Te Tai Tokerau Northland Pineapple Industry Opportunities

Prepared by : Kim Brown on behalf of Plant & Food Research NZ June 2024

Contents

Acknowledgements

Firstly, we would like to acknowledge and thank our key sponsor The Horticentre Charitable Trust for the funding to support this work, also a warm thank you to Rhod Mitchell and Steve Hales from the Whangarei Horticentre team, for your continual expertise and experience that you provide to our Northland growers.

We would like to send our heartfelt appreciation to the Schafli whanau for opening their pineapple plantation for the field day and for all the hard work and knowledge that you shared with us.

Thank you to Hugh Rose and the committee members from the Tropical Fruit Growers of New Zealand Inc for your eternal enthusiasm and support for the industry.

A very grateful thank you to the team at Plant and Food Research New Zealand, Declan Graham and the team truly provide the knowledge and connections that will help advance Northland's tropical landscape future.

The continual support from our regional expertise within the Ministry for Primary Industries is greatly needed and appreciated; the regional team is the conduit and circuit breaker that ensures Northland gets the support needed.

Facilitators: Kim Brown, Charlene Sutton

Executive summary

Te Tai Tokerau Northland has a history and an emerging interest in the commercial production of tropical fruits and crops.

The New Zealand grown pineapple has been tested and proven to be sweeter than samples of imported fruit readily available from the chain retail stores, and it scored high on all the independent sensory testing recently completed.

The Queen variety appears to grow well in in field grown conditions that would usually be considered not ideal for the optimum grown of the fruit.

Proof of concept for the pineapple industry has been completed on at least one known plantation in Northland, however more opportunities at different locations could now be a solid possibility with the availability of mature stock plants to kick start the expansion. Ideally any stock plants relocated could be part of a joint research project that ensures growers have the best wrap around support for production and market access.

An opportunity to grow a high value crop on marginal land without significant growing infrastructure and irrigation requirements is of great interest to landowners and administrators.

There may be future investment into added value for additional processing of the fruit at some stage, however it is not a requirement to be able to get the fresh product to the market; existing infrastructure, compliance support and market pathways are available or easily adaptable to accommodate the product.

This report aims to highlight the potential for the future pineapple industry in Northland, along with the challenges identified around costs of the stock plants on offer, other variety options and length of time to full production.

The project undertaken was to establish if there is a community of growers, investors and industry representatives interested in accelerating the New Zealand pineapple industry, in conclusion it is believed that there is a strong community of interest that could be the foundation of the future.

Background

Owen and Linda Schafli from Geneva fruits limited have established the first commercial pineapple plantation in NZ, over the last ten years they have transformed a plot of marginal land into a highly productive fruit growing operation. Owen has a strong background in growing pineapples, having many generations before him producing commercial crops in South Africa.

Currently the business is at a point of transition; although the Schafli family are self-supportive from their own plantation, they have a strong desire to see the establishment of the crop in other areas of Northland and eventually at scale.

The plantation mainly grows the Queen variety, a sweet fruit that deep golden yellow with an edible core unlike the Cayenne variety which is the common type that is currently imported into New Zealand.

New Zealand imports over 9000 tonnes of fresh pineapple each year,

it is the fourth largest commodity behind citrus, grapes, and bananas (Fresh Facts 2023).

This project aims to work towards providing the local market, including the food service industry, a superior quality product. Supply of the Geneva product has not been able to keep up with the consumer demand; although production has increased the demand for the fruit has significantly increased year on year.

Pineapple growing proof of concept has been developed over the last 10 years. The existing plantation has over 40,000 plants on approx. 1.2 ha, additionally advanced stock plants have been propagated ready for field trials and or immediate expansion of the business.

Three options for expansion have been identified so far, all options could be done concurrently; the following ideas present a starting point:

- Research that includes regional climate and soil mapping and site-specific mapping for suitable locations, small field trials at various locations in northland including covered cropping to determine the potential and opportunity for prospective investors and growers along with growers guides for NZ conditions. A best varietal study and investigation into any new potential varieties could be included in this work.

*Note that some contribution from growers will likely be required for the stock plants, around 500-1000 plants would be optimal also in-kind contribution by way of land use, land prep, inputs, and labour.

- A hybrid model that incorporates new growers investing in the purchase of stock plants, with the addition of research, agronomist expertise, compliance, and business development, then do the modelling, analysis, investment prospectives, industry group model, pathways to market. Development of high health clone stock plants could be included to ensure constancy and volumes.
- A model that does not have any research included and is based on a multiplying as you grow over time concept, much like the kumara industry. This model would require a grower to purchase advanced stock plants for example 10,000 plants to cover .25 of a hectare. Over time as more growers come on board, a structure could be formed to work together to set aside funds for research, marketing, and business development.

**Note that no funding has yet been approved for either option at this stage.

Field day and workshop

The first ever hui for potential pineapple growers, buyers and the service industry was held at Geneva Fruits Limited on May 17, 2024 (invite and agenda Attachment 1). A total of 38 people attended, and four apologies were received due to illness, and ability to attend due to the road closures and delays to the Brynderwyn Hills. For some it was the first-time seeing pineapple fruiting in New Zealand at the scale Geneva fruits have achieved.

Talking points / desk top research was provided as pre reading prior to the workshop (Attachment 2)

Workshop presentations

Plant and food Research NZ (PFR) provided a brief history of the historical crops that were looked at for the Northland climate back in the 1980's, additionally discussion was shared regarding the more recent peanut trials and the potential for other tropical fruits as a part of an ongoing emerging interest. PFR undertook a brix test on the Geneva queen pineapples and compared them to a readily available supermarket fruit. The results showed that the Geneva pineapple scored higher sugar readings against the other brands. An independent sensory test was also completed by a panel of tasters, again the Geneva fruit scored higher on all points (Report Attachment 3)

The Ministry for Primary Industries, Agriculture and Investment services (MPI AIS) provided an update of the funding opportunities for research funding through the Sustainable Food and Fibre Futures (SFF Futures), and the Māori Agribusiness Pathway to Increased Productivity (MAPIP) programme. Support in principle has been discussed with the wider MPI AIS team to receive an application to fund a research project for pineapple growing trials.

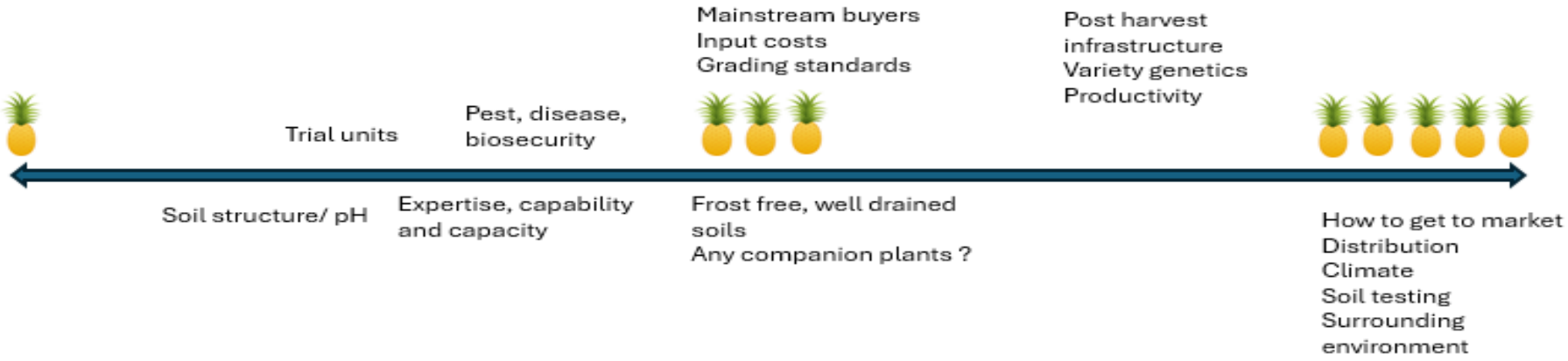
Tropical Fruits New Zealand Inc gave an enthusiastic endorsement of the work that Geneva fruits have already achieved and the other opportunities to diversify traditional farm systems with the addition of topical crops.


Workshop group sessions

Guests broke out into industry clusters including growers, buyers, and consumers and service industry representatives.

Growers' questions

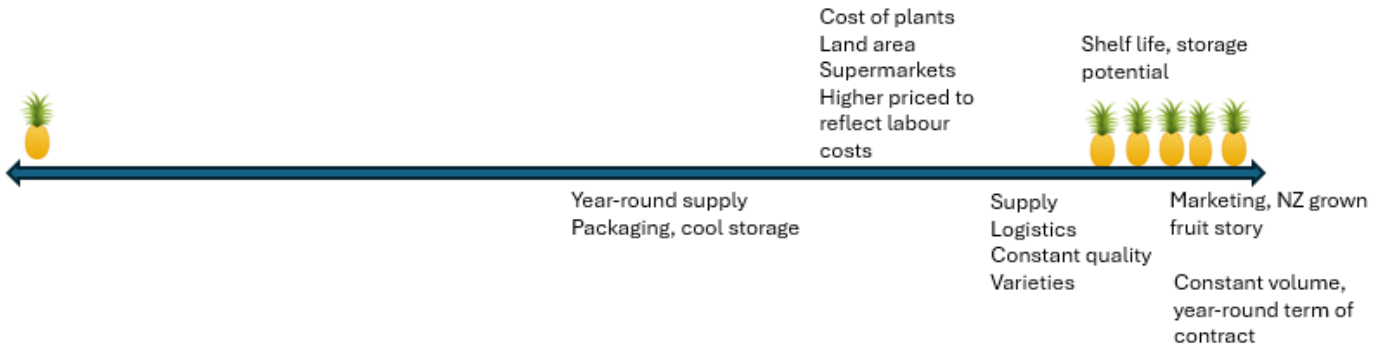
What do you need to know to start growing pineapples?



