GOVERNMENT OF WESTERN AUSTRALIA

Department of **Water and Environmental Regulation**

Department of **Primary Industries and Regional Development**

Nutrient Best Management Practices

for beef, sheep and dairy grazing enterprises in south-west Western Australia

HEALTHY ESTUARIES WA

Revitalising Geographe Waterways

VASSE taskFORCE

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Contents

About this guideline

The Best Management Practices (BMPs) have been developed to provide farmers practical advice on managing nutrients on-farm to optimise nutrient use efficiency and reduce nutrient loss, saving farmers money and reducing impacts on the environment.

The BMPs are based on:

- scientific literature relevant to grazing properties in south-west Western Australia (WA) located in high rainfall (above 600 mm per year) areas,
- industry standards, and/or
- expert advice.

Where practical, industry guidelines and references have been included to provide farmers with additional information or easy access to supporting calculators or information. The guidelines have been developed with the input of scientists, catchment groups, grazing and fertiliser industry representatives, and farmers.

Background

Beef, sheep and dairy enterprises are the most extensive land uses in south-west WA and are critical to the economy; supplying local, national, and international markets with high quality produce.

Nutrient inputs, through fertiliser and/or feed, are one of the biggest costs to grazing farmers. Nutrient loss from grazing properties also makes up the largest source of nutrients entering south-west waterways and estuaries, contributing to algal blooms and occasional mass fish kills.

The Best Management Practices (BMPs) encompass the 4Rs of nutrient management: **Right source, Right rate, Right time, and Right place.** Additional farm management practices to keep nutrients on farm and maximise productivity and profitability are also included.

The BMPs are categorised into the headings below with additional information on why the BMPs are important, how to undertake the BMPs and useful references.

1. Farm record keeping
2. Right source/Right rate
3. Right place
4. Right time
5. Storing fertiliser
6. Fertiliser application
7. Riparian management
8. Grazing management

The BMPs will be updated as new information and practices evolve to support farmers achieve sustainable, productive and profitable farming enterprises.

Best Management Practices

1 - Farm record keeping

Having farm maps and accurate records of on-farm activities provides an easy way to track and measure changes over time. Quality Assurance (QA) programs providing incentives require records to demonstrate environmental stewardship and sustainability.

BMP	Why should I do this?	How can I do this?	Reference
Create a farm map showing paddock boundaries, soil testing transects or locations, soil types, watercourses and environmentally sensitive areas, and infrastructure	A good map helps plan farm management and identifies areas of high nutrient risk, including environmentally sensitive areas, waterways and drains.	Create your own maps with free online mapping platforms like Google Earth, Google Maps or QGIS. Contact your local catchment group for assistance.	QGIS Google Earth
Develop a whole farm nutrient plan including farm map, soil test results, nutrient inputs and outputs, and actions for minimising nutrient loss	Having an up-to-date nutrient management plan will help prioritise ways to improve nutrient use efficiency, access funding incentives and demonstrate your on-farm environmental sustainability initiatives.	Use a Fertcare® Accredited Advisor to prepare a nutrient management plan to meet the minimum standard for dairy farms. Contact your local catchment group for help to develop a whole farm nutrient plan.	Fertcare® technical standards for nutrient management planning on Australian dairy farms

BMP	Why should I do this?	How can I do this?	Reference
Record soil and plant tissue testing results and fertiliser products used (including the rate and timing) for each paddock	Accurate records are essential for better decision making and may be required for stewardship and QA programs.	Develop your own spreadsheet to record results and management actions or use online platforms such as Back Paddock or Agworld to keep track of soil test results, rotations, inputs and yields.	Back Paddock Agworld

2 - Right source/Right rate

Decisions about the source of fertiliser and rate of application should be based on evidence from soil and plant tissue testing results, as well as good agronomic advice. Applying the 4Rs (Right source, Right rate, Right place, Right time) will help optimise nutrient use efficiency, keep more nutrients and profits on farm, and achieve better outcomes for the environment.

BMP

Determine production targets for each paddock based on stocking rate and feed requirements

Production targets are the percentage of the potential production achievable on a given paddock.

Why should I do this?

Knowing your production targets allows you to use soil test data to determine **Fertility Index** values for your paddocks. This better informs fertiliser rates, saving money and reducing nutrient loss to the environment.

How can I do this?

Work with a Fertcare® Accredited Advisor to assist you in determining your production target(s).

