PFR SPTS No. 22021

Sustainable Vegetable Systems – Quarterly report October–December 2021

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Summary

This report summarises activity carried out by The New Zealand Institute for Plant and Food Research Limited (PFR) from 1 October to 31 December 2021, across the different workstreams of the Sustainable Vegetable Systems (SVS) project.

Workstream 1 – Field experiments:

- A fresh market potato crop has been established in the Canterbury Vegetable rotation. Data collection continues in this crop and the onion crop in the Canterbury Potato–Onion rotation.
- Lettuce has been harvested from the Hawke's Bay Vegetable rotation, and peas sown. Onion data continue to be collected in the Hawke's Bay onion and pea crop.
- We used a prototype of the farmer-facing tool to estimate the optimum N for the potato crop in the Canterbury Vegetable rotation. This tool has a more dynamic inclusion of soil N mineralisation and previous crop residue mineralisation. The tool also provides an indication of best timing of side-dress applications based on reaching a set minimum soil N level. We are using nitrate test strips to assess soil N levels before making side-dress decisions.

Workstream 2 – Regional monitoring:

- Samples that have been able to be collected have been processed.
- The collated data have been made available to the Workstream 2 to develop N budgets for each crop. The data are also available for use in Workstream 3.

Workstream 3 – Modelling:

- A meeting was held for PFR modellers and industry members to discuss the approaches needed and issues to consider in developing a grower-facing tool that is workable and usable. The key next step is to include social science findings from Workstream 4 in subsequent discussions.
- Modelling scenarios for all crops harvested so far are being developed and data collated.

Workstream 4 – Technology transfer:

- Grower interviews to understand the practices, current knowledge and issues faced with N management of crops were conducted by phone or video conference because of COVID-19 restrictions.
- Initial findings were presented to the modelling group and Waka Paul participated in the modelling grower-facing tool meeting.
- A report is being prepared from the data collected to help inform modelling discussion, tool development and facilitating implementation.
- A plan to continue with information sharing is being developed, with COVID-19 restrictions affecting the ability of focus groups to meet and field days to be held.

1 Workstream activity

1.1 Workstream 1: Field experiments

Activity this quarter focused on managing the experimental crops and collecting data. The lettuce crop grown in the Hawke's Bay vegetable rotation was harvested, and the following crop of peas was sown. A fresh market potato crop is growing in the Canterbury vegetable rotation, and onion crops are growing in Canterbury and Hawke's Bay rotations.

1.1.1 Canterbury Rotation 1: Potato–Onion rotation

- This rotation is currently in an onion crop (Figure 1) sown on 25 September 2021. Data collection is continuing and analysis of those data will be presented in future reports.

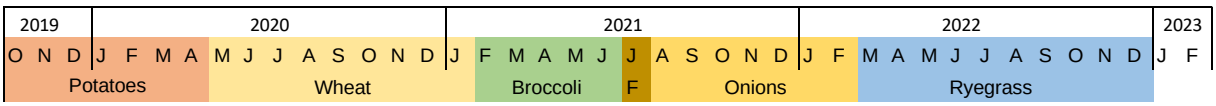

Figure 1. Canterbury potato–onion rotation crops. A fallow period ('F') occurs between the broccoli and onion crops.

- The fertiliser N rates were 0, 60, 120 and 240 kg N/ha applied at planting and varying amounts side-dressed three times (Table 1). All N fertiliser was applied as calcium ammonium nitrate (CAN).
- The optimum rate of fertiliser was determined based on soil N test values of 54 kg N/ha available in the top 15 cm. The Nutrient Management for Vegetables Handbook (Reid & Morton 2019) uses soil results for the top 15 cm, and for the amount of N available the recommended

fertiliser rate is close to 120 kg N/ha. Discussion with the technical panel confirmed this rate of fertiliser.

- Treatment differences are noticeable in the canopy colour (Figure 2). The lower N rates of 0 kg N/ha (N1 treatment) and 60 kg N/ha (N2 treatment) have a lighter green colour, suggesting some N limitation to growth. The N3 and N4 treatments have darker green canopy, suggesting that N is not likely to be limiting for these treatments.

Table 1. Fertiliser application rates applied to onions in the Canterbury rotation.

Timing	N1	N2	N3	N4
Planting	0	15	30	60
Side dress 1 ~ 2 leaf	0	15	30	60
Side dress 2 ~ 4 leaf	0	15	30	60
Side dress 3 ~ bulbing	0	15	30	60
Total	**0**	**60**	**120**	**240**

