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# Manuka Genetics

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# International recognition of Manuka

Manuka (*Leptospermum scoparium* and *Leptospermum scoparium incanum*) honey and oil is gaining strong international recognition for its powerful medicinal properties.

## Unique properties of Manuka

- Many monofloral honeys have peroxide activity in their honey which is short lived and reacts adversely with human body tissues.
- Methylglyoxal (MGO) is an organic molecule within Manuka honey.

MGO is non peroxide activity (NPA), long lasting and doesn't react adversely with human body tissues.

# Unique Manuka Factor (UMF)

- MGO in Manuka honey has been New Zealand trademarked as ‘Unique Manuka Factor’ or UMF.
- UMF ratings of 18+ have strong antibacterial activity and can be used to treat wounds.
- High UMF Manuka honey has been proven to kill *Staphylococcus aureus* (also known as ‘Golden Staph’ or the ‘Super Bug’).

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# Government target

- Government target for Manuka honey = $1B pa in exports by 2025.
- 2014: Manuka exports = $145M from 900,000ha of indigenous Manuka.

## Issue: Size of indigenous Manuka forest

- Resulted from Supplementary Minimum Prices (SMPs) being removed on sheep, beef and wool (1984) that made traditional farming on marginal land unprofitable.
- A large portion is Maori owned.
- Revenue is likely to flatten out at $200M pa in exports.
- Need new plantings to reach Government target.

## Issue: Supply and demand

- International demand is outstripping supply.
- Prices for 20+ UMF honey = $100 kg.
- Influx of entrants to beekeeping industry.
- Expansion of hives by existing beekeepers.
- New Manuka plantings haven’t kept up with demand.

# Issue: Overstocking

- Wherever there's a reasonable amount of wild Manuka growing, beehive apiaries are spaced approx. 500m apart.
- Overstocking results in dilution of Manuka honey with other florals, doesn't result in increased yields and creates friction between beekeepers.

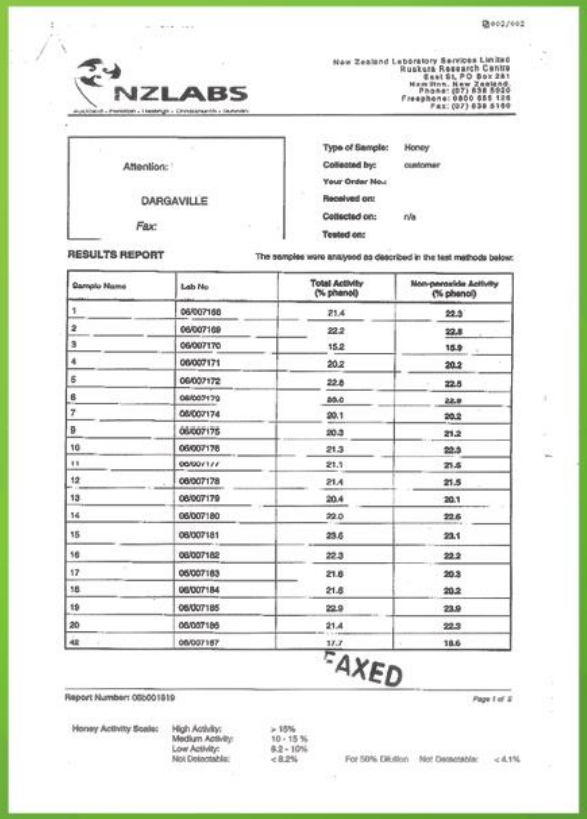
## Issue: Lifespan of Manuka

- Natural life span of 25-50 years.
- Much of indigenous forest is already 30 years old.
- There's been little attempt to increase, manage or replace the plantings since 1980s.
- There's a need for substantial plantings of Manuka forest.

**Kauri Park Nurseries (KPN) is leading the way in Manuka plant genetics and plant production.**

# Key drivers of increased UMF

- Improved plant genetics.
- Large areas planted.
- Higher MGO levels in the honey is derived from high dihydroxyacetone (DHA) levels in flower nectar.



