

Queensland
**REEF WATER
QUALITY**
Program



Reef protection regulations
Farming in Reef catchments

Farm nitrogen and phosphorus budget guide

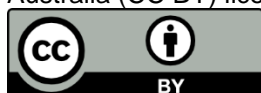
Version 2.1

(Agricultural environmentally relevant activity standard
for sugarcane cultivation)

Prepared by:
Office of the Great Barrier Reef, Environmental Policy and Programs, Department of Environment and Science

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Updated October 2023

STANDARD CONDITIONS 9-19: FARM NITROGEN AND PHOSPHORUS BUDGET

Under the Reef protection regulations, the following standard conditions for a farm nitrogen and phosphorus budget must be implemented and maintained as part of the Agricultural Environmentally Relevant Activity (ERA) standard for sugarcane cultivation – version 2:

Standard condition 9

Sugarcane cultivation in any Great Barrier Reef catchment that requires an environmental authority for a prescribed ERA in schedule 2, section 13A of the *Environmental Protection Regulation 2019* (new cropping and horticulture) must develop a Farm Nitrogen and Phosphorus Budget prior to fertilising the agricultural property.

Standard condition 10

From 1 December 2021, for the Wet Tropics, Burdekin and Mackay Whitsunday regions within the Great Barrier Reef catchment, a Farm Nitrogen and Phosphorus Budget must be developed prior to fertilising the agricultural property.

Standard condition 11

From 1 December 2022, for the Fitzroy and Burnett Mary regions within the Great Barrier Reef catchment, a Farm Nitrogen and Phosphorus Budget must be developed prior to fertilising the agricultural property.

Standard condition 12

A Farm Nitrogen and Phosphorus Budget developed for an agricultural property prior to the date it is required under standard condition 10 or standard condition 11 must be developed in accordance with standard condition 13-19.

Standard condition 13

The first Farm Nitrogen and Phosphorus Budget for an agricultural property must be developed and verified by either:

- a) an **appropriate person**, or
- b) the person carrying out the agricultural ERA if the person is accredited under a **recognised accreditation program**.

Standard condition 14

The Farm Nitrogen and Phosphorus Budget for the agricultural property must be reviewed and updated (in accordance with standard condition 15), at least annually by the person carrying out the agricultural ERA, and completed prior to fertilising.

Standard condition 15

A review and update of the Farm Nitrogen and Phosphorus Budget must include:

- a) a recalculation of the **whole of farm nitrogen amount** for the following harvest period (in accordance with standard condition 7 and standard condition 17);
- b) a recalculation of the **whole of farm phosphorus amount** for the following harvest period (in accordance with standard condition 7 and standard condition 17);
- c) an update to the farm map (in accordance with standard condition 17);
- d) consider any other change(s) that may affect the amount of fertiliser calculated under standard condition 7 and standard condition 16.

Standard condition 16

The Farm Nitrogen and Phosphorus Budget for the agricultural property must be reviewed, updated and verified every five (5) years by either:

- a) an appropriate person, or
- b) the person carrying out the agricultural ERA if the person is accredited under a recognised accreditation program.

Standard condition 17

A Farm Nitrogen and Phosphorus Budget must be completed for the whole of farm and must include the following:

- a) a farm map that includes:
 - (i) farm number or unique identifier/s,
 - (ii) block boundaries,
 - (iii) block identifiers,
 - (iv) area of each block (in hectares),
 - (v) area of whole of farm (in hectares),
 - (vi) crop class (e.g. plant, first ratoon, second ratoon),
 - (vii) management zone boundaries (if management zones have been defined for a farm);
- b) identification of physical or soil chemical constraints to yield (if they exist) for each management zone and/or blocks;
- c) soil tests and analysis undertaken in accordance with standard condition 6;
- d) nitrogen fertiliser rates calculated in accordance with standard condition 7 for each plant block and ratoon block for the following harvest period;
- e) calculation of the whole of farm nitrogen amount for the following harvest period;
- f) phosphorus fertiliser rates calculated in accordance with standard condition 7 for each plant block and ratoon block for the following harvest period;
- g) calculation of the whole of farm phosphorus amount for the following harvest period;
- h) name(s) and contact details of the **appropriate person** who developed and/or verified the Farm Nitrogen and Phosphorus Budget/s for the agricultural property.

Standard condition 18

The amount of fertiliser containing nitrogen applied to the agricultural property must not exceed the whole-of-farm nitrogen amount in the Farm Nitrogen and Phosphorus Budget.

The amount of fertiliser containing phosphorus applied to the agricultural property must not exceed:

- a) the whole of farm phosphorus amount in the Farm Nitrogen and Phosphorus Budget; or
- b) the amount calculated under SC7 for blocks not included in the whole of farm phosphorus amount where phosphorus is being applied to supply multiple crops in the whole crop cycle.

Standard condition 19

The application rate of nitrogen fertiliser calculated for the agricultural property in accordance with standard condition 7 for individual blocks and/or management zones, can be exceeded only where:

- a) a Farm Nitrogen and Phosphorus Budget has been developed for the agricultural property in accordance with standard condition 13-19; and
- b) the higher rate(s) is offset by lower rate(s) on blocks or management zones elsewhere within the whole of farm so that the whole of farm amount of nitrogen in the Farm Nitrogen and Phosphorus Budget is not exceeded.

The application rate of phosphorus fertiliser calculated for the agricultural property in accordance with SC7 for individual blocks and/or management zones can be exceeded only where:

- a) the blocks or management zones are included in the whole of farm phosphorus amount under the Farm Nitrogen and Phosphorus Budget; and
- b) the higher rate(s) is offset by lower rate(s) on blocks or management zones elsewhere within the area that the whole of farm phosphorus amount applies, so that the whole of farm amount of phosphorus in the Farm Nitrogen and Phosphorus Budget is not exceeded.

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Glossary

Activity: The environmentally relevant activity (ERA) to which this agricultural ERA standard applies.

Appropriate person: Means a person who has professional qualifications, training or skills or experience relevant to completing a Farm Nitrogen and Phosphorus Budget. This must include the ability to give an authoritative assessment, advice and analysis relevant to the farm, block and/or management zone, using protocols, standards, methods or literature, where relevant.

A grower can be considered an appropriate person if they demonstrate they have the appropriate skills, qualifications, or experience to complete the Farm Nitrogen and Phosphorus Budget acquired through a recognised program endorsed by the Department of Environment and Science (department).

Authorised person: Means a person appointed as an authorised person under the *Environmental Protection Act 1994* by the chief executive or chief executive officer of a local government.

Block: An area of land that is typically used to grow sugarcane.

Commercial: For the purposes of this guide, commercial is defined as undertaking the activity (sugarcane growing) for a fee or reward.

Constraint: Means something that affects productivity and yield. Also known as a limiting factor.

Crop class: Means the stage of the plant's lifecycle, e.g. plant, first ratoon, second ratoon, standover.

Crop cycle: For the purposes of this guide a crop cycle is one plant and four ratoon crops.

Crop cycle phosphorus amount: Means the total amount of phosphorus that can be applied over a full crop cycle (five years).

District yield potential: Means yield potential for a sugarcane growing district as per the regulated method (refer to the *'Prescribed Methodology for Sugarcane'*).

