

An introduction to the OVERSEER[®] Nutrient budgets model (Version 5.4)

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OVERSEER[®] nutrient budgets 2009

software for nutrient budgeting and assisting in nutrient and
environmental management

Pastoral

Fruit crops

Exit

Pastoral introductory/small block

Arable and vegetable crops

Press F1 for help

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Version 5.4



The OVERSEER[®] Nutrient Budgets model (Overseer):

- Version 5.4 released April 2009
- Replaces 5.3 (released 2008)
- Key messages:
 - No major changes to the Pasture model
 - Major changes to crop and horticulture models
 - Changes to how *Overseer* is managed

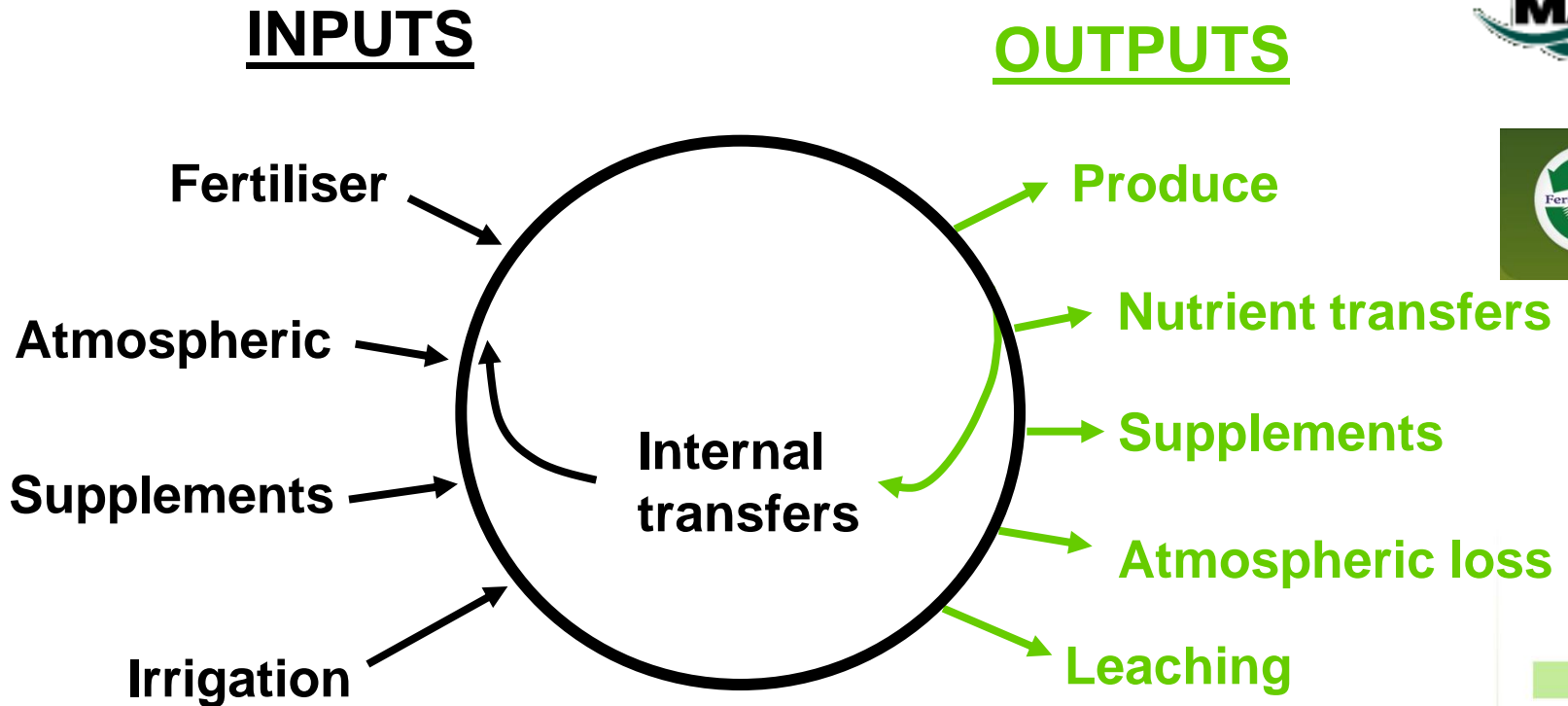
What is Overseer? 1:

- Widely used throughout New Zealand
- A Decision Support System farm model for farmers, advisors, policy
- Allows nutrient budgets to be constructed for many enterprises:
 - Dairy, sheep, beef, deer; fruit; vegetables and arable crops
- Calculates budgets for a wide range of nutrients:
 - N, P, K, S, *and* Ca, Mg, Na, acidity

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A nutrient budget



A nutrient budget is a tool to help achieve your nutrient management objectives

What is Overseer? 2:

- Calculates maintenance fertiliser nutrient and lime requirements
- Estimates environmental effects:
 - N leaching/run-off
 - P run-off and risk index
 - Greenhouse gas emissions: CH₄, N₂O, CO₂
- Covers wide range of management options and mitigation practices
- Ability to do “what if” scenarios
- Its use enables flexibility in achieving a nutrient ‘target’ or ‘cap’



What is Overseer? 3:

- The *Overseer* philosophy:
 - The aim of the model has been to use input data that are reasonably easily obtainable by farmers or consultants
 - Suitable default values are built into the model
- Based on summaries of NZ (& overseas) research:
 - *Overseer* relies on sound science generated from research programmes funded by e.g. FoRST, SFF and Industry.
- Strong development support (MAF, AgResearch, FertResearch) for regular updates
 - Model development started in the 1990s and has continued since, with regular additions/improvements to the model

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Overseer – main assumptions

- User supplies actual and reasonable inputs
- Long-term annual averages
- Assumes any management practice implemented on the farm follows best practice



Overseer - note

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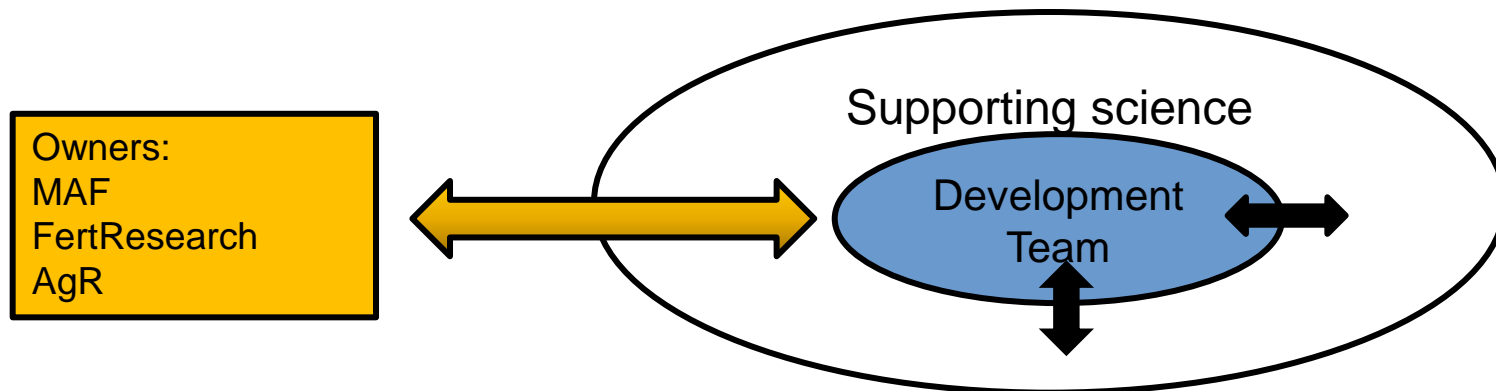
Caution:

- Effective use of the model requires the user to enter actual and reasonable input values, representative of the farm
- ***A reasonable level of understanding of farm systems and of the particular farm is required to be able to do this***



Overseer ownership

- OVERSEER[®] is **jointly owned** by MAF, FertResearch and AgResearch
- MAF and FertResearch are committed to a **substantial investment programme** to improve *Overseer*, to be implemented 2008-2013
- AgResearch is currently the **Lead Provider**, charged with enacting the Owners' plans, working with other organisations as necessary



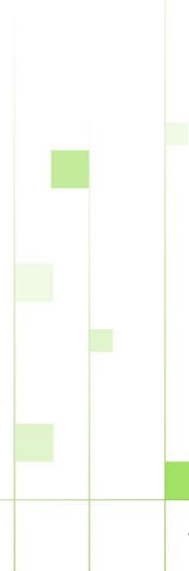
Overseer ownership



- *Overseer* has been developed on the premise that the model is freely available to all and that it benefits New Zealand farmers
- For this reason, *Overseer* has not been sold for profit (either alone or in conjunction with other farming software products) by the Owners or by third parties e.g. software companies

Owners' priorities

- Major focus is on 'consolidation':
 - Improving reliability for the user
 - Training and supporting documentation
 - Reviewing the underlying science
 - Prioritise new features to be added, e.g.
 - Supplements removal
 - Integrate cropping and pasture models
 - (Forage crop component)



Obtaining Overseer



Download from the AgResearch website:

<http://www.agresearch.co.nz/overseerweb/default.aspx>



OR

Obtain on CD from MAF:

Send name and address to MAF Policy, Private Bag
3123, Hamilton



OR

email overseer@maf.govt.nz

The pastoral model



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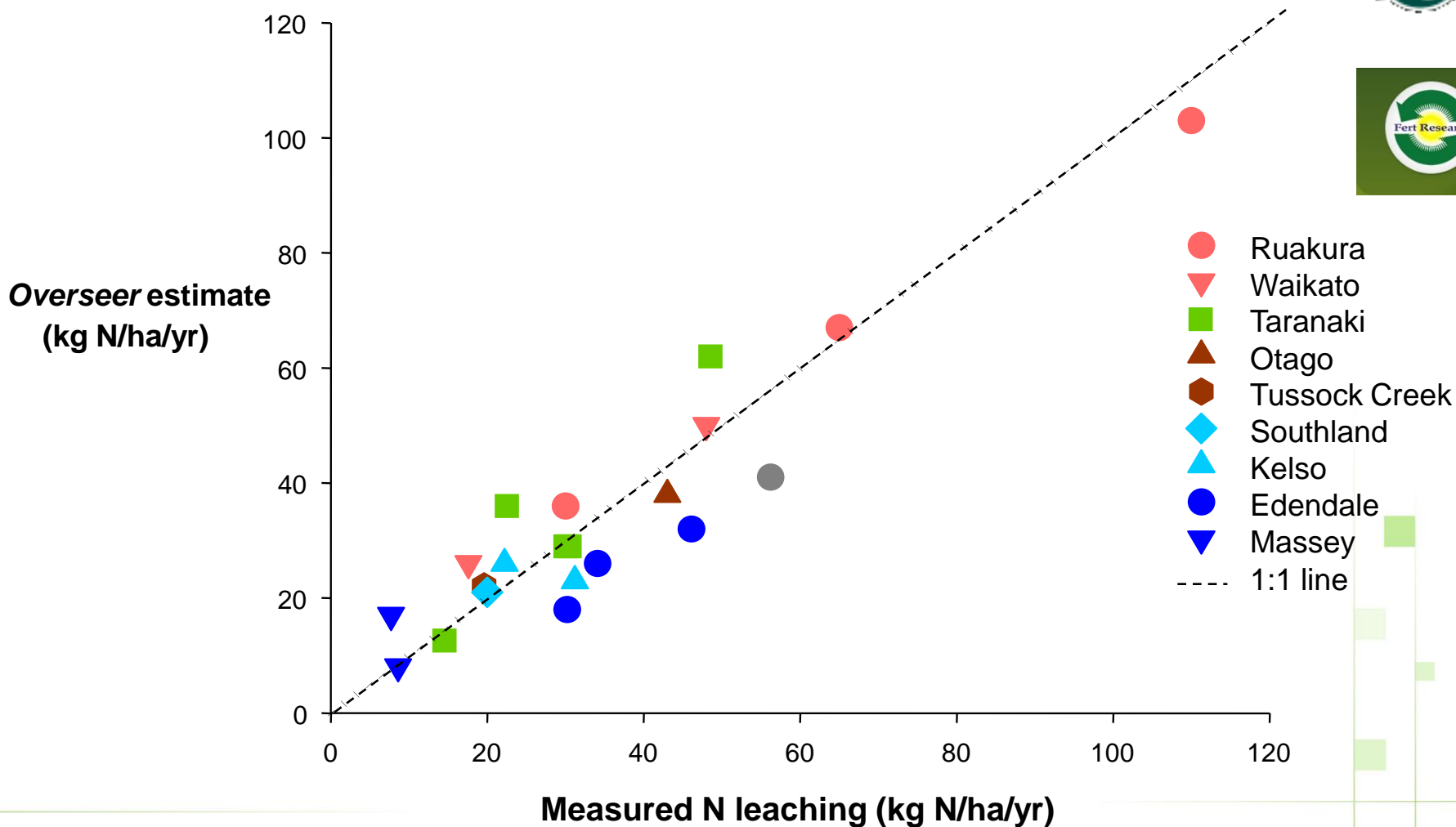
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Overseer validation on dairy farm systems



Overseer is validated against field experiments:



Pastoral model: changes for version 5.4.1



Parameter reporting tool

- Reporting button allows a summary report of all input data to be generated
- Minor bug fixes
- Making the model more consistent and clearer to use

Report from OVERSEER nutrients budget 2009, version beta on 4/03/2009 09:21 a.m.
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A. Good-Farmer A. Consultant
Clean and Green Farm Ag advice ltd
File: Example farm.o