How interest are you in becoming a pineapple grower?

Buyers' questions

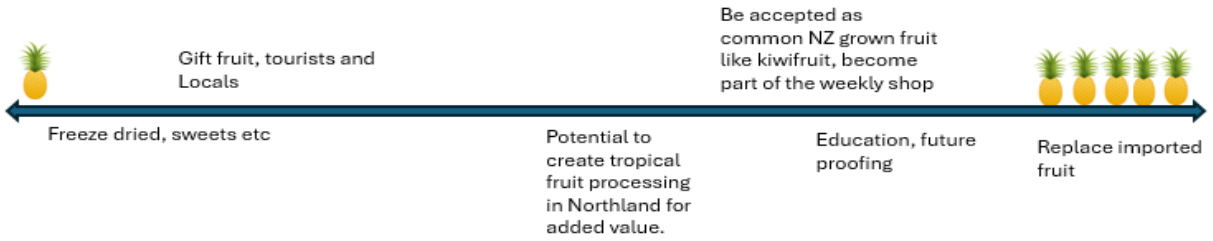
What information do you require to consider contract negotiations with pineapple growers?



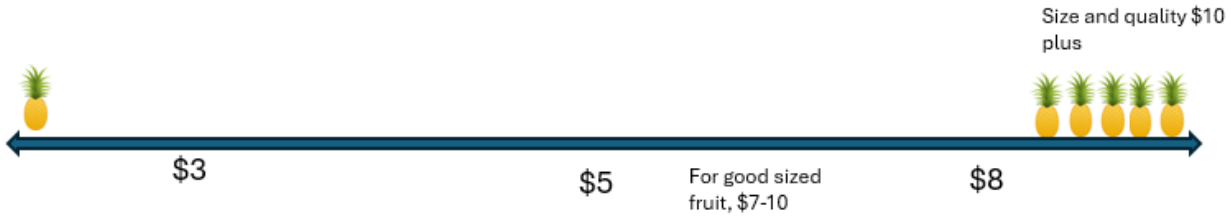
Where do you see the NZ grown pineapples in the market?

Consumers and Food service

What will the NZ grown pineapples be used for?



In terms of price and value, where do you think the retail price for fresh produce would sit at?



The feedback during the workshop was very positive from all industry representatives, several new connections were made between each group which may be of benefit should the motivation for a working group to be ignited in the future.

Post workshop comments were also positive:

"I thoroughly enjoyed the morning walking amongst the pineapples and absorbing (writing up my own notes) Owens knowledge about growing, propagating and the potential returns/interest in the Queen pineapple variety". (Iwi Trust leader and representative)

The opportunity for Te Tai Tokerau Northland

Emerging tropical fruit markets have been increasing in recent years as new reliable cultivars are now available to growers.

Proof of concept has been done, however there is only one known commercial fruit producing planation in Northland, therefore it is not conclusive that the crop will be a success elsewhere.

Northland is projected to be warmer (up to 1.1˚C by 2040 and 3.1˚C by 2090) with fewer frosts and more droughts in some parts. By 2090, Northland is projected to have 13 to 75 extra days per year where temperatures exceed 25˚C. This presents many opportunities for growing new subtropical plants with greater success and as an alternative to crops that will no longer do as well as the climate adjusts.https://www.nrc.govt.nz/media/i3qnkklo/northland-region-climate-change-projections-and-implications-summary-report_niwa.pdf

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For the 2023 -2024 year we consumed 9,254.82 tonnes of fresh pineapple with a VFD of $12.27 million.

(Value for Duty, value of imports before the addition of insurance and freight costs).https://unitedfresh.co.nz/assets/site/images/images/Fresh-Facts-%E2%80%93-December-2023.pdf

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Currently we do not have any robust field data that can determine an accurate average yield, this is largely because Geneva fruits have been growing their stock plants year on year rather than focussing on core fruit production, however If we make a conservative assumption that we can produce 20 tonne per hectare (10 tonne less than Queensland due to our climate and the size and weight of the Queen variety) then:

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450 Hectares could be utilised to produce current consumption of around 9000 tonnes of fruit.

An advantage of the pineapple opportunity is that there is some stock plant material that can be made available to interested growers who wish to invest in early diversification. This option has the advantages of being first and all the benefits of exclusivity could be capitalized on, however this also comes with the greatest risk and a substantial initial investment for the stock plants (approximately $400,000 for 10,000 plants to cover .25 of a hectare.

The preference for the Geneva Fruits limited is to release 10,000 stock plants in one transaction, along with limiting future supply of stock plants to maintain a high value scarce market for the domestic fresh produce market.

It is noted that Geneva Fruits does not intend to be the leader of any new grower's co-operative or industry group that may be stood up if interest is elevated.

Conclusions / Recommendations

- There is a community of interest willing to ignite the pineapple industry in New Zealand; the responses and feedback from growers, wholesalers and consumers has been highly positive and supportive.
- The industry has potential to accommodate both the boutique, high value fruit as well as locally grown quality commodity fruit for high volumes, potentially year-round supply.

- The Queen variety is best suited to the boutique fruit as its flavour and sweetness is its advantage over the smooth cayenne varietals. Also, the Queen variety is known to be more adaptable to cooler field grown climates.
- The Queen variety is likely to be the most successful for field grown crops in our climate without the need for crop cover infrastructure and irrigation, this provides an interesting prospect for marginal lands with lower land use classes to be utilised for high value horticulture.
- The crop does not require costly infrastructure for added value processing, nor any high-level compliance which is required for export crops.
- It is recommended that a cost benefit / return on investment is completed by an agribusiness professional and pair reviewed by industry leaders for endorsement of accuracy. Although it would be based on some anecdotal information from Geneva fruits, a conservative approach towards returns should be observed.
- There are other known varietals in NZ such as the MD2 Hybrid which was developed from a research programme offshore some time ago. Potentially this variety may be the start of research and trials in NZ both field grown and under cover. Other varietals may be more suited to the commodity market if it can reach suitable production volumes in our conditions.
- It is recommended that a varietal search is undertaken with in New Zealand along with DNA mapping to check any issues with offshore plant variety rights and to identify traits that may be important to our New Zealand growing conditions. Through the field day project, growers have already come forward with information that may point to a range of varietals in addition to the above mentioned that could be used for testing and subsequent micro propagation.
- Opportunity for tissue culture propagation and high health nursery growing on could be undertaken with minor changes to current infrastructure and expertise in our commercial nursery industry in Northland. Additionally tissue culture infrastructure and expertise for pineapple production is currently already available in New Zealand.
- Should a cluster of interested growers commit to trialling pineapple, a future grower's group could be set up and funding applications applied for through the MPI available funds to support research including agronomy support and project management. Note that Government funding

rarely invests more than 40 % of an entire project, therefore growers would need to pay for the stock plants and provide land and other inputs for the trial.

- Support from other industry leaders such as fruit wholesalers and independent retail chains would be essential to be able to demonstrate the market. This could be financial contribution or other support in principle via written correspondence.

Thank you to our sponsors:

Horticentre Charitable Trust

TROPICAL FRUIT GROWERS OF NEW ZEALAND INC

Plant & Food Research
Rangahau Ahumāra Kai

Your Invited..

Pineapples Northland Field Day

Friday May 17th 2024 10am-2:30pm

Geneva Fruits Plantation

100 Lamb Road Rd
Parua Bay
Whangarei

On Behalf of Plant & Food Research, MPI, and the Horticentre Charitable Trust we would like to invite you to our Pineapple field day, with our hosts Linda and Owen Schafli from Geneva Fruits

Join us at NZ's first commercial pineapple plantation and help us shape the future of this new exciting crop for Northland

Please confirm attendance before May 14th via return email to:

Kimhardy2017@outlook.com

Thank you to our sponsors :

Horticentre Charitable Trust

TROPICAL FRUIT GROWERS OF NEW ZEALAND INC

Plant & Food Research
Rangahau Ahumāra Kai

Ministry for Primary Industries
Manatū Ahu Matua

Te Tai Tokerau Northland Pineapples Field Day Programme May 17 2024 :

9:30 - 10 :00	Assemble and register at Geneva Fruits Plantation, 100 Lamb Road Parua Bay
10:00 - 11:30	Tour of the plantation with hosts Owen and Linda Schafli
12:00 -12:30	Lunch at the Tamaterau Hall, 650 Whangarei Heads Road
12:30 - 12:45	Open meeting , and introductions
12:45 - 1:30	Declan Graham -Plant & Food, Māori Agribusiness , Hugh Rose -TRGNZ, Lynwood Nursery.
13:30– 2:00	Group exercise , break into clusters
2:00– 2:30	Pineapple Chase , open question time
2:40	Close meeting

Thank you to our sponsors :

Horticentre Charitable Trust

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Rangahau Ahumāra Kai

TROPICAL FRUIT GROWERS OF NEW ZEALAND INC

Te Tai Tokerau-Northland Pineapple Talking Points.

