No. of
Pages 4

In the South East nitrogen (N) is the principal nutrient that must be managed. To avoid nitrogen in the form of Nitrate passing below the root zone and entering thegroundwater it is important that the N application rate from all sources does not exceed the capacity of the pasture to assimilate it. Once assimilated in the pasture it can be removed by grazing to produce milk or live-weight gain or harvested as green chop, silage or hay.

Reducing the excess nitrogen excreted by the cows can play an important role in managing the nitrogen in dairy shed effluent. Dairy cow rations should be balanced so that the correct amounts of protein and energy are supplied daily. When the protein in a cow's diet exceeds her needs the extra protein is largely excreted as nitrogenous compounds and increases the amount of nitrogen which needs to be managed in the dairy shed effluent.

Nitrogen budgeting

A Nitrogen Budget can be used to balance the amount of nitrogen applied to the land through the application of effluent as a fertiliser with what is being removed from the soil/plant environment through the removal of products e.g silage, milk, live weight etc. So that a complete Nitrogen Budget is taken in to account, you will also need to consider the amount of nitrogen that is already stored in the soil profile and any nitrogen that may be lost in a gaseous form during the effluent application process. Once these elements of the Nitrogen Budget are determined, the amount of nitrogen added per hectare per year from all sources including effluent, can be calculated.

The information will allow you to effectively manage the nitrogen content of the dairy effluent and minimise the potential risk of excess nutrients leaching in to the groundwater system.

The amount of nitrogen removed in products

The table below shows the amount of nitrogen removed per tonne of dry matter for a range of agricultural products in the South East of South Australia.

Nutrients removed in agricultural products

Product removed	Average DM	Nutrients removed (kg/tonne DM)		
		P	N	K
Cut Forage, Fescue	25%	3.7	24.0	22.0
Cut Forage, Lucerne	25%	2.9	28.8	25.0
Cut Forage, Oats	25%	2.0	27.2	20.0
Cut Forage, Ryegrass	21%	3.0	28.8	20.0
Hay, Barley	87%	2.7	14.4	14.0
Hay, Clover Dominant Pasture	88%	2.2	25.6	12.0
Hay, Grass Dominant Pasture	85%	3.0	22.4	16.0
Hay, Lucerne, early flower	88%	3.0	35.2	22.0
Hay, Lucerne, late flower	85%	2.0	24.0	25.0
Hay, Oaten	86%	3.2	15.2	16.7
Hay, Oats & Vetch	88%	3.0	22.6	16.7
Hay, Peas	90%	2.2	25.6	12.0
Hay, Ryegrass & Clover	83%	3.0	15.2	22.0
Livestock, Cow's Milk (per 1000 litres, at 3% protein)	#	1.1	6	1.9
Livestock, Cattle Liveweight Gain (per tonne)	#	8	60	4
Livestock, Sheep Liveweight Gain (per tonne)	#	5	20	2.5
Livestock, Wool (per tonne)	#	4	200	20
Lupins	92%	3.1	56.0	8.2
Potato tops	30%	0.2	3.0	2.0
Potato, tubers	23%	2.4	15.2	21.7
Silage, Grass Dominant Pasture	40%	3.0	22.4	16.0
Silage, Lucerne	40%	2.2	27.2	25.6
Silage, Maize	30%	3.1	12.8	15.4
Silage, Rye & Clover Pasture	35%	3.0	22.4	16.0

The amount of nitrogen stored in the soil.

Not all nitrogen is available to plants in the year of application. Some nitrogen is held in un-decomposed organic matter which needs to break down before it can be used by plants.

Approximately 60% of the nitrogen in effluent is available to plants in the first year. The remainder is carried over into year 2 (30% is available) and year 3 (the final 10% is available).

The amount of nitrogen carried over from these previous years needs to be accounted for in the nitrogen budget.

The amount of nitrogen lost as gas

During and after spreading

The amount of nitrogen lost as gas will depend on the method used to spread the effluent and whether it is incorporated into the soil quickly by additional irrigation or rainfall.

Effluent applied through a sprinkler system will lose approximately 25% of its N content by volatilisation. Losses when spreading by manure cart will be around 18% of total N.

About 25% of applied nitrogen can be lost after spreading unless it is immediately incorporated into the soil.

By grazing animals

Nitrogen is lost in the form of ammonia by grazing cattle. A dairy cow of 600 kg live-weight will emit around 0.120 kg of ammonia nitrogen per day.

Developing a nitrogen budget

A nitrogen budget speadsheet model is supplied on the CD-ROM with these guidelines. This spreadsheet model is written in Excel and requires Microsoft® Windows 95 or later running Microsoft® Excel 97 or later.

To install the model on your hard drive click **“Install Nitrogen Budget Model”** in the contents screen of the CD and follow the prompts. Once installed it can then be run from the CD, Windows Explorer or Excel.

To run the Nitrogen Budget Model

There are three ways in which to run the Nitrogen Budget Model on your computer. Choose the method that you are most familiar with.

You can either:-

1. Click the **“Run Model”** button on the CD contents screen, **OR**
2. Double click the ***“Nitrogen budget.xls”*** file in Microsoft Explorer, **OR**
3. Select File, then Open, ***“Nitrogen budget.xls”*** in Excel to open the model. As the program is opening, a message will appear on the screen that will ask you to “Disable Macros”, Enable Macros or More Information.
4. Click **“Enable Macros”** (or the model will not run).