Fallow: An area of land that is typically used to grow sugarcane, and that is left with either grass/weedy cover, green manure or a leguminous crop (i.e. crop or ground cover with low or no nitrogen demand) for a period of at least six months. The fallow period begins on the harvest date of the previous sugarcane crop.

Farm Nitrogen and Phosphorus Budget: Is the farm map and any other documents (including records, fertiliser recommendations, and soil test results) used to prepare the Farm Nitrogen and Phosphorus Budget. Also referred to as the N&P Budget.

Fertiliser: Means any fertiliser product that has a quantified amount, obtained by analysis, of nitrogen and/or phosphorus.

Great Barrier Reef catchment: Has the same meaning as in the *Environmental Protection Act 1994*. The Great Barrier Reef catchment is the area shown on a map prescribed by regulation as the Great Barrier Reef catchment.

Management zone: For the purpose of this guide, means a block, or groups of blocks, with the same or similar yields and management history. Zones are defined in conjunction with an appropriate person by identifying areas based on fertiliser recommendations using soil test results, soil type and/or advice from the appropriate person.

Mill ash: Means a by-product produced by sugar mill boilers. Also known as boiler ash.

Mill by-product: Mill mud and mill mud/ash mixes.

Mill mud: Means the residual mud and fibre filtered from the raw sugar juice during the sugar refining process. Also called filter mud, filter cake or sugarcane press mud.

Plant crop: For the purposes of this guide means the initial sugarcane crop after planting.

Ratoon crop: For the purposes of this guide means a new crop of sugarcane that regrows from the portion of stalk left underground after harvesting of the previous crop.

Recognised accreditation program: Means an accreditation program recognised under the *Environmental Protection Act 1994* by the chief executive for the agricultural ERA. As at April 2022, this applies to Smartcane BMP accreditation.

Relevant primary document: Means a document relating to the carrying out of the activity that is the subject of the record from which information in the record was obtained; and includes:

- a) receipts and invoices for the purchase of a fertiliser product;
- b) a summary of tailored advice about carrying out the agricultural ERA (e.g. recommended application rates and frequency); and
- c) a fertiliser or mill mud, or mill mud/mill ash mix invoice showing the product, amounts, and date(s) of delivery;
- d) a soil test report which shows the results of soil testing and any nutrient recommendations made;
- e) a contractor receipt which shows the amounts and locations of fertiliser products applied;
- f) a fertiliser product bag tag or other information which shows the percentage of nitrogen and phosphorus.

Soil conditioner/s: Means a substance added to soil to improve the growing conditions for plant roots. Examples are gypsum, lime and organic matter. For the purpose of this guide, mill mud and mill ash are also considered soil conditioners.

Soil testing: Means a test of the characteristics of soil, analysed by a National Association of Testing Authorities (NATA) or Australasian Soil and Plant Analysis Council (ASPAC) accredited laboratory, or one holding an equivalent certification.

Sugarcane growing district: Means a sugarcane growing district as per the regulated method under standard condition 7 (refer to the *Prescribed Method for Sugarcane*).

Standover cane: Means sugarcane left unharvested at the end of the harvest season that can be harvested in the following season or destroyed.

Whole crop cycle: A period of five years (one plant and four ratoons).

Whole of farm: Means the area of plant and ratoon blocks (and not fallow blocks) to which the Farm Nitrogen and Phosphorus Budget applies where:

- a) the activity is carried out under the day-to-day management of a single responsible individual, for example, a site or operations manager;
- b) the activity is operationally interrelated;
- c) the activity is, or will be, carried out at one or more places;
- d) places where the activities are carried out are separated by distances short enough to make feasible the integrated day-to-day management of the activities;
- e) the activity is carried out within the same sugarcane growing district as per the *Prescribed Method for Sugarcane*.

Whole of farm nitrogen amount: Means the total amount of nitrogen fertiliser (sum of each block calculated using the *Prescribed Method for Sugarcane*) for the whole of farm for a 12 month period.

Whole of farm phosphorus amount: Means the total amount of phosphorus fertiliser (sum of each block calculated using the *Prescribed Method for Sugarcane*) for the whole of farm for an annual period. Excludes blocks where phosphorus is being applied to supply multiple crops in the whole crop cycle and those areas using the 10kg of phosphorus allowance for plant crops where soil tests result in a nil phosphorus amount (as outlined in the prescribed methodology).

Introduction

The *Environmental Protection Act 1994* requires **commercial** beef graziers, sugarcane growers, banana growers and horticulture and grain growers in the Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy and Burnett Mary regions of the **Great Barrier Reef catchment** to comply with commodity-specific minimum practice agricultural standards under the Reef protection regulations.

The purpose of the Reef protection regulations is to protect the health of the Great Barrier Reef by reducing pollutant run-off (nutrients, sediment and pesticides) in waterways that flow to the Reef.

The regulated minimum practice agricultural standards are based on the best available science and agricultural industry expertise to deliver significant water quality benefits for the Reef while driving better land management practices for profitable and productive farming.

The explanatory information in this document is to be used by growers, and others involved in providing advice on developing a **Farm Nitrogen and Phosphorus budget**.

The Great Barrier Reef catchment consists of the Cape York, Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy and Burnett Mary regions (Figure 1).

Producers in Cape York are not currently required to meet minimum practice agricultural standards as the region has met its Reef water quality targets (under the Reef 2050 Water Quality Improvement Plan 2017-2022).

You can find out if your property is in one of these regions by completing this [online form](https://www.qld.gov.au/ReefRegulations) available at www.qld.gov.au/ReefRegulations.

The online form gives you the number of hectares of your Lot/s in each Reef catchment. If a Lot on plan (i.e. the boundaries of your property) crosses the outer boundary of the Great Barrier Reef catchment, the Lot is considered within the Reef catchment if more than 75 percent of the Lot, or more than 20,000 hectares of the Lot, is within the Reef catchment boundary. If a Lot is located across the boundary of two Reef regions, the Lot is taken to be in the region where more than 50 percent of the Lot is located.

