum tillage practices. This is particularly important if your soils are light and easily eroded by the wind.
- If you are cultivating sloping ground, work across the slope face rather than up and down the slope.
- Reduce run-off from soils by improving infiltration, e.g. remediate soil compaction and surface crusting.
- Manage irrigation to avoid ponding and over-application or run off.
- Consider furrow-dyking along crop rows and installing silt traps to capture sediments in run-off water.
- Keep stock out of waterways.
- Measure and record Olsen P levels regularly. Reduce phosphorus fertiliser applications if levels are above the target levels for your soil-type and crop.
- Consider the type of phosphorus fertiliser being applied. Losses are more likely from products with readily soluble forms of P. Examples of the more common forms of soluble phosphorus fertilisers include; superphosphate, triple superphosphate, sulphur super, MAP, DAP and compound fertiliser formulations.

Nutrient Management Plan Purpose

The purposes of the nutrient management plan for cropping is to:

1. Supply optimal levels of nutrients for plant growth and product quality.
2. Minimise the pollution of surface and ground water resources from nutrient losses from agricultural land.
3. Maintain or improve the physical, chemical and biological condition of soil.

Plan Development

Assess the risk for nutrient losses from the crop and grazing rotations on your farm. You will need to consider each paddock and its crop, but many will have a low risk for nutrient losses requiring no specific management change.

Critical Source areas for sediment and phosphorus losses may include:

- Soil types: light easily erodible soils
- Farm features such as: tracks, natural waterways, drains, irrigators, shelterbelts, wetlands, feed troughs, silage stacks, stock camps, wallows, trees, bush and scrub.
- Cropping ground where there is any risk of soil movement (wind erodible soils, sloping ground).
- Areas where ponding and run-off occur during rain or irrigation.
- Cropping ground close to waterways such as streams, wetlands or drains.
- Soils with Olsen P levels higher than the optimal ranges for the farm's cropping enterprises.
- Waterways accessible to stock

Develop and document a management strategy for each identified risk on the farm.

Your management strategy must include:

- Details about the planned change in management.
- The time-frame and cost (if any) for the management activity.
- How the success of the management change will be assessed.
- Evidence of your management change

The plan requires you to indicate the nutrient management practices you are currently using.

Farm Records:

- Soil test results from recent soil tests for your cropping paddocks.
- Fertiliser recommendations for your crops.
- Records of your crops and their yields.
- Records of your fertiliser applications

Management Area
Irrigation and Water Use

Refers to pages 15-17 in the template

Objective: To operate irrigation systems efficiently, ensuring that the water is supplied where and when it is needed.

The irrigation management plan provides an overview of the irrigators and irrigated areas on your farm and their associated environmental risks.

Regional councils will expect your farm environment plan to demonstrate that:
1. Your irrigation system is operating efficiently.
2. Your water use is monitored and is efficient for the soil and the crop demand.

The Irrigation NZ website houses many resources for irrigators and notice of events being run to improve your ability to manage your irrigation efficiently.

You may choose to use the Irrigation NZ template for irrigated farms which you can also find on their website.

http://irrigationnz.co.nz/

Note: If you are a member of an irrigation scheme, you may prefer to use the Farm Environment Plan template developed for the scheme.

For the most effective use of your water you should:

Apply the right amount of water at the right time to get maximum growth from your crops
If you apply too much water, more than the soil can hold, drainage occurs, this is a waste of water and the nutrients that may also be leached. If your irrigation is too late the crop will be short of water and its growth rate and final yield will be reduced.

Maintain and manage the irrigation system to minimise wastage and leaks
It is wasteful of both money and water to pump water and then let it go to waste because of leaks in the system and/or applications to tracks and other non-productive areas.

Leaks can reduce the operating pressure so the system doesn't apply water evenly, leading to uneven crops.

Plan ahead for possible restrictions to water
In seasons when the demand for water is high, water restrictions are a possibility. If you depend on irrigation, decide on irrigation priorities by understanding which of your crops is the most sensitive to a water deficit. Prioritise crops that are of the highest value or are at a growth stage that is vulnerable to a shortage of water.

