mānuka farming
NEW ZEALAND
Excellence through science

Case Study of Integrated Mānuka Honey and Carbon Storage Plantation Development: Makopua Station

Report Commissioned by the Hawke's Bay Regional Council

Maggie Olsen, Stephen Lee
Mānuka Farming NZ Ltd.
September 8, 2021

TABLE OF CONTENTS

DISCLAIMER

1.0 Executive Summary

This report covers the development and outcomes of the integrated mānuka honey and carbon storage plantation at Makopua Station as developed by Tweeddale's Honey. Tweeddale's honey is a family owned business with over 60 years of beekeeping experience in the North Island producing over 1000 tonnes of honey per annum.

- Makopua Station is 1600ha site located 30min drive away from the Tweddale's central beekeeping yard. It is being planted over 5 years as to be best supported by the 1 Billion Tree Programme. Government funding has been essential to stay on this development timeline.
- Purchasing and development of this property made sense for this family-run business for several reasons: 1) the amount of information about manuka plantation functioning was sufficient, 2) desire to leave a legacy for the next generation, 3) increasingly high costs and high competition to access manuka honey producing sites for beekeeper, 4) security of supply into the future, 5) many wild manuka sites are reaching senescence, 6) located near to the Tweeddale center of operations, 7) size of property allows for sufficient bulk honey production, 8) improving legal protections for "manuka" name reassures viability of investment on future high value of manuka honey.
- Planting success has been greatly assisted by having professional planters and establishment managers.
- Novel spray regime was developed to spray over top of manuka. Drones used to spot spray Old Man's Beard.
- 2200 stems/ha planting plan to control further erosion, assist with weed control, and reduce issues around increasingly common extreme weather events.
- The manuka cultivars must be matched to the growing conditions and to local bee flying times to enable a successful honey harvest.
- Centrally placing hives and grazing out of competing clover nectar sources can significantly improve the quality of the manuka honey harvest.
- Overwintering on-site of the plantation may not be financially viable for all sites
- Public perception depends on: standing in the community, community involvement and employment, planting of an ecologically-restorative native.
- Carbon storage in manuka does not yet have sufficient data to reliably model carbon returns for manuka plantation.
- An Emissions Trading Scheme consultant is recommended for management of all ETS activity.
- Revenue streams to generate cash flow prior to honey are: grazing sheep lease at 50% of standard stocking rates (from year 3), rent from homestead occupation, and carbon storage/ETS returns. Cash flow from honey expected at year 5-7 with true commercial production from year 10.
- The plantation is expecting an annual net revenue of $4 million from honey ($2500/ha per year), approximately $200k per year from carbon ($150/ha per year).
- Honey value could be greatly increased if stored for 1-2 years (estimated $3125/ha per year). The UMF™ value is expected to be between 17-18 UMF.
- Honey value could be doubled again if aged honey is sold in retail packs (estimated $6250/ha per year)
- A 20% profit share for honey is a sustainable amount for beekeepers to split with landowners. This can be topped-up in years of good production.

2.0 Report Purpose and Approach

The objective of this assignment is to showcase an integrated farm planting programme which combines mānuka honey production alongside carbon storage as a viable landuse. The case study will highlight the problems addressed by the farm planting, the project context, management challenges, financial returns, risks, and opportunities around utilizing non - *P.radiata* forestry species. This is to add context and provide a real world example for the Right Tree Right Place (RTRP) project for the Hawkes Bay Regional Council (HBRC) and for wider afforestation applications in the region.

The forestry industry is undergoing a change with decreased social license, desire for improved environmental outcomes, and new information around non-P.radiata forestry creating an industry environment for new afforestation options to emerge. This report is based upon MFNZ involvement with the project, especially an in-depth interview with Don and Conchita Tweeddale, along with a site visit.

3.0 Project Background

3.1 The Business: Tweeddale's Honey

This family-owned business was started by returning soldier Stuart Tweeddale and his wife Thelma in 1945 from 300 beehives purchased in Palmerston North. The Taihape business was built on the sale of white clover and bush honey, which was low-priced and unpredictable due to the high altitude of the operating area. Don Tweeddale joined his father's beekeeping venture at age 10 and now, with 60 years under his belt and together with the help of his family, has grown their hive numbers to 24,000 producing over 1000 tonnes of honey annually. The business now operates with the help of 5 generations of the Tweeddale's family on over 600 properties and itself has land holdings of 16,000ha specifically for the production of four varieties of premium, certified New Zealand honey.

3.2 The Property: Makopua Station

Makopua station is a 1600ha property located 16km east of Taihape in the Omatane district. It borders the Ruahine Forest Park and is erodible, steep hill country on papa/mudstone soils. It also has a homestead, several smaller houses, a large woolshed, and associated satellite sheds located on the property. As a sheep and beef farm it has run 14,800 stock units. The station was sold due to environmental issues around erosion and steepness causing issues for stock and water quality, as well as the previous owner wanted to concentrate on his other, more profitable finishing farms. Tweeddale's Honey is the third owner.