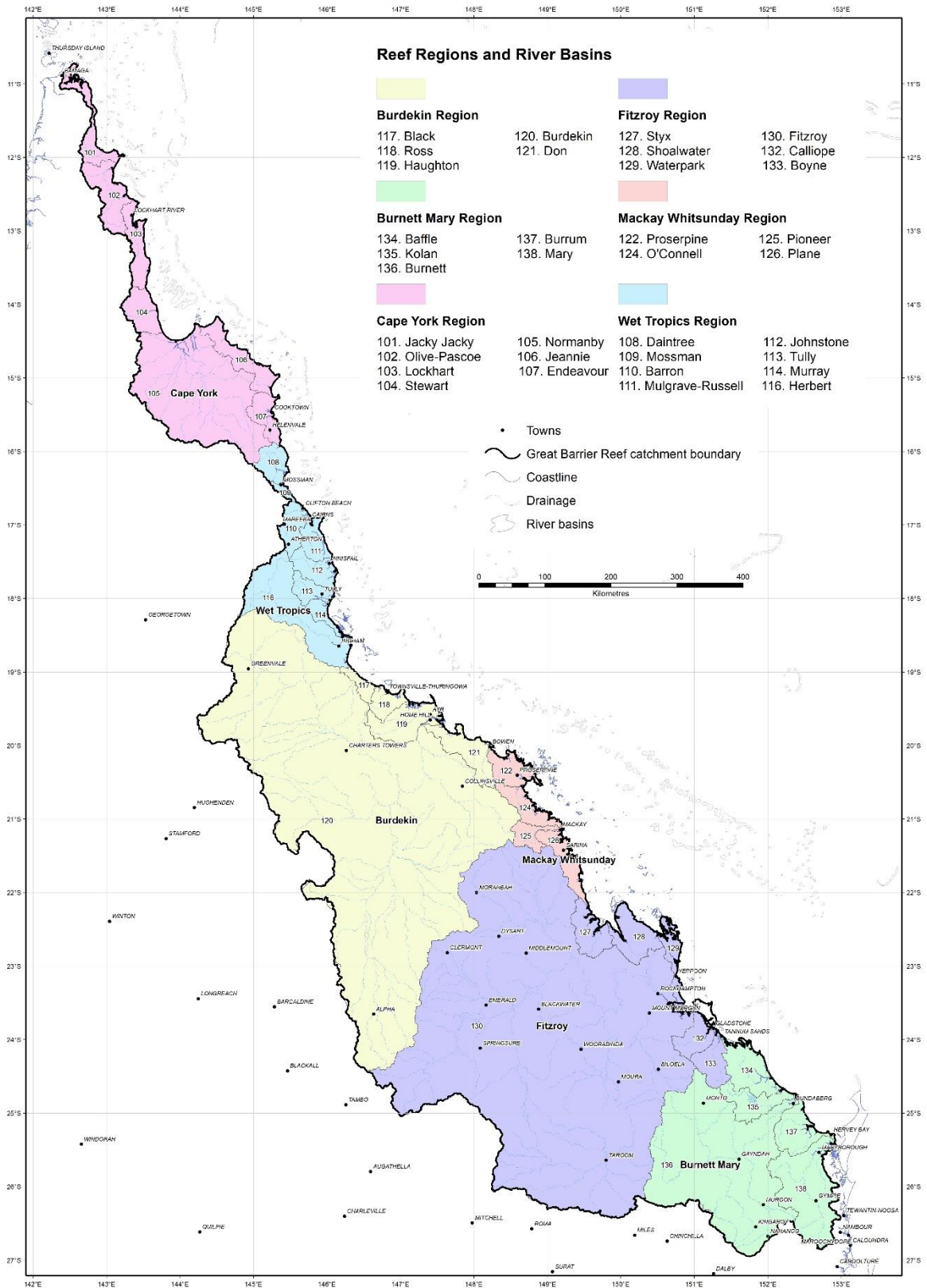


Figure 1: The Great Barrier Reef stretches more than 2,300 kilometres along Queensland's coastline. It receives run-off from 35 catchments which are spread over six natural resource management regions.

Purpose of this guide

The purpose of this document is to provide practical information to enable you to comply with the standard conditions for developing a Farm Nitrogen and Phosphorus Budget (N&P Budget) for your farm in accordance with the Agricultural ERA standard for sugarcane cultivation – version 2 under the *Environmental Protection Act 1994*.

The intent of the N&P Budget is to encourage and assist growers to identify and address constraints to productivity, and to review and refine their nitrogen and phosphorus management at a finer scale. This should lead to improved nutrient use efficiency, improving production and profitability, whilst reducing the amount of surplus nitrogen and phosphorus that could be lost from the farm.

The N&P Budget supports you to calculate nitrogen and phosphorus rates for each **block** or **management zone** on your farm using the [Prescribed methodology for sugarcane cultivation](#). It can be used to document measures used to ameliorate or manage constraints, as well as your farm fertiliser program, soil nutrient status and yield.

Although only nitrogen and phosphorus are regulated through an N&P Budget, you are encouraged to incorporate these requirements into a more comprehensive nutrition management plan, to look at other aspects of your farming that can help ensure your crop receives optimum nutrition to achieve its yield potential.

Regulations timeframe for commercial sugarcane growing

The Reef protection regulations apply to different regions at different times. Please refer to the table below for the timeframes for commercial sugarcane growing.

Commodity	Region	General record keeping requirements	Minimum practice agricultural standards	Farm nitrogen and phosphorus budget
Sugarcane	Burdekin, Mackay Whitsunday and Wet Tropics	1 December 2019	1 December 2019	1 December 2021*
	Burnett Mary and Fitzroy	1 December 2019	1 December 2022	1 December 2022*
	All regions in the Great Barrier Reef catchment	From commencement of an environmental authority for ERA13A – Commercial cropping and horticulture in the Great Barrier Reef catchment – sugarcane cultivation		

*This means that the N&P Budget will be prepared to cover fertiliser rates for the following harvest period in 2022 (for Wet Tropics, Burdekin and Mackay Whitsunday) and for the following harvest period in 2023 (for Burnett Mary and Fitzroy).

What do I need to do?

Before undertaking an N&P Budget you should seek professional advice from an **appropriate person** – see the **Contacts** section for more information.

There are a number of stages associated with the N&P Budget, which are outlined below.

Stage 1. Develop a farm map

Develop a farm map/s clearly showing **block** boundaries, block identifiers, area of each block (ha).



Stage 2. Soil testing

Use the regulated method for soil sampling.



Stage 3. Identify management zones

Define and mark management zones and crop constraints that may exist on the farm map, including any standover cane, and attach or overlay the soil type map.



Stage 4. Working out how much nitrogen and phosphorus to apply

Use the regulated method to calculate nitrogen and phosphorus rates and the **whole of farm** amount of nitrogen and phosphorus.



Stage 5. Review and Update

Annual review of N&P Budget taking into account on-farm changes.



Stage 6. Varying rates within your farm

Advice on varying the application rates of nitrogen and/or phosphorus across your farm taking into account the farms specific circumstances.



You can find more detail on each stage in the following sections.

Development of the farm N&P Budget

Your first N&P Budget must be developed and verified by either an **appropriate person** or the person carrying out the agricultural ERA if that person is accredited under a **recognised accreditation program**. You can use the same or a different appropriate person/s to develop and/or verify your N&P Budget. You must then review and update the N&P Budget for your farm at least annually prior to fertilising. It must be developed prior to fertiliser being applied to the farm each year. You can amend your N&P Budget at any time, as long as the annual review is completed at least every 12 months. Every five years, the N&P Budget must be reviewed, updated and verified by an appropriate person or the person carrying out the agricultural ERA if they are accredited under a recognised accreditation program. An [Example layout for an N&P Budget](#) is provided on page 17.

Can I develop and verify my own farm N&P Budget?

An appropriate person can be yourself or a third party such as an agronomist.

A third party must have professional qualifications, training or skills or experience relevant to completing an N&P Budget. This must include the ability to give an authoritative assessment, advice and analysis relevant to the farm, block and/or management zone, using protocols, standards, methods or literature, where relevant.

Advisers or growers who are certified under the [Fertcare Accredited Advisor Program](#) are also considered an appropriate person.

You can develop and verify your own N&P Budget if you have the appropriate skills, qualifications or experience acquired through a recognised training program endorsed by the Department of Environment and Science.