Parameter report

Parameter name	Units	Value
Region		Waikato / Coromandel
No Fuel, electricity and other farm inputs		
No Farm capital (structure) inputs		
Block setup summary		
Block name	Block type	Effective area (ha)
Pasture Only	Pastoral	57
Total farm area declared as blocks	ha	57
Relative productivity assessment method		No difference between blocks
Make all block stock ratios same as farm stock ratios		True
Stock Information: Sheep, beef and deer		
Monthly stock reconciliation		
Beef:		
	Mob 1	Mob 2
Class	Dairy (MA cows pregnant)	Calves (female)
Breed	Friesian	Friesian
Numbers July	370	
Numbers August		
Numbers September		
Numbers October		
Numbers November		408
Numbers December		408
Numbers January		408
Numbers February		408
Numbers March		408
Numbers April		
Numbers May	370	
Numbers June	370	
Maximum weight (kg)		
Live weight start (kg)		
Live weight start (kg)		
Carcass weight (kg)		
Age start (months)	36	3
Grazing off options for beef animals not used		
Wintering off/animal shelter options for deer animals not used		
Advanced pasture supplement feeding options for beef not used		
Animal health supplementation using for Non-dairy animals		
No animal supplementation has been entered		
No supplements added		

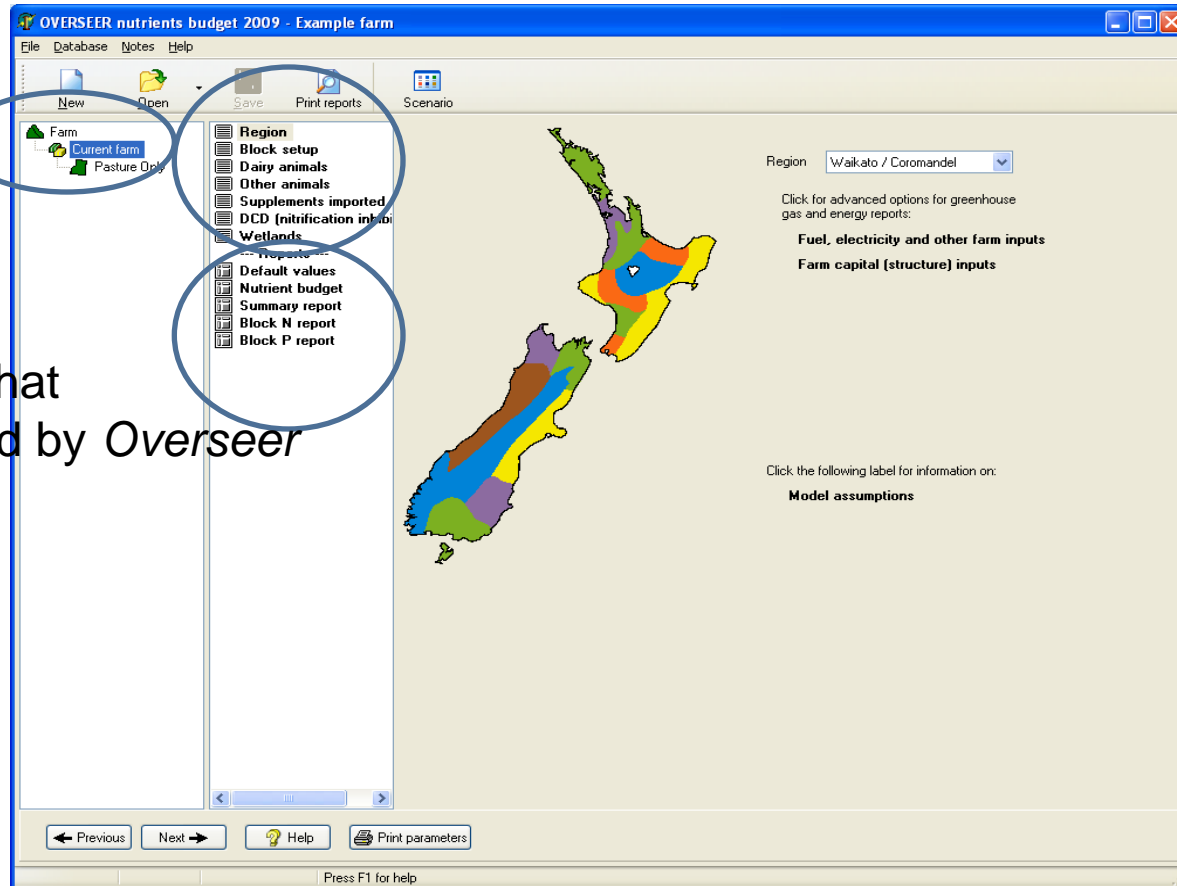
Page 1 of 2 Pages

Using the pastoral model: 2



List of details required

Farm level



List of reports that will be produced by Overseer

Using the pastoral model: 3



Information required for the model:

- Farm level:
 - Region, block set up
 - Feedpads, animal shelters, farm dairy and associated effluent management
 - Animal species, stocking rates and management
 - Supplements imported onto farm
 - Use of nitrification inhibitors, areas of wetlands

Using the pastoral model: 4



Information required for the model:

- Block level:
 - Topography, climate, soils, irrigation
 - Effluent application management
 - Pasture type and development phase
 - Animal species present
 - Soil analysis and fertiliser inputs