Introduction

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Currently the business is at a point of transition; although the Schafli family are self-supportive from their own plantation, they have a strong desire to see the establishment of the crop in other areas of Northland and eventually at scale.

The plantation mainly grows the Queen variety, a sweet fruit that deep golden yellow with an edible core unlike the Cayenne variety which is the common type that is currently imported into New Zealand. New Zealand imports over 9000 tonnes of fresh pineapple each year, it is the fourth largest commodity behind citrus, grapes, and bananas (Fresh Facts 2023). This project aims to work towards providing the local market, including the food service industry, with locally grown produce.

Supply of the Geneva pineapples has not been able to keep up with the consumer demand; although production has increased the demand for the fruit has significantly increased year on year.

The Cultivar Queen Victoria, (Queen or Rough variety)

The scientific name for pineapple is Ananas Cosmosus, a member of the Bromeliaceae family. The family contains more than 2,100 species placed in 46 genera, but the most economically important species is the pineapple.

There are four major varieties of pineapples:

- Smooth Cayenne
- Queen Victoria
- Red Spanish
- Pernambuco

They are primarily grown in Hawaii, Brazil, Costa Rica, Honduras, Mexico, Dominican Republic, El Salvador, Ecuador, Nicaragua, Australia, Malaysia, China, Indonesia, Thailand, and South Africa.

Queen pineapple

The Queen Pineapple is very popular, sweeter, and more palatable to be eaten fresh. The Queen Pineapple has thorny leaves and is generally smaller in size than the cayenne. The Queen is grown primarily for the local and overseas fresh fruit markets.

Cayenne pineapple

The Cayenne pineapple is usually processed and used for juice and canning. The Cayenne pineapple has smooth leaves and can reach up to 6kg.

https://www.pineapples.co.za/

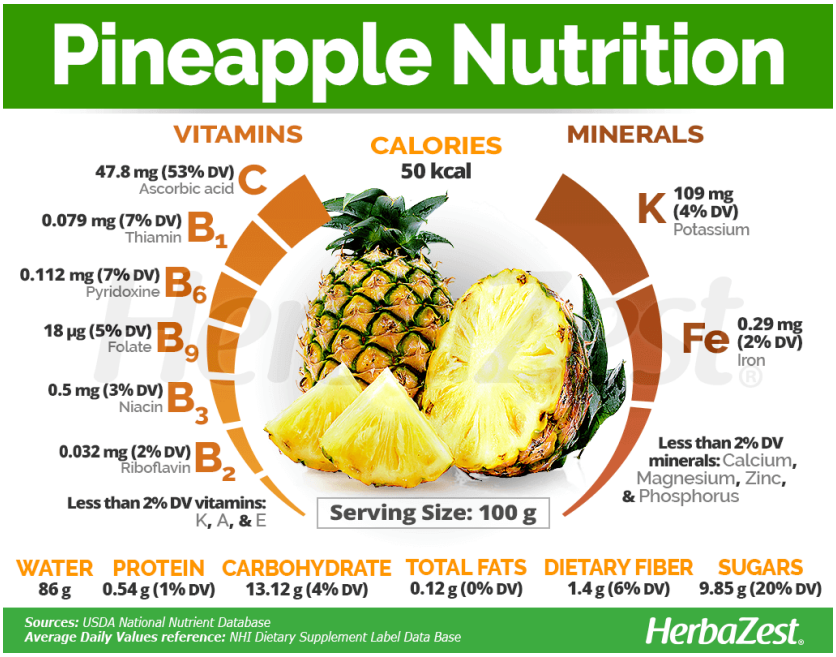
Health benefits

Raw pineapple is an excellent source of manganese (45% DV in a 100 g serving) and vitamin C (80% DV per 100 g).

Mainly from its stem, pineapple contains a proteolytic enzyme, bromelain, which breaks down protein. If having sufficient bromelain content, pineapple juice can thus be used as a marinade and tenderizer for meat. Pineapple enzymes can interfere with the preparation of some foods, such as jelly or other gelatine-based desserts, but would be destroyed during cooking and the canning process. The quantity of bromelain in the fruit is probably not significant, being mostly in the inedible stalk. Furthermore, an ingested enzyme like bromelain is unlikely to survive intact the proteolytic processes of digestion.

https://www.evergreenspta.co.za/Pineapples/375-queen-pineapple.html

Examples of nutritional claims:



Nutritional value per 100 g (3.5 oz)	
Energy	202 kJ (48 kcal)
Carbohydrates	12.63 g
- Sugars	9.26 g
- Dietary fiber	1.4 g
Fat	0.12 g
Protein	0.54 g
Thiamine (Vit. B_1)	0.079 mg (7%)
Riboflavin (Vit. B_2)	0.031 mg (3%)
Niacin (Vit. B_3)	0.489 mg (3%)
Pantothenic acid (B_5)	0.205 mg (4%)
Vitamin B_6	0.110 mg (8%)
Folate (Vit. B_9)	15 ?g (4%)
Vitamin C	36.2 mg (44%)
Calcium	13 mg (1%)
Iron	0.28 mg (2%)
Magnesium	12 mg (3%)
Manganese	0.9 mg (43%)
Phosphorus	8 mg (1%)
Potassium	115 mg (2%)
Zinc	0.10 mg (1%)

Example of health product:

Bromelain Forte contains 500mg of bromelain, a proteolytic enzyme derived from the fruit and stem of pineapple that assists the digestion of protein.

Bromelain supports healthy digestion and can be absorbed without degradation or losing its biological activity.

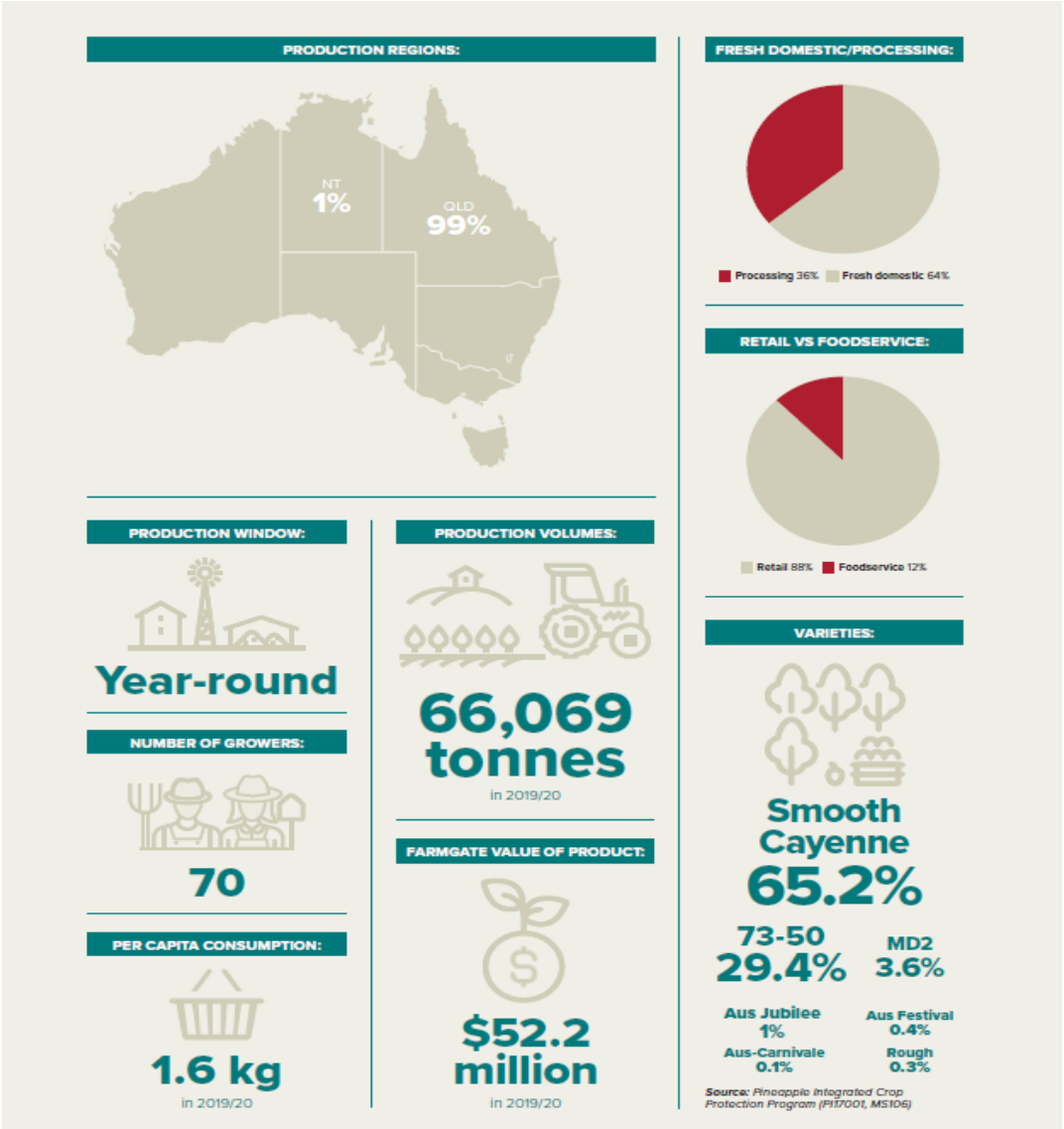
Bromelain is anti-inflammatory and assists in the healing of minor body tissue injuries.