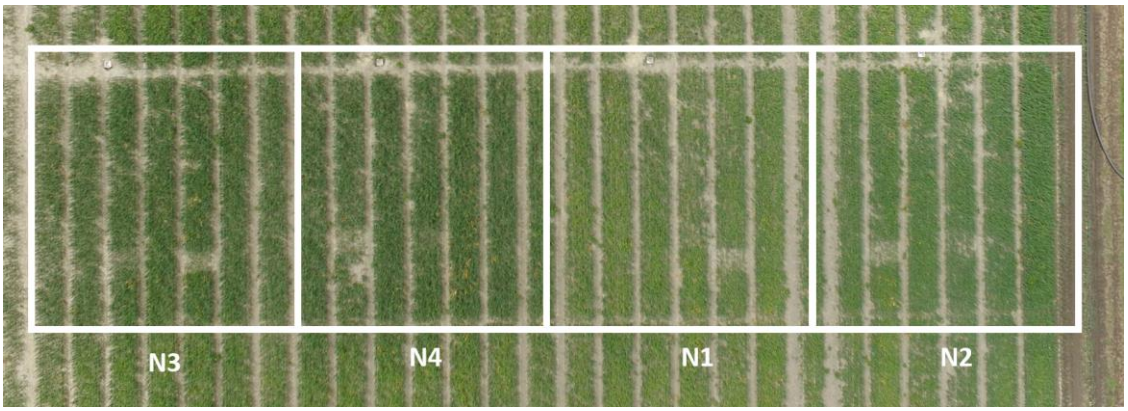

Figure 2. Onion plots with different N treatment rates of the Canterbury rotation.

1.1.2 Canterbury Rotation 2: Vegetable rotation

- The focus in this quarter was establishing the potato crop (Figure 3) and ensuring data collection proceeded as planned.

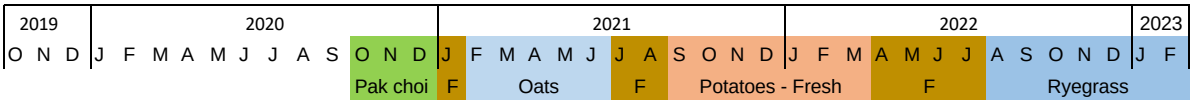

Figure 3. Canterbury vegetable rotation. Fallows ('F') occur between the different crops.

Potato sowing

- ‘Agria’ seed tubers with a size of 45-55 mm were sown on 22 October 2021 at a planting density of 45,000 per hectare, and a depth of 17 cm. This is a fresh market crop, with an expected yield of around 70 t/ha.
- Soil P content was somewhat low and K was slightly moderate prior to planting (Table 2). Basal rates applied at planting were 82 kg P/ha using triple super and 217 kg K/ha using a mix of potassium chloride and potassium sulphate. These rates are in close agreement for P and K rates needed given the soil test values indicated by Reid & Morton (2019).
- Additional basal fertilisers applied were kieserite at 100 kg/ha, boronate 46 at 20 kg/ha, zinc sulfate at 15 kg/ha, manganese sulfate at 60 kg/ha and copper sulfate at 10 kg/ha.

Table 2. Soil nutrient content for the potato crop of the Canterbury vegetable rotation, grown at the PFR Canterbury research site.

pH	Olsen P (mg/L)	Potassium (me/100g)	Calcium (me/100g)	Magnesium (me/100g)	Sodium (me/100g)
6.5	23	0.35	9.8	0.66	0.17

- We used the prototype of the farmer-facing tool being developed in Sustainable Vegetable Systems (SVS) (see Section 1.3) to determine the optimum N rate for the potato crop. Our approach until now has been to use the guidelines provided in the Nutrient Management Guide. However, for this crop we used the prototype tool to estimate the optimum N rate for potato crops (see Section 1.3 for more detail about the tool and approach used). Briefly, the prototype takes account of the amount of N mineralised by the soil as measured by the PMN (Potentially Mineralisable Nitrogen) test, and estimated N supplied by previous crop residues, soil mineral-N levels and the estimated growth of the crop. This should provide a more dynamic and time-detailed indication of N requirement for the crop than is currently available.
- Using this approach, the estimated optimum N rate was 186 kg N/ha, to be applied in three equal splits during the growth of the crop. The dates of these applications were also estimated by the prototype tool, based on changes in soil N content during growth (see Section 1.3). The estimated dates were 16 and 28 December 2021 and 5 January 2022. We used nitrate test strips before these dates to confirm that soil N levels did indeed justify applying additional N (close to 35 kg N/ha in the top 30 cm of soil, Section 1.3), and slightly adjusted the actual application dates to 13 and 22 December to prevent any N limitation occurring. This approach will also be used for the final estimated fertiliser application date of 7 January 2022. All N fertiliser was applied as CAN.

1.1.3 Hawke’s Bay Rotation 1: Onion rotation

- This rotation has started with an onion crop (Figure 4) and the focus this quarter has been on collecting the data needed (Figure 5).

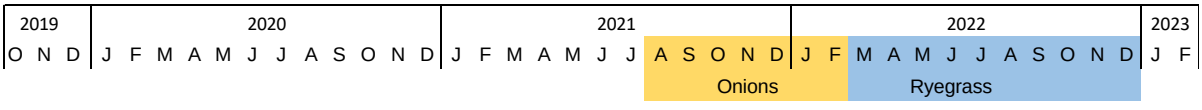

Figure 4. Hawke’s Bay onion rotation.