NZLABS

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Attention:
DARGAVILLE
Fax:

Type of Sample: Honey
Collected by: customer
Your Order No.:
Received on:
Collected on: n/a
Tested on:

RESULTS REPORT

The samples were analysed as described in the test methods below:

| Sample Name | Lab No | Total Activity (% phenol) | Non-peroxide Activity (% phenol) |
|---|---|---|---|
| 1 | 06/007168 | 21.4 | 22.3 |
| 2 | 06/007169 | 22.2 | 22.8 |
| 3 | 06/007170 | 15.2 | 15.9 |
| 4 | 06/007171 | 20.2 | 20.2 |
| 5 | 06/007172 | 22.6 | 22.5 |
| 6 | 06/007173 | 20.0 | 22.9 |
| 7 | 06/007174 | 20.1 | 20.2 |
| 8 | 06/007175 | 20.3 | 21.2 |
| 10 | 06/007176 | 21.3 | 22.3 |
| 11 | 06/007177 | 21.1 | 21.6 |
| 12 | 06/007178 | 21.4 | 21.5 |
| 13 | 06/007179 | 20.4 | 20.1 |
| 14 | 06/007180 | 22.0 | 22.6 |
| 15 | 06/007181 | 23.6 | 23.1 |
| 16 | 06/007182 | 22.3 | 22.2 |
| 17 | 06/007183 | 21.6 | 20.3 |
| 18 | 06/007184 | 21.5 | 20.2 |
| 19 | 06/007185 | 22.9 | 23.9 |
| 20 | 06/007186 | 21.4 | 22.3 |
| 42 | 06/007187 | 17.7 | 18.6 |

FAXED

Report Number: 06b001819

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Honey Activity Scale: High Activity: > 15%
Medium Activity: 10 - 15 %
Low Activity: 8.2 - 10%
Not Detectable: < 8.2%
For 50% Dilution Not Detectable: < 4.1%

Sample comment: Samples were received intact.
Results are based on the sample as received.

Test Methods

| Test | Principle | Reference |
|---|---|---|
| Honey Activity | The activity is measured as the equivalent % phenol. Two types of activity are measured: Total Activity: all the activity, including activity due to hydrogen peroxide ($H_2O_2$). Non-Peroxide Activity: $H_2O_2$ is removed by treating honey with enzyme. | The University of Waikato, Honey Assay Method. |

Honey Activity Scale: High Activity: > 15%
Medium Activity: 10 - 15 %
Low Activity: 8.2 - 10%
Not Detectable: < 8.2%
For 50% Dilution Not Detectable: < 4.1%

Gordana Aleksic M Sc, Laboratory Manager
Donna Clarke, NZCS, Laboratory Technician
Shobna Ram, B Sc, Laboratory Technician

FAXED

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# KPN's plant selection program

Aims to:

- Identify Manuka cultivars from wild populations which exhibit high UMF and increased productivity.
- Test DHA in nectar in large numbers of plants from many provenances throughout New Zealand.

# KPN's plant selection program

Progress to date:

- Identified certain provenances with higher average DHA levels.
- Selected high DHA plants from a wide range of provenances including South Island provenances and semi alpine provenances.
- Identified superior plants which are currently being used for seed production and being multiplied by cuttings.

**Kauri Park Nurseries has the capacity to produce several million plants per year.**

## KPN's breeding program

- Eight selections which have DHA levels of between 8,000-19,500mls/l.
- The average DHA level is around 2,000- 3,000 mls/l.

**Manuka plantings of these superior genetics is expected to result in a quantum leap forward in UMF levels and volume of honey harvested per ha.**

# Honey bees preference

- Manuka is not a preferred nectar species of honey bees.
- Honey bees prefer clover and native species such as kamahi, towai and rewarewa, which will dilute the Manuka honey and reduce the UMF.
- The larger the Manuka plantings, the less likely the bees are going to collect nectar from other sources.