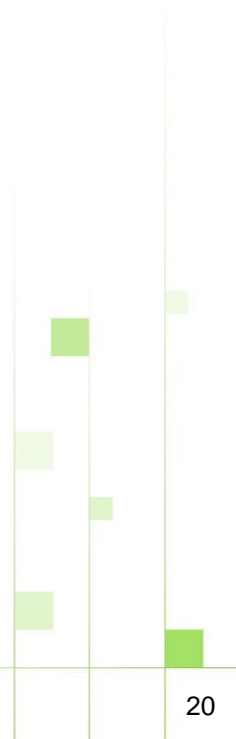


Using the pastoral model: 5

Reports generated:

- Whole farm:
 - Nutrient budget report
 - Nitrogen report: inputs, losses and performance indices
 - Phosphorus report: inputs and run-off risk
- Individual block:
 - Nutrient budget report
 - Maintenance fertiliser requirements
 - Nitrogen leaching report
 - Phosphorus run-off report

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Using the pastoral model: example report



Whole-farm nutrient budget:

(kg /ha/yr)	N	P	K	S	Ca	Mg	Na	H+ *
Inputs								
Fertiliser and lime	0	0	0	0	0	0	0	0.0
House block imports	0	0	0	0	0	0	0	0.0
Atmospheric / clover N	232	0	2	4	3	6	21	0.0
Irrigation	0	0	0	0	0	0	0	0.0
Slow Release	0	3	24	22	2	2	8	0.0
Supplements imported	0	0	0	0	0	0	0	0.0
Outputs								
Product (milk, meat, fibre)	22	5	1	3	11	0	1	0.0
Net transfer	0	0	0	0	0	0	0	0.0
Supplements sold	149	19	124	10	29	14	7	0.8
Atmospheric	21	0	0	0	0	0	0	0.0
Leaching/runoff	28	0	19	14	61	32	72	-1.8
Immobilisation/absorption	12	17	0	0	0	0	0	-0.1
Change in inorganic soil	0	-39	-117	0	-95	-39	-50	1.1

* acidity (affects lime requirements)

Block effluent report Change in soil tests Pasture

Comments Interpretation Select nutrient budget: Whole farm

Using the pastoral model: example report

Block maintenance fertiliser requirements:

Fertiliser nutrient maintenance recommendations for Pasture Only

Maintenance nutrient and lime *
(to maintain soil test levels)

	P	K	S	Ca	Mg	Na	Lime***	PKS	All except lime
Nutrients required (kg/ha/year)**	39	163	31	94	40	47	70		
Predicted relative yield (%)	95	100	97	100	100	100		93	93

See a consultant for advice on type of fertiliser required to supply nutrients.

Predicted relative yield for given fertiliser nutrient inputs

	P	K	S	Ca	Mg	Na		PKS	All except lime
Nutrients added (kg/ha/year)	0	0	0	0	0	0	Clear		
Predicted relative yield (%)	93	98	83	100	100	100		76	76

Click for: **Fertiliser Use booklets**
Code of Practice for Nutrient Management

* check whether soil test values for the block are at the economic optimum before using a maintenance fertiliser rate. Rates lower than maintenance may be required if soil test levels are above optimum.
** assumes effluent from FDE and feedpads still added to effluent block(s).
*** pure lime - divide by lime purity to get application rates.

Using the pastoral model: 6



Scenario testing:

- Allows the user to set up scenarios for testing
- Production or mitigation options
- Allows scenarios to be compared side by side

Mitigation scenario options

Select options to reduce N leaching (pasture only)

Decrease N or winter N fertiliser rates

Replace fertiliser N with supplements

Alter winter management options (grazing off, wintering pads)

Grazing off Dairy Sheep **Beef** Deer

Wintering pads Dairy **Beef** Deer

Click to change supplement inputs

For wintering pads, if supplements brought in are not directed to the wintering pad then the model assumes that feed is from silage made on the farm - the estimated silage rate is not shown on the input forms.

It is also recommended that the effluent block area is changed.

Add DCD (nitrification inhibitor)

Add artificial wetland to drainage outlet on blocks with mole/tile drains

Select options to reduce greenhouse gas emissions

Change energy or fuel use

Increase animal efficiency by reducing animal numbers but maintaining production

Alter lime applications

Changing fertiliser inputs, adding DCD or replacing fertiliser with supplements can also reduce greenhouse gas emissions.

Select maintenance fertiliser option

Apply maintenance fertiliser (excluding N and lime)

Select effluent management options

Add or change effluent block area

Note that this option cannot be undone.