Develop a plan to best minimise the impacts of water restrictions.

The FAR Focus on Irrigation Management for Cropping is an excellent resource for irrigators.
http://www.far.org.nz/mm_uploads/Iss_04_Irrigation.pdf

Non irrigation water is measured and monitored
Develop a maintenance programme to ensure non-irrigation water is not wasted. Consider the reticulation system for stock water and usage for washing down farm machinery.

Management Area
Animal Effluent and Solid Waste

Refer to pages 18-19 in the template.

Objective: To minimise risk of contamination of water bodies from stored and applied effluent.

This section needs to be completed if you collect and store from a stock enterprise and spread it back onto your pasture and/or cropping ground.

If you bring in effluent and manures from somewhere else to use as a nutrient source for your farm, you should follow the good management practices associated with testing and spreading to reduce the risk of any nutrient losses.

Management Area
Water Bodies - Wetlands, Riparian Areas, Drains, Rivers and Lakes

Refer to pages 20-21 in the template and pages 11-12 in this guide for information about nutrient and sediment losses associated with grazing.

Objective: Wetlands and riparian areas are managed to avoid damage to the water body's bed and margins and to minimise the risk of the direct input of nutrients, sediment and microbial pathogens to water bodies.

Assess the risk of sediment and nutrient losses associated with cropping and animal grazing on your farm and identify possible management changes to reduce these risks.

These may include the development of vegetated set-backs adjacent to water body margins to trap sediments moving off cultivated and grazed land.

Exclude stock from water.

It is also important to develop a management plan for riparian plantings to prevent weed proliferation and the establishment of unwanted plants. These resources from NIWA (https://www.niwa.co.nz/sites/niwa.co.nz/files/import/attachments/riparian.pdf) and DairyNZ (https://www.dairynz.co.nz/media/4034406/riparian-management-guide-auckland.pdf) have very good information about establishing and maintaining riparian plantings.

Management Area
Point Sources for Nutrient and Contaminent Losses

Refer to pages 22-23 in the template.

Objective: To manage the number and location of offal pits, rubbish pits, silage bunkers, compost heaps etc to minimize the risk to health and water quality.

Point source pollution is defined as the 'discharge of pollutants from a single fixed point'. On the farm these critical areas may include offal pits, rubbish dumps, compost heaps and silage stacks.

Dead stock is an unfortunate fact of life in farming. Disposal of carcasses and offal requires good management to reduce the possible impacts on human and stock health and the environment. The options available to dispose of dead stock are varied and often depend on local services. Regional councils have permitted activity rules, relating to the disposal of dead animals and offal. Familiarise yourself with, and follow, your local rules.

General farm rubbish can damage the environment or poison animals, plants and people if it is not disposed of safely. It may break down into chemical compounds which can pollute groundwater and waterways. Separate general rubbish into waste types and recycle or reuse on-farm if possible.

Well placed supplementary feed storage areas can save money through reduced spoilage, fuel use and travelling time. Design feed storage close to where it will be used, taking into account the food safety minimum distances. The storage area must be designed to capture leachate and run-off and should exclude rodents, rain and surface water.

Follow the approved Growsafe procedures for the storage and disposal of chemicals. Develop a dedicated wash-down area for the sprayer and ensure run-off wash down water does not enter drains leading to waterways.

Management Area
Biosecurity

Refers to pages 24-25 in the template.

Biosecurity is the collective responsibility for you, your farm employees and of every person visiting or working on the property.

What is Farm Biosecurity Plan?

Your farm biosecurity plan is a set of measures designed to protect your property from the entry and spread of pests and diseases. As most arable systems involve both cropping and animal production, it is important to consider the biosecurity risks relating to crop production and stock movement.

You and your employees are likely to be the people that first notice disease symptoms or new weeds and insect pests. If you see something that you don't recognise get help with identification as soon as possible. It is better to be proven wrong than to lose the opportunity to contain and control a new weed or pest species on your farm.