The available soil N in this field averaged 89 kg N/ha in the top 30 cm and based on the recommendations of Reid & Morton (2019), this is equivalent to an N application of 90 kg/ha for optimum growth. N was applied as CAN fertiliser at three times during crop growth (Table 3).

Table 3. Fertiliser application rates applied to onions in the Hawke's Bay rotation.

Timing	N1	N2	N3	N4
Side dress 1 ~ 2 leaf	0	15	30	60
Side dress 2 ~ 4 leaf	0	10	20	40
Side dress 3 ~ bulbing	0	20	40	80
Total	**0**	**45**	**90**	**180**

The rates of N fertiliser treatments used in the Hawke's Bay crop (Table 3) are lower than those applied in the Canterbury onion crop (Table 1) and having this range of rates should provide a good test of the model and the recommendations across two different environments.

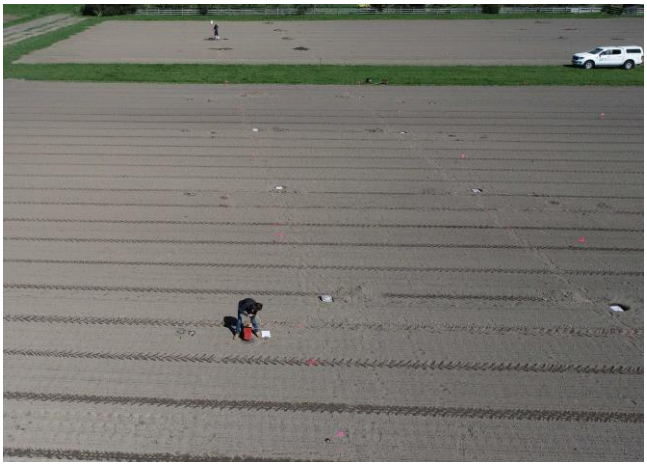

Figure 5. Hawke's Bay onion rotation immediately after sowing. The two columns of the Hawke's Bay rotation can be seen. White squares are the sumps for leachate collection from each plot, already installed in Column 1 and being installed in Column 2. Soil water content is being measured using neutron probe technique.

1.1.4 Hawke's Bay Rotation 2: Vegetable rotation

- During this quarter, the lettuce crop was harvested and the pea crop was sown (Figure 6).

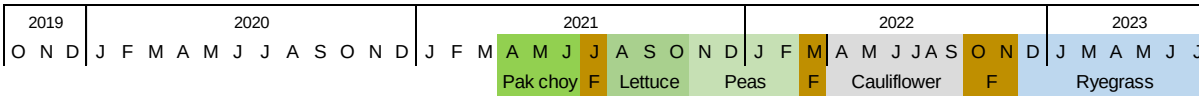

Figure 6. Hawke's Bay vegetable rotation. Fallows ('F') occur between the different crops.

Lettuce harvest

- The lettuce crop was harvested on 19 November 2021, with all plants from a 2 m length of two beds collected. Plants were separated into marketable and residue components; marketable plants were free from blemish and had outer leaves removed. Plant numbers were counted and fresh and dry weight recorded. Ground samples have been sent for N analysis and results are being completed. We also recorded any pukeko damage in each plot.

- Roots were sampled using corers, within and between rows to a depth of 30 cm, in order to obtain an indication of root biomass and N content. Root samples were washed out, dried, weighed and sent for N analysis.
- The remainder of the area was harvested by a contractor (Thornhill).
- N analysis of all plant material has not yet been completed because of COVID-19 restrictions; a N balance analysis and yield analysis will be completed for subsequent reporting.

Pea sowing

- Peas of variety 'Ashton' were sown on 20 December 2021, aiming for a population of 90 plants/m^2. Irrigation (15 mm) was applied within 2 days to aid germination, and a further irrigation applied (15 mm) 2 weeks after sowing. Agrichemicals (500 mL of Tazer per hectare and 3 L of Foschek per hectare in 200 L of water) were applied for downy mildew control on 15 January 2021. The presence of the disease was likely due to the previous lettuce crop.
- Soil Olsen P levels were 35 and 36 µg/L in columns 1 and 2, respectively. Reid & Morton (2019) recommend that if Olsen P is above 10 µg/L then a maintenance application for a 15 t/ha crop would be 5 kg P/ha. Our late planting of the pea crop means that a very high yield such as 15 t/ha is unlikely and so a decision was made not to apply any P fertiliser for maintenance, as the rate would be less than 5 kg P/ha. The MAF soil quicktest K values were 19 and 22 for columns 1 and 2, respectively. Reid & Morton (2019) indicate that if the quicktest K values are above 10, then no maintenance K is needed.
- Following standard recommendations for peas, no N fertiliser was applied.

1.2 Workstream 2: Regional monitoring

Details of site activities:

- We have continued to process plant samples for biomass and plant N content and are catching up with earlier delays due to COVID-19 in processing lab samples.
- Data were collated of biomass and crop N content and shared with the Workstream 2 working group for further analysis and N budget preparation. The collated data are also available for Workstream 3 modelling work.

