Sustainable practice development, and the Horticulture industry in NZ

Horticulture NZ's environmental management processes.

CSG presentation – 2 / 12 / 2014

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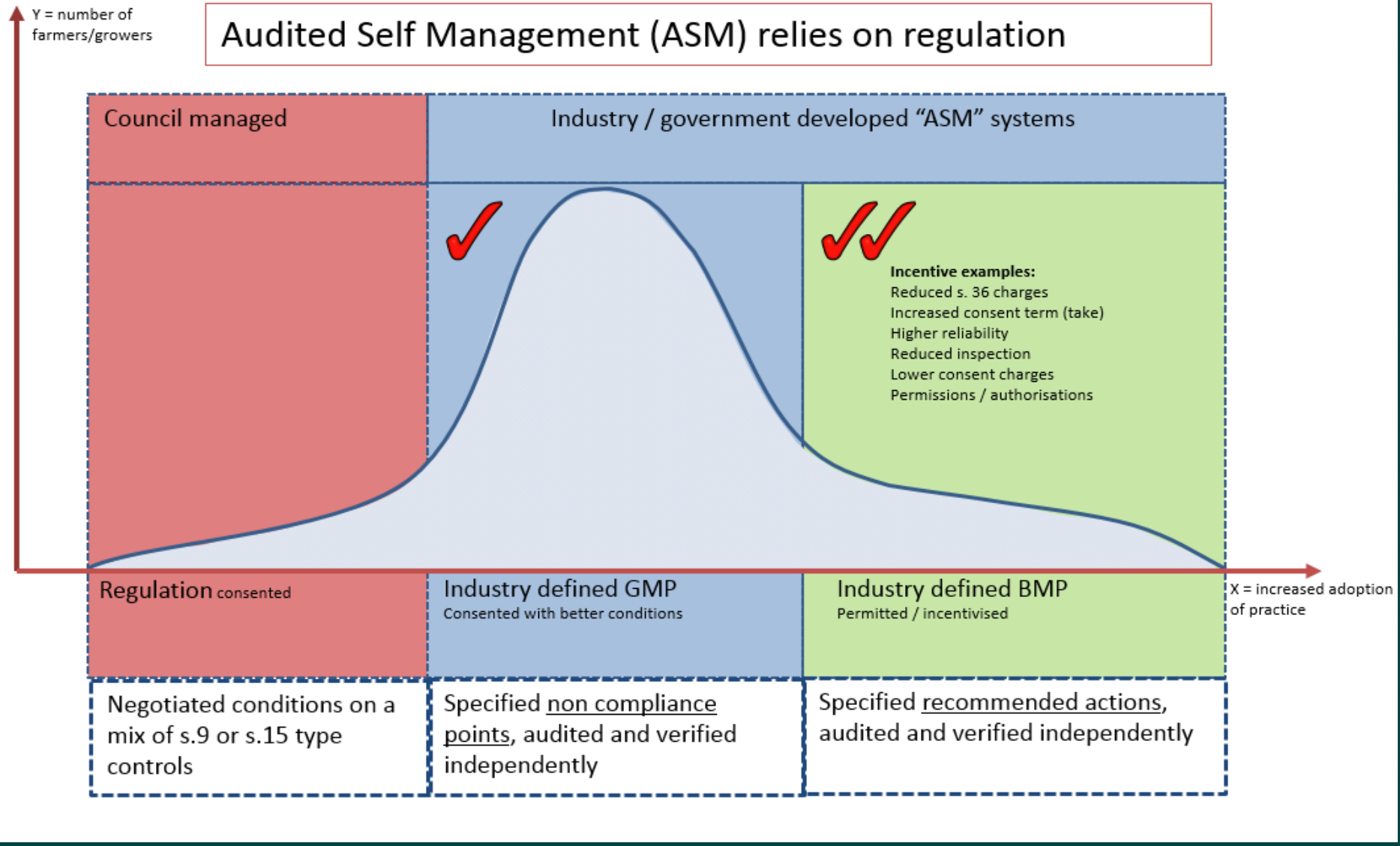
Strategy for horticulture sector