3.3 Reasons for Development

As the mānuka honey industry continues to boom, the beekeeping industry is facing several issues which made the development of the Makopua plantation more appealing for the Tweeddales. Below these risks are discussed and how the development of the plantation addresses these issues in the wider industry and how it assists the Tweeddale business specifically. These reasons are drawn directly from the interview with the Tweedales.

3.3.1 Development “at the right time” for the business

The Tweeddales felt that there is now enough information available around plantation mānuka that they could make the right decisions about moving forward with a largescale planting. They have been involved with High-Performance Mānuka PGP Programme which has provided information about how mānuka plantations function. There are also more commercial cultivars available which have the necessary growing and flowering information to match to the sites growing conditions and bee flying requirements.

There is also a desire to leave a legacy for the next generation, with the business bottom line moving away from pure financial concerns to the environmental and business security of the family. The Makopua plantation development is expected to be a productive facet of the Tweeddale honey production business for the next two to three generations with plantation maintenance being prioritized.

3.3.2 Escalating cost of placing hives and increased numbers of beekeepers.

The registered number of hives (approximately 900,000) and beekeeping enterprises (approximately 9000) have doubled over the past 7 years (2019 Apiculture Monitoring Report, MPI). With more beekeepers operating in New Zealand there is a corresponding increase in competition for access to profitable land blocks and apiary sites. This is an even larger concern for sites that produce mānuka honey as the prices for non-mānuka honey have fallen, driving beekeepers to depend on mānuka honey production to carry their business financially. There is overall high competition for beekeepers to negotiate access to sites which produce mono-floral mānuka honey. Current access fees for mono-floral manuka producing sites is $150/hive per year (no correlation to honey production). For non-manuka producing sites the fee is $600-1000 per apiary per year.

In developing their own mānuka plantation, the Tweeddales do not have hive or apiary fees and do not share the returns made from honey sales from Makopua Station production.

3.3.3 Security of Access/Supply

Another facet of the escalating cost of hive placements relates to landowner-beekeeper contractual agreements and highlights a risk for beekeepers as landless farmers. This is security of access to apiary sites and thus continuation of honey production and supply. Agreement between landowners and beekeepers can vary quite dramatically, ranging from casual ‘handshake’ agreements to long-term supply contracting. They are usually 3-5 year access contracts with either a fixed fee per site (or per hive) and may have an element of honey profit sharing as a top-up payment.

Oftentimes beekeeping operations do not have the financial resources (or potentially cash flow) to outlay significant per hive or per apiary costs to landowners. This leaves these areas at-risk to be re-negotiated by other beekeeping enterprises who promise large annual payments to a landowner. With the unpredictable nature of honey production, these larger payments may not be realistic, may not be sustainable, or at worse case, never eventuate. As understanding how an apiary performs can take two years of evaluation, switching beekeepers may lead to all parties being disappointed and perhaps a loss of local beekeeping knowledge as contracts bounce from one beekeeper to the next.

Makopua plantations offers long term access to a large swathe of land that will be producing manuka honey for a long period of time. This is a huge benefit to the Tweeddales as being both the landowner and the beekeeper.

3.3.3 Wild mānuka sites are getting old

Mānuka has a lifespan in the forest as it is normally a pioneer species, he accepted lifetime of a mānuka tree being approximately 75 years.. Many of the wild, mono-floral mānuka sites used by the Tweeddales are reaching beyond maturity into senescence and decay. This means that the ability of the stand to produce honey is reducing or will reduce over the coming decades. This is a wider problem faced by the industry around the country as more of the wild manuka spaces are getting utilized.

By planting fresh mānuka trees, the Makopua Station presents a resource that will be available and producing for at least several decades with the potential for much longer if plantation maintenance is prioritized into the future.

3.3.4 Located a short distance (30min drive) from central beekeeping yard

Driving large distances is part and parcel of the beekeeping profession. Apiary sites are often located remotely to reach large areas of specific floral types. The location of Makopua Station allows for workers to access the site easily to complete regular beekeeping tasks. The hives also have a reduced freight cost when placing for the summer season or for bringing hives back to the central yard for overwintering.

3.3.5 Large size of property

The honey industry, and specifically the mānuka industry, in New Zealand is young and heavily fragmented. There are issues with accessing overseas markets due to the level of commercial honey supply. Achieving a critical mass of annual honey production is essential for the Tweeddales for reaching and maintained access to overseas markets, reaping the financial benefits of directly selling high quality mānuka to bulk overseas customers. Makopua Station provides the correct type of scale for commercial mono-floral mānuka honey production.

Smaller beekeeping operations that produce smaller amounts are often “price-takers” and forced to sell their honey to domestic honey marketing companies who combine harvests from multiple beekeepers to create the necessary supply for international markets. This prevents the full value of the honey from reaching the beekeepers and landowners. It has also caused a proliferation of local honey brands and investment into small processing facilities as beekeepers seek to extract more value from smaller amounts of honey (via retail packing and selling).