Recognised grower training programs for farm nutrient management:

- Better Soils Management Course (delivered by [Back Paddock](#))
- Online Six Easy Steps® nutrient management training (delivered by [Sugar Research Australia](#))
- Other training or education which is mapped to the following Units of Competency from the Rural Training Package:
 - [AHCWRK313](#) – Collect samples for a rural production or horticulture monitoring program
 - [AHCPCM406](#) – Develop a soil health and plant nutrition program
 - [AHCPCM513](#) – Conduct environment and food safety risk assessment of plant nutrition and soil fertility programs

Do I need to use an appropriate person if I'm Smartcane BMP accredited?

Growers accredited under the [Smartcane Best Management Practice \(BMP\) Program](#), which is a [recognised accreditation program](#) under the *Environmental Protection Act 1994*, do not need to use an appropriate person to update, review or verify their N&P budget. This only applies while a grower holds a current accreditation under the Smartcane BMP. Should a grower cease to be accredited, the requirement for review, updating and verification by an appropriate person will apply.

Growers who are not accredited will need to use an appropriate person to develop and verify their first N&P Budget. However, growers who then become Smartcane BMP accredited will not need to use a third-party appropriate person for the five-yearly review, assuming they remain accredited at that time.

This requirement will remain in place whilst the Smartcane BMP Program is a recognised program under the *Environmental Protection Act 1994*. Recognised programs provide assurance that a person is complying with the agricultural ERA standard (e.g. sugarcane cultivation).

This requirement is in place because through the BMP accredited growers already:

- comply with all regulated soil testing and N and P application requirements and meet the BMP standard for overall nutrient management
- have their nutrient management standards independently assessed by a third party
- have annual reviews and must confirm they are continuing to meet the BMP requirements
- may be subject to an audit to re-assess their compliance with all BMP requirements at any point during the five-year accreditation period
- undergo an independent third-party audit of all BMP requirements to renew their accreditation after five years.

Record keeping requirements

To comply with Reef regulations, you must keep a copy of your N&P Budget for at least six years and make it available for inspection to an **authorised person** on request. Records must be made within three business days. Records can be kept in any form, but must contain the following information as a minimum:

1. Calculated **whole of farm nitrogen amount** for the following harvest period (kg)
2. Calculated **whole of farm phosphorus amount** for the following harvest period (kg)
3. Annual amount of nitrogen applied to the whole of farm for the previous harvest period (kg)
4. Annual amount of phosphorus applied to the whole of farm for the previous harvest period (kg) or record of blocks/management zones where the crop cycle phosphorus amount is being applied
5. Actual yield achieved for the previous harvest period (tonnes cane/ha)
6. Historical yields (if applicable to meeting Standard condition 18) (tonnes cane/ha)
7. A farm map, including:
 - a. farm number or unique identifier/s
 - b. block boundaries
 - c. block identifiers
 - d. area of each block (in hectares)
 - e. area of whole of farm (in hectares)
 - f. crop class and **fallow** areas
 - g. identification of any physical or soil chemical constraints to yield (if they exist) for each management zones and/or blocks
8. Name(s) and contact details of the appropriate person who developed and/or verified the N&P Budget for the agricultural property
9. Date the N&P Budget was developed and verified.

The actual documents that relate to the record (for example soil test reports, fertiliser contractor print-outs, or fertiliser invoices) are **relevant primary documents** that provide proof of the records and must also be kept.

Stage 1: Develop a farm map

Your N&P Budget must include a farm map (see Figure 2 as an example) for your property that includes the following information:

- farm number or unique identifier/s
- block boundaries
- block identifiers
- area of each block (in hectares)
- area of whole farm (in hectares)
- crop class (e.g. **plant**, first **ratoon**, second ratoon, standover cane)
- management zone boundaries (if management zones have been defined for your farm – see [Stage 3 Management zones](#)).

Stage 2: Soil testing

Use the regulated method for soil sampling

The fertiliser recommendations in your N&P Budget must be based on **soil testing** and analysis that has been carried out using the latest version of the [Prescribed methodology for sugarcane cultivation](#), available online at www.qld.gov.au/ReefRegulations.

You must be able to reference soil test records for each block of cane to be fertilised*. You should use the recommendations in your soil test results as the starting point for your N&P Budget. These fertiliser rates may then change depending on whether, for example, constraints have been identified and adjusting rates are used as a management technique.

Soil testing should include a full range of nutrients, not just nitrogen and phosphorus, to ensure that the crops full nutritional needs are met.

Record keeping requirements for soil testing are:

- Date of soil testing and a description of the location and the dominant soil type sampled.
- Map of the boundaries of blocks or management zones:
 - where soil sampling has been undertaken; and
 - where fertiliser and mill mud or mill mud/mill ash mix has been applied.
- A soil map showing the dominant soil types covering the blocks or management zones where samples were taken (see Figure 3 as an example of how you can record your soil types on your farm map).
- Identification of constraints (on a farm map) relating to soil or position in the landscape, for inclusion in N&P Budget

Additional documents (relevant primary documents) must also be kept as proof of the information in the records, for example:

- A soil test report that shows the results of soil testing; and
- A copy of any tailored advice in relation to soil testing.

Records must be made within three (3) business days and kept for six (6) years. You can use any format to keep your records, for example computer-based or paper-based. You can access forms for record keeping in Attachment 1 of the [Prescribed methodology for sugarcane cultivation](#).

Stage 3: Management zones

Step 3.1 Identify crop constraints

Your farm may have underlying constraints (also known as limiting factors) to the crops yield potential. These may include, but are not limited to, soils that are frequently waterlogged, highly sodic or severely compacted. Other considerations, for example different varieties, may also affect yield potential. Constraints such as these may provide opportunities to refine nutrient rates.

Under the minimum standards, an appropriate person must identify these areas of constraint on your N&P Budget (Figure 3). Addressing these constraints is not a mandatory requirement, however the appropriate person should provide recommendations to address the constraint or recommend refined nutrient application rates that better align with the crops capacity to use the applied nutrients. In some areas nutrients may be available through sources other than fertiliser, such as from legume crops, composted manure, or nitrogen in irrigation water, which should be taken into account. Your N&P Budget can be used to adjust fertiliser rates for each block as long as the whole of farm amount is not exceeded (see [Step 4.2 Work out the Whole of Farm Amount](#)).

Measures for responding to constraints and improving nutrient use efficiency might include:

- ameliorants or organics
- drainage works

- improving soil health
- introducing new varieties
- fallow management
- applying nitrogen and phosphorus rates lower than the rate calculated under [Stage 4: Work out how much nitrogen and phosphorus to apply](#), for any specific blocks and/or management zones.

Step 3.2 Define management zones

Based on your farm map and identification of constraints, you should work out, with the help of an appropriate person, if management zones can be defined across your property. As a minimum, if your soil sampling plan uses a representative block to describe a number of blocks to be planted, this group of blocks could be regarded as a single management zone. Other considerations include:

- irrigation availability
- areas where **soil conditioners** have been previously applied
- areas of standover cane
- a group of blocks with the same or similar average yield over several crop cycles and the same or similar management history.

If you define management zones for your farm, you should mark them on your farm map (see Figure 4 as an example).