ENVIRONMENTAL MANAGEMENT SYSTEM FRAMEWORK

Aspect	Problem ID	Science / Tools	System	Audit / report
Nitrogen	✓	W	W	W
Phosphorous	✓	✓	✓	W
Soil Cons.	✓	✓	✓	W
Water eff.	✓	✓	W	
Agrichems	✓	✓	✓	✓
Biodiversity	W	W		

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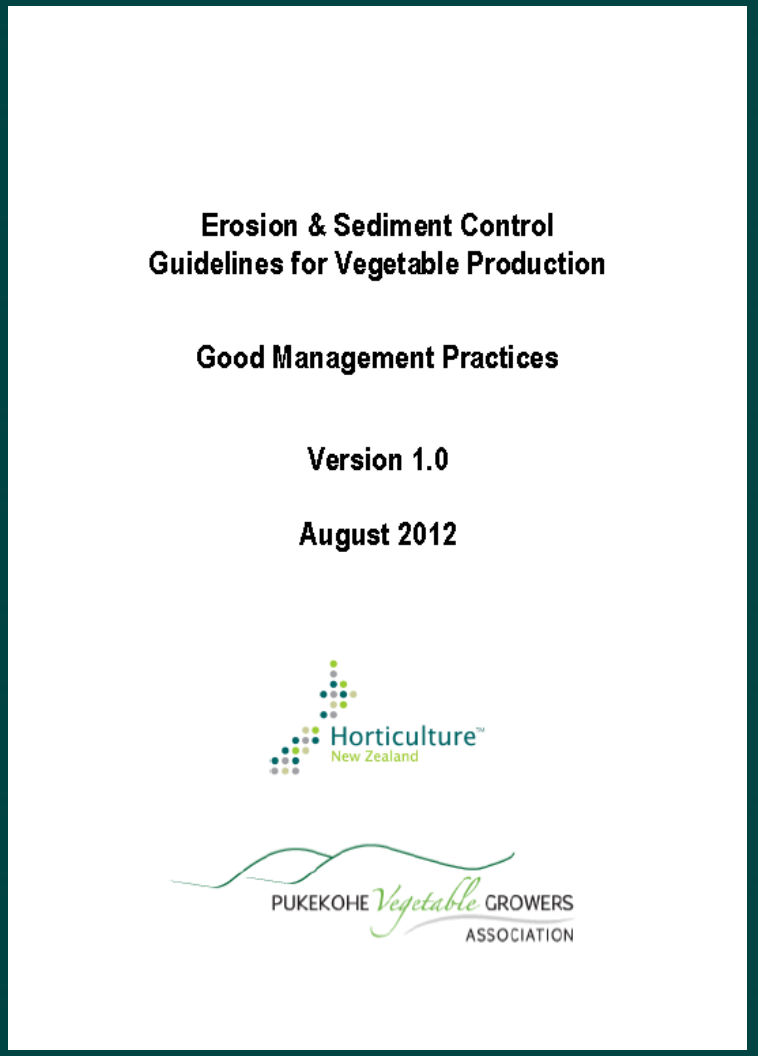
Example: Soil Conservation

- Based on Horizons Region Code of Practice - a revision of Ohakune CoP's and FSP
- 15 Years plus of industry led science now.
- New Approach: Risk based assessment, laying out a pathway to achieve maximum protection.
- Methods are inclusive and all encompassing.
- Out for comments with growers, Councils, EDS, Forest and Bird, Iwi before finalising.
- Growers wish to incorporate nutrient management but may publish NM separately.