Large scale allows also assists in creating a mono-floral nectar resource for the bees to harvest. This helps to improve the overall quality of manuka honey that will be harvested from Makopua. Consistency of volume and consistency of UMF™ is important when supplying international demand.

Makopua Station is 1600ha. This provides the scale to produce commercial amounts of mānuka honey and allows the Tweeddales to seek better honey pricing for their bulk overseas sales.. Once the plantation has reached production age, it is estimated to support 1500-1600 hives and produce 55 to 65 tonnes of honey annually (34-43kg/hive).

3.3.6 Surrounded by farmland

As the property itself was pasture and the vast majority of surrounding area is also hill country pasture, there are few competing nectar sources to distract the bees from mānuka. With the planting of mānuka throughout the station the bees will be presented with

large amounts of mānuka with minimal competing nectar sources (e.g. rewarewa (*K.excelsa*), kamahi (*W.racemosa*), mixed native bush). This helps to ensure that the mānuka honey produced by the plantation will be higher mono-florality than sites which have non-mānuka nectar sources present within harvesting range of the bees.

3.3.7 No blackberry or gorse present

Weed control is often the highest costs of forestry establishment and Makopua station has very few woody weeds. This allowed for a certain ease of establishment and lower establishment cost for this specific site.

Control of woody weeds is a particular concern in mānuka plantation development with all mitigation efforts often taking place prior to mānuka seedlings are planted. Control after planting requires on-the-ground control which requires high amounts of labor and is high cost.

3.3.8. Legal protection for the name "Mānuka"

There are feelings of confidence around the word "Mānuka" honey being legally protected for honey producers in New Zealand. Geographic Indication (GI) laws are prescriptive laws which prevent producers from outside a specific location to use specific names (e.g. sparkling wine can only be sold as champagne if produced in the Champagne region of France). These protections in overseas markets will help in mānuka honey retained its high value in the long term.

Development of Makopua station is seen as a more viable investment given that manuka honey is more likely to retain its value when these legal protections are in place.

3.4 Other benefits of plantation development

Converting pasture to forestry provides several other amenities and benefits to the area and community. Bird life has been seen to increase on the property. Makopua also presents an area for locals to go hunting (with permission from the owners). This is a double benefit of assisting with pest control in the site and creating goodwill in the community.

4.0 Planting the Site

Planting began in winter 2016 with 300ha being planted every year. The planting program will last for 5 years with planting to be finished in winter of 2021, for a total of ~1600ha planted. The property is planted at 2200 stems/ha with a sub-planting of 400-600 flax/300 ha. The flax planted on site provides an additional source of pollen for the bees during the mānuka harvest period, as mānuka does not provide all necessary nutrition to maintain hive health (as measured in number of brood frames per hive). The experience of different aspects of the Makopua plantation as experienced by the Tweeddales are discussed below.

4.1 Planting Labor

A good, reliable planting crew and on-site manager who actively audits planting as it is happening is essential for establishment success. Experienced crews plant according to the planting plan and have better planting technique. Planting on time also helps to create an

environment for the mānuka seedlings to survive. Survival of 95-98% was achieved at Makopua Station.

4.2 Pest and Weed Control

Planted areas were desiccated via helicopter prior to planting. A follow-up spray was done over the top of mānuka. A bespoke spray regime was developed on-site in conjunction with the forest manager to create a spray that would wilt the grass, kill thistle, but not affect the mānuka. This post-planting spray assists in getting the mānuka growing well and out above the grass. Old Man's Beard (OMB) is a significant pest and unwanted organism in the area. Financial support has been available through the local council for control options and control of this pest has been aggressively undertaken.

Drones have been used to fly a grid over the steep terrain of the site, will recognize flowering weeds automatically, and apply herbicide directly to identified weeds. Drone usage will continue annually.

Red deer and possums are present on site. Red deer usually do not eat manuka, but cause breakage via rubbing. Locals and family are quite keen hunters and assist with control of the deer. Possum control is done via bait traps with support from the local council. Control of pest animals usually only needs to occur until the manuka is of sufficient height to avoid full browsing damage of growing tips.

4.3 Erosion

The higher density of planting locks up the soil more quickly to prevent further erosion of the steep terrain. This is especially important as more extreme weather events are happening more regularly due to increasing climate change effects. Higher density plantings also more quickly closes canopy to reduce current weeds and avoid future weed incursions.

4.4 Funding

300ha per year is the maximum size planting that is fully eligible for funding via the 1 Billion Tree (1BT) Programme. It should be noted that the Tweeddales found that accessing the Afforestation Grant Scheme (AGS), which ended funding rounds in 2018, was easier and more conducive for planting. This was due to the full amount of funding being awarded up front, rather than the 30% with the balance paid after two years as is awarded under the 1BT Programme. Negotiation of the payout timeline was part of the project development