Stage 4: Work out how much nitrogen and phosphorus to apply

Step 4.1 Calculate nitrogen and phosphorus rates

Using the [Prescribed methodology for sugarcane cultivation](#), use your soil test results for each block to calculate the regulated amounts of nitrogen and phosphorus to apply (see Table 1). These amounts will be provided to you as part of your soil test result.

Record keeping requirements

You are required to keep a record of fertiliser (nitrogen and phosphorus) recommendations for each block of cane. The recommendations may be kept in any format as long as they can be referenced to each block on your farm map. For example, you may choose to record your fertiliser recommendations in an electronic spreadsheet with a column showing the block number the recommendation applies to.

Step 4.2 Work out the Whole of Farm Amount

Once you have your recommendations for each block, an appropriate person can develop your N&P Budget by summing the regulated amounts of nitrogen and phosphorus for each block to define the whole of farm amount (see Table 2) by:

- adding together the calculated amount of nitrogen for each block to get your whole of farm nitrogen amount for the year and
- adding together the calculated amount of phosphorus for each block to get your whole of farm phosphorus amount for the year; or
- clearly identifying blocks where you are applying phosphorus at rates higher than the annual allowance but do not exceed the amount calculated for the crop cycle (five years), i.e. one plant plus four ratoons. If you choose to use the **crop cycle phosphorus amount** method across some blocks or the whole farm (see Table 2), or you utilise the 10kg of phosphorus allowance for plant crops where soil tests result in a nil phosphorus amount outlined in the prescribed methodology, remove these applications from the whole of farm amount of phosphorus and consider them separately. You still need to keep a record of the phosphorus applied to these blocks.

The appropriate person will use this information to determine fertiliser products to apply and refinements to application if applicable. The N&P Budget does not necessarily require different products for each management zone or block.

Stage 5 Review and update your N&P Budget

Each year, your sugarcane N&P Budget must be reviewed and updated, taking into account:

- soil testing and analysis results for the blocks to be planted in that year
- changes due to crop class and fallow area
- any other change made to your property that affects the amount calculated under [Stage 4: Work out how much nitrogen and phosphorus to apply](#). Changes could include blocks that have been ploughed out earlier than expected, standover cane due to adverse weather conditions, or other circumstances
- annual recalculation of the whole of farm amounts for nitrogen and phosphorus to reflect the above changes.

In relation to cane that becomes **standover** during the current budget year, at the time it becomes known that cane will become standover, the N and P Budget for the **current year** must be amended to show:

- the amended crop class on an updated farm map showing blocks that would have been fallow/planted/ratooned but are now standover
- a recalculation of the whole of farm N and P fertiliser amounts in accordance with the Prescribed Method rates to reflect the new crop classes
- no further N and P fertiliser allowance is assigned to the standover cane
- no further N and P fertiliser is applied to other block(s) using N and P fertiliser that was previously assigned to standover block(s).

For the **following year** there are two potential scenarios:

1) The standover cane is harvested/ploughed out and the block becomes fallow – **no nitrogen fertiliser is assigned to the fallow block** for the purpose of growing sugarcane until replanted

2) The standover cane is harvested/ploughed out or slashed to replicate harvest, and the block is ratooned or replanted, and N and P fertiliser is applied to the new crop – **N and P fertiliser is assigned for the new plant/ratoon crop.**

The N and P Budget for the following year should therefore show:

- a farm map with the crop class, incl standover cane (identifying which of the above applies post-standover)
- no N and P fertiliser allowance is assigned to the standover cane
- for scenario 1) no N and P fertiliser is assigned to the future fallow block
- for scenario 2) N and P fertiliser is assigned for the **new plant/ratoon crop.**

You can review and adjust the N&P Budget yourself or choose to engage an appropriate person to do the update for you. After five years, your N&P Budget must be reviewed and verified by an appropriate person or the person carrying out the agricultural ERA, if that person is accredited under a recognised accreditation program.

Each year you must:

- re-calculate and add together the calculated amount of nitrogen for each block to get the whole of farm nitrogen amount that can be applied in the coming season; and
- re-calculate and add together the calculated amount of phosphorus for each block to get the whole of farm phosphorus amount that can be applied in the coming season, and/or
- record your phosphorus applications for blocks not included in the whole of farm phosphorus amount where phosphorus is being applied to supply the whole crop cycle or for those areas using the 10kg of phosphorus allowance for plant crops where soil tests result in a nil phosphorus amount (as outlined in the prescribed methodology).

These calculations must use the block areas defined on your farm map. You may wish to engage an appropriate person to help you with updating the calculations. The N&P Budget can be amended at any time to take account of unforeseen farm management changes due to, for example, extreme weather, however the whole of farm amount must be equal to or less than the combined calculated amounts worked out using the two components of the [Prescribed Methodology for Sugarcane cultivation](#).

Note: where you have applied the calculated amount of phosphorus for the **whole crop cycle**, these blocks must be removed from the whole of farm amount of phosphorus and recorded separately.

Stage 6 Varying rates within your farm

Based on the recommendations from an appropriate person, you may wish to vary the application rates of nitrogen and/or phosphorus across your farm, taking into account the farms specific circumstances. You may do this under an N&P Budget, but must ensure that you do not exceed the whole of farm amount (or the amount calculated under SC7 for blocks not included in the whole of farm phosphorus amount where phosphorus is being applied to supply multiple crops in the whole crop cycle or for those areas using the 10kg of phosphorus allowance for plant crops where soil tests result in a nil phosphorus amount (as outlined in the prescribed methodology).

The appropriate person may recommend making deductions for a combination of situations, for example nitrogen available through a legume fallow crop and an agronomic assessment of crop nitrogen requirements taking into account current understanding. See Tables 5 and 9 for an example of varying rates across a farm.

You have now completed all steps required to develop, review and update an N&P Budget for your farm. It is important that you work through these steps with an appropriate person.

Example layout for an N&P Budget

This section provides an example layout for completing and recording an N&P Budget. This approach is not compulsory and you can choose to use your own method, as long as it meets all of the requirements of the regulated minimum standards, including use of the soil testing method and nutrient calculation method contained in the [Prescribed methodology for sugarcane cultivation](#).

See the **Contacts** section for organisations that can provide further advice.

Stage 1: Develop your farm map

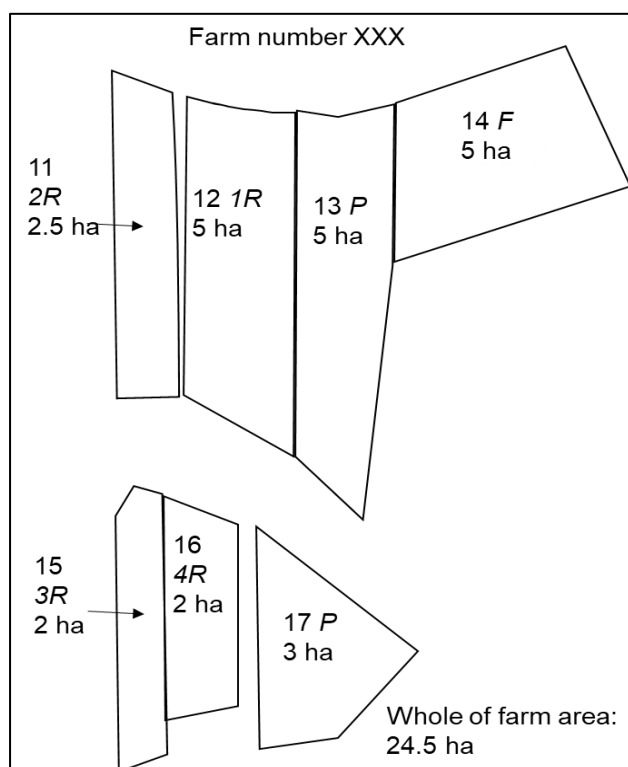


Figure 2: Example of a farm map for a mock property showing farm number, whole farm area, block boundaries and areas, and crop class.