Click following labels for information on:

Reducing N leaching

Reducing greenhouse gas emissions

Optimising fertiliser policy

Identifying wetland/riparian strip options

Scenario name

No case has been set

* = item has changed from current farm

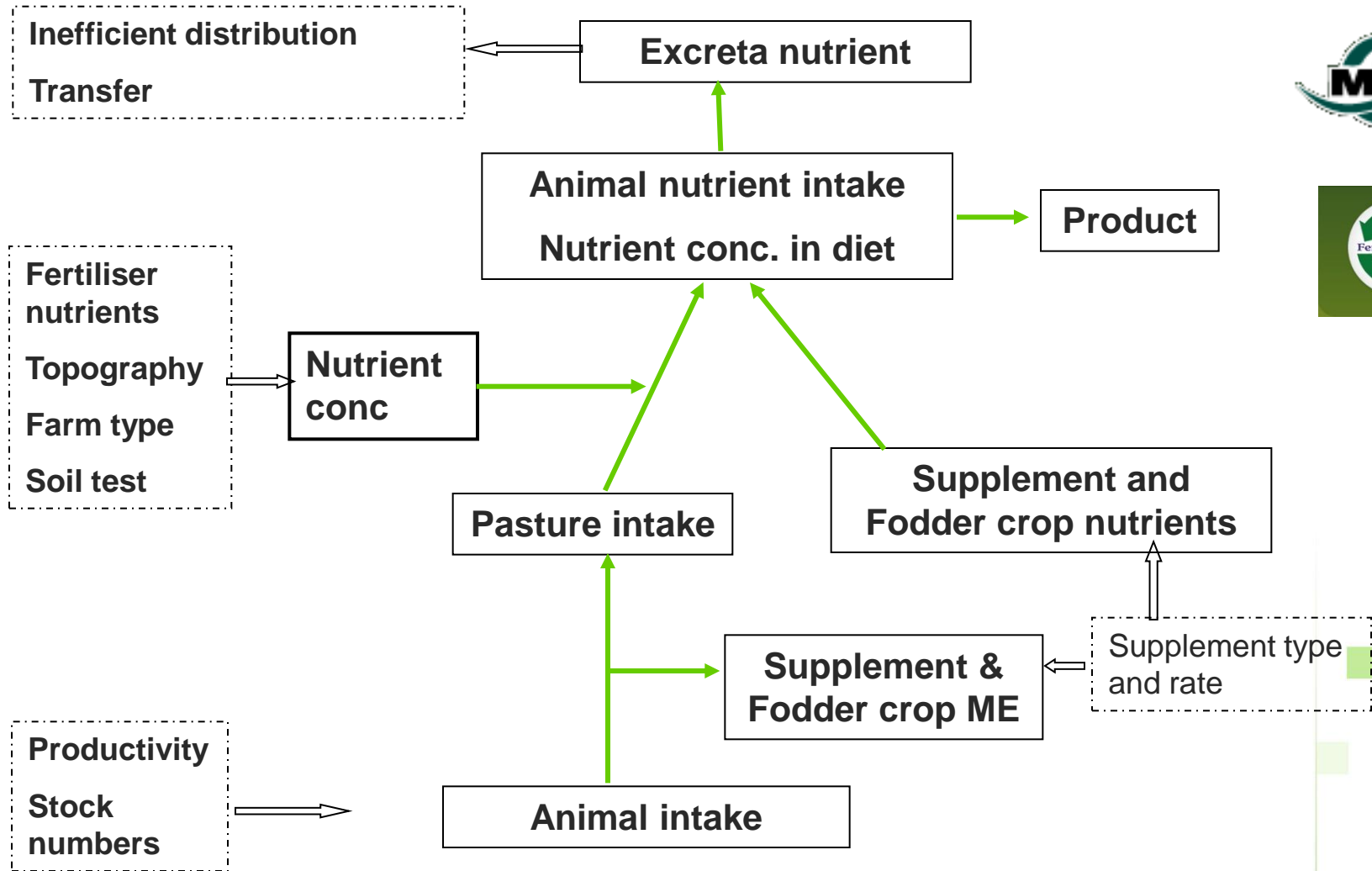
Tab for testing mitigation options

Scenario testing – beware!

- If changing the level of one input, make sure that appropriate changes are made to any other inputs that are affected
- Inputs won't be adjusted automatically, unless using the pre-set scenario options
- For example, changes to clover content, development status, rainfall, irrigation, soil test levels or fertiliser input will probably also result in changes in product yield or stocking rate



