Pineapple Industry Development and Extension Project (PI22000)

North Queensland Regional Priority Trials

Contents:

1. Trial Topic Background

Research Timeline

- Readings
    - (Nicholls & Price, 2016; Sanewski et al., 2018)
    - Pineapple Best Practice Manual
    - Final Report – “Chocolate Disorder” – Garth Sanewski
    - (Cano-Reinoso et al., 2022)

2. Trial Concept Development Timeline

October 2023

- 5/10/23-6/10/23 - Pineapple Think Tank @ MRF
    - SWOT Analysis – points raised that will be addressed by conducting crop protection trials
        - Weaknesses

        - Fruit quality inconsistent
        - Lack of agronomic knowledge
        - High production costs
            - Inputs
    - Threats
        - Input costs rising
        - Red tape – reef compliance etc.
- Financial and Investment" was the #1 ranked category at the Think Tank, and within that category "Cost of Production" was ranked #1
- Solutions to Issues and Challenges
    - Generated in group discussions
        - Precision agriculture
            - Greater utilisation of soil and leaf analysis
            - Fertiliser
            - Crop protectants
            - Herbicides

19/10/23-20/10/23 - NQ Regional Priority Setting Study Group

- #1 Regional Priority – Hybrid Nutrition (73-50 & MD2)
    - Soil analysis
    - Leaf analysis
        - Leaf sampling protocol
    - Appropriate macronutrient levels
        - N level?
        - K level?
    - Link between fruit quality and robustness?
    - Link between nutrition and NI?

November 2023

December 2023

- 1/12/24 – Discussions with Stuart Irvine-Brown (DAF, Senior Research Agronomist) regarding nitrogen budget tool that was developed as part of a previous nitrogen budget project (by Rachel Abel, DAF) that ran on SEQ farms. This project found that there were significant losses of pre-plant and side-dress granular fertiliser application due to high rainfall in the early establishment phase.
- 21/12/24 – Obtained Rachel Abel's research project report on early nitrogen application. The quality of the data and assessment were high. Higher than average rainfall was recorded at the trial sites, likely exaggerating the nitrogen losses. However, Queensland experiences significant variability in rainfall, so the

trial results still have merit. This work was initiated due to high dissolved inorganic nitrogen levels being recorded in the creeks bordering pineapple fields which flow to the Pumicestone Passage.

- Attendance at Pineapple Environment Team (PET) group meeting
    - Discussions on nitrogen use efficiency and water quality

January 2024

- 16/1/24 – Discussions with Tim Wolens at Maroochy Research Facility regarding historical trial work, feedback on priorities
    - Feedback
        - Different thoughts in industry on pre-plant and side dressings
        - He supports some pre-plant fert (drilled into bed)
        - Compost use – problems with Freshcare?
        - N:K ratio important
        - Fertiliser transformation in the soil should be communicated to growers
- 18/1/24 - Endorsement of regional priorities at AP meeting
    - AP endorsement of trial topic and intended scope
        - NQ – Hybrid Nutrition (73-50 & MD2)
            - Hybrids have different requirements than smooth cayenne, reduce input costs, natural flowering link?
            - Identify optimal rates to reduce input costs and improve fruit quality
            - Review regional nutrition programs, conduct leaf, and soil tests, trial nutrition amendments.
            - Collect data on yield, natural flowering, plant weights, disorders etc.
- 25/1/24 – Spoke with NQ AP Regional Representative Courtney Thies
    - Discussed actions to date – background reading, literature review, Pineapple Environment Team (PET) group meeting, grower visits etc.
    - Courtney recommended discussing farm operations with her brother Ben Scurr, as she manages more of the scheduling and administrative duties on-farm.
    - Courtney to follow up with NQ growers on trial ideas and gauge grower appetite for complexity of trial designs. What do NQ growers want to focus on in the nutrition space?

February

- 12/2/24 – Spoke with Ben Scurr (Pinata Farms) regarding crop nutrition
    - Cation availability
    - Approach to management
    - Farm specific nutrition
- 12/2/24 – Spoke with Stephen Scurr (Pinata Farms)

- Consensus with stakeholders on collecting production practices and nutrition programs to build a picture of what inputs are being applied on-farm.

