Sustainable Vegetable Systems

Quarterly Report - Programme Governance Group

Quarter 4, April – June 2022

Contract Agreement Number: 21859

In partnership with:

Sustainable Vegetable Systems

1.1 Summary of progress during this quarter

Workstream 1 – Controlled experimentation to quantify nitrate leaching

- 'Nui' ryegrass seed crop sown into both Rotations 1 and 2 at Lincoln. This is the final crop for these rotations.
- 50:50 mix of 'Asset' and 'Tama' ryegrass sown in Hawke's Bay Rotation 3. This is the final crop for that rotation.
- 'Casper' cauliflower has been transplanted in Hawke's Bay Rotation 4.
- All sites are setup for the crops above and data collection is ongoing, no issues or setbacks to report.

Trial crop rotations

Crop experiment and rotation outline - **LINCOLN**																								
	2020						2021												2022					
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May …	
Rotation 1	**Wheat**							**Broccoli mid Feb**					**Fallow**	**Onions**							**Fallow**	**Cover crop (ryegrass)**		
Rotation 2				**Pak choi - Shanghi**			**Fallow**	**Cover crop (ryegrass / Oats)**					**Fallow**			**Potatoes - Fresh**						**Fallow**	**ryegrass**	
Crop experiment and rotation outline - **Hawke's Bay**																								
	2020						2021												2022					
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May …	
Rotation 3														**Onion**							**Cover crop (ryegrass)**			
Rotation 4									**Pak choi**		**Fallow**		**Lettuce**			**Peas**				**Fallow**			**Caul.**	

Workstream 2 – Crop rotations

Site No.	2020				2021												2022					
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	Cover Crop (ryegrass cut and carry)				Fallow						Onions							Fallow			Grass	
2	Barley (crop/cover crop)					Fallow						Onions resown						Fallow		Cauliflower		
3	Mustard				Fallow		Carrots									Fallow						
4		Potato				Fallow		Cauliflower				Fallow		Maize							Fallow	
5			Potato					Fallow		Onions									Fallow	Grass		
6		Maize silage							Fallow	Grass						Fallow	Cabbage				Fallow	Grass
7				Pumpkin			Fallow			Grass			Fallow			Butternut Squash				Fallow		
8	Potato							Fallow	Wheat										Fallow			
9			Pumpkin					Fallow	Fallow	Turf grass									Fallow			

Workstream 2 – Regional on-farm monitoring

- Field sampling is ongoing. Sample processing by the PFR lab for N content analysis is still catching up from delays caused by the COVID-19 pandemic.
- Latest available data were collated and shared with the Workstream 2 working group and the Workstream 3 modelling work.
- Monitoring continues at the 9 regional sites. Five of the sites were predominantly fallow during winter. Three included a grass, cut and carry, grazed, and cover crop. The regional monitoring sites crop rotations are shown above.
- The splitting of soil samples between the commercial and Plant & Food Research laboratories for side-by-side comparison was completed and the analysis reported back by Mike Beare (PFR).
- The regional monitors meet on the last Monday of the month, along with PFR, and covers H&S, progress update, and discusses any issues and ideas amongst the nationally dispersed monitoring group.
- The additional crop monitoring continued. This is to provide a more robust database on crop nitrogen concentrations and harvest weights. The vegetable crop sampling will continue to provide a regional and seasonal dataset.
- A winter grown potato crop in Auckland was planted in mid-June. Pre planting samples were taken and continue on a monthly basis through to the postharvest fallow period.

Workstream 3 – Farmer facing tool(s)

- Andrew Barber, Anne-Marie Jolly, and Hamish Brown have been planning the tasks and timing for developing the next version of the grower facing tool.
- A Tool development critical pathways (Gantt) chart was prepared through to project completion. All Workstream 4 dissemination activities has been hung off the tool development process.
- Feedback from demonstrations to growers and agricultural professionals using the proof-of-concept alpha was integrated into the next version of the tool.
- Workstream 3 held a workshop on the 24th May in Lincoln, with a follow-up Zoom meeting (8th June) to capture post workshop reflections. The workshop included the demonstration of the tool by Hamish Brown (PFR). Feedback was captured and is being incorporated into the tools next version.
- The aim is to have the next version ready for limited release and testing from May 2023. Proof-of-concept beta includes work by an external interface developer.
- Rezare completed their tool pathway options report, to be presented at the next Project Governance Group meeting in August.