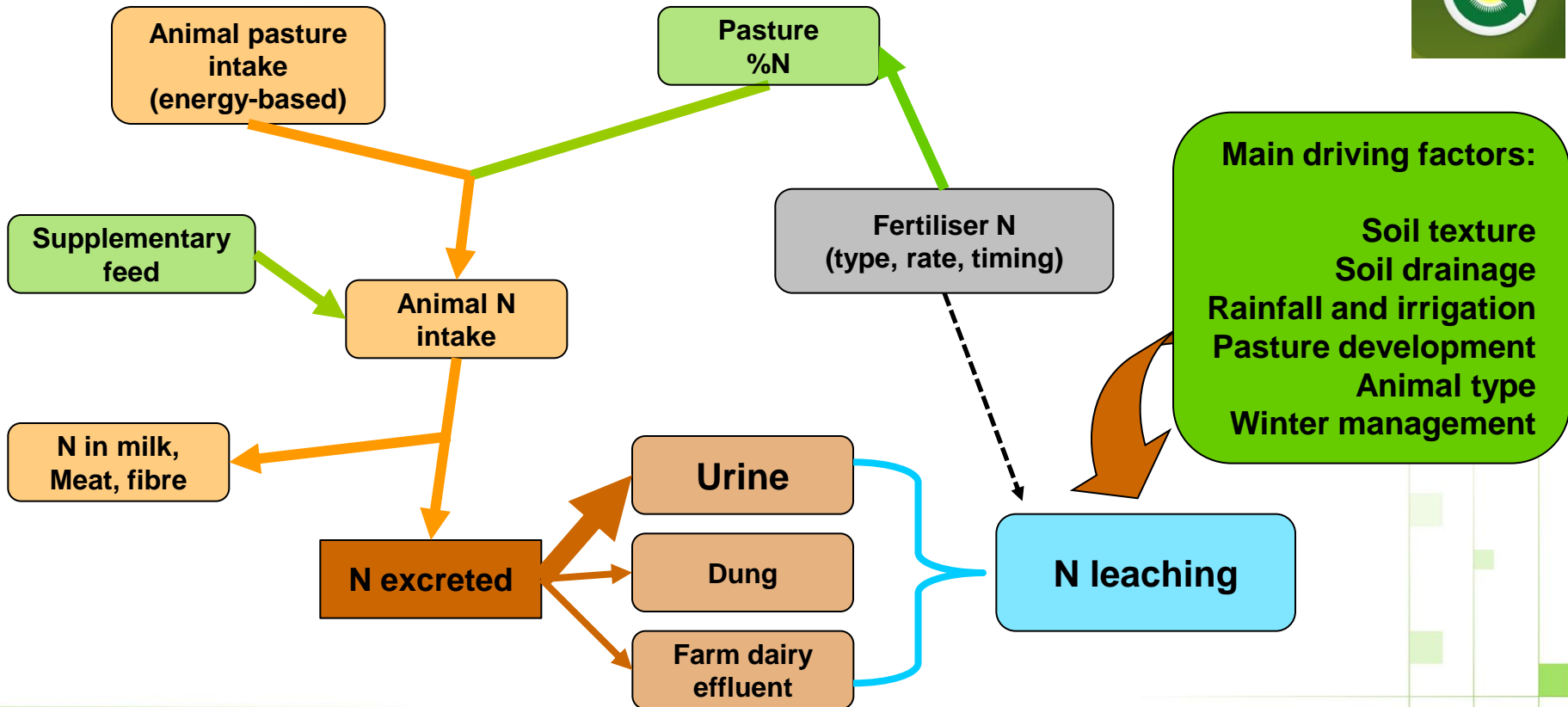
Background: the *Overseer* intake sub-model



Applies for all nutrients

Background: sub-model to predict N loss

Overseer represents the key drivers of nutrient loss:

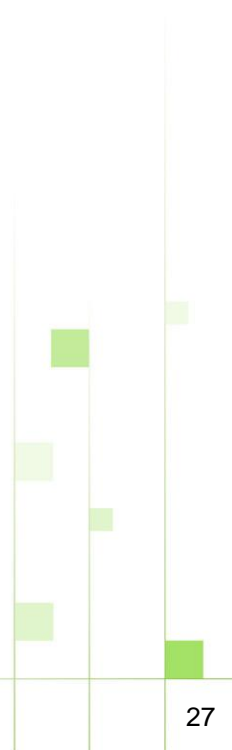


Background: greenhouse gas sub-model



- Methane and nitrous oxide:
 - uses the NZ Inventory methods for CH_4
 - N_2O based on animal intake
 - includes some “on-farm” factors

- Carbon dioxide:
 - covers fuel, electricity, lime, fertiliser production....