1.3 Workstream 3: Modelling

Modelling design and development

- A modelling workshop was held via Zoom (Figure 7) spread over 2 days (1–2 December, 2021). The workshop was broken into two sessions, with a session held on each day. Key information arising from this workshop was:
  - A tool should help indicate that grower practice is improving in terms of sustainability
  - The tool acts as a guide for users, and indicates a range within which good practice is achieved
  - The tool focuses on providing information for best practice, rather than as a compliance tool as initially thought.

Figure 7. Sustainable Vegetable Systems modelling discussion via Zoom.

- The PFR modelling team has developed an initial prototype for how such a tool might work (Figure 8). This tool is still being developed but was used to estimate the fertiliser requirement for the potato experiment in Workstream 1 (see Section 1.1.3).
- The tool example was used for the fresh market potato crop, and to implement it:
  - User inputs the sowing date, expected harvest date and expected yield. The tool then calculates pattern of Crop N uptake from assumptions of the dry matter content of tubers, Nitrogen Harvest index, N content to tubers, haulms and fine roots. These values have been obtained from experimentation. The daily N uptake is calculated from an assumed sigmoidal growth pattern.
  - User inputs soil mineral N and PMN test values. The depth for these measurements should be appropriate for the crop. In this case a depth of 30 cm was used.
  - The N that is released from residues over the growth of the crop depends on the residue type, soil and environment conditions. In this case, the residues were the roots of the previous oat crop, and the amount of N available was estimated.
  - The N that is released from soil mineralisation is calculated from the PMN test and the soil and environmental conditions.
  - The user enters a ‘trigger’ soil N content – when the soil reaches this N content, fertiliser must be applied. Presently this is set at 35 kg N/ha. This is an estimated value at which the ability of the crop to access the nitrogen it needs is likely to be limited, and the point from which additional supply will be needed for optimum growth.
    - The user can also set the number of times the fertiliser is applied – in this case there are three side-dressings, as well as one application at sowing.
  - The tool calculates the amount of fertiliser needed, and the times when it should be applied.
  - Ongoing work in this space will be to include leaching losses, and further refinements may include in-season weather, to predict leaching losses for subsequent N recommendations. This tool will also link into a N balance to help understand the system N use.

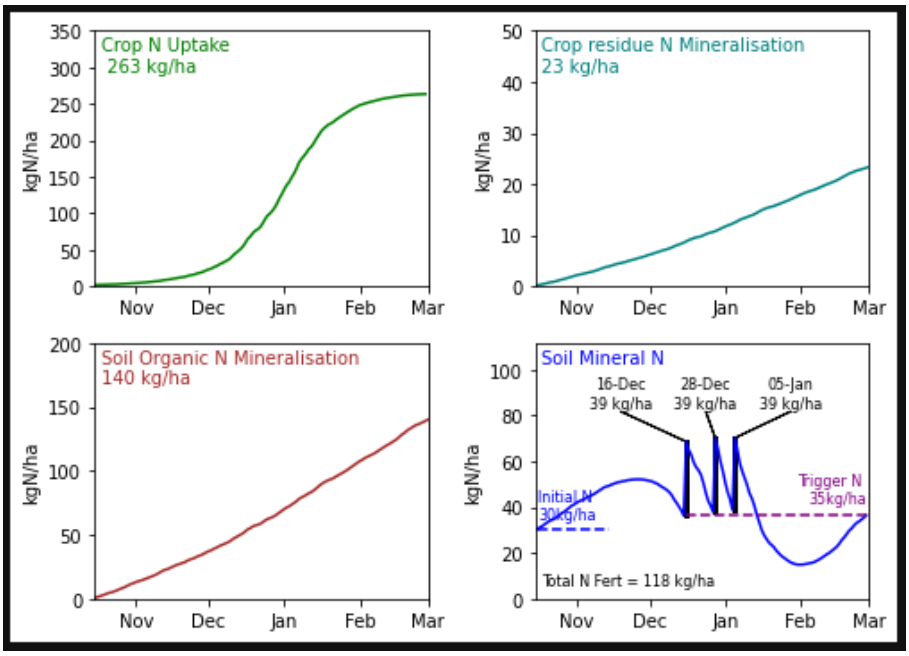

Figure 8. Output from prototype farmer-facing tool, providing indication of prediction for soil N supply to optimise fresh market potato yield in the Canterbury Vegetable rotation.

Modelling delivery and implementation

- Earlier work with the data from the potato–wheat rotation (Searle et al. 2021) identified that, on average, soil mineral N was under-predicted across treatments, indicating the need to refine the components of N in the system. Additional work has added the broccoli crop in this rotation to the modelling analysis. Yields of broccoli, especially for the N1 and N2 treatments were under-predicted by the model using the currently available parameters (Figure 9).
- Estimated plant N uptake was very low for the broccoli, especially N1 and N2 treatments as a result of the under-predicted biomass (Figure 10), and this is because modelled soil N was low for these treatments (Figure 11). One potential factor contributing to under-prediction of soil N is the underestimation of N mineralised by SCRUM-APSIM and this is being further explored.