March

- 4/3/24 – Phone call with Peter Malone (Pace Farming)
    - Discussed production schedule, crop protection, nutritional inputs, leaf & soil testing etc. etc.
- 5/3/24 – Phone call with Chris Berra (Berra Farming)
    - Discuss the idea of gathering nutrition information. Scheduled time in future to call back.
- 5/3/24 – Phone call with Michael Ottone (Ottone & Sons)
    - Discuss the idea of gathering nutrition information. Scheduled time in future to call back.
- 5/3/24 – Phone call with Ben Scurr (Pinata Farms)
    - Discuss the idea of gathering nutrition information. Scheduled time in future to call back.
- 6/3/24 – Phone call with Tony Accorsini (Accorsini Pty Ltd)
    - Discussed production schedule, crop protection, nutritional inputs, leaf & soil testing etc. etc.
- 6/3/24 – Phone call with Michael Ottone (Ottone & Sons)
    - Discussed production schedule, crop protection, nutritional inputs, leaf & soil testing etc. etc.
- 7/3/24 – AP Project Update Meeting
    - Presented work completed so far on trial concept development
        - Detailed grower survey on nutrition and agronomic practices
            - Conversations with growers
                - Peter Malone – Pace Farming – In progress
                - Tony Accorsini – In progress
                - Michael Ottone – Ottone & Sons - Completed
                - Chris Berra – Berra Farming – Rescheduled
                - Ben Scurr – Pinata Farms – Rescheduled
    - AP Feedback
        - Sam Pike
            - Happy with trial update and feedback that the PI22000 team is doing a great job
- 11/3/24 – Phone call with Peter Malone (Pace Farming)
    - Continued discussion on production schedule, crop protection, nutritional inputs, leaf & soil testing etc. etc.
- 13/3/24 – Phone call with Tony Accorsini (Accorsini Pty Ltd)
    - Continued discussion on production schedule, crop protection, nutritional inputs, leaf & soil testing etc. etc.
- 18/3/24 – Phone call with Ben Scurr (Pinata Farms)
    - Discussed production schedule, crop protection, nutritional inputs, leaf & soil testing etc. etc.
- 27/3/24 – Phone call with Chris Berra (Berra Farming)
    - Discussed production schedule, crop protection, nutritional inputs, leaf & soil testing etc. etc.
- 28/3/24 – AP Trial Progress Update Meeting

- Trial concept development
    - Advised that nutrition program survey has been completed
    - Next step is to compare nutrition programs between farms and with available leaf and soil analyses.

April

- 4/4/24-5/4/24 – NQ Study Group
    - FNQ Food Incubator Hub tour in Cairns
    - Study group held at Pinata Farms
        - Farm walk looking at fumigation trials, calcium spray trials etc.
        - Shed presentations and discussion
            - Update on regional priority trials
                - Advised that nutrition program survey has been completed
                - Next step is to compare nutrition programs between farms and with available leaf and soil analyses.
- 15/4/24 – Meeting with Zane Nicholls (DAF, historical Development Horticulturist)
    - Zane conducted nitrogen use efficiency trials in SEQ 10-15 years ago
    - Controlled release fertiliser was shown to be more efficient, minimising nitrous oxide emissions (Nicholls & Price, 2016)
        - Action On The Ground (AOTG) Project Update - “Fertiliser trials comparing pre-plant and side-dress fertiliser phases for conventional (CV) practice against a 50% four-month controlled release nitrogen (CRN) fertiliser applied at 70% of the CV rate to deliver a cost-per-hectare equivalency between treatments produced encouraging results. On-farm **demonstration trials** indicated a 2.5% increase in yield for CV practice treatments, while the replicated N2O emissions trial realised a 14% reduction in emissions in favour of CRN. A sub-surface fertiliser spreader was developed to improve fertiliser use efficiencies. The project covered 19.3 ha of production area involving 10 individual farm sites.”
    - Discussed engagement and extension

May

- 10/5/24 – Soil and leaf tests received from grower
- 17/5/24 – Discussion on regional priority trials with Garth Sanewski (Principal Horticulturist, DAF)
    - Analysis of nutrition programs, available leaf and soil tests and potential trial topics
        - Garth – Australian production systems have high rates of K when compared to overseas programs. This may be causing cation imbalances, which may exacerbate deficient cations such as calcium, magnesium and zinc etc.
        - Lack of leaf and soil testing across the industry, only one survey respondent had matching leaf and soil tests. Would be good to conduct some baseline testing with those who participated in the nutrition survey, to compare with the nutrition programs we now have data for.

3. Evolution of Trial Concept

- Establish average nutrient program for each NQ pineapple farm
    - Elemental nutrient budget completed in spreadsheet for each farm
        - Comparison of elemental inputs/plant completed
        - Opportunity to introduce growers to this tool to help understand their nutrition program in greater granularity.
        - This data needs to be paired with a standardised leaf and soil testing protocol to make sense of it.
- Soil and leaf testing on-farm
- On-farm nutrition trials covering learnings from nutrition programs, soil tests, and leaf tests

4. Current Knowledge Gaps

- What are the soil and leaf nutrient levels being achieved on NQ pineapple farms?
- Are certain nutrients being applied in excess, or at levels below, crop requirements?
- Will the optimisation of these nutrition programs result in a reduction in natural flowering and/or increases in shelf life through changes to fruit quality/robustness?

5. Research Aims

- The aim of this research is to optimise the nutrition programs on NQ pineapple farms. We will achieve this by gaining a better understanding of their nutrition programs, and then discovering what soil and leaf nutrient levels are being achieved with these current practices. This will provide us with the foundations to formulate a relevant nutrition trial addressing relevant nutrient deficiencies/luxury consumption.

6. Research Questions

- What do NQ hybrid nutrition programs consist of?
- What are the soil and leaf nutrient levels being achieved on NQ pineapple farms?
- Are certain nutrients being applied in excess, or at levels below, crop requirements?
- Will the optimisation of these nutrition programs result in a reduction in natural flowering and/or increases in shelf life through changes to fruit quality/robustness?