Stage 2: Soil testing

Table 1 provides an example that allows cross referencing of the farm map, soil sampling results, and nutrient recommendations that may be provided with your soil test report.

Table 1: Example of fertiliser recommendations provided from soil testing results. Each block can be referenced to a soil test.

Recommendation by: John Citizen							Date: 13/02/2018	
Farm number: xxxxxx							Recommendation (kg/ha)	
Block number	Mill mud (t/ha) applied (year)	Soil sample reference (year)	Area (ha)	Previous yield, t/ha	Crop class	Soil type	Nitrogen	Phosphorus
11	150 t 2017	000000317-2015	2.5	100	2R	xxxxxxx	130	0
12	150 t 2017	000000313-2016	5	100	1R	xxxxxxx	130	0
13	Nil	000000324-2017	5	0	P	xxxxxxx	110	30
15	Nil	000000886-2014	2	90	3R	xxxxxxx	140	0
16	Nil	000000383-2014	2	90	4R	xxxxxxx	140	0
17	Nil	000000324-2017	3	0	P	xxxxxxx	110	30
14	Nil	Not tested	5	110	F	xxxxxxx	0	0

Stage 3: Define areas of crop constraints and management zones

Once you have defined any areas of crop constraints, you should mark these on your farm map. Figure 3 shows an example of how you might do this.

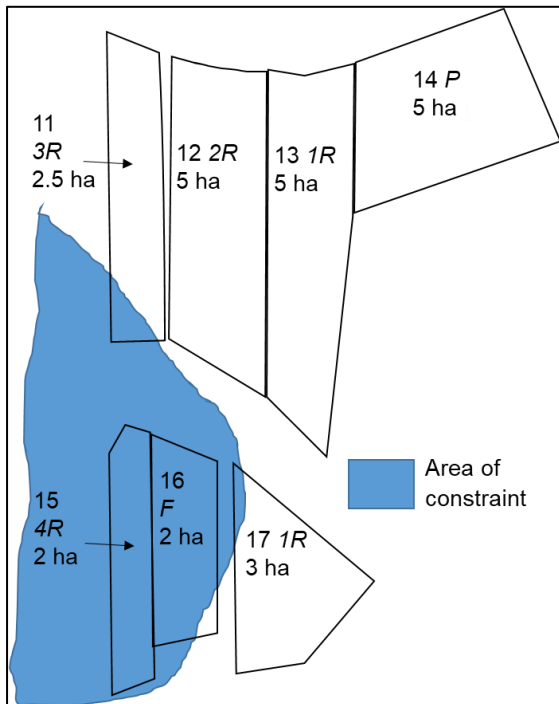


Figure 3: Example of a farm map for a mock property showing a hypothetical area of constraint (shown as the blue area).

If you decide that it is appropriate to define management zones for your property, you should also mark these on your farm map. See Figure 4 for an example.

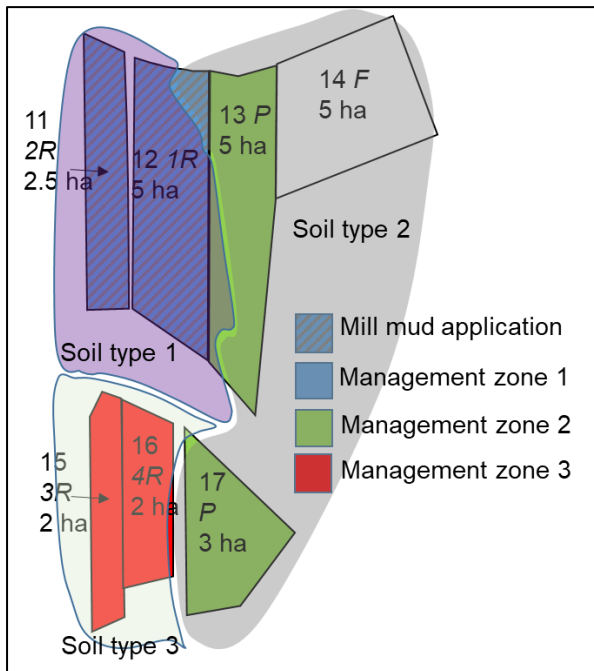


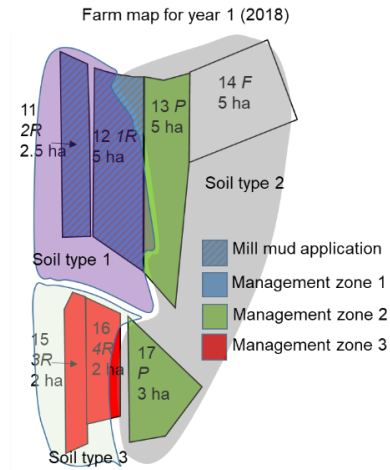
Figure 4: Example of a farm map for a mock property showing management zones and dominant soil types.

Stage 4: Work out the whole of farm amount

Table 2 provides an example of a whole of farm amount calculation taken from the hypothetical values presented in Figure 4 and Table 1, for the first year of the N&P Budget.

Table 2: Nitrogen and phosphorus recommendations for each management zone, and whole of farm amount in 2018 (year one).

Zone	Block/s	OC%	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Notes
1	11, 12	1.4	80	150	130	0	7.5	975		No P for crop cycle – mill mud applied at 150 t/ha in 2017
2	13, 17	1.5	45	155	110	40	8	880	320	Crop cycle P requirement applied at plant (2018)
3	15, 16	1.1	55	150	140	0	4	560		No P for crop cycle – mill mud applied at 150 t/ha in 2015
Fallow	14	-	-	-	0	0	5	0	0	Grassy fallow
Whole of Farm amount							19.5	2415	No whole of farm P amount	

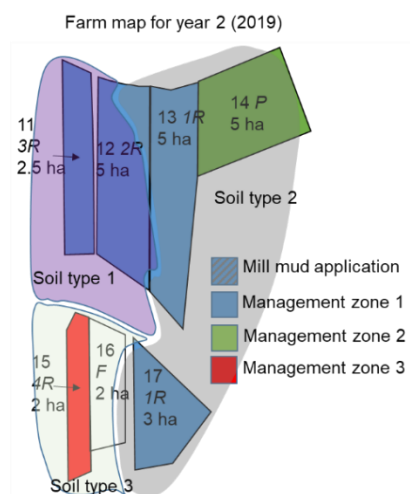


Stage 5: Review and update your N&P Budget

Table 3 provides an example of updated nitrogen and phosphorus recommendations based on new soil test results for plant blocks and changes to the crop cycle stages, to create a new whole of farm amount for nitrogen and phosphorus for year two. This process will reflect the rotation of crops across your property, for example the progression on a specific block from plant through ratoon crops.