Risked based assessment:

"Prioritising the methods with the greatest environmental benefit practical for your farm"



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Soil risk assessment

THE FOUR KEY STEPS TO MINIMISING SOIL EROSION & SEDIMENT LOSS

1. Paddock assessment

Map and describe the paddock (slope, area, history)

Identify where water is coming from

Identify where water leaves the paddock

2. Implement control measures for stopping or controlling water entering the paddock

Interception drains

Correctly sized culverts

Benched headlands

Bunds

Grassed swales
(controlled overland flow through the paddock)

3. Implement erosion control measures to keep soil on the paddock

Cover crops

Wheel track ripping / Wheel track dyking

Contour drains

Using short row lengths

Cultivation practices including minimising passes

Harvest management – timing / all-weather facilities

Post-harvest field management

Wind break crops (wind erosion)

4. Implement sediment control measures to manage the water and suspended solids that move off the paddock

Ensure the accessway is not at the lowest point

Raised accessways / Bunds

Vegetated buffers / Riparian margins / Hedges

Silt fences

Stabilised discharge points and drains

Decanting earth bunds and silt traps

Picture: Field tests of sediment movement on dairy land converted to brassica production in the Horowhenua district

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Costs and Benefits

Mitigation strategy	Range in effectiveness (%)	Cost per hectare	Tractor size	Time
Detailed erosion mgmt plan		$80 - $180		
Cover crop	90-99	$82	120	3.00
Minimum tillage	?	?	?	?
Stubble mulching	?	$66	120	1.00
Wheel track ripping	50-80	$33	120	2.00
Wheel track dyking	50-80	$33	120	2.00
Contour drains	30-70	$75		
Contour cultivation	50-80	Not recommended		
Setback strip by drain	50-80	$105		
Wind break crop				
Benched headlands	50-80	$64	170	1.25
Bund	80-95	$130		
Vegetated buffer strip	50-80	$255		
Silt fence	80-95	$378		
Silt trap	80-95	$750 - $1,300		
Silt trap maintenance		$75	180	5.55

Produced by Landcare Research 2013

Verified by Agricultural Engineer

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Strategic approach for vegetable sector

Benchmark nitrogen management performance by region

- Understand grower performance in nitrogen leaching. Demonstrate the range of predicted leaching results.
- Describe the full range of industry accepted good and best management practices.
- Determine the economic efficiency of resource use ($/kgN applied/ha)
- Publish science describing the nature of the footprint, and activities that influence the size of the footprint.
- Describe the economic impact of reducing fertiliser inputs to address limits that will be set.

Develop codes of practice for soil and phosphorous management by region.

- Work off existing templates developed for Franklin and Horizons regions.
- Develop a design standard for the CoP
- Have the Codes independently peer reviewed

Benchmark irrigation efficiency, water use needs and crop requirements by region.

- Water balance models
- Seasonal irrigation demand
- Daily take amounts (mm)
- Economic efficiency of water use by crop
- Identified gmp's specific to sectors.

Design the audit that proves compliance with GMP/BMP.

- Develop the right modules
- Obtain endorsement by RC's, env ngo's and iwi
- Develop a robust reporting system that can
  - Demonstrate adherence to agreed actions
  - Monitor environmental performance
  - Be available publicly for scrutiny