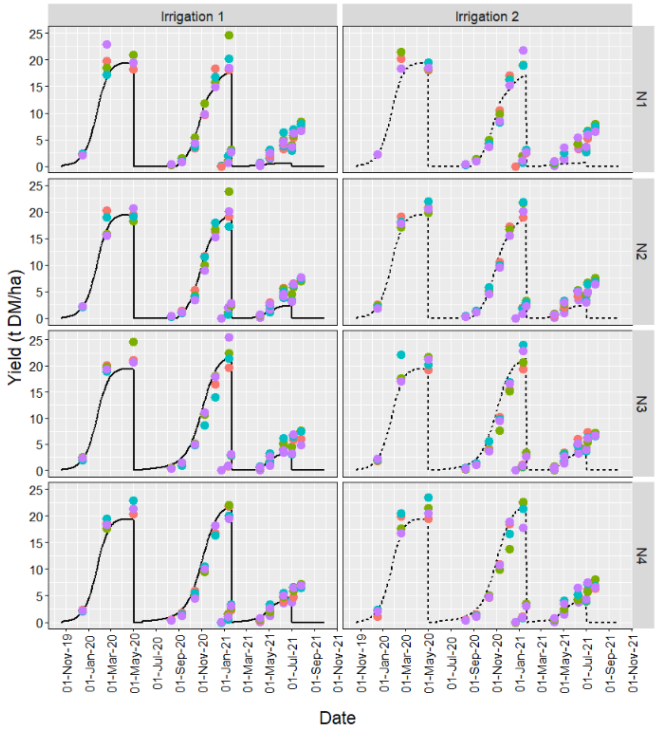

Figure 9. Measured (symbols) and SCRUM-APSIM-predicted total dry matter for Canterbury Rotation 1 crops (Potatoes – wheat – broccoli).

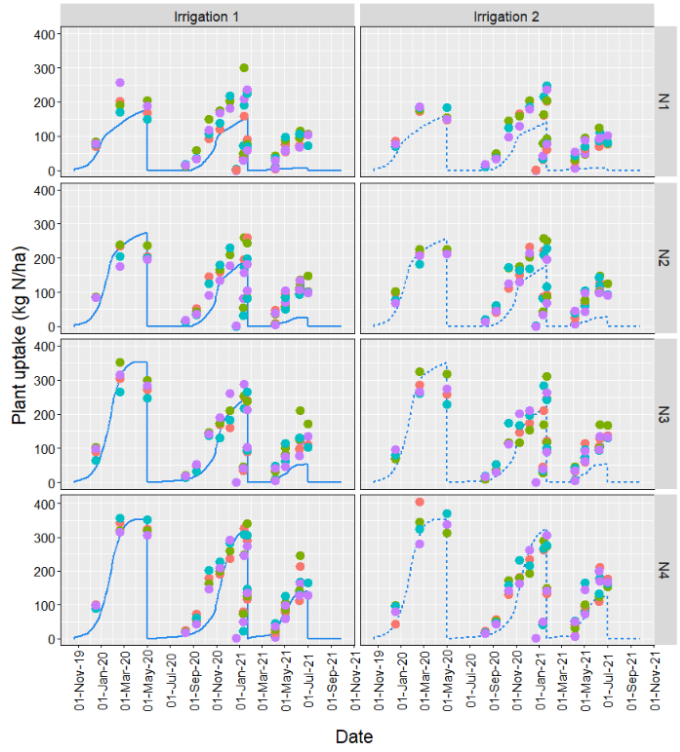

Figure 10. Measured (symbols) and SCRUM-APSIM-predicted total nitrogen uptake for Canterbury Rotation 1 crops (Potatoes – wheat – broccoli).

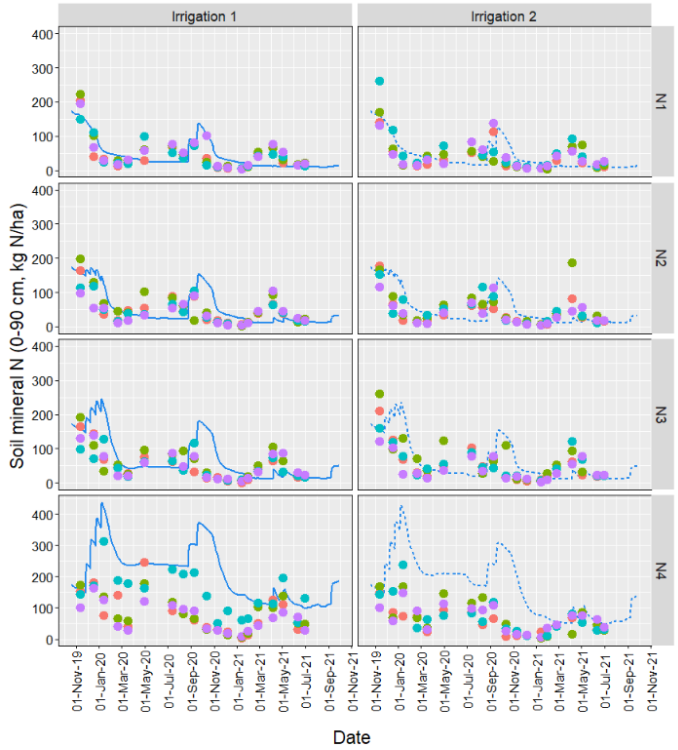

Figure 11. Measured (symbols) and SCRUM-APSIM-predicted soil mineral nitrogen (N; 0–90 cm depth) measured in the Rotation 1 experiment at Canterbury crops (Potatoes – wheat – broccoli).