Bromelain Forte reduces symptoms of soft tissue trauma including mild tissue oedema and pain.

Case study Queensland

There are approximately 75 commercial pineapple enterprises, with all but one based in Queensland. Key growing districts are in Wamuran, Elimba, Glasshouse Mountains, Beerwah, Yandina, Maryborough, Hervey Bay, Childers, Bundaberg, Cawarral, Yeppoon, Rollingstone, Mutarnee, Bilyana and Mareeba, with one commercial farm located just outside Darwin in the Northern Territory.

Australia produces less than one per cent of the world's fresh pineapple but supplies almost the entire domestic market. Four primary packing houses pack and market more than 70 per cent of fresh pineapples. There are approximately 35 million pineapples produced each year. Currently around 2000ha of pineapples are grown in Australia, the production is currently 66,069 tonnes so that is an average of 33 tonnes per hectare. A levy group and fund sit under the Hort Innovation umbrella, the "Pineapple Fund" https://australianpineapples.com.au/.



Note that the Queen variety (Rough) is now just 0.3% of total production, likely due to new hybrids that have developed over the years that have a focus on ease of harvesting and larger fruit.

https://www.horticulture.com.au/globalassets/hort-innovation/levy-fund-financial-and-management-documents/sip-2022-2026-pdfs/hort-innovation-sip-2022-26-pineapple.pdf

Growers' advice Queensland

Average climatic conditions example:

YANDINA	WAMURAN	GLASSHOUSE MOUNTAINS
High Temp: 24 °C Low Temp: 14 °C Mean Temp: 19 °C Humidity: 73% Annual rainfall 1508mm	High Temp: 24 °C Low Temp: 13 °C Mean Temp: 18 °C Humidity: 74% Annual rainfall 991.5 mm	High Temp: 24 °C Low Temp: 13 °C Mean Temp: 18 °C Humidity: 74% Annual rainfall 991.5 mm

Temperature is the most important climatic factor affecting productivity. The optimum air temperature is 32°C during the day and 20°C at night. During periods of intense sunlight and high temperature (above about 35°C), fruit is susceptible to sunburn damage. A frost-free site is essential.
For non-irrigated crops, rainfall should be well distributed throughout the year and more than 750mm per year. The best soils for pineapple production are non-compacted, well-aerated and free-draining loams, sandy loams and clay loams with no heavy clay or rock within 1m of the surface. Good drainage is essential because poor drainage leads to a weak root system, which makes the plant more susceptible to root and heart rot diseases. A soil pH in the range of 4.5–5.6 is optimal for pineapple production.

Pineapples are a multiple fruit, which means they grow from a cluster of up to 150 fertilised flowers that join together. Pineapples take up to two years to be ready for harvesting. After a pineapple has been cut from its parent plant another fruit will start to develop called the ratoon crop. Once this ratoon crop is harvested the plants are usually mulched into the ground and the tops from previously harvested fruit (or slips that form within the original plants) are planted to begin the cycle again (https://australianpineapples.com.au/growing/).

Good planting practices: https://www.youtube.com/watch?v=9peko6-FGGs

Nutrient monitoring and growth development for flower forcing spray practices are carried out using leaf sampling. Note that Geneva fruits allows natural flowering, the use of plant growth regulators is common practice on most commercial plantations to create efficiencies in labour costs for harvesting.

Nutrient monitoring: https://www.youtube.com/watch?v=Yv77R9tiZtM

Handling pineapples correctly is important to reduce the risk of bruising.
Pineapples do not ripen after being harvested (non-climacteric fruit). All a pineapple's sugar comes from the starches in the stem of the plant. Once that source is cut off, the pineapple cannot make more sugar on its own.
Pineapples are harvested at a shell colour maturity that reflects the season and sugar/acid level.

Handling pineapples correctly: https://www.youtube.com/watch?v=8A-CkK7riEo

https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/crops/fruit-veg/pineapple
There is several "how to videos" for growers on this site that will give you an idea of the practices used in an established larger scale industry.

Pests and diseases of pineapple found in Australia.

https://www.horticulture.com.au/globalassets/hort-innovation/current-sarps/pineapple-sarp-2019.pdf

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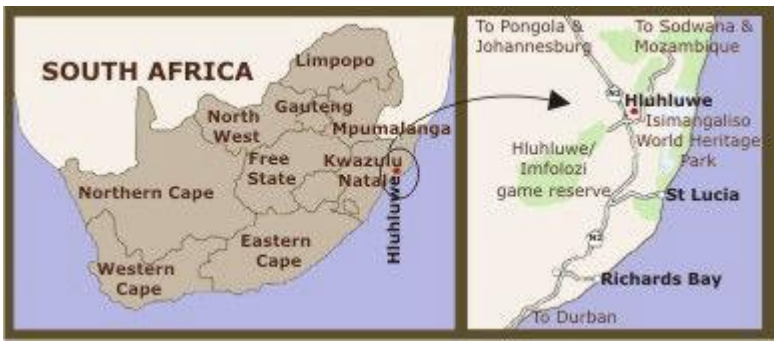
Sustainability projects recently completed for the industry; the Australian team visited the Geneva plantation as part of the study tour.

Pineapple integrated crop protection:

https://www.horticulture.com.au/contentassets/f69803c5ce544baa932bedcae9b0ca35/final-report--pi17001.pdf

Case study South Africa

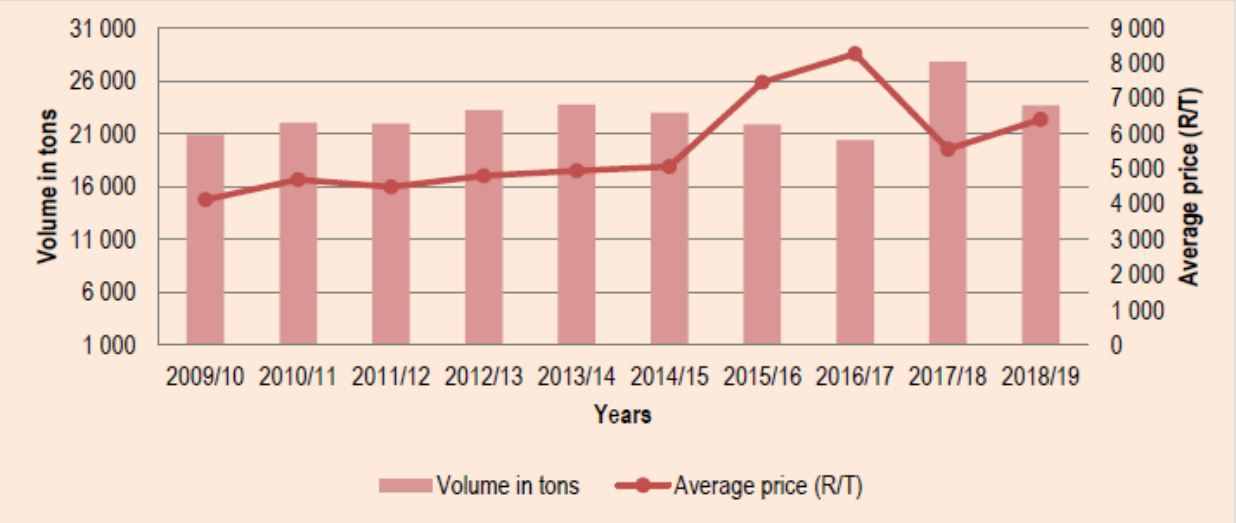
Hluhluwe Queen Pineapples



The Hluhluwe Queen Pineapple Marketing Association was established on 11 November 1988 to promote pineapples. The Hluhluwe region of Northern KwaZulu Natal produces most of the fresh Queen pineapples available, on the South African market.

The Hluhluwe Queen Pineapple Marketing Association was established on 11 November 1988 to promote pineapples. Pineapple farmers pay a levy on their production hectares to become a member of the association. The association currently has 11 pineapple producing farms.
The association's main goals are:
- To market and promote queen pineapples produced by its members,
- To act as mouthpiece for the members and represent them as far as promoting queen pineapples produced in the Hluhluwe area, and
- To utilize funds collected for pineapple research.

Figure 4: Local pineapples sales, 2009/10 – 2018/19



Source: Statistics and Economic Analysis, DAFF

8000 R/T = $720NZD/ Tonne.

Figure 3: Pineapple crop distribution, 2009/10 – 2018/19

Source: Statistics and Economic Analysis, DAFF

Growers' advice South Africa

The tropical plant prefers warm, humid, and frost-free climates and grows well in sandy, slightly acidic soil. Pineapples are harvested twice every five years. The first harvest is at 26 to 30 months and the second harvest is 18 months later. The planting of pineapples is staggered to ensure the pineapples can be harvested daily for most of the year. Harvesting pineapples in South Africa starts in March and continues until mid-December.