The fruit and arable/vegetable crop models

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Fruit/crop models: changes for version 5.4.1



- Major model upgrade:
 - Fruit, vegetable and arable crop model components of *Overseer* have been redeveloped
 - Funded under a HortNZ managed SFF project with industry support
 - Model development by Plant & Food and AgResearch
- These models:
 - Provide nutrient budgets at farm and block level
 - Provide estimates of N leaching
- New feature: Parameter reporting
 - Reporting button allows a summary report of all input data to be generated
 - Applies to all models

Same look and feel as pastoral model



Information required for each block

The screenshot shows the 'OVERSEER nutrients budget 2009 - example fruit farm' window. The interface includes a menu bar (File, Database, Notes, Help), a toolbar (New, Open, Save), and a left-hand navigation pane with a tree view containing 'Farm', 'Bramley', 'Cox', 'Prepops', 'Nutrient budgets', and 'Block N report'. The main area has tabs for 'Block', 'Crop details', 'Soil', 'Irrigation', and 'Fertiliser'. The 'Block' tab is active, displaying 'Farm scale data' for 'Bramley' with fields for 'Region' (BOP), 'Block Name' (Bramley), 'Crop' (Apples), 'Block area' (10.0 ha), 'Distance from coast' (60 km), and 'Rainfall' (1,200 mm). There are also 'Optional climate inputs' for seasonal variation in rainfall, annual potential evapotranspiration (PET), and seasonal variation in PET. A 'Make this block the same as the first block' checkbox is present. At the bottom, there are buttons for 'Add block', 'Delete block', 'Go to Farm Client', 'Show results', 'Print parameter report', 'Previous', 'Next', and 'Help'.

Reports that will be generated
By Overseer

2 levels of information – FARM and management BLOCK (crop rotation)

Using the fruit and crop models: 1



Most information is required at the BLOCK level:

- Crop details and management
- Soil type and soil analysis
- Climate: rainfall
- Irrigation: amounts and timing
- Fertiliser: rates and timing



Specific crop details:

- Fruit:
 - Species, age of trees, ground cover, pruning
- Vegetable/arable crops:
 - Focus is on the crop rotation
 - Run over 2 years; data for lead in year and harvest year
 - Species, cultivation, sowing and harvest dates

Using the fruit and crop models: 2



Fruit crops included:

- Kiwifruit
- Apples
- Grapes
- Avocadoes
- Peaches

Using the fruit and crop models: 3

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Arable crops included:

- Forage
 - Maize silage, Barley (Spring), Triticale (Spring), Triticale (Autumn), Rye Corn (Spring), Rye Corn (Autumn), Oats (Spring), Oats (Autumn)
- Grain crops
 - Barley (Spring), Maize (Short), Maize (Med), Maize (Long), Oats (Spring), Oats (Autumn), Wheat (Spring), Wheat (Autumn)
- Green manure
 - Oats & Rye, Brassica, Mustard, Lupins, Phacelia
- Seed
 - Clover, Ryegrass

Using the fruit and crop models: 4



Vegetable crops included:

- Vegetable: Greens
 - Broccoli (winter/spring), Broccoli (summer), Brussel Sprouts, Cabbage(winter/spring), Cabbage(summer), Cauliflower(winter/spring), Cauliflower(summer), Lettuce, Spinach
- Vegetable: Legumes
 - Green Beans, Dried Beans, Lentils, Green Peas, Dried Peas
- Vegetable: Root crops
 - Kumara, Potato (Short), Potato (Medium), Potato (Long), Beets, Carrots, Parsnips
- Vegetable: Other
 - Sweet corn, Squash, Onions, Tomato

Using the fruit and crop models: 4



Reports generated:

(kg /ha/yr)	N	P	K	S	Ca	Mg	Na
Inputs							
Fertiliser, lime, organic	0	0	0	0	0	0	0
Atmospheric / Clover N	121	0	2	3	2	4	12
Irrigation	0	0	0	0	0	0	0
Calcium nitrate sprays	0	0	0	0	0	0	0
Slow Release	0	3	26	0	4	5	9
Mineralisation (cultivation)	0	0	0	0	0	0	0
Outputs							
Product	37	8	149	1	6	5	4
Atmospheric	6	0	0	0	0		
Leaching/runoff	6	1	12	0	73		
Removal of prunings	0	0	0	0	0		
Gain in framework	0	0	0	0	0		
Immobilisation/absorption	0	0	0	0	0		
Change in inorganic soil pool	34	17	0	2	0		

Change in soil tests

Show nutrient budget for the following block:

Whole farm

Click for Code of Practice on Fertiliser Use

N report by block

	N in drainage* (ppm)	N leached (kg N/ha/yr)	N surplus (kg N/ha/yr)	Added N** (kg N/ha/yr)
Overall farm	1.8	6	84	
Block name				
Bramley	2.0	7	109	0
Cox	1.6	6	67	0

* N concentration in drainage water at the bottom of the root zone. Maximum recommended level for drinking water is 11.3 ppm (Note that this is not an environmental water quality standard)

** Fertiliser inputs

Print

Whole farm or block Nutrient budgets

Future developments for *Overseer* 2009-2010



Software development:

- Improved testing regimes & protocols
- Improved documentation
- User manual
- Architecture review



Technical developments (pastoral model):

- Move from annual to a monthly time step
- More flexibility for cut & carry systems
- Integrate cropping and pastoral models



For further information

<http://www.agresearch.co.nz/overseerweb/default.aspx>