Production targets generally range from 80% of potential production for sheep and beef grazing up to around 95% for dairy or hay paddocks, however, your targets will depend on your goals and specific circumstances.

Reference

Go to the Fertilizer Australia Fertcare® Accredited Advisors List to find an advisor in your area.

See "How to" links in Section 8 on Grazing Management.

BMP

Soil test your whole farm at least every three years following the Fertcare® soil sampling guidelines

Contact your local catchment group to see if there are any soil testing programs available in your catchment.

Why should I do this?

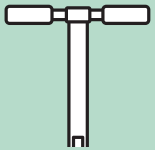
Soil testing is the only way to accurately establish the nutrient status of your soil to determine the right product and rate of fertiliser to address nutrient deficiencies.

Following the Fertcare® sampling guidelines will reduce the variability of soil test results and enable long-term comparison of results providing greater confidence in soil testing.

Soil testing across your whole farm every three years allows monitoring of soil nutrient status over time and adjustment of fertiliser requirements.

How can I do this?

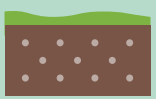
Use appropriate sampling equipment.



Use safe and clean practices.

Collect a minimum of 20-40 cores depending on core diameter.

Sample to the correct depth for enterprise and issues.



Avoid atypical areas such as stock camps.

Record sampling locations, equipment, depths, date and conditions.

Reference

Soil sampling high rainfall pastures in WA

A guide for 'fit for purpose' soil sampling

Accurate soil sampling

DPIRD Whole Farm Nutrient Mapping

BMP	Why should I do this?	How can I do this?	Reference
Use an Australasian Soil and Plant Analysis Council (ASPAC) certified laboratory to analyse soil	Using an ASPAC certified laboratory ensures soil test analysis are accurate.	To find a laboratory in WA go to the ASPAC website.	ASPAC
Determine Fertility Index of paddocks for phosphorus (P), sulfur (S) and potassium (K)	Knowing the Fertility Index of your soil is critical to ensuring adequate nutrients are applied to address deficiencies, and unnecessary nutrients are not applied that may cause environmental harm or add to farm input costs.	Use the Department of Primary Industries and Regional Development (DPIRD) Nutrient Calculator or a Fertcare® Accredited Advisor to calculate your fertiliser requirements based on Fertility Index. Farm nutrient maps provided as part of the subsidised soil testing program will also include the Fertility Index.	Better Fertiliser Decisions for Pasture DPIRD Whole Farm Nutrient Mapping

Fertility Index is the nutrient level measured in your soil test result divided by the **critical value** of that nutrient for your target production

A **critical value** is the level of fertility measured in a soil test that you will need for your soil type to achieve your target production. Critical values for high rainfall pastures have been developed for phosphorus, sulfur and potassium in Making Better Fertiliser Decisions for Grazed Pastures in Australia.

BMP	Why should I do this?	How can I do this?	Reference
Use a Fertcare® Accredited Advisor to help interpret soil test results and provide agronomic advice	Fertcare® Accredited Advisors are trained to national standards for nutrient advice to farmers, considering both productivity and the environment. They are audited every two years by a Fertcare® Approved Auditor to ensure sound advice is provided to farmers based on objective measures.	Go to the Fertilizer Australia Fertcare® Accredited Advisors list to find an advisor in your area.	Fertcare® website Fertcare® Accredited Advisors

RIGHT SOURCE / RIGHT RATE

BMP

Apply phosphorus (P) only to paddocks that are deficient in P where soil testing shows P Fertility Index is less than 1

A **Fertility Index of 1** is considered optimal.

Why should I do this?

P trials across south-west WA have shown that adding P above a Fertility Index of 1 does not increase productivity.

Adding unnecessary P increases input costs and contributes to poor water quality in waterways.

How can I do this?

If the P Fertility Index of your paddock is greater than 1, do not apply P.

Work with a Fertcare® Accredited Advisor to determine the most suitable fertiliser product or use the DPIRD Nutrient Calculator.

Your fertiliser representative or reseller can help order a custom blend based on your soil test results.