**It's advisable to position bee apiaries in the centre of a Manuka forest.**

**An ideal forest size would be 50ha or more.**

# Planting Manuka

The purity of the Manuka honey is influenced by the total area of Manuka planted.

**The local provenance should be planted with plants from other provenances to spread the flowering duration over a minimum of 12 weeks.**

**Need to withstand hard frosts and winter snow.**

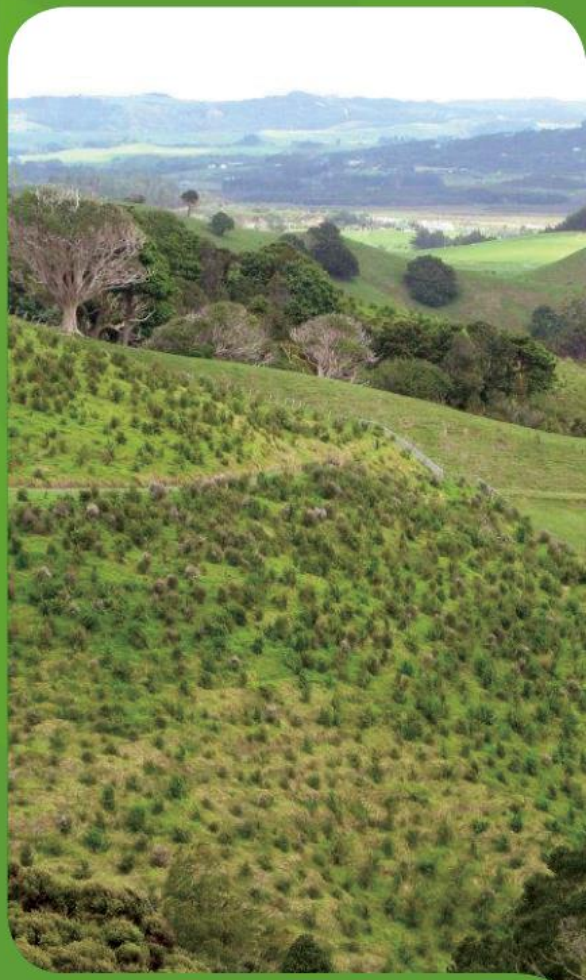
# Selecting a site

- Consider proximity of indigenous Manuka forests and physical barriers for bees (eg wide block of pines or water) which may isolate bees from travelling to non Manuka nectar sources.
- A good site is a sheltered valley with high hills on either side.
- Manuka thrives on northern and eastern facing hillsides.
- Avoid proximity to large sources of non Manuka nectar.

# Soil types

Manuka does well in a range of soil types:

- sand, volcanic, clay, peat, limestone, alpine and pakihi.
- swampy soils where the roots of the plant never dry out.
- barren windswept hillsides where they are constantly battered by salt laden winds.



## Soil types

Other factors that may increase UMF:

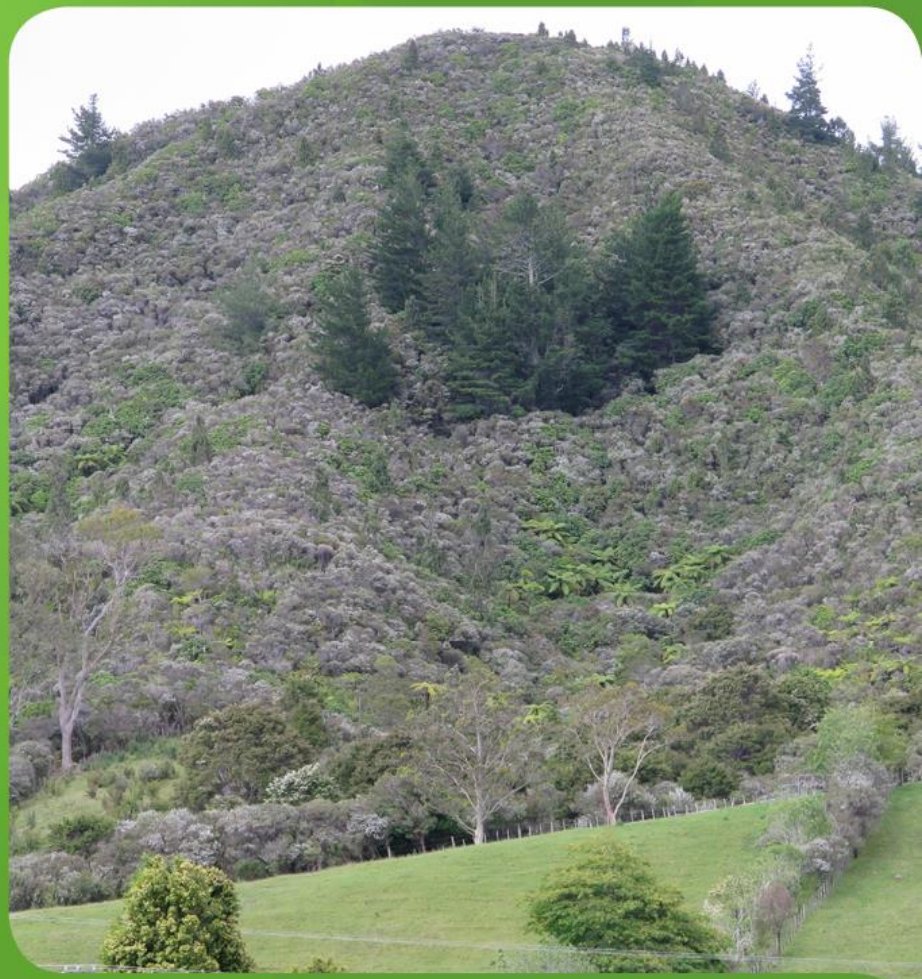
- Low pH and low fertility soils.
- Warmer temperatures.

# Preparing the site

- For gorse, tobacco weed, or wilding pines, spray the whole block with *Metsulfuron methyl* to eradicate. Wait 12 weeks before planting so *Metsulfuron methyl* residues have dissipated.
- If gorse, tobacco weed, or wilding pines are not an issue , only use *Roundup* to eradicate grass and weed species. Spray grass land with *Roundup* in strips 3m apart, or spray 500mm circles at 3m x 3m spacings (wait 1 week).
- For planting, loosen the soil to make it easy for the roots to spread outwards.

# Planting costs

- Seed grown plants: Approximately $1,500/ha (exc weed control costs). Available from KPN in 60 cell or 72 cell trays.
- Cutting grown plants (likely to produce higher UMF): Approximately $3,500/ha.
- Available from 2016.
- KPN also supplies plants and planting services.



# Planting rates

- Traditional planting rate = 1111 plants per ha.
- Gentle contoured land = 2500 plants per ha in hedgerows. Hedgerows can be trimmed and sold for leaf oil extraction. Trimmed plants can be maintained in a juvenile state increasing their longevity.

# Post planting

- It may be necessary to release the plants from grasses, one year after planting by spraying *Gallant* over the top of the Manuka.
- Manuka produces higher UMF honey in low pH and low fertility soils (don’t add lime or fertilise soil). Add Sulpher to soil if necessary to reduce the pH.
- Goats, wallabies and hares are known to eat the plants, especially in the first year after planting.

# First honey harvest

- Begins in year 3.
- Maximum honey yields from year 6 onwards.
- The honey yield per ha from indigenous Manuka = 25-50kg per ha.
- Current average price to beekeeper = $20-$25 per kg
  ($500-$1000 from honey per ha).
- Usual hive stocking rates on indigenous Manuka is 1 hive per ha.