- The estimation of soil water has progressed, with improved estimates of soil water across the profile to depths of 60 cm (Figure 12a–c). Soil moisture in the top 20 cm of the soil profile was over-estimated during the potato crop season (Figure 12a), possibly because of the model's inability to account for variability in soil water status as a result of mounding of potatoes.
- Simulations are being updated with data from new crops in rotation for which harvests have been completed and data summarised.

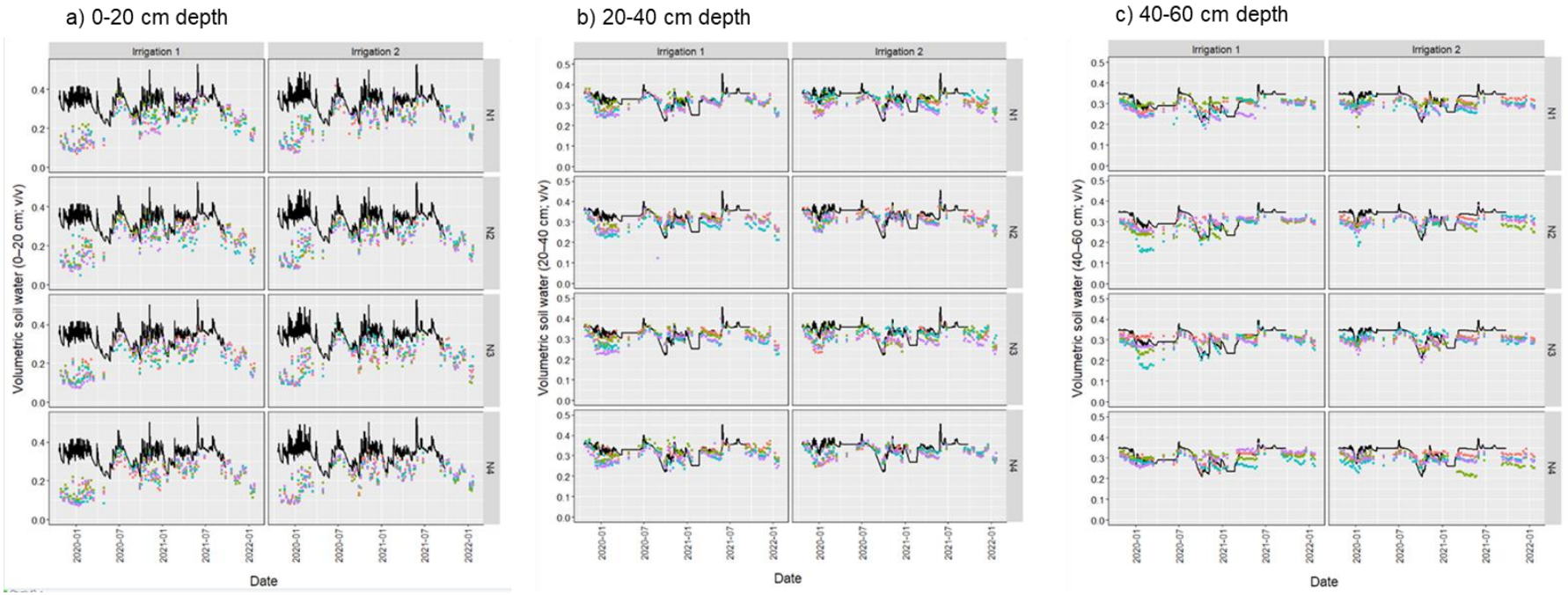

Figure 12. Measured (symbols) and SCRUM-APSIM-predicted (black lines) seasonal soil water content in the a) 0–20 cm soil layer, b) 20–40 cm soil layer, and c) 40–60 cm soil layer in the Canterbury Rotation 1 experiment (Potatoes – wheat – broccoli).

1.4 Workstream 4: Technology transfer

1.4.1 Facilitating implementation

Understanding what is enabling and useful for growers in nutrient management is a key focus of the SVS project, and any developed tool needs to be fit for purpose. This requires strong grower input and understanding of issues faced.

As part of this process, a PFR social scientist had a work plan of focus groups and interviews; this fits into the larger stakeholder map that has been developed. A report on these aspects of the SVS programme will be provided separately.

Focus groups

Two separate focus groups were formed with group members representing growers and industry representatives in the regions of Pukekohe, Gisborne, Ohakune and Canterbury.

COVID-19 had prevented these focus groups being implemented earlier in the project because of restrictions on travelling and meetings. The focus groups discussed and explored who makes decisions and takes action on-farm for nutrient management, the drivers, values and attitudes to nutrient management, the tools being used and value attributed to those tools.