WEATHER BY MONTH // WEATHER AVERAGES HLUHLUWE

< >

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	24.8 °C (76.6) °F	25 °C (77) °F	24.4 °C (76) °F	22.6 °C (72.7) °F	20.9 °C (69.7) °F	19.3 °C (66.7) °F	18.7 °C (65.7) °F	19.6 °C (67.3) °F	20.7 °C (69.2) °F	21.3 °C (70.3) °F	22.5 °C (72.6) °F	24.1 °C (75.3) °F
Min. Temperature °C (°F)	22.2 °C (71.9) °F	22.4 °C (72.2) °F	21.7 °C (71.1) °F	19.8 °C (67.7) °F	17.8 °C (64.1) °F	15.8 °C (60.4) °F	15.3 °C (59.5) °F	16.2 °C (61.1) °F	17.2 °C (63) °F	18.3 °C (64.9) °F	19.7 °C (67.4) °F	21.3 °C (70.3) °F
Max. Temperature °C (°F)	27.9 °C (82.2) °F	28.1 °C (82.6) °F	27.6 °C (81.8) °F	25.9 °C (78.6) °F	24.8 °C (76.6) °F	23.4 °C (74) °F	22.8 °C (73) °F	23.8 °C (74.9) °F	24.7 °C (76.5) °F	24.9 °C (76.8) °F	25.9 °C (78.6) °F	27.4 °C (81.3) °F
Precipitation / Rainfall mm (in)	110 (4)	95 (3)	103 (4)	63 (2)	41 (1)	25 (0)	30 (1)	33 (1)	47 (1)	86 (3)	100 (3)	104 (4)
Humidity(%)	75%	75%	76%	73%	70%	65%	66%	66%	68%	72%	74%	74%
Rainy days (d)	10	9	10	7	4	4	4	5	5	8	9	9
avg. Sun hours (hours)	7.2	7.5	7.7	7.4	8.0	7.9	7.8	7.8	7.2	6.5	6.5	7.1

Data: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: avg. Sun hours

Varietals

Ninety percent of the fresh pineapples sold in South Africa are the Queen variety.

The Smooth Cayenne is used for both canning (75% of which is exported) and as fresh fruit and because production of the Queen is relatively more costly, fresh consumption is shifting towards the Smooth Cayenne. The new MD2 variety is planted in small quantities in both regions and is aimed at fresh fruit markets as well as ready to
eat products for export.
The Cayenne plant is the larger of the two varieties and the leaves are smooth, while the leaves of the Queen have thorns. The Cayenne fruit can reach a mass of 4kg, is very juicy and has a softer tissue with a pale-yellow colour. The Queen fruit is smaller (up to 1.5kg) but has a crisp and bright yellow flesh and is less acid than Cayenne. The MD2 has a cylindrical fruit with an attractive yellow skin, the flesh is firm, and it has a higher sugar and Vitamin C content than the Cayenne variety.

Research

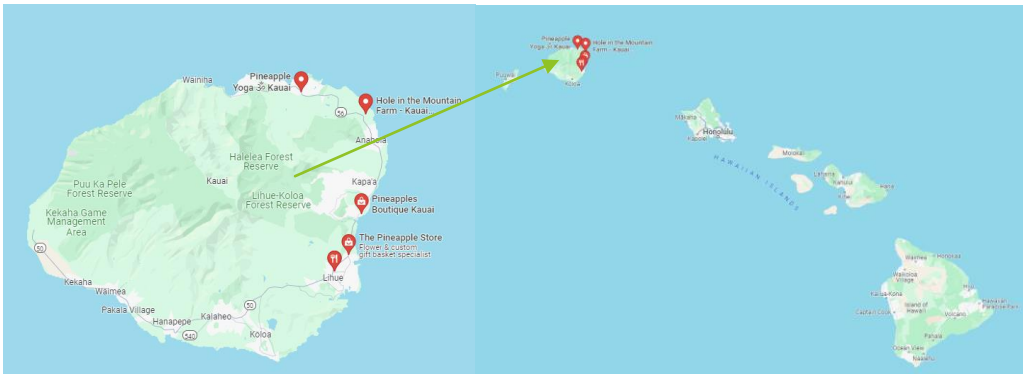
Pineapple research in the Zululand area is as old as the industry. The first pineapple research station was established in 1929. Numerous requests by the Growers Association to the Department of Agricultural Technical Services for a permanent research site, lead to the allocation of 252 ha of state land in 1987. This is up till today the site of the present research station, which is a satellite station of the Institute for Tropical and Subtropical Crops (ITSC) at Nelspruit; the ITSC being an institute of the Agricultural Research Council. The official opening of the present research station was in 1988. The following main topics have been investigated: nutrition planting, nematode control, phenological disorders, growth regulators, post-harvest.

A profile of the South African pineapple market value chain 2020

http://webapps1.daff.gov.za/AmisAdmin/upload/Pineapple%20Market%20Value%20Chain%20Profile%202020.pdf

Case study Hawaii

Kauai Sugarloaf™ Pineapple



Three farmers on Kauai grow a white variety known as Kauai Sugarloaf White Pineapple. It's known for its delicate flavour, that is very low in acid. The plant parentage is from the Kona pineapple variety. The plantations over the three farms are grown with a mixture of other tropical fruits to make up coverage of around 17 hectares. The largest farm (Hole in the Mountain Farm) grows around 250,000 pineapple plants on 6 hectares of land.

The fruits are sold locally at markets and income is increased from farm tours, capitalising on the tourists to the island.

They claim to be "The world's tastiest pineapple" and the price per fruit ranges from $10-$25 USD each. They ship to the US using the freight company that ships cut flowers from Hawaii to the US.

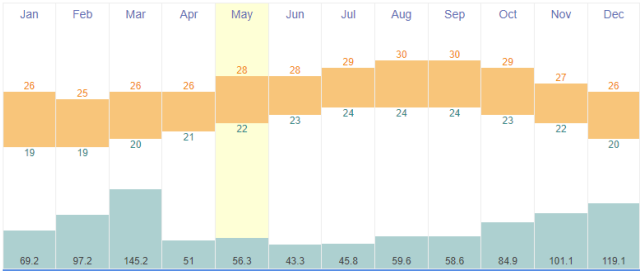
https://kauaisugarloaf.com/about-us/

Growers' advice Kauai

Annual Weather Averages Near Kaua'i

Averages are for Lihue Lihue Airport, which is 21 kilometers from Kaua'i.

Based on weather reports collected during 1992–2021.



Quick Climate Info

Hottest Month	August (27 °C avg)
Coldest Month	February (22 °C avg)
Wettest Month	March (145.2 mm avg)
Windiest Month	July (43 km/h avg)
Annual precip.	931.5 mm (per year)

The volcanic soils on the island are young, they are not nutrient rich like typical volcanic soils, the temperate is key optimal range is between 17 – 30 degrees Celsius, higher temperatures reduce the sugar production within the fruit. Average humidity on the Island is 74 %

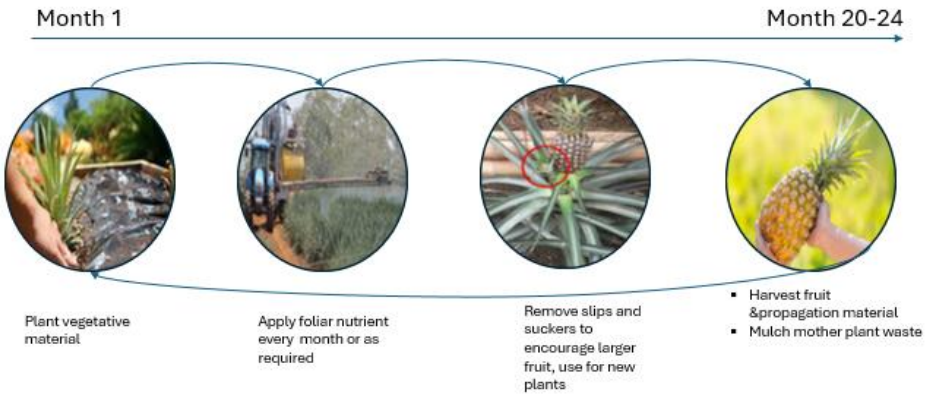
Irrigation is used to keep the plant soil at a constant moisture level to help mitigate issues such as heavy short bursts of rain in the weeks leading up to harvest as this causes fruit split.

Drainage is essential, plants can be grown on slopes or on raised contour beds. Plastic mulch is used for the new plants. (Note there are now biodegradable ones available in NZ).