# Honey income

- Honey income is affected by:
  - Climatic conditions affecting nectar flow and bee activity.
  - Dilution of Manuka honey from other nectar producing plants.
- Honey is stored for 12 – 18 month period until MGO levels peak.
- Requires trust between the forester and beekeeper if contract is based on a share of the honey value.

## Additional economic benefits

- Access Carbon credits.
- Pruning for Manuka oil extractors ($500-$600 per tonne of raw foliage).
- As value of Manuka honey increases so too capital value of land.

## Other information

- Pollen rich species such as Tree Lucerne (*Chamaecytisus palmensis*) should be planted around the apiary site.
- Financial subsidies and grants are available for forestry establishment through several Regional Councils, MPI, Nga Whenua Rahui, and in particular, the East Coast Forestry Project.
- A Manuka forest can grow indefinitely if it's kept free of plant species that colonise Manuka forests.

# Economic model

| | Per Unit | Cost Per Ha | Wild forest | Commercial forest |
|---|---|---|---|---|
| **Capital** | | | | |
| Number plants/Ha | | 1111 | | |
| Ave cost per plant | $0.70 | $778 | | |
| Ave planting cost | $0.70 | $778 | | |
| Weed control per ha | $400 | $400 | | |
| Pest control | $44 | $44 | | |
| Total Capital cost/Ha | | $2,000 | | |
| **Income from Honey and CC's** | | | | |
| No Hives/Ha | 1 | | 1 | 2 |
| Kgs Honey/Hive | 35 | | 35 | 35 |
| Price per kg | | | $25 | $30 |
| Total Gross Income from Honey per Ha | | | $875 | $2100 |
| 30% Share Gross Income to Landowner | | | $263 | $630 |
| Gross Income from Carbon Credits/Ha | $3 | | $24 | $24 |
| 70% Share Gross Income to Beekeeper | | | | $1470 |
| **Operating Expenses** | | | | |
| Beekeeper per Hive | $300 | | $300 | $600 |
| **Income from Leaf Oil** | | | | |
| Foliage harvested/tonne ha | | | 2 | 5 |
| Litres oil/tonne foliage | 3 | | 6 | 15 |
| Income per litre oil | $500 | | $3000 | $7500 |
| Cost of raw foliage /tonne | $400 | | $800 | $2000 |
| Cost of Oil extraction /tonne | $250 | | $500 | $1250 |
| **Costs to harvest raw Foliage** | | | | |
| Labour cost to harvest foliage/tonne | $350 | | $700 | $1750 |
| Foliage harvesting/fuel and delivery/tonne | $50 | | $100 | $250 |

| Annual Production is as follows. | |
|---|---|
| • Yr1 | 0% |
| • Yr2 | 0% |
| • Yr3 | 20% |
| • Yr4 | 40% |
| • Yr5 | 80% |
| • Yr6+ | 100% |

## Advantages
## of commercial Manuka forests vs wild Manuka forests

- Hive stocking rates expected to increase 2-4 hives per ha when superior plants flower.
- Price per kg expected to increase with high UMF.
- Flowering period can be lengthened from 6 to 12 weeks, increasing volume of honey harvested per ha.
- Manuka Leaf Oil production can complement income without adversely effecting honey production.