7. Research Overview

Project Code: PI22000 - Pineapple Industry Development and Extension Project (DAF)
Crop: Pineapple
Topic: Hybrid Nutrition

Type: Various
Production Region: North Queensland

Hosts: TBC
Farm Address:
Trial Location:

Trial Host Contacts

TBC
Farm Address:
Trial Plot GPS Coordinates:
Farm Block Number:

Primary Contact
TBC
Ph:
Email:

Secondary Contact
TBC
Ph: TBC
Email: TBC

8. Materials & Methods

8.1 Plant Material & Experimental Design

Part 1 – NQ Grower Nutrition Program Survey

Overview – Part 1 - NQ Grower Nutrition Program Survey

Five growers from NQ pineapple farms participated in the survey. Three of these growers are located in Rollingstone, one in Tully, and one in Mareeba. They provided detailed information about the products, rates, intervals, and spray concentrations for an average crop fertiliser application program. Additional information was gathered on their production system, including planting densities, crop protection inputs, irrigation (if applicable), crop rotation, and more. The information has been tabulated in an excel spreadsheet using the provided analysis of inputs provided by the grower or obtained from the manufacturer's website. This has allowed the breakdown of inputs to the elemental level, which is particularly useful when growers are using different products with different concentrations of elements. Elemental inputs/plant have been calculated and compared with the programs of different farms. This information has been collected with the assurance that it will not be shared with other farms without their permission/consent. Feedback will be sought from participants on whether this is something that growers are interested in sharing with each other. Alternatively, it could easily be de-identified if the data has no obvious clues as to the farm it originated from.

Each single farm spreadsheet will be shared with the participating farm. Assistance can be provided if there is interest in understanding how the spreadsheet works, amendments that can be made, changing of products that have a different analysis etc. Cost of inputs has been left out, as this is often dependent on timing and scale of order. However, input costs could quite easily be incorporated into the spreadsheet if desired.

Part 2 – NQ Grower Leaf and Soil Testing Survey

Overview - NQ Grower Leaf and Soil Testing Survey

As mentioned previously, to make a sound decision on where to focus our efforts on hybrid nutrition, we need to understand what sort of soil and leaf nutrient levels are being achieved with the current programs. This part will be conducted in consultation with participating farms and will consist of standardised soil and leaf sampling and deliver information on how to tag and store this data so that it can be used to track changes in soil/plant nutrition over time.

Part 3 – NQ On-Farm Nutrition Trials

Overview - Part 3 – NQ On-Farm Nutrition Trials

Part three will consist of grower hosted on-farm trials that address key issues identified from the outputs of parts one and two. Data collection on natural flowering and fruit quality/robustness to be included to address grower identified priorities.

Genetics, Planting Density & Cycle
Variety: TBC
Planting Density: TBC
Planting date: TBC
Cycle: TBC
Ratoon: TBC

Treatments

Number	Treatment	Replicates	Application Frequency	Application Rate	Comments
1					
2					

Figure 1. Trial plan TBC

Trial Block
Plot size: TBC
Estimated plants/replicate: TBC
Beds/block:
Bed centres:
Boom length:
Planting date:
History:
Soil Type:
Soil pH:
Soil organic matter (%):
Cation exchange capacity (CEC):
Block drainage:
Bed height:

Planting Material
Type:
Curing Time:
Average weight at planting:
Pre-plant treatments:
Phosphorous acid:

Crop Protection

Fumigation:
Crop protection inputs pre-plant:
Crop protection inputs post-plant:

-

Nutrition
Pre-plant fertiliser:
In-crop fertiliser:

Scientific Equipment/Software

Assessments

Pre-Plant

Assessment	Type	Interval	No. sub-samples/sample	Total Samples
Total	N/A	N/A		

In-Crop

Assessment	Treatment	Type	Interval	Sampling Intervals in Plant Crop Cycle	Samples/Interval	Total Samples
Total	N/A	N/A	N/A	N/A		

Post-Harvest

Assessment	Treatment	Type	Interval	Sampling Intervals in Plant Crop Cycle	Samples/Interval	Total Samples
Total	N/A	N/A	N/A	N/A		

Statistical Analysis

Sampling design and analysis developed in consultation with DAF biometrician Ky Matthews.

References

Cano-Reinoso, D. M., Kharisun, K., Soesanto, L., & Wibowo, C. (2022). Effect of calcium and silicon fertilization after flowering on pineapple mineral status and flesh translucency. *Plant Physiology Reports*, *27*(1), 96-108. https://doi.org/10.1007/s40502-022-00651-2

Nicholls, Z., & Price, S. D. (2016). Measuring nitrous oxide emissions from conventional and controlled release fertilisers in south-east Queensland pineapple production. *Acta Horticulturae*, 169-176. https://doi.org/10.17660/ActaHortic.2016.1111.25

Sanewski, G. M., Bartholomew, D. P., & Paull, R. E. (2018). *The pineapple: botany, production and uses*. CAB International.