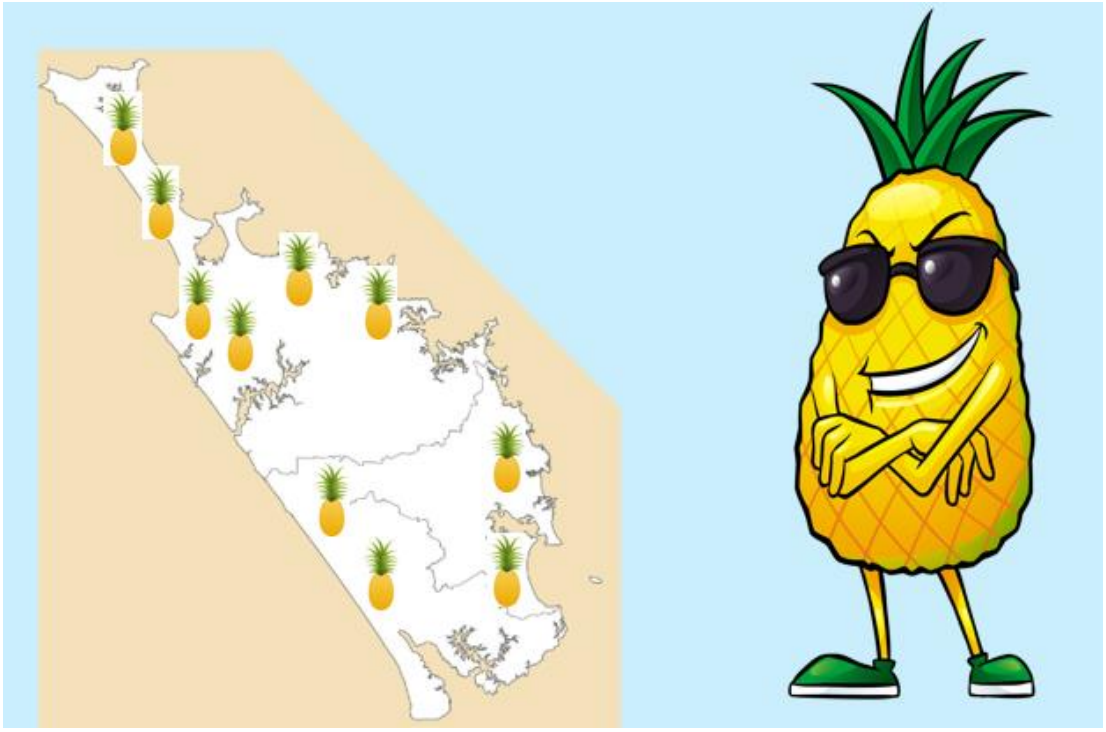
The pineapple plant will expand continually by growing new shoots or slips from the base of the stem these will produce a new fruit in each of the shoots, this is known as the ratoon crop. At Kauai farms they remove the shoots and slips off the main plant as it grows so that the energy goes into the main fruit, once it has fruited any remaining shoots and slips are recycled for the next planting rotation and the old plant is mulched into the soil.
They do keep an area of old plants that allow the ratoons to keep expanding, they harvest some fruit off these, but they are mainly kept for the propagation material as stock plants.

Learn about the Kauai sugarloaf Pineapple Part one
https://www.youtube.com/watch?v=Jcda4g6qCq4
Learn about the Kauai sugarloaf Pineapple Part two
https://www.youtube.com/watch?v=On-gmUw-fWM
Learn about the Kauai sugarloaf Pineapple Part three
https://www.youtube.com/watch?v=MhPvKTP9wZg

Planting cycle



The opportunity for Aotearoa NZ



Northland is projected to be warmer (up to 1.1℃ by 2040 and 3.1℃ by 2090) with fewer frosts and more droughts in some parts. By 2090, Northland is projected to have 13 to 75 extra days per year where temperatures exceed 25℃. This presents many opportunities for growing new subtropical plants with greater success and as an alternative to crops that will no longer do as well as the climate adjusts.https://www.nrc.govt.nz/media/i3qnkklo/northland-region-climate-change-projections-and-implications-summary-report_niwa.pdf

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For the 2023 -2024 year we consumed 9,254.82 tonnes of fresh pineapple with a VFD of $12.27 million.

(Value for Duty, value of imports before the addition of insurance and freight costs).https://unitedfresh.co.nz/assets/site/images/images/Fresh-Facts-%E2%80%93-December-2023.pdf

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Currently we do not have any robust field data that can determine an accurate average yield, this is largely because Geneva fruits have been growing their stock plants year on year rather than focussing on core fruit production.

If we make a conservative assumption that we can produce 20 tonne per hectare (10 tonne less than Queensland due to our climate and the size and weight of the Queen variety) then:

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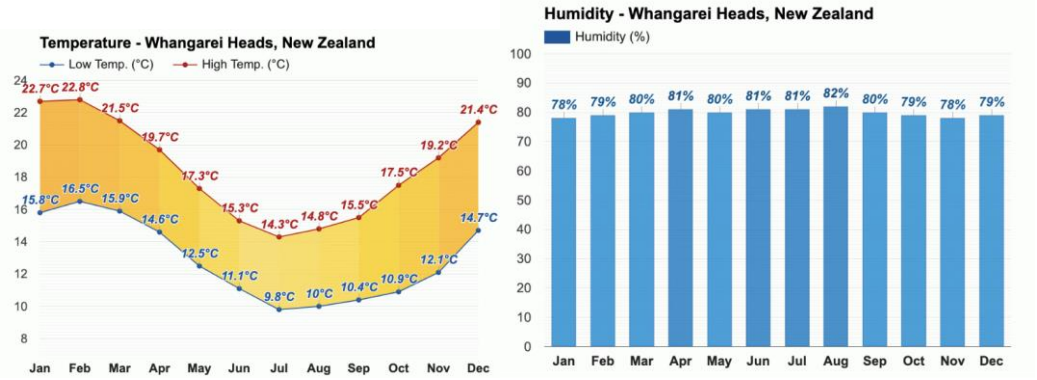
450 Hectares could be utilised to produce current consumption of around 9000 tonnes of fruit.

Growers' advice Aotearoa NZ

The numbers are based on what we do know so far, however the future scope could provide many increases in yields and returns through trials with covered crops, alternative varietals that are present in NZ such as the Smooth Cayenne and the hybrid MD2 known as several other trade names such as "Super Sweet" and Golden Ripe.

There may be new NZ varieties that, if proven to be stable and successful they may have the potential to be grown commercially by a local Northland specialist nursery and made available to growers at scale.



Average rainfall 1300mm (https://webstatic.niwa.co.nz/static/Northland%20ClimateWEB.pdf)

Geneva Fruits plantation is located approximately 7km from this weather data station, also as in many parts of Northland, unique micro-climates may have varied results. The fruit is growing on this site in less-than-optimal temperatures; however, the average humidity is higher than plantations in other countries.

There will be opportunities aimed at increasing the current consumption through marketing and advertising, NZ grown fruit by locals for locals is a story that sells.

The added value products for the food and beverage industry presents another opening to include home grown pineapples in the industries that are already established around NZ, there are plenty of uses for second graded fruit such as:

Current state of research and growth options

Pineapple growing proof of concept has been developed over the last 10 years.
An existing plantation has over 40,000 plants on approx. 1.2 ha, additionally advanced stock plants have been propagated ready for field trials and or immediate expansion of the industry.

Three options for expansion have been identified so far, all options could be done concurrently; the following ideas present a starting point:

1. Research that includes regional climate and soil mapping and site-specific mapping for suitable locations, small field trials at various locations in northland including covered cropping to determine the potential and opportunity for prospective investors and growers along with growers guides for NZ conditions. A best varietal study and investigation into any new potential varieties could be included in this work.

   **Note that some contribution from growers will likely be required for the stock plants, around 500-1000 plants would be optimal also in-kind contribution by way of land use, land prep, inputs, and labour.*

2. A hybrid model that incorporates new growers investing in the purchase of stock plants, with the addition of research, agronomist expertise, compliance, and business development, then do the modelling, analysis, investment prospectives, industry group model, pathways to market. Development of high health clone stock plants could be included to ensure constancy and volumes.

3. A model that does not have any research included and is based on a multiplying as you grow over time concept, much like the kumara industry. This model would require a grower to purchase advanced stock plants for example 10,000 plants to cover .25 of a hectare. Over time as more growers come on board, a structure could be formed to work together to set aside funds for research, marketing, and business development.

   ***Note that no funding has yet been approved for either option at this stage.*

Thanks again to our sponsors for the field day:

Horticentre Charitable Trust

TROPICAL FRUIT GROWERS OF NEW ZEALAND INC

Plant & Food Research
Rangahau Ahumāra Kai

PFR SPTS No. 25530

Eating quality of 2024 New Zealand-grown pineapples: basic postharvest and sensory assessments by Plant & Food Research staff

Ha B, White A, Coetzee P, Pidakala P, Ortiz G

May 2024

1 Introduction

Plant & Food Research is currently exploring the opportunity of developing a Sustainable Food and Fibre Futures (SFFF) project for growing pineapples in Northland (New Zealand). After an initial engagement with a Northland pineapple grower, PFR Business Manager Declan Graham supplied two New Zealand-grown pineapples of the 'Queen' cultivar to staff from the Postharvest Science team in Mt Albert to have them analysed for basic eating-quality measures and sensory evaluation. They were assessed alongside a commercially sourced overseas-grown pineapple of the 'Mayan Gold3' (MG3) cultivar from Dole, which is a cross between 'Smooth Cayenne' and 'Queen'.