Workstream 4 – Developing a change landscape

- Filming with Wanderly Media has proceeded as part of the Workstream 4 engagement activities. Three videos plus a guide to Quick N testing. Three video themes:

    - Project introduction and overview
    - Case studies/monitor sites. Greater understanding of the nitrogen cycle.
    - Science story - trial sites to labs to modellers a grower's tool.
- Initiated contact with NIWA-led Irrigation Insight Programme to consider the applicability of the high-resolution weather forecasting for on-farm water management tool development in SVS.
- Planning for expanding stakeholder mapping and outcome logic of programme is underway, to improve strategic outcomes of SVS.
- FOLKL conducted 10 in-depth interviews with grower-operators conducted between 6 June - 21 June 2022. The objectives were to improve our understanding of the operators' problem recognition (if any) of N leaching and how a tool might better support their nitrogen decision making. The results are contained in their report which is being fed into WS3 tool development.
- NZ Grower articles:
    - April. Nitrogen Balance – Understanding. Management and environmental implications of nitrogen use in crop production. Prepared by Bruce Searle, Trish Fraser, and Jo Sharp (PFR)
    - May. SVS – Understanding grower and agronomist's perspectives. Based on a report prepared by Waka Paul, Social Scientist, Plant & Food Research.
    - June. N-Sight: Making the invisible, visible. Prepared by Andrew Barber.
- The Onions NZ Winter Tour and Research Forum held in late June in Christchurch and Hawke's Bay included an SVS presentation by Andrew Barber.

1.2 Key highlights and achievements

- Considerable planning has gone into the tool development pathway through to the end of the project.
- The analysis by Rezare on the tool development pathway options was completed and forms the basis of the PGG discussions in August.
- Wanderly captured video right around the country in very trying circumstances. The videos are now being storyboarded and edited.
- Workstream 3 held a workshop in Lincoln that included the demonstration of the tool by Hamish Brown (PFR). Feedback was captured and is being incorporated into the tools next version.
- Three of the four PFR trial rotations are in their final ryegrass cropping phase. One site was planted in cauliflower, with harvest anticipated in September followed by its final ryegrass phase.
- Preliminary results from the controlled experiments are presented in the latest PFR Quarterly report. This includes N uptake in the marketable yield and the amount remaining in crop residue. Understanding the fate of crop residues is crucial to the nitrogen budgets.
- At the halfway stage of the project, there is a distinct transition from trials and data collection into analysis, modelling, and tool development.

1.3 Collaboration with other programmes *(optional)*

Red font is new text this quarter.

Project name	Industry lead / Researcher	Description	Link to SVS
Future Ready Farms	SFFF Ballance	This programme aims to trial and develop 12 farm nutrient technologies that will help meet national environmental targets for reducing greenhouse gas emissions, agricultural chemical use, and nutrient loss to waterways. Products and tools for reduction of nitrogen emissions from the horticulture [kiwifruit] and arable sectors are identified. [FRF will collaborate with SVS, but not looking to develop vegetable focused tools]	Scott Champion (Ind. Chair)
MPI SFF - Mineralisable N to improve on-farm N management	PFR led, funded by MPI, FAR, VR&I, Environment Canterbury, HBDC, Waikato Regional Council, Ravensdown, Hill Laboratories, Eurofins Food Analytics Ltd.	The productivity of broad acre cropping depends on supplying sufficient nitrogen to meet crop demand; however, farmers often do not know how much N will be mineralised during the growing season. Plant & Food Research have developed a new laboratory test (published 2017) that can be used to predict in-field N mineralisation. The new test is faster and more accurate than existing commercial tests. This project will conduct on-farm demonstration trials with different crops, soils, and climates to demonstrate the benefits of the new test to improve N management on farm.	SVS sampling protocol includes the hot water (HW) test in both the trials and regional monitoring sites. Mike Beare (PFR) is involved in SVS through the Tech. Panel. Soil samples are being split and sent to both Eurofins and PFR to test HW result consistency and Mineral N vs hot water extractable inorganic M.