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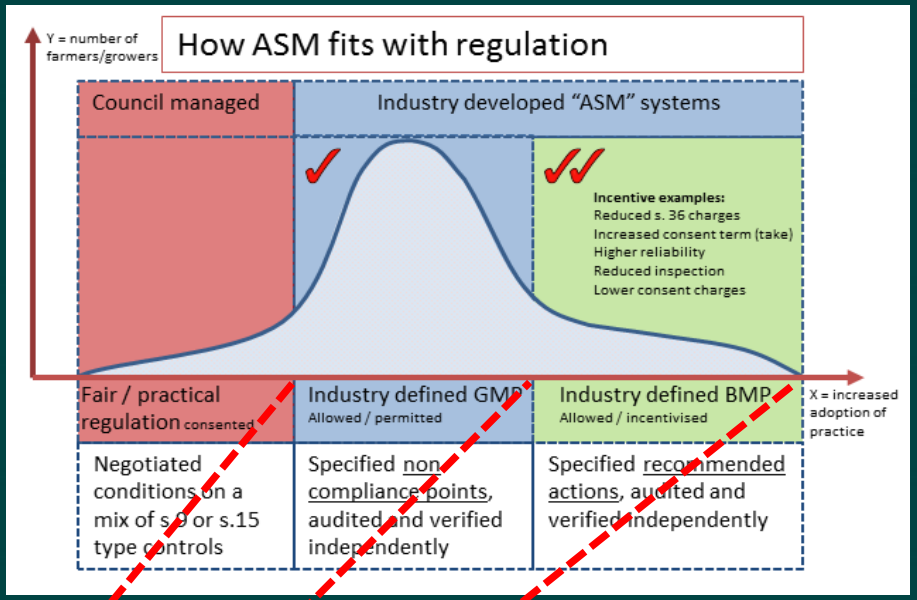
Strategy for vegetable sector (Fruit – less of a priority)

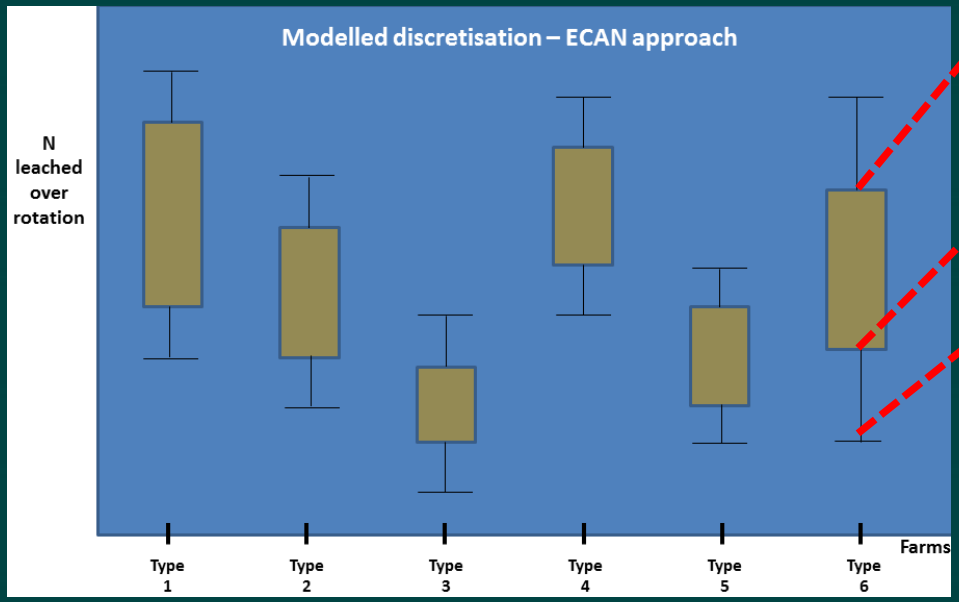
Categorise (discretise) farm type

Benchmark nutrient leaching

Benchmark management techniques

Define N efficiency





Define GMP

Define BMP

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Reality of OVERSEER

NZGAP vegetable cropping programme

Aspect	Problem ID	Science / Tools	System	Audit / report
Nitrogen	x	?	?	
Phosphorous	x	x	X	
Soil Cons.	x	x	X	
Water eff.	x	x		
Agrichems	x	x	x	X
Biodiversity	?			