2 Materials and methods

2.1 Fruit sourcing and preparation

Two New Zealand-grown pineapple (NZ1 and NZ2) of the 'Queen' cultivar were harvested on 24 April and arrived in Mt Albert on 29 April 2024. On the same day a commercially available overseas-grown pineapple of the 'Mayan Gold3' (MG3) cultivar (Dole, country of origin Philippines) was purchased at an Auckland supermarket (Victoria Park New World). New Zealand-grown pineapples were stored at 10°C overnight; the commercial fruit was kept at room temperature.

On 30 April, the fruit were allowed to warm up to room temperature before being prepared for sensory evaluation. The fruit were cut in half lengthwise; one half was kept back for postharvest fruit quality assessments, and the other half was prepared further for sensory assessment by PFR staff. It was first cut into quarters, and the core was removed. The two quarters were then cut into approximately 1 cm-wide segments, leaving the skin on. The core was also cut into approximately 1 cm-wide segments and was available for participants to taste if they wished to do so.

2.2 Fruit quality assessments

All fruit quality assessments were performed both at the crown end and the bottom end of the fruit. The colour of the flesh and the core were assessed using a Minolta chromameter (CR-400 – Illuminant: C). Soluble solids content (SSC, °Brix) was measured in juice using a digital refractometer (Atago PR-32α). Acidity (citric acid) was measured in juice using a Digital Acidity Meter (Model:GMK-835 series).

2.3 Sensory evaluation

Sensory evaluation of fruit samples was performed by seventeen PFR staff from the Postharvest Science and the Sensory & Consumer Science teams at Mt Albert.

While the tasting took place openly and collectively around the kitchen island in the sensory facility, each participant tasted and evaluated the samples individually and in quiet. Staff selected one of three samples in a random order, evaluating fruit samples monadically one at a time. Filtered water and Arnott's Original Water Crackers (Arnott's Biscuits Limited, Homebush NSW) were available to be used as palate cleansers between samples.

The questionnaire to evaluate fruit samples (Appendix) was developed based on the method of Romli et al. (2021) and presented as paper ballots.

Participants were asked to assess first the visual appearance, then the odour and aroma, texture and mouthfeel, and finally the taste and flavour of the sample using check-all-that-apply (CATA) questions, providing sensory descriptors. They also had the opportunity to give an open-ended comment.

3 Results and discussion

3.1 Fruit quality

The New Zealand-grown pineapples were smaller than the overseas-grown pineapple.

Once picked, pineapples do not ripen further, thus both skin and flesh colour give an indication of the maturity stage at which the fruit were harvested. The skin of the New Zealand-grown pineapples was bright yellow and the fruit still had the crown leaves attached. In contrast, the overseas-grown pineapple had dark green skin and the crown leaves had been removed (Figure 1A).

A B

Figure 1. Pineapples used in this study; A whole fruit (left to right: Imported, NZ1 and NZ2), B fruit cut for sensory evaluation (left to right: NZ1, NZ2 and Imported).

The flesh colour of the New Zealand-grown pineapples was a more intense yellow than that of the commercial imported fruit, which was a paler yellow (Figure 1B, Table 1). Both skin and flesh colour indicate that the New Zealand-grown pineapples were harvested at a later maturity stage.

Table 1. Flesh colour of pineapples used in this study.

	Sample area	Colour								
		Lightness (L*)	Redness (a*)	Yellowness (b*)	L*	C*	h	X	Y	Z
NZ 1	Flesh	78.0	-3.0	38.7	78.0	38.9	94.4	51.0	53.2	27.7
	Core	73.2	-0.9	35.6	73.2	35.6	91.5	44.2	45.4	24.4
NZ 2	Flesh	74.2	-3.2	39.2	74.2	39.3	94.7	45.0	47.0	23.3
	Core	75.3	-2.6	37.1	75.3	37.2	94.1	46.9	48.8	25.7
Imported	Flesh	70.1	-4.4	40.0	70.1	40.3	96.3	38.8	41.0	18.9
	Core	72.6	-2.7	23.6	72.6	23.7	96.5	42.8	44.6	31.9

SSC content in New Zealand-grown pineapples was higher (average 15.6 and 16.1 °Brix) than that of the overseas-grown fruit (average 13.5 °Brix) (Table 2). This also indicates that the New Zealand-grown pineapples were harvested at a later maturity stage. However, all fruit met maturity requirements for commercially marketed pineapples, which state that the minimum total soluble solids content of the fruit flesh should be at least 12 °Brix (UNECE Standard FFV- 49). Acidity (citric acid content) was only slightly higher in New Zealand-grown pineapples (average 0.76 and 0.78%) than in the overseas-grown fruit (average 0.7%).

Table 2. Soluble solids content (SSC) and acidity of pineapples used in this study.

Sample	Sample area	SSC (°Brix)	Acidity (%)	B/A Ratio
NZ1	Crown end	14.4	0.81	17.77
	Bottom end	16.7	0.71	
NZ2	Crown end	15.8	0.81	23.52
	Bottom end	16.4	0.74	
Imported	Crown end	12.1	0.74	19.50
	Bottom end	14.8	0.64	

3.2 Sensory evaluation

Participants' perceptions of the samples' visual appearance matched the instrumental measures, with New Zealand-grown fruit predominantly perceived as 'bright yellow' and the overseas-grown fruit perceived as either 'pale/whiteish' or 'yellowish' (Figure 2). More participants perceived New Zealand-grown pineapples as attractive and fresh, than they did the overseas-grown fruit.

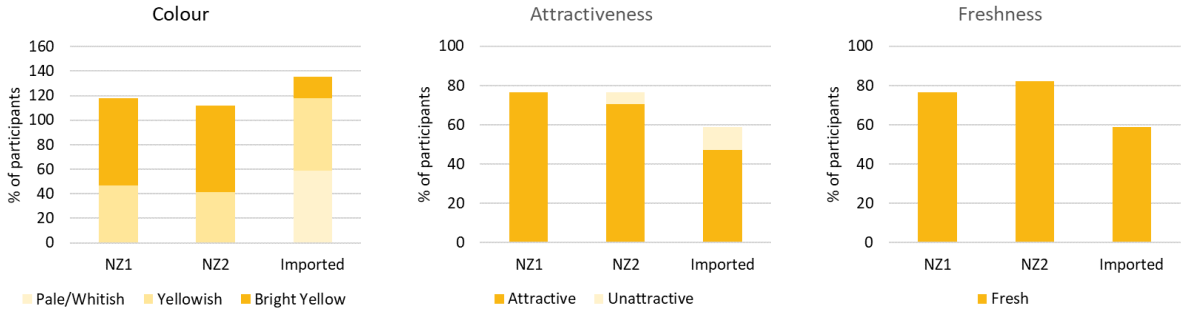


Figure 2. Participants' perceptions of the visual appearance of pineapples used in this study. Values are average citation frequency (% of participants, n=17).

Participants' perceptions of 'sweet odour' and 'pineapple aroma' were more frequent and stronger for New Zealand-grown pineapples than for the overseas-grown fruit (Figure 3). Sour aroma was more prevalent in the overseas-grown fruit, and unpleasant aroma was perceived only by one participant and only in the overseas-grown fruit.

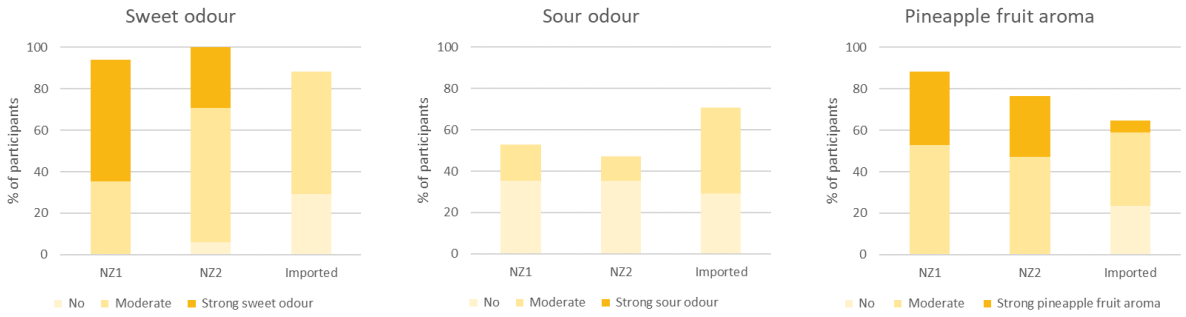


Figure 3. Participants' perception of the odour and aroma of pineapples used in this study. Values are average citation frequency (% of participants, n=17).

In the assessment of the texture and mouthfeel of fruit (Figure 4), New Zealand-grown pineapples were perceived as 'crunchy' and 'hard/firm' by more participants and as 'soft' by fewer participants, than the overseas-grown fruit. In total, 88% of participants perceived the overseas-grown fruit as 'fibrous', compared with 53% and 59% of participants for the two New Zealand-grown fruit. 'Unpleasant mouthfeel' was experienced by 18 to 29% of participants, with no difference between New Zealand-grown and overseas-grown fruit. The vast majority of participants perceived the fruit as juicy, with slightly higher numbers for New Zealand-grown fruit (94 and 88%) than for overseas-grown fruit.

"Queen' pineapples are known to have an edible core and some of the participants indicated that they would be comfortable eating the fruit flesh together with the core.