Table 3: Updated nitrogen and phosphorus recommendations and whole of farm amount for 2019 (year two).

Zone	Block/s	OC%	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Notes
1	11, 12	1.4	80	150	130	0	15.5	2015	0	No P for crop cycle – mill mud applied at 150 t/ha in 2017
	13, 17	1.5	45	155	130	0				Crop cycle P requirement applied at plant (2018)
2	14	1.5	45	160	110	40	5	550	200	Crop cycle P requirement applied at plant (2019)
3	15	1.1	55	150	140	0	2	280	0	No P for crop cycle – mill mud applied at 150 t/ha (in 2015)
Fallow	16	-	-	-	0	0	2	0	0	Legume fallow
Whole of Farm amount							22.5	2845	No whole of farm P amount	



Stage 6: Varying rates within your farm

As an example, in year three you may wish to vary the fertiliser rates across your farm. Table 4 represents an update of the hypothetical values presented in Tables 2 and 3 into year three of the N&P Budget (determined using [Step 4.1 Calculate nitrogen and phosphorus rates](#)) where the [Prescribed Methodology for Sugarcane Cultivation](#) has been used to calculate the application rates for specific blocks and management zones to determine the whole of farm amount.

Table 4: Updated nitrogen and phosphorus rates as defined by the regulated method, and whole of farm amount for year three.

Zone	Block/s	OC%	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Notes
1	14	1.5	45	160	130	0	13	1690	0	
	13, 17	1.5	45	155	130	0			0	
2	16	0.9	40	150	120	20	2	240	0	Good legume fallow
3	11,12	1.4	80	150	130	0	7.5	975	0	
Fallow	15	0	0	0	0	0	-	0	0	
Whole of Farm amount							22.5	2905	No whole of farm P amount	

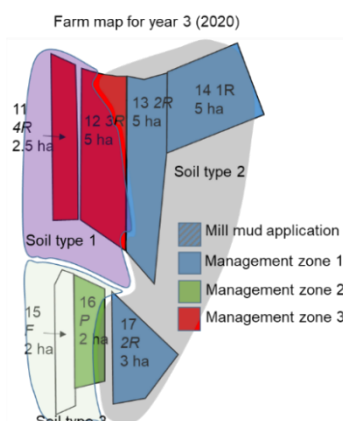


Table 5 provides an example of how the rates determined using Step 4.1 (the [Prescribed methodology for sugarcane cultivation](#)) can be varied whilst not exceeding the whole of farm amount.

In this example the appropriate person recommended making deductions for a combination of situations, i.e. nitrogen available through a legume fallow crop and an agronomic assessment of crop nitrogen requirements taking into account current understanding.

Table 5 shows a higher application rate of nitrogen being applied to zone one (increase in yield potential) that is offset with lower applications of nitrogen being applied to zones two (nitrogen available from fallow legume crop) and three (lower nitrogen demand according to agronomic understanding). The combined rates as a result of these adjustments do not exceed the whole of farm amount of nitrogen and phosphorus.

Table 5: Example of how nitrogen rates can be varied within the N&P budget. Red text shows the varied N rates; the blue shaded columns show the original and varied N amount per management zone.

Zone	Block/s	OC %	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Varied N rate (kg/ha)	Varied P rate (kg/ha)	Varied N amount (varied N rate x area kg)	Varied P amount (varied P rate x area kg)	Notes	
1	14	1.5	45	160	130	0	13	1690	0	140	-	1820	-	Favourable conditions. These blocks always yield the highest	
	13, 17			155						-	-				
2	16	0.9	40	150	120	20	2	240	0	80	-	160	-	Accounting for legume N	
3	11,12	1.4	80	150	130	0	7.5	975	0	120	-	900	-	Variety change	
Fallow	15	0	0	0	0	0	-	0	0	-	-	0	-		
Whole of Farm amount							22.5	2905	No whole of farm P amount				2880		

Managing the whole of farm phosphorus amount

The example above focused on a calculation of the whole of farm amount for nitrogen and used the [crop cycle phosphorus amount](#) as described in the [Prescribed methodology for sugarcane cultivation](#) (see **Option 1** below).

However you can use the whole of farm phosphorus amount and vary rates across your farm if you choose. Therefore there are two options available to you:

- 1) Whole of farm phosphorus amount – P applied annually to blocks calculated via the [Prescribed methodology for sugarcane cultivation](#)
- 2) Crop cycle phosphorus amount - P applied to supply multiple crops in the whole crop cycle calculated via the [Prescribed methodology for sugarcane cultivation](#).

You may wish to use one method on one area of your farm and the other method on a different area. Further detail on each option is below.

Option 1

If you use the crop cycle phosphorus amount on all or part of your farm, do not include those areas in the whole of farm phosphorus amount in your N&P Budget, but you must still make a record of phosphorus rates applied to these blocks.

Example crop cycle amount

Region	Herbert
BSES P	45 mg/kg
PBI	290 (High sorption class)
Plant amount	20 kg/ha P x 1 year
Ratoon amount	10 kg/ha P x 4 years
Crop cycle amount	60 kg/ha P (applied at plant and covering 5 years)

OR

Option 2

If you apply your phosphorus annually on all or part of your farm, you can then work out the whole of farm phosphorus amount in your N&P Budget by adding together the calculated amount of phosphorus for each of those blocks/management zones to get your whole of farm phosphorus amount for the year, see [Step 4.2 Work out the Whole of Farm Amount](#).

The following is another hypothetical example used to illustrate an acceptable procedure for working out the whole of farm phosphorus amount and varying phosphorus rates while ensuring you do not exceed the whole of farm phosphorus amount. Table 6 provides an example of a whole of farm amount calculation for the first year of the N&P Budget.

Table 6: Nitrogen and phosphorus recommendations for each management zone, and whole of farm phosphorus amount in 2018 (year one).

Zone	Block/s	OC%	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Notes
1	23, 24	1.1	35	160	140	15	9	1260	135	Plant P=20 Ratoon P=15
2	21, 22	0.9	37	155	120	20	10	1200	200	Plant P=20 Ratoon P=15
3	25, 26, 27	1.3	28	400	130	25	12.5	1625	312.5	Plant P=30 Ratoon P=25
4	Fallow						4	0	0	Grassy fallow
Whole of Farm amount							35.5	4085	645.5	