Aspect	Problem ID	Science and tools	System	Audit / Report
Nitrogen	**Cropping** •Vege crops inefficient uptake of N •Share / lease / rotation is for other reasons not N efficiency •Price and quality driving behaviour •No modern yield / quality / nitrogen trials •Models poorly reflect cropping systems – but N loss likely to be high •Driver for system measuring outputs (Overseer accepted)	**Overseer** •APSIM •FAR Review •Lysimeter network **BMP Devpt** •Grower / Agronomic Reference Groups •Consent process (Horizons) •MGM **Quantification** •Benchmarking •Joint Venture **Investment in other parts of system** •Catchment Modelling	**Code of Practice** •Risk based assessment •Outline of GMP / BMP •International peer review •Grower and Council Review **Certification** •1 day Course •Review Massey •Expert verification of adoption **Consenting** •Conditions •Practice notes	**NZGAP** •Consultation on module development •Data collection / capacity •Reporting systems •Auditor training and cost

Related Science Projects

•Effectiveness of Soil conservation methods (Phosphorous)

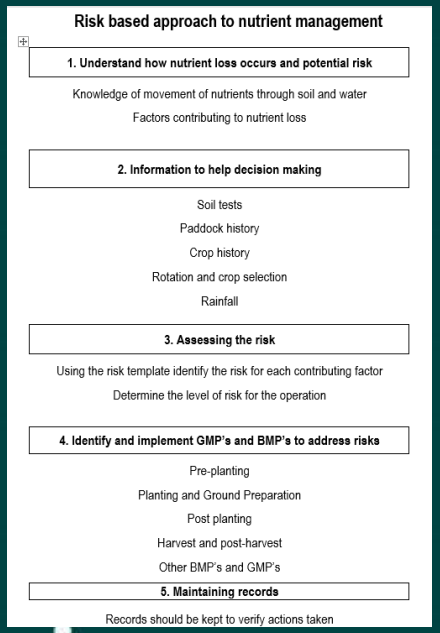
•Irrigation efficiency

• Yield response

Nitrogen Risk Assessment – in consultation for Waikato

Crop	Crop growth period		Total area in crop (hectares)	Total paddock area (hectares)	No of plants per unit measure	Typical crop yield	Fertiliser type	When applied	Residual management	Any other source of nutrient	Irrigation Method: E.g. Centre Pivot	
	Planting (Date)	Harvest (Date)	Net production	Ancillary activities		E.g. 60t/ha fresh wt	E.g.: 5kg/ha DAP	Method (eg side dressing)	E.g. incorporated, grazed	Eg effluent, compost	Seasonal (mm) (Maximum (mm)	Return Period

Management practices	Crop stage	Grower Adoption Y/N	Rationale/reasons	Consultant comments
Plan irrigation requirements	Pre-planting	Y / N		
Irrigators are calibrated	Planting	Y / N		
Volumes applied informed by relevant factors e.g. Plant growth/ stage/ soil type/ water holding capacity and climatic conditions	Post-planting	Y / N		
Water is applied to maintain soil moisture between the wilting point and field capacity where possible.	Post-planting	Y / N		
Irrigation applied allows achievement of the yield target for fertiliser applied.	Post-planting	Y / N		
Irrigation efficiency is measurable at greater than 80%	Post-planting	Y / N		
Water is metered.	Post-planting	Y / N		
Irrigation scheduling is undertaken using a crop model or tied into a soil moisture monitoring system	Post-planting	Y / N		
On-site soil moisture monitoring	Post	Y / N		



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Waikato JV Report

- Agreed process
- Reference Group
- Agreed service provider
- Agreed timeframe and purpose (how the work would be used)
- Agreed method
  - Overseer
  - Mitigations
  - Rotations
  - Gross margin Analysis
  - Reference check
  - Assumptions

The objective of the study was to collect primary physical, financial and environmental data from growers in Pukekohe to provide representative models of vegetable systems in the Lower Waikato sub-catchment and to analyse the impact of mitigation practices on the environmental and economic performance of the farms

Table 1: Whole Farm N leaching results (kg N / ha / annum)

	Status Quo	M 1	M2 10%	M2 20%	M2 30%	M2 40%	M 3
Rotation 1	64	66	59	57	53	49	59
Rotation 2	65	61	57	54	51	47	63
Traditional Market Garden	73	69	65	59	51	44	65

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Waikato JV Report (Cont'd)

Table 2: gross Margin results of mitigation strategies.