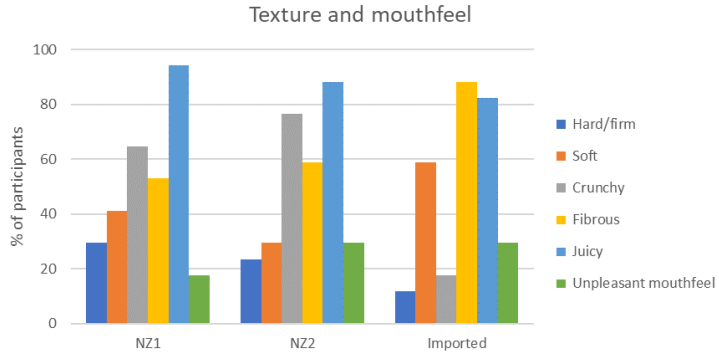


Figure 4. Participants' perception of the texture and mouthfeel of pineapples used in this study. Values are average citation frequency (% of participants, n=17).

Participants' perceptions of the samples' taste matched the instrumental measures, with New Zealand-grown fruit perceived as sweet and tropical more often than overseas-grown fruit, reflecting the fruit's higher SSC (Figure 5, Table 2). At the same time, the overseas-grown fruit was perceived as sour by more participants than the New Zealand-grown fruit were, even though the instrumental measurements showed that the acidity in the overseas-grown pineapple was actually slightly lower than that of the New Zealand-grown fruit. Fresh pineapple flavour was perceived by 94% of participants in one of the New Zealand-grown fruit (NZ1) and at slightly lower but similar frequency (76% of participants) for the other New Zealand-grown and the overseas-grown fruit. Tinned pineapple flavour was perceived at lower frequency and bitter aftertaste lower again, by only one or two participants.

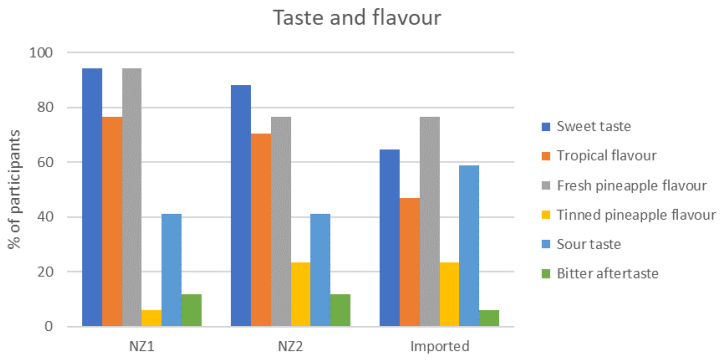


Figure 5. Participants' perception of the taste and flavour of pineapples used in this study. Values are average citation frequency (% of participants, n=17).

4 Discussion and conclusions

This was a very small study with a total of only three fruit; the intent of this study was not to scientifically compare New Zealand-grown pineapples to overseas-grown pineapples, but to get a general indication of the eating quality of locally grown fruit.

New Zealand-grown pineapples were well received by participants. Even though the fruit were smaller than the overseas-grown fruit and slightly misshapen, the presence of the crown and the yellow skin colour made them appealing to look at. The presence of a crown is an advantage New Zealand-grown fruit, produced for the New Zealand market, have over imported produce, for which the removal of the crown is to ensure compliance with New Zealand biosecurity regulations, as the crevices in the crown could harbour unwanted pests.

The darker yellow colour of the flesh of the New Zealand-grown pineapples indicated advanced ripeness and the fruit looked very attractive, Being able to harvest fruit at a later maturity stage is also is an advantage New Zealand pineapples, grown for the domestic market, have over imported fruit which are usually harvested at an earlier maturity stage and will spend a minimum of 2 to 3 weeks within the supply chain (from harvest, shipping, customs, delivery to distribution centre, to supermarket). More participants in this study perceived the appearance of New Zealand-grown fruit as 'fresh' than they did the overseas-grown fruit.

The higher SSC resulted in participants perceiving New Zealand-grown fruit as sweeter and more tropical than the overseas-grown fruit. This indicates that even though the climate in New Zealand might not have optimum growing temperature year-around, as other pineapple-growing countries like Costa Rica, Indonesia or the Philippines have, this does not necessarily result in fruit being of poorer eating quality.

We believe that there are good prospects of New Zealand consumers buying locally grown "Queen' pineapples, as they offer an attractive and flavourful alternative to imported fruit.

5 References

FFV-49: Pineapples - 2023. Date of issue: 15 March 2024. 3. UNECE standard FFV-49 concerning the marketing and commercial quality control of pineapples.

Romli R, Easa A, Murad M 2021. Influence of post-harvest physiology on sensory perception, physical properties, and chemical compositions of Moris pineapples (*Ananas comosus L*.). J. Food Sci. 86 10.1111/1750-3841.15877.

Appendix

Pineapple sample _____ 30/04/2024

1. Visual appearance

Describe the physical properties observed include the colour, size, shape, and surface texture.

Pale/Whitish	☐	Fresh	☐
Yellowish	☐	Attractive	☐
Bright yellow	☐	Unattractive	☐

Other: _____

_____

2. Odour and aroma

Please cut the pineapple cube, sniff the freshly cut surface and detected the volatiles compounds enter the nasal passage and perceived by the olfactory system and record the odour identified. Then, chew the pineapples and determine the aroma perceived by the olfactory system obtain from a substance in the mouth.

No sweet odour	☐	No sour odour	☐
Moderate sweet odour	☐	Moderate sour odour	☐
Strong sweet odour	☐	Strong sour odour	☐
No pineapple fruit aroma	☐	No unpleasant odour	☐
Moderate pineapple fruit aroma	☐	Strong unpleasant odour	☐
Strong pineapple fruit aroma	☐		

Other: _____

_____

3. Texture and mouthfeel

Describe all the attribute perceived in the mouth, other than taste. Chew pineapple cubes and list down all the texture perceptions that describe the sample.

Hard/firm	☐	Fibrous	☐
Soft	☐	Juicy	☐
Crunchy	☐	Unpleasant mouthfeel (Irritation, itchy, numb, pain)	☐

Other: _____

_____

4. Taste and flavour

Describe all the impression perceived via the chemical sense from a product in the mouth which include the taste (gustatory perceptions) and aroma, and the chemical feeling factors (bite, burn, pain).

Sweet taste	☐	Bitter aftertaste	☐
Sour taste	☐	Tropical flavour	☐
Fresh pineapple flavour	☐	Tinned pineapple flavour	☐

Other: _____

_____

Internal report for:

Plant & Food Research

PUBLICATION DATA

Ha B, White A, Coetzee P, Pidakala P, Ortiz G. May 2024. Eating quality of 2024 New Zealand-grown pineapples: basic postharvest and sensory assessments by Plant & Food Research staff. A Plant & Food Research internal report. Job code: NA. PFR SPTS No. 25530.

KEYWORDS: *Ananas comosus*, 'Queen' cultivar, Northland (New Zealand), fruit quality, sensory evaluation, small scale pilot trial.

Report prepared by:

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May 2024

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May 2024

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SFFF Concept - Growing a Pineapple Opportunity in Northland

Objectives
Develop an SFFF project through engagement with a community of interest, i.e. growers and other stakeholders (nursery, input suppliers, fruit marketers, regional development agencies etc.), who want to become involved in developing a Northland pineapple sector. From the initial gathering, a framework for stakeholder engagement will be developed to expedite an SFFF.

Possible Focus Areas of an SFFF Project
Utilising Owen Shafli's Parau Bay property as a benchmark for growing pineapples, select sites around Northland to grow 200-400 plants, for collecting data and information to understand various factors conducive to commercial pineapple production in Northland. The information collected will facilitate a grower peer-to-peer learning approach to pineapple cultivation.

- **Climate factors**
    - Growing degree days required
    - Annual average temperature
    - Number of hot days
    - Min and maximum temperatures
    - Rainfall / evapotranspiration index
    - Annual sunshine hours
    - Wind speed
    - Soil factors – profile, water holding capacity, drainage etc.
- **Agronomic factors**
    - Days from plant to fruiting
    - Viable life of plants
    - Optimum number of plants per hectare
    - Bed preparation.
    - Number of fruits per plant
    - Propagation potential of plants
    - Irrigation requirements
    - Nutrition / fertiliser / compost requirements
    - Understanding of common physiological disorders
    - Pests and diseases – crop protection requirements
    - Weed control
    - Factors associated with pineapple production under a rain-shelter
    - Flower induction – programming flowering and harvest
    - Use of crowns vs slips as planting material (we find crowns as more susceptible to diseases)
    - Degreening response, programming harvest
- **Postharvest factors**
    - Understanding correct harvest maturity
    - Post harvest disinfection/disinfestation / washing etc.
    - Storage considerations – temperature requirements
    - Packaging considerations
    - Postharvest Quality grades and percentage in each grade
- **Business Case**
    - Economics of pineapple production in Northland
    - Marketing scenarios
- **Consumer**
  Support the development of a Northland pineapple story …

- Sensory panel and focus groups discussion to understand sensory preferences / liking score / attractiveness, eating occasions, emotions / values to help identify the unique selling points and premium pricing opportunity for a locally produced pineapple. An informal sensory study has already been completed.
- Determine nutritional composition to support nutrient content claims.