Information from these focus groups is now being incorporated into the adoption frameworks and will be presented in detail in a separate social science report. This is also being shared with the Workstream 3 team to help focus development of a farmer-facing tool.

1.4.2 Facilitating communication

Articles continue to be produced for the grower magazine, with the ‘Understanding Soil Nitrogen’ article published in December 2021.

Due to restrictions of COVID-19 and the challenges and risks of interacting directly with growers these online activities and materials replaced the PFR time allowed for attending and presenting at field days. Additional activity is being planned including a series of podcasts and videos. PFR is currently discussing a collaboration with LandWISE on their annual conference, which will be held virtually. We believe this may be an opportunity to present SVS and its integration with other nutrient research currently underway. This will be discussed further with the Workstream 4 team.

2 Key highlights and achievements

Workstream 1

- A fresh market potato crop has been sown in the Canterbury Vegetable rotation. Data collection continues in this crop and the onion crop in the Canterbury Potato–Onion rotation.
- Lettuce has been harvested from the Hawke's Bay Vegetable rotation, and peas sown. Onion data continue to be collected in the Hawke's Bay Onion rotation, and the pea crop.
- We used a prototype of the farmer-facing tool to estimate the optimum N for the potato crop in the Canterbury Vegetable rotation. This tool has a more dynamic inclusion of soil N mineralisation and previous crop residue mineralisation. The tool also provides an indication of best timing of side-dress applications based on reaching a set minimum soil N level. We have incorporated the use of nitrate test strips to assess and check soil N levels before making side-dress decisions.

Workstream 2

- Samples that have been able to be collected have been processed.
- The collated data have been made available to the Workstream 2 to develop N budgets of crops. The data are also available for use in Workstream 3.

Workstream 3

- A meeting was held for PFR and industry modellers to discuss the approaches needed and issues to consider in developing a tool that is workable and usable. The key next step is to include social science findings from Workstream 4 in subsequent discussions.
- Modelling scenarios for all crops harvested so far are being developed and data collated.

Workstream 4

- Grower interviews to understand the practices, knowledge and issues faced with N management of crops were conducted by phone or video conference because of COVID-19 restrictions.
- A report is being prepared from the interviews to help inform modelling discussion and tool development.
- A plan to continue with information sharing is being developed, with COVID-19 restrictions affecting the ability of focus groups to meet and field days to be held.

3 Collaboration with other programmes

- Real time N-losses – Rural Professional Fund through Our Land and Water, looking at real time measurement of N losses under vegetable (onion) production in Hawke's Bay. PFR is providing data analysis support.
- Residue incubation – 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. Some residues will be obtained from crops in Workstream 1.
- Process Vegetable Coefficients – looking to quantify some of the coefficients needed for N uptake and use by processing crops within Overseer.
- Mineralisable N to improve management – a SFFF project looking to improve the measurement and prediction of the amount of biologically mineralised N in a field. This pool of N is a key component for understanding crop N requirements, together with measurements of mineral N (nitrate and ammonium).
- Asparagus N budgeting (Our Land and Water National Science Challenge) – looking to quantify N budgets for asparagus crops. This project is using many of the same measurements of soil N and crop N uptake, and a similar outcome is being produced.

4 Upcoming

- Lettuce harvest will be completed in Workstream1. Data from the onion crops sown will continue to be collected, and the potato crop established.
- N balance discussions will be ongoing, and data from Workstream 1 and 2 further evaluated for N balance development.
- Modelling workshop to be held. Scenario testing of data ongoing.
- Ongoing interviews and approaches to focus groups developed. Articles for communication of concepts and developments continue.

5 Acknowledgements

We would like to thank all the agronomists who have supported decision making in Workstream 1. Thanks to Premier Pea Seeds for supplying pea seeds for sowing in Hawke's Bay. Also many thanks to the PFR Canterbury Soils Lab for all the analysis being done and to Dr Mike Beare (PFR) for calculating the soil N mineralisation from PMN tests.

6 References

Reid J, Morton J 2019. Nutrient management for vegetable crops in New Zealand. Edition 1.0. Wellington. Horticulture New Zealand.

Searle B, Michel A, Brown H, Khaembah E, Fraser P, White T, Jenkins H 2021. Sustainable Vegetable Systems - Annual Report 2021. A Plant & Food Research report. SPTS No. 20835.

Appendix – Programme Progress

Recommendations/decision points

- With COVID-19 affecting opportunities for contact, an alternative approach to sharing information with growers (other than focus groups and field days) is being developed, including the use of videos, podcasts and other communications.
- Decisions on final crops in rotations need to be confirmed.