Reference

DPIRD Nutrient Calculator

uPtake website

Critical P values

Phosphorus for high rainfall pastures

BMP	Why should I do this?	How can I do this?	Reference
Apply sulfur (S) and potassium (K) to paddocks deficient in S or K where soil testing shows Fertility Index of less than 1	Maximise production by choosing fertilisers that address nutrient deficiencies determined by soil testing. Applying fertiliser products that meet your soil and pasture requirements is cost-effective and reduces impacts to the environment.	Choose the most appropriate fertiliser product to address nutrient deficiencies. Work with a Fertcare® Accredited Advisor or use the DPIRD Nutrient Calculator to determine the ideal nutrient blend and the fertiliser products or quantities to supply those nutrients.	DPIRD Nutrient Calculator Potassium for high rainfall pastures Sulfur for high rainfall pastures
Use low water-soluble phosphorus (P) fertiliser on soil with Phosphorus Buffering Index (PBI) below 35 where there is a high risk of P leaching if P is required (Fertility Index is less than 1)	Low water-soluble P fertilisers can decrease P losses off farm from sandy soils with low PBI when paired with an appropriate fertiliser management program.	If your P Fertility Index is less than 1 and you intend to apply P fertiliser, identify paddocks where BPI is below 35 and use low water-soluble P fertiliser on those paddocks.	

Phosphorus Buffering Index (PBI) is a measurement of your soil's tendency to chemically adsorb phosphorus.

BMP	Why should I do this?	How can I do this?	Reference
Match nitrogen (N) application to pasture demand	Nitrogen can dramatically increase production but only when applied at the right time. Supplementing feed may be a more economical option.	Use N look-up tables or seek advice from a Fertcare® Accredited Advisor to compare cost of N versus feed. Consider the guidelines in the Fert$mart Nitrogen Pocket Guide.	Fert$mart Nitrogen Pocket Guide Fertcare website Fertcare® Accredited Advisors
Apply nitrogen at rates of 20 to 50 kg/ha of N per application, no closer than 21 to 28 days apart, and no more than 50 kg/ha of N (e.g. 110kg/ha of urea) in a single application	Over application of N and poor timing can increase N losses exponentially and have a negative impact on the environment (water and air) and human health.	Seek advice from a Fertcare® Accredited Advisor. Use the Fertcare® technical standards for nutrient management planning on Australian dairy farms to finetune dairy nitrogen application rates, especially if applying dairy effluent.	Fertcare® technical standards for nutrient management planning on Australian dairy farms

Before applying N, estimate the likely N response (use lookup tables, experience, consultants) and compare the cost of the additional pasture produced to other purchased feed options.

BMP	Why should I do this?	How can I do this?	Reference
Maintain soil pH in the range of 5 - 7 (as measured in $CaCl_2$)	Optimum plant growth and nutrient availability occurs in the pH range 5.5 - 7. At low pH, aluminium and some nutrients become available to plants at toxic quantities, and other nutrients become less available.	Add lime to low pH soils with advice from a Fertcare® Accredited Advisor or use calculators and apps to determine liming strategies for your paddocks: • Use the iLime calculator / app • Use the Lime Comparison Calculator to identify which lime product is the best value for money • Access the Lime WA Inc site for lime quality information from many lime producers • Use LimeMate to calculate the required rates of lime to achieve target pH values	Soil Acidity Guide Soil Acidity ebook iLime Lime Comparison Calculator Lime WA Inc LimeMate

BMP	Why should I do this?	How can I do this?	Reference
Take plant tissue tests in spring on actively growing plants	Tissue testing can identify plant nutrient deficiencies or imbalances of macro or micronutrients that affect plant health and may impact on production.	Work with a Fertcare® Accredited Advisor for advice on interpreting plant tissue tests.	Tissue sampling and testing for high rainfall pastures in WA Fertcare website

3 - Right place

Knowing where you are placing fertiliser in the landscape is key to optimising productivity and reducing nutrient loss off farm. Surface runoff and leaching can shift nutrients away from where plants need them.

BMP	Why should I do this?	How can I do this?
Spread fertiliser using GPS guidance with at least a 10 m mapped buffer away from waterways and other environmentally sensitive areas	A minimum 10 metre buffer reduces the risk of nutrient losses to waterways and environmentally sensitive areas, keeping fertiliser on-farm.	Use GPS guidance with a mapped buffer when spreading. **Environmentally sensitive areas** include waterways, wetlands or remnant native vegetation.
Apply fertiliser to non-waterlogged soils	Growth of pasture is usually poor in waterlogged soils and nutrients will not be utilised. Nutrients applied to waterlogged soil may be lost to the environment.	Mark seasonally waterlogged areas on maps and/or fence the inundated area for easier management.