For biosecurity measures relating to farm stock, Beef + Lamb NZ and Deer NZ's document; **Drystock Biosecurity Guidelines – Seven Intervention Points for On-farm Biosecurity**, is a useful reference.

http://beeflambnz.com/Documents/Farm/Drystock%20biosecurity%20guidelines.pdf

Assessing Biosecurity Risk on your Property

Pests have no boundaries and almost anything coming on to your property can be a potential source of new pests and diseases for livestock and plants. There is little you can do to prevent the risk of pests arriving on your property by air, water or the movement of wild animals and birds. However you can develop protocols to reduce the risk of pests hitching a ride on people's clothing, animal feeds and manures, seeds and plant propagation material, and vehicles, machinery and equipment.

Report unfamiliar weeds, insect pests and diseases as soon as possible. FAR is a good starting place.

Signage

Use signs like the one below to tell people that farm biosecurity is a priority.

If people understand your concerns they are more likely to respect your wishes.

Place the signs at the gate and near the house or sheds so they are easily seen.

If you don't want to use signs, ensure visitors report to management before they go onto the farm. Inform them about where they can and can't go.

Movement of Vehicles and Machinery

Vehicles and equipment can carry soil and plant debris onto your farm. All contractors should be requested to have clean equipment before entering your property. Cast your eye over it before they set to work.

Use designated parking areas

Wash-down facilities

A designated area for washing down clothing, boots, vehicles and equipment enables weed seeds to be contained in a small area. The washdown area should:

- Be well away from the cropping paddocks,
- Have a sealed or gravel surface,
- Not drain onto cropping land or waterways,
- Have a sump or collection area for easy inspection.

Cleaning equipment and machinery

All plant material and soil needs to be removed from the machine. Use the wash-down area. Clean from the top down to avoid recontamination of the bit you have just cleaned.

People movement

People moving between farms can transport pests on clothing and footware. Brief all employees, contractors, and visitors about your farm biosecurity measures.

Overseas visitors

Check that family members, employees and visitors returning from overseas have washed their clothing and footwear. This is particularly important for clothing items that don't normally go near a washing machine.

Contractors and utility workers

Inform people entering your farm to work about your biosecurity policy and make sure their vehicles and clothing are clean. It is also your responsibility to let them know if you have weeds, pests and diseases on your farm that could be a risk for their next clients.

Stock feed and new stock purchases

Purchased animal feeds should be inspected for weed seeds, insects and signs of disease. Feed-out in the same parts of the paddock so that it is easy to do a weed inspection after feeding out has finished.

Newly purchased stock should be held in a holding paddock for at least seven days to allow weed seeds to pass through the digestive system. Inspect for newly germinated weeds regularly.

Purchase seed and plant material from a reputable source

Always try and use certified material and keep a record of the certification report.

Documentation Section

Refers to page 26 in the template.

Use this section to hold

1. A list of all the resource consents you hold for your farm operation
2. Soil tests, nutrient budgets, invoices and all other paperwork relating to your management plans.
3. Overseer Nutrient Budget

Note: An Overseer nutrient budget is required by a number of regional councils as part of your farm environment plan.

Farm information you need to keep which can be used to prepare an Overseer nutrient budget includes:

1. The location of the farm; latitude and longitude data to at least 3 decimal places. This enables identification of climate and soils for the farm.
2. Annual yield of arable and horticultural crops and a description of 24 months of the rotation. Start with the crop that is in the ground in April.
3. A description of the management practices used, including:
    i. Ground cover - pasture, fodder crops, crops and the crop rotation, non-grazed areas (forestry, riparian, and tree areas).
    ii. Stock management –lambing/calving/fawning dates and percentages, any purchases and sales and associated dates, types and age of stock.
    iii. Fertiliser application-types and quantities/ha for each identified block for all crops in the rotation.
    iv. Cultivation practice and crop residue management.
    v. Quantities of introduced or exported feed.
4. Irrigation areas: rates, monthly volumes and system type.
5. Monthly stocking rates for all the animal classes on your farm.
6. Farm animal effluent, pig farm effluent, stand-off pad and feed-pad effluent management including;
    i. Area of land used for effluent application.
    ii. Annual nitrogen loading rate and nitrogen load rate/application.
    iii. Instantaneous application rate.

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