Progress against workplan

Key: Project Status

Completed	
On Track: no change to outcome(s) or milestone date; <10% variance to budget	
Slight Variation/Delay: adverse change to expected outcome(s); >3 month delay to milestone; 10–25% variance to budget	
Attention Required: outcome(s) not expected to be achieved; >6 month delay to milestone; >25% variance to budget	

This Quarter

Workstream	Financial	Timing	Outcome	Progress against Work Plan Comments
1.				1.1 Robust data from controlled experiments • Potatoes for fresh market sown in Canterbury vegetable rotation. • Ongoing data collection across all crops. 1.2 Data analysis underway • Contribution to N balance development and modelling.
2.				2.1 1 Data collection, analysis and contribution to reporting • Any changes to protocols with changing crops identified and discussed. • Data analysed and passed to Workstream 3. • N balance developed and discussed.
3.				3.1 1 Model design and development • Modelling workshop held to discuss and determine structure and requirements of farmer-facing tool and detail required for baseline predictions, design options considered. 3.2 Model delivery and implementation • Model calibration continues; provides information on system leaching and information for development of farmer-facing tool.
4.				4.1 Understanding the current landscape • Individual grower interviews data summarised and reported on. Any missing gaps identified and needed interviews conducted. • Focus groups initiated online due to COVID-19 restrictions. Information to feed into modelling discussions, and used to identify gaps and shape further any surveys/questions needed. • Information from surveys contribute to model meeting and modelling discussions. • Surveys conducted as required. 4.2 Extension activities • Extension plan being developed taking into account risks from COVID-19. Data from focus groups and interviews analysed and used to inform developing extension plan. • N balance development with Workstream 2 participants to co-develop a useable approach. • Next articles in the list of communication plant to be published. This includes baseline survey information, understanding N in the soil-crop system, and N balances. • Development of feedback loops from Workstream 4 to Workstreams 1 and 3.

Next Quarter

Workstream	Financial	Timing	Outcome	Activity in the next Quarter Comments
1.				1.1 Robust data from controlled experiments • Potatoes for fresh market harvested in Canterbury vegetable rotation. Onions harvested in both Canterbury and Hawke's Bay. • Cauliflower prepared for sowing. • Decision made on final crops in rotations where needed. 1.2 Data analysis underway • Contribution to N balance development and modelling.
2.				2.1 Data collection, analysis and contribution to reporting • Any changes to protocols with changing crops identified and discussed. • Data analysed and passed to Workstream 3. • N balance developed and discussed.
3.				3.1 Model design and development • Prototype tool further evaluated and development points considered with modelling team within SVS. 3.2 Model delivery and implementation • Model calibration continues; provides information on system leaching and information for development of farmer-facing tool.
4.				4.1 Understanding the current landscape • Information and support provided to guide discussion for developing farmer-facing tool. 4.2 Extension activities • N balance discussion with Workstream 2 participants to co-develop a useable approach. • Next article in the list of communication plant to be published. This includes baseline survey information, understanding N in the soil-crop system, and N balances. • Continue feedback loops from Workstream 4 to Workstreams 2 and 3. • Video and podcast planned and started.

Progress towards outcomes

These have been taken from The Programme – Schedule 5 and KPIs in the contract for each Workstream (WS).

Outcome	Target	Actual	Status	Comment
WS1 Literature review	30 Sep			
WS1 Trial sites established at PFR Hawke's Bay and Canterbury	30 Nov			
WS2 Development of a Technical Working Group	30 Sep			
WS2 Regional on farm monitoring sites established	30 Sep			
WS3 Development of a community of practice made up of current Overseer users	30 Nov			
WS4 Development of extension activity plan	30 Oct			
KPIs				
1.1 & 2.3 Methodology is developed and approved by Technical Panel	31 Oct			
2.1 Attain and maintain participation of 9 monitor paddocks for WS 2 across 5 regions	30 Sep			
2.2 Technical Panel is established and met	30 Sep			
3.1 Agreement on monitoring data requirements and links to WS2	31 Oct			
3.2 Agreement with Overseer on model access and working relationship	30 Nov			
4.1 Development of extension activity plan	30 Oct			

Key: Outcome Status

Completed: The outcome has been delivered	
On Track: The outcome is on-track to be delivered	
Variation/Delay: There is a delay expected or a change to the outcome	
Attention Required: It is likely that the outcome won't be achieved or the benefits associated with it will be significantly reduced if changes aren't made	

Programme issues or risks

COVID-19 limitations could pose a risk for collecting of data, especially if PFR teams are affected and need to isolate at key stages of data collection. Plans are being developed to address this as much as possible. The move to red light under COVID-19 restrictions also creates limitation for technology transfer, grower engagement, and importantly for development of a 'farmer-facing' tool. A plan to deal with this risk is being developed, including the use of videos to present key ideas and information, as well as a podcast series.

Communications and engagement

- A plan for monthly articles on the project with timely topics has been developed. This includes updates from the modelling workshop that will be held, N budget approaches, and soil testing terms.
- Within Workstream 2, individual discussion with participating growers of N budgets will help inform work in Workstreams 3 and 4.
- A plan for a podcast series and videos to impart key information is being developed. Initial podcast and videos prepared and shared across industry.

Health and safety

Health and Safety protocols have been implemented when visiting fields and conducting experimentation.

Confidential report for:

Potatoes New Zealand Incorporated

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