BMP	Why should I do this?	How can I do this?	Reference
Apply nitrogen (N) fertiliser to grass dominated areas with good ground cover (at least 70%) to actively growing plants	Nitrogen loss through leaching or volatilisation is likely to be high if fertiliser is applied to bare soil. Clover dominant pastures tend to respond to less N application.	Avoid areas with bare soil. See a Fertcare® Accredited Advisor for advice on applying N. Consider the guidelines in the Fert$mart Nitrogen Pocket Guide.	Fertcare® Accredited Advisors Fert$mart Nitrogen Pocket Guide
Avoid applying fertiliser to potentially high nutrient areas (e.g. stock camps, gateways, feed pads)	These areas are already getting nutrients transferred by animals and are unlikely to need additional fertiliser.	Mark these areas on the map to remind all machinery users to avoid applying fertiliser to them.	

4 - Right time

Applying fertiliser at the right time will optimise productivity and minimise loss to the environment.

BMP	Why should I do this?	How can I do this?
Apply fertiliser on still days (wind speed less than 15 km/h)	Fertiliser drift will be higher on windy days, potentially leading to uneven spread and loss to waterways and environmentally sensitive areas.	Check the weather forecast before spreading. The loss of ammonia from surface-applied N fertiliser increases under warm, windy conditions.
Apply fertiliser on dry days and avoid applying fertiliser if more than 20 mm rain is forecast	Applying fertiliser immediately prior to **heavy** rains increases the risk of nutrient loss off farm.	Check seven-day weather forecast to help plan fertiliser application outside of heavy rain events.

BMP	Why should I do this?	How can I do this?	Reference
Apply phosphorus (P) and potassium (K) in spring if soil testing shows a marginal deficiency (Fertility Index 0.75 - 1)	The highest nutrient demand from pasture is in spring. Applying fertiliser in spring provides plants with nutrients during periods of highest demand resulting in greater uptake by the plant. Lower rainfall in spring will also reduce nutrient loss to the environment. In marginally deficient soil, there are enough nutrients in the soil and seed to carry the pasture to spring.	Work with a Fertcare® Accredited Advisor to interpret soil tests to assess P and K requirements against critical soil test values. Assess your P and K levels in the soil against national critical values using the DPIRD Nutrient Calculator.	Phosphorus for high rainfall pastures Potassium for high rainfall pastures Better Fertiliser Decisions for Pasture
If P is deficient (Fertility Index less than 0.75), apply P in autumn when pasture is growing and again in spring	Autumn application of P is only required if P is highly deficient in the soil. Splitting a high P application reduces the risk of nutrient loss to the environment.		DPIRD Nutrient Calculator

BMP	Why should I do this?	How can I do this?	Reference
Apply nitrogen (N) when pasture is actively growing	If plants are not actively growing they will not use N and any excess N will be lost to the environment.	Check that soil moisture is adequate to sustain the regrowth, rainfall is likely in the regrowth period, temperatures are conducive to good pasture growth, there is good species composition and other major soil nutrients are optimal. Consider the guidelines in the Fert$mart Nitrogen Pocket Guide.	Fert$mart Nitrogen Pocket Guide

5 - Storing and transporting fertiliser

Good storage facilities keep fertiliser away from moisture and wind and allow fertiliser spills to be contained and cleaned up preventing loss to the environment.

BMP	Why should I do this?	How can I do this?	Reference
Store fertiliser in above-ground pits, bunkers, or sheds with a concrete floor, impermeable cover, with separation between products	Keeping fertiliser dry and free from moisture will limit nutrient runoff, reduce atmospheric losses, and improve handling. Storage facilities should be sealed to avoid run off.	Fertcare Guidelines on fertiliser storage Fertcare Guidelines on fertiliser handling	Guidelines on fertiliser storage Guidelines on fertiliser handling
Mix and store fertilisers at least 30 m away from surface water bodies including drains, and clean up spills	Contamination can result from small quantities spilled regularly in the same place. Fertilisers can cause harm if the nutrients they contain reach surface or groundwater.		
Cover fertiliser when travelling on public roads	Fertiliser lost during transport is a waste of money and may go directly into drainage systems or waterways.	Fertcare Guidelines on fertiliser handling	Guidelines on fertiliser handling

6 - Spreading fertiliser

Spreaders vary in their distribution pattern of fertiliser. Don't waste valuable fertiliser dollars distributing the product unevenly or in the wrong areas.