The model should open at the menu screen.

The menu is used to select the aspects that need to be calculated for your effluent management system.

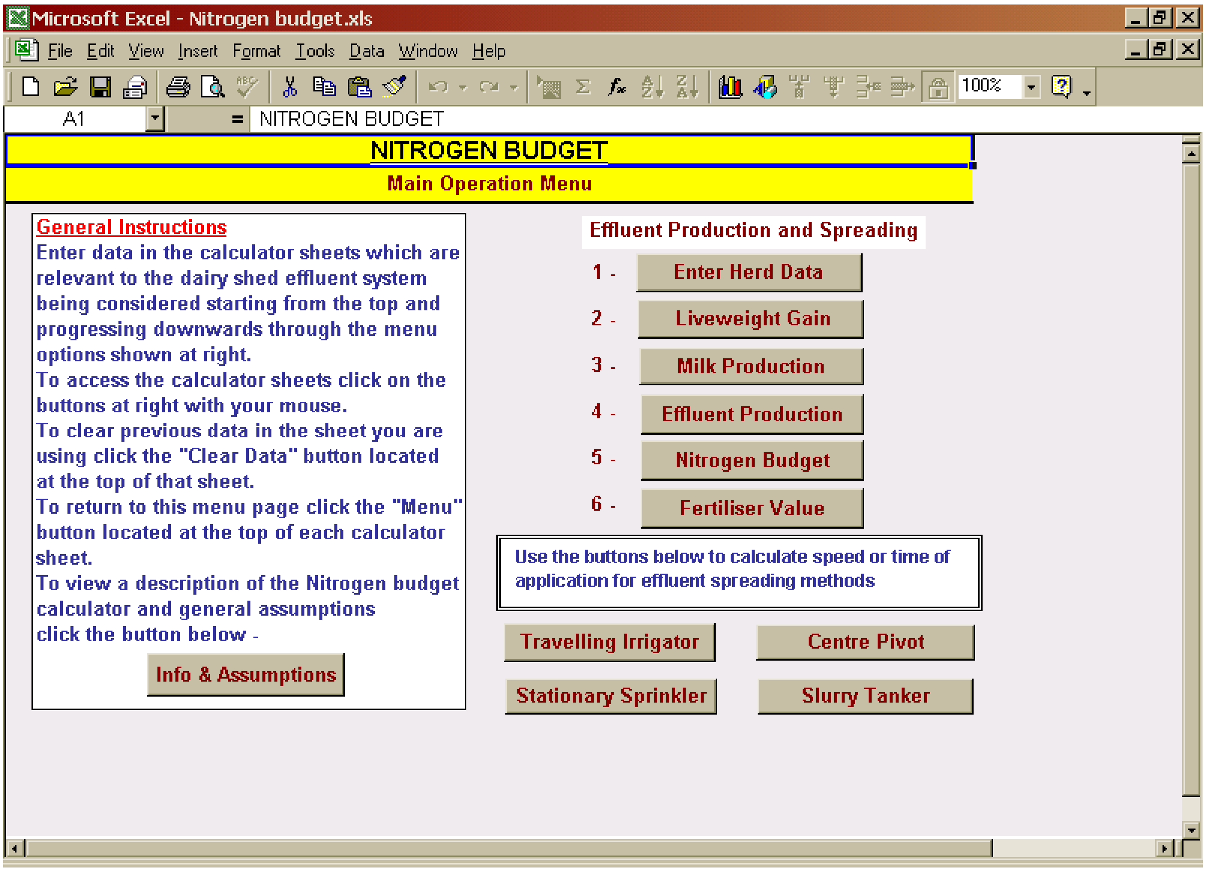
The options include calculating the amount of:-

- Live weight gain from your effluent utilisation area and milk produced.
- The nitrogen budget, including maximum application rates.

- The estimated composition of effluent leaving the dairy shed (This can be used by the model where the actual composition of effluent is not known).
- The value of the nutrients as fertiliser.
- The speed at which a travelling irrigator needs to move to apply the target application.
- How long a stationary sprinkler should say on one spot to reach the target application.
- How long a run is required by a slurry tanker/waste spreader to apply the target application.
- The speed of rotation of a centre pivot irrigator and the number of rotations, to apply the target application.

The main menu screen layout is shown below. To make a selection, click on the button of choice.

You will be prompted on each screen for the information required to calculate the various aspects of the Nitrogen Budget. For more information on the data required for each input sheet click the "Details" button.



NITROGEN BUDGET

Main Operation Menu

General Instructions

Enter data in the calculator sheets which are relevant to the dairy shed effluent system being considered starting from the top and progressing downwards through the menu options shown at right.

To access the calculator sheets click on the buttons at right with your mouse.

To clear previous data in the sheet you are using click the "Clear Data" button located at the top of that sheet.

To return to this menu page click the "Menu" button located at the top of each calculator sheet.

To view a description of the Nitrogen budget calculator and general assumptions click the button below -

Use the buttons below to calculate speed or time of application for effluent spreading methods

The Main Menu Screen Layout for the Nitrogen Budgeting Model.

Assistance with the calculations

If you are unable to run this spreadsheet model, contact your dairy field officer, dairy consultant, PIRSA, or the EPA who may be able to assist with processing your data.