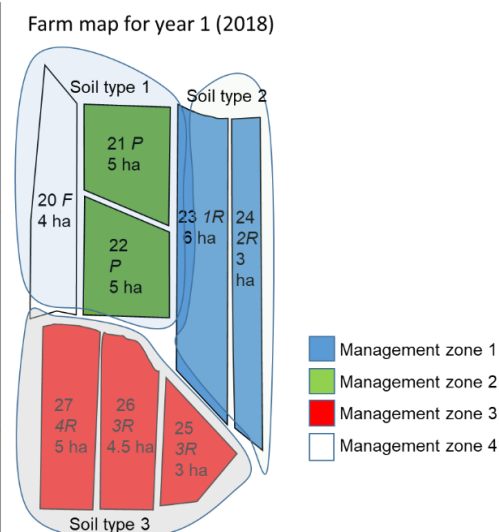
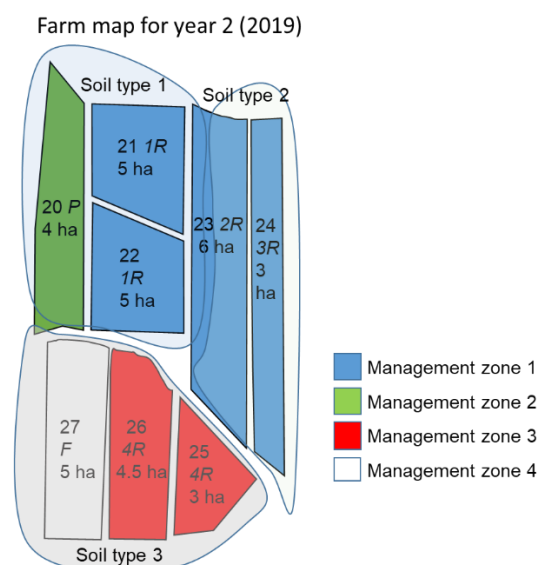


Table 7 provides an example of updated nitrogen and phosphorus recommendations based on new soil test results for plant blocks and changes to the crop cycle stages, to create a new whole of farm amount for nitrogen and phosphorus for year two. This process will reflect the rotation of crops across your property, for example the progression on a specific block from plant through ratoon crops.

Table 7: Nitrogen and phosphorus recommendations for each management zone, and whole of farm phosphorus amount in 2019 (year two).

Zone	Block/s	OC%	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Notes
1	21,22	0.9	37	155	140	15	19	2660	285	Plant P=20 Ratoon P=15
	23,24	1.1	35	160						
2	20	1	33	188	120	20	4	480	80	Plant P=20 Ratoon P=15
3	25, 26	1.3	28	400	130	25	7.5	975	187.5	Plant P=30 Ratoon P=25
4	Fallow	27					5	0	0	Grassy fallow
Whole of Farm amount							35.5	4115	552.5	



As an example, in year three you may wish to vary the fertiliser rates across your farm. Table 8 represents an update of the hypothetical values presented in Tables 6 and 7 into year three of the N&P Budget (determined using [Step 4.1 Calculate nitrogen and phosphorus rates](#)) where the [Prescribed Methodology for Sugarcane Cultivation](#) has been used to calculate the application rates for specific blocks and management zones to determine the whole of farm amount.

Table 8: Nitrogen and phosphorus recommendations for each management zone, and whole of farm phosphorus amount in 2020 (year three)

Zone	Block/s	OC%	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Notes
1	20	1	33	188	140	15	23	3220	345	Plant P=20 Ratoon P=15
	21, 22	0.9	37	155						
	23,24	1.1	35	160						
2	27	1.5	25	450	110	30	5	550	150	Plant P=30 Ratoon P=25
4	Fallow	25, 26					7.5	0	0	Grassy fallow
Whole of Farm amount							35.5	3770	495	

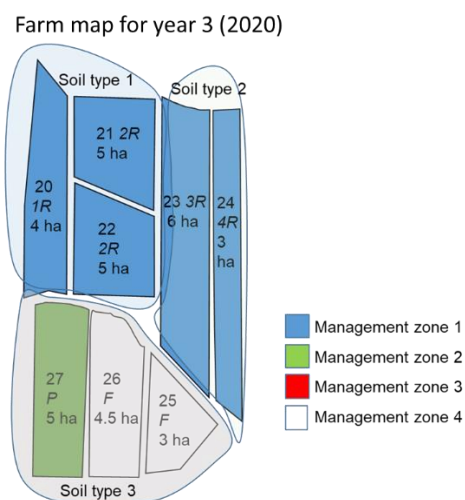


Table 9 provides an example of how the phosphorus rates determined using Step 4.1 (the [Prescribed methodology for sugarcane cultivation](#)) can be varied whilst not exceeding the whole of farm amount.

In this example the appropriate person recommended making deductions for a combination of situations, i.e. trialling higher phosphorus rates due to a very high PBI result.

Table 9 shows a higher application rate of phosphorus being applied to zone two that is offset with lower applications of phosphorus being applied to zone one so that the whole of farm amount of phosphorus is not exceeded.

Table 9: Example of how phosphorus rates can be varied within the N&P budget. Red text shows the varied phosphorus rates; the blue shaded columns show the original and varied phosphorus amount per management zone.

Zone	Block/s	OC %	BSES P	PBI	N rate (kg/ha)	P rate (kg/ha)	Area (ha)	N amount (N rate x area, kg)	P amount (P rate x area, kg)	Varied N rate (kg/ha)	Varied P rate (kg/ha)	Varied N amount (varied N rate x area kg)	Varied P amount (varied P rate x area kg)	Notes
1	20	1	33	188	140	15	4	3220	345	NA	15	NA	309	Reduced P rate from 15 to 11 kg P/ha on blocks 23, 24.
	21,22	0.9	37	155		15	10				15			
	23,24	1.1	35	160		15	9				11			
2	27	1.5	25	450	110	30	5	550	150	NA	37	NA	185	Trialling higher P rate from 30 to 37 kg P/ha due to very high PBI result.
4 Fallow							7.5				-			
Whole of Farm amount							35.5	3770	495	NA		NA	494	P adjustments informed with leaf sampling analyses.

What if I have standover cane?

Where a grower has developed an N and P budget for the year, they can distribute the N and P across the farm as long as the whole of farm amount is not exceeded during the year. It is noted that any fertiliser allowances calculated for the standover blocks that were included in the original whole-of-farm totals, may already have been partially or wholly applied to other blocks on the farm because the grower did not know at that time the blocks would later become standover cane.

For example, during the crushing season a blocks' rate was 100kg N/ha and the N and P budget had allocated 120kg N/ha to this block by deducting 20kgN/ha from a block that later became standover. In this example, as the allocation occurred before the block supplying the 20kg N/ha was known to be standover, this is regarded as in line with N and P budget requirements. However, once it is known that the block will be stood over the N and P budget must be amended to include standover cane and no further N and P can be applied to or redistributed from the standover block/s.

Contacts

For further information and to seek advice, you can contact the following organisations:

Department of Environment and Science (DES)

☎ 13 QGOV (13 74 68)

✉ officeoftheGBR@des.qld.gov.au

www www.qld.gov.au/ReefRegulations

Department of Agriculture and Fisheries (DAF) extension officers can be contacted on:

☎ 13 25 23 (cost of a local call within Queensland), or 07 3403 6999

✉ callweb@daf.qld.gov.au

www www.daf.qld.gov.au/about-us/contact-us

Contact details for regional offices can be found here:

www www.daf.qld.gov.au/contact/offices

Sugar Research Australia extension staff can be contacted on:

☎ 07 3331 3333

✉ sra@sugarresearch.com.au

www www.sugarresearch.com.au/contact/

Natural resource management groups

www www.nrmrq.org.au/find-your-regional-group

SmartCane BMP

☎ 07 3864 6444

✉ info@smartcane.com.au

www <https://www.smartcane.com.au/home.aspx>