BMP	Why should I do this?	How can I do this?	Reference
Use a variable rate spreader to spread fertiliser	A variable rate spreader enables you to alter the rate of fertiliser application to meet nutrient requirements of individual paddocks and reduce the risk of nutrient loss off farm.	Adjust your spreader manually for each paddock to match the required fertiliser rate. If you have the appropriate data and variable rate spreader technology, use this to automatically adjust the rate.	
Calibrate your fertiliser spreader annually to test the accuracy and evenness of spreading. Check the set up before each use.	A highly variable spread pattern compromises production rates and farm profitability as some areas receive too much fertiliser and others too little. Over or under fertilising can lead to nutrient and productivity loss.	Consult your fertiliser spreader manual for calibration instructions. For Marshall multi-spreaders, use the Marshall Multispreader App to help calibrate your spreader for a range of fertiliser types and spread widths. Read the Accu-Spread guidelines and watch available videos.	Marshall Multi-spreader App Accu-Spread

Coefficient of Variation (CV) is a measure of how evenly the machine spreads fertiliser and is calculated as a percentage. The lower the value of the CV the more evenly the machine is spreading (with less than 15% CV being ideal).

BMP	Why should I do this?	How can I do this?	Reference
Have your spreading equipment Accu-Spread® accredited, or use an Accu-Spread® accredited contractor	Accu-Spread accredited machinery will ensure a more even distribution of fertiliser within the targeted application zone.	Contact your local catchment group to attend an Accu-Spread field day to test your spreader. Use an accredited Accu-Spread accredited contractor.	Accu-Spread Farmer Testing Considerations Accu-Spread accredited contractors

7 - Riparian management

Healthy waterways are supported by well-designed and managed riparian, or riverbank, zones. Excluding stock through fencing and maintaining or enhancing native vegetation along waterways can reduce erosion and nutrient loss, improve biodiversity and support grazing management.

BMP	Why should I do this?	How can I do this?	Reference
Install stock exclusion fencing at least 10 m from waterways and build stock crossings and/or off stream watering points if required	Fencing to keep stock out of waterways reduces bank erosion and stops animal waste deposition directly into the waterway.	Contact your local catchment group to get assistance with your stock exclusion fencing project and see if funding subsidies are available. Visit Healthy Estuaries WA for further information.	Hall 2019 (unpublished DWER report)
Maintain and enhance at least 10 m of vegetation along waterways and major drains	Well managed vegetated strips along waterways and major drains can reduce erosion, provide a nutrient buffer, improve biodiversity, provide shade, and enhance your property.	Contact your local catchment group to get assistance with revegetation and see if funding subsidies are available.	River Restoration Manual

A **riparian zone** is land alongside creeks, streams, gullies, rivers and wetlands.

8 - Grazing management

Optimising pasture growth through good grazing management maximises return on your investment in fertiliser.

BMP	Why should I do this?	How can I do this?	Reference
Determine and implement a sustainable stocking rate for your farm	Determining your stocking rate is the essential link to match animal energy demands with pasture energy supply, optimising your fertiliser and feed inputs.	Talk to a Fertcare® Accredited Advisor or use calculators below to determine your sustainable stocking rate: MLA stocking rate calculator Evergraze stocking rate calculator DPIRD Stocking rate guidelines	MLA Stocking Rate Evergraze Stocking Rate DPIRD Stocking Rate

BMP	Why should I do this?	How can I do this?	Reference
Implement an appropriate grazing rotation to prevent overgrazing and improve pasture utilisation	Rotating animals allows you to optimise pasture productivity and utilisation, maximise nutrient distribution, minimise unnecessary loss to the environment and maintain animal health.	Join a grazing group e.g *Dairy Australia Feeding Pastures for Profit* or *Grazing Matcher*. For more information contact Western Dairy, Western Beef or your local Catchment Group.	MLA Grazing Management MLA Pasture Utilisation
Maintain ground cover of at least 70% across the farm and 100% on slopes	Maintaining groundcover of at least 70% through appropriate pasture species and stocking rates increases water use efficiency and helps to reduce soil and nutrient loss, particularly in high-intensity rainfall events.	Use MLA tips and tools on how to maintain ground cover to reduce run off and water loss to maintain soil health and carbon.	Maintain Ground Cover

Rotational grazing refers to moving livestock between paddocks for optimum use of available feed, preventing overgrazing and allowing time for pasture to recover.

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