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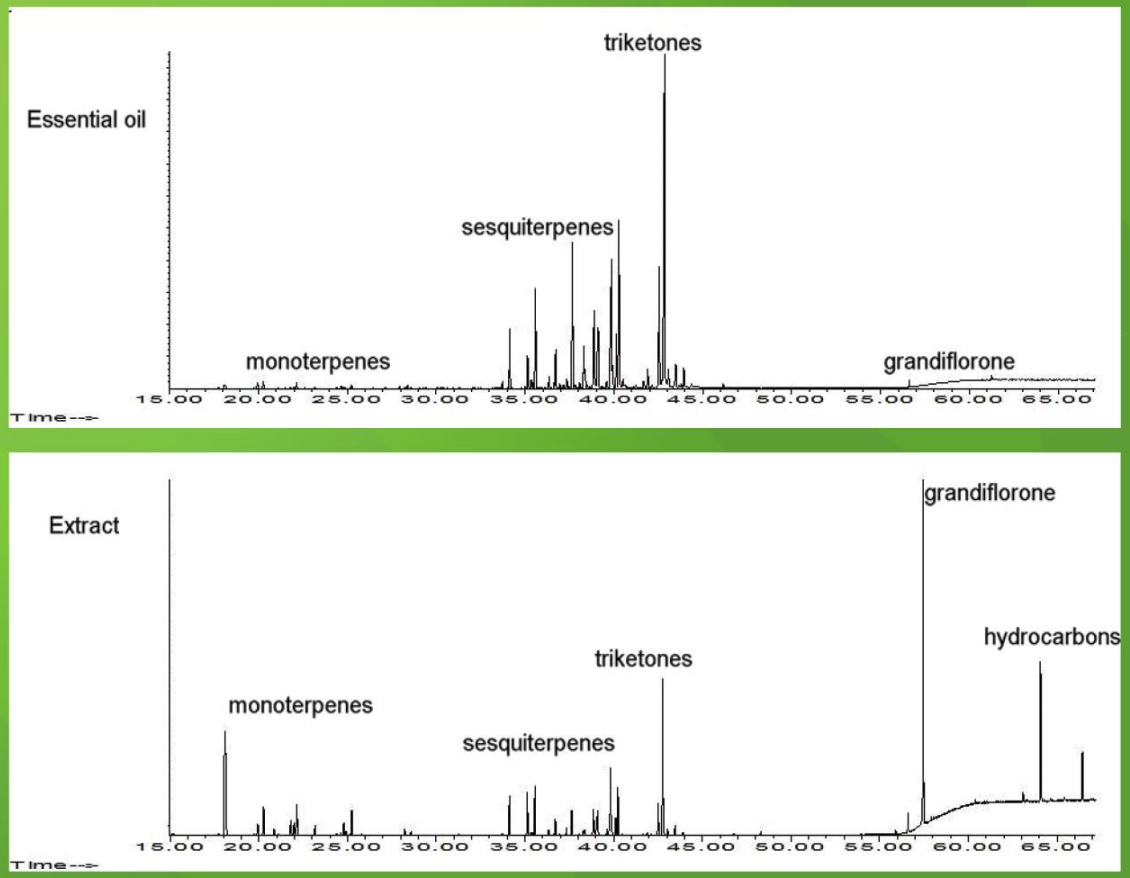
# Advantages
# of commercial Manuka forests vs wild Manuka forests

- Manuka produced for honey and leaf oil is three times more profitable than pine trees.
- Manuka provides regular annual cash flow and provides passive income for landowners and employment for beekeepers, foliage harvesters, and honey and oil processors.



# About Kauri Park Nurseries

- New Zealand’s largest revegetation and amenity nursery.
- Producing 6,500,000 plants per year.
- 50 acre site at Kaiwaka.
- Owned by the Wearmouth family.
- Founded in 1994.
- Specialising in native plant production.

## Our Expertise

- Major infrastructure and local government.
- Commercial and residential development.
- Commercial landscaping.
- Reforestation plantings.
- Riparian plantings.
- Manuka forestry.

# Our Capabilities

- 240+ varieties grown in finely tuned conditions.
- Supply bulk quantities nationwide.
- Leaders in eco sourcing and experts in environmental compliance.
- Dedicated truck fleet.
- Short turnaround, seamless service and project management.
- 40 full time staff including 15 from Northland iwi.


# Andrew Wearmouth

- 22 years in business growing Calla Lilies and Sandersonia.
- Negotiating with foreign nationalities and biosecurity legislation.
- Exporting to more than 20 countries.
- Calla Lily breeding program.
- Dutch competition in the flower and bulb trade.
- Sold the Calla Lily breeding program in 2012 to Hobaho.
- Joined Kauri Park in 2012.