Status Quo	M 1	M2 10%	M2 20%	M2 30%	M2 40%	M 3
3,591	3,578	1,870	-787	-2,397	-3,884	611
4,540	4,527	1,348	-921	-3,593	-5,496	1,560
3,274	3,137	1,110	-666	-2,497	-3,940	294

Assumptions

Phosphorous – precursive model only
Gross margin – varies annually
Overseer – good start of a list of work to be done
No macroeconomics (frost free growing region, substitutability etc)

But an excellent start – now duplicated in Horizons, Canterbury, started in Tasman, Gisborne, with Hawkes Bay next.

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Further work and key issues

Version control in Overseer

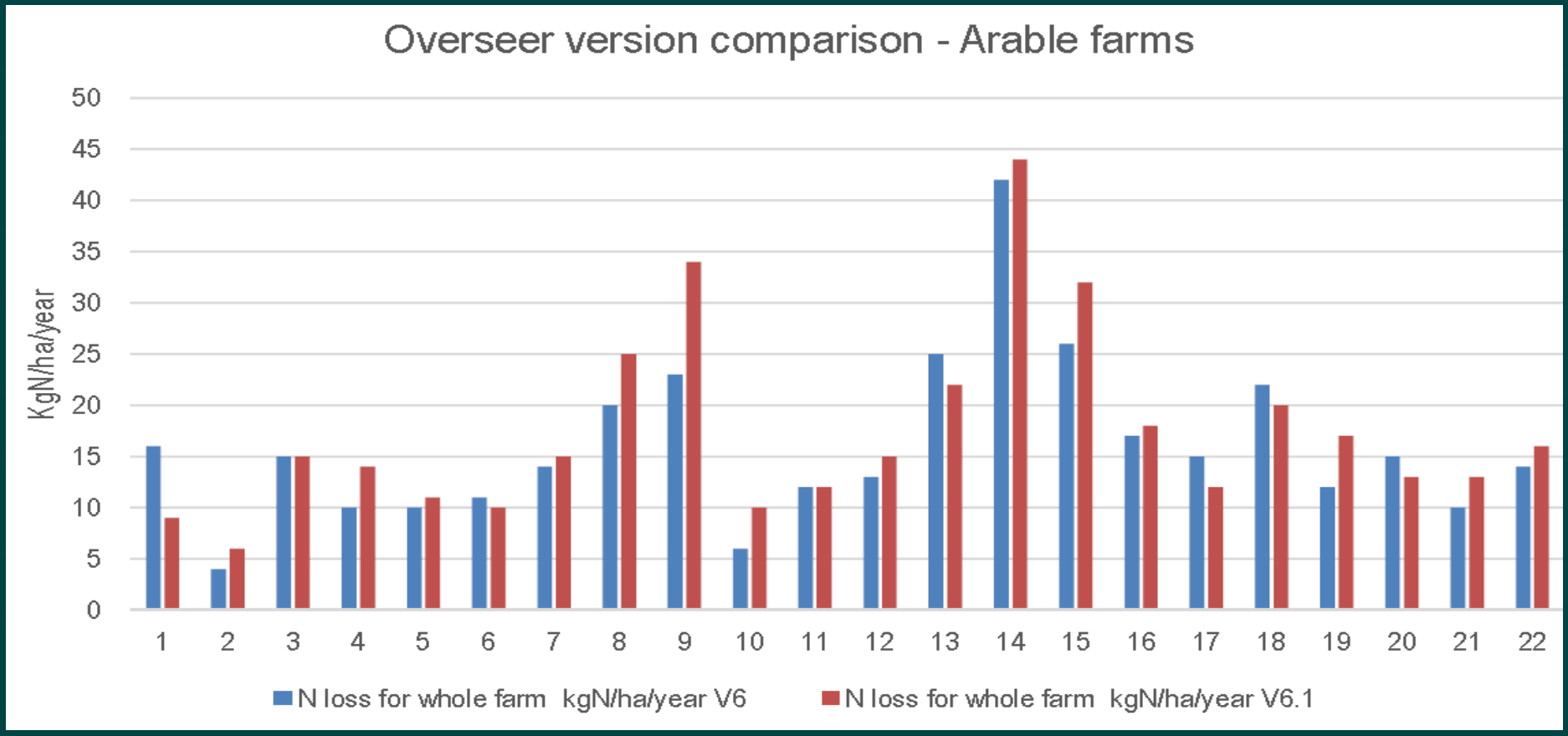
Confirmation of effective mitigation

Accounting frameworks

For example, I carried out my analysis on the Lower Waikato growers in version 6.1.0 in February 2014. When I open up the same files in the latest version 6.1.3 which was released on Friday the 22nd August 2014 the results have almost doubled from those calculated earlier.

Table 1: N leaching results from different versions of OVERSEER

	V 6.1.0 February	V 6.1.3 August
Rotation 1	58	93
Rotation 2	65	105
Traditional market garden	73	123



ENVIRONMENTAL MANAGEMENT SYSTEM FRAMEWORK: Fruit Sector

Holistic solutions harder to come by
Less challenging profile equals less effort
Some tools have been or are being developed

- Benchmarking / water footprint (kiwifruit sector)
- ARGOS (kiwifruit, Sustainability dashboard)
- GlobalGAP (Fruit sector generally)
- Some irrigation efficiency work (Pipfruit NZ, others)
- Programmes often company led (eg Watties)

Challenges:

- Lack of cohesion in environmental science planning across the fruit sectors.
- GlobalGAP less responsive to local drivers.
- Has been less of a priority for Horticulture NZ due to significant vegetable industry risks

Gisborne and Tasman Benchmarking

GDC: Grapes, citrus, pipfruit, kiwifruit practices.

Draft (citrus errors likely)

Tasman: Work to benchmark pipfruit, berry crops, grapes

Strawberry sector - started

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GAP: A strategic response to strangulation from profligate market access systems

www.newzealandgap.co.nz

Plan Proposal for Councils

Key Horticulture issues identified by Council with sectors and iwi

Land and Water Plan

Permitted activity status for NZ GAP certified growers meeting council N and Sediment discharge requirements

NZGAP incorporated by reference in Plan (appropriate modules in appropriate plan provisions)

Default to controlled / consented activity if PA requirements not met or not NZ GAP certified