Project name	Industry lead / Researcher	Description	Link to SVS
Crop residue N project	VR&I, PNZ, FAR / PFR	PFR-funded project looking to quantify the rate of decomposition of different vegetable residues and the rate of N release from the residues into the soil. Taking the small-scale laboratory trials conducted last year by Trish Fraser (PFR) into a larger scale field trial and literature review.	Essential for the nutrient budget. Direct industry and researcher connections. Some residues will be obtained from crops in Workstream 1.
Measuring real time nitrate leaching from a Hawke's Bay onion field	Ravensdown / PFR	The purpose of this research was to compare data from two nitrate sensors installed in a sump measuring nitrate-nitrogen concentrations in situ, with data from grab samples that were taken immediately to a laboratory for analysis.	Problem recognition. Direct industry and researcher connections.
Future Proofing Vegetable Production	VNZ & PNZ / LandWISE	Completed MPI SFF project. On farm trials in Levin and Gisborne. Developed a simple nitrogen budgeting tool designed specifically for vegetable production systems.	Picking up on the nitrogen budget and further developing the components and deliverable tool. Direct industry and researcher connections.
Process Vegetable Coefficients	PVNZ / PFR	Quantify some of the coefficients needed for N uptake and use by processing crops within Overseer.	Direct industry and researcher connections.
Protecting our groundwater: Fluxmeter	FAR, VR&I / PFR	A network of tension fluxmeters were installed on commercial arable and vegetable farms around New Zealand to directly measure losses of nitrogen and phosphorus in drainage water. Completed. Now being extended by FAR & VR&I.	Problem recognition. Direct industry and researcher connections.
Measuring nitrate in drains	Auckland Univ.	A Massey Univ. trial measuring nitrate levels in tile drains is being conducted in one of the Regional Monitoring sites. Now have the contact details and will follow up. The student trial has been running since 2019.	Trial is on a regional grower's site.

Project name	Industry lead / Researcher	Description	Link to SVS
Modelling to reduce nitrogen in Pukekohe (Whangamaire stream)	MPI	Indicative environmental-economic modelling to investigate the potential scale of impacts on commercial vegetable growing from the annual median nitrate in Pukekohe. Considerable change in productive land use may be required to achieve the NPS-FM 2020 national bottom line. https://www.hortnz.co.nz/assets/Environment/National-Env-Policy/JR-Reference-Documents-/MPI_2020-42078-Pukekohe-Modelling-Report-Final-Sanitized.pdf	Aware of
Asparagus N budgeting	LandWISE, Asparagus product group / PFR	Previous survey work identified a very wide range of fertiliser practices. Preparation of FEP's highlighted the need for better information that can be fed into asparagus nutrient budgets.	Using sampling protocols developed by SVS. Direct industry and researcher connections.
Freshwater Management Tool	Auckland Council	AC is currently in the process of developing a Freshwater Management Tool. This tool will provide a more sophisticated assessment of water quality in the Auckland region. 2% of waterways in the Auckland region are predicted to exceed the 95th percentile concentration of 9.8 mg/L. All are in the vege rich sub-catchments of the Franklin aquifer.	HortNZ is working with AC.
Global Literature Review on nitrogen mitigation options in vege. prod.	MPI / PFR	Literature review of mitigation technologies and their potential impact. Not yet available beyond MPI and PFR.	Important background for beyond SVS when mitigations are investigated.
Remote soil water measurement	NIWA	Remote auto sampling of soil leachate. Lysimeter was originally prototyped by Landcare Research, developed into a product by NIWA. https://niwa.co.nz/publications/isu/instrument-systems-update-21-november-2015/remote-soil-water-measurement. Researcher says progress has been slow and expensive (Andrew correspondence 2020).	Watch progress, along with other emerging technology.

Project name	Industry lead / Researcher	Description	Link to SVS
Ag Matters	NZ Ag GHG Research Centre	Dissemination of practical information, backed by science, to help farmers and growers get to grips with climate change. https://www.agmatters.nz/	Collaborate on dissemination and case studies.

1.4 Upcoming

- Crop rotations in WS2 monitoring sites include the planting of onions on 2 sites.
- Decisions on the tool development pathway to be made by the PGG.
- Engagement of a tool interface developer.
- Reference Group meeting (28th July)
- Vegetables NZ roadshows in Pukekohe (27th July), and Chch (4th August).
- Potatoes NZ conference (23rd and 24th August), cancelled.
- Vegetables NZ Nutrient Mgmt Workshop in Nelson (11th August)
- NZ Agronomy symposium (31st Aug.)
- Community of Practice workshop in Lincoln on the 14th Sept.

1.5 Investment (Cash & In-kind)

Investment period	Co-investor contribution	MPI contribution	Total investment
During this quarter	$0.166m	$0.477m	$0.643m
Programme to date	$1.262m	$3.042m	$4.303m