Nitrogen

Developing Overseer module and GMP definition

Water Use

Adapt generic CoP's

Sediment

Phosphorous

Develop locally relevant COP's

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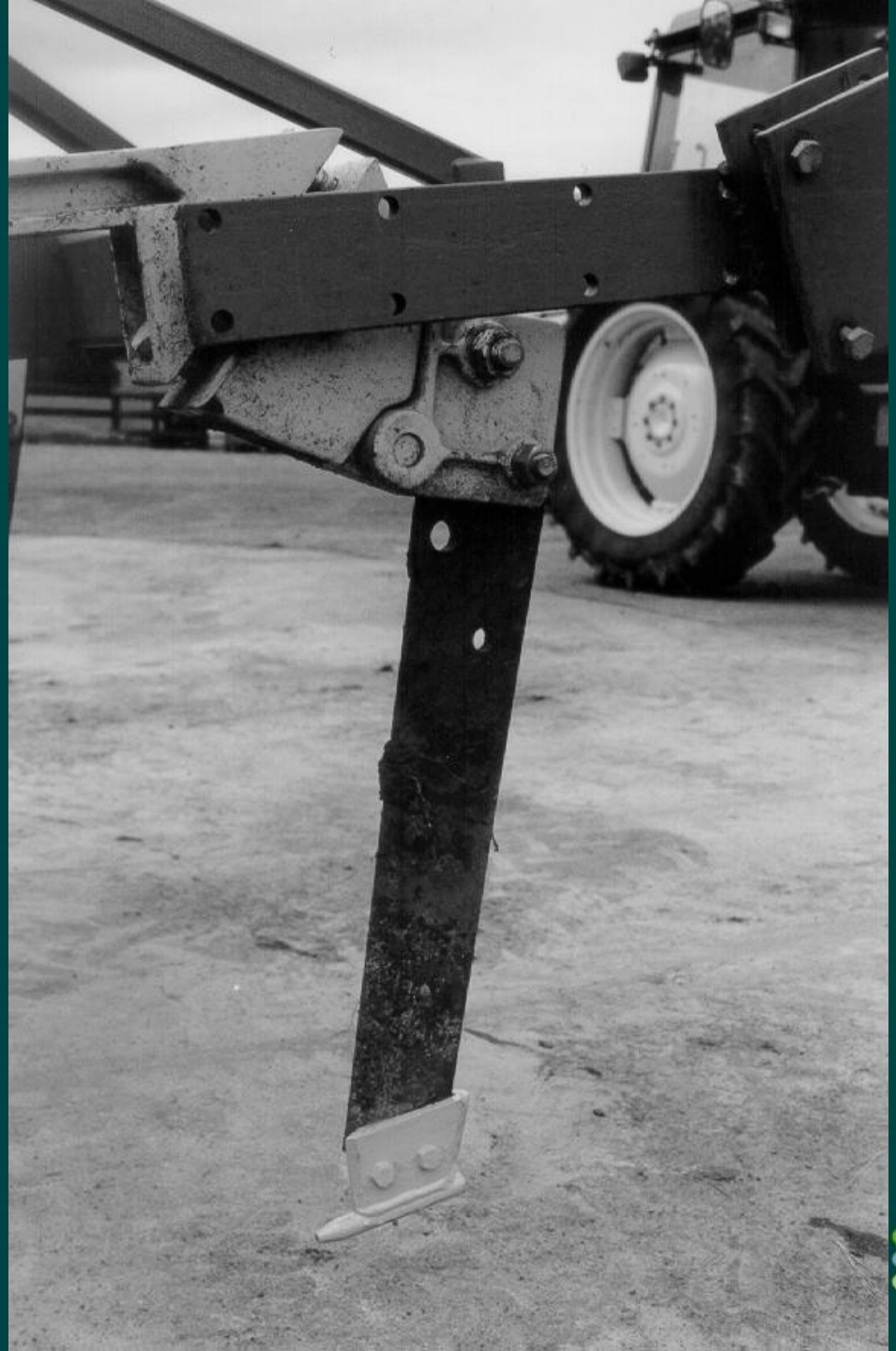
PUKEKOHE HILL
PRIMARY SCHOOL


Manaaki Whenua
Landcare Research
NEW ZEALAND LTD
THE IMPACTS OF SUBSOILING ON
INFILTRATION, SOIL EROSION AN
VEGETABLE PRODUCTION, PUKEKOHE
A Franklin Sustainability Project
Dr Craig Ross and John Dando
Manaaki Whenua
Landcare Research
NEW ZEALAND LTD
Erosion at Pukekohe During the Storm
of 21 January 1999
L. R. Basher and T. Thompson
The Role of Wheel Track Compaction in
Runoff and Sediment Generation Under
Vegetable Production at Pukekohe
L.R. Basher, C.W. Ross, J. Dando, J. Ekanayake
Manaaki Whenua
Landcare Research

Doing it right

Franklin Sustainability Project
Guide to Sustainable Land Management



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Wheel track diking can be an effective on both flat and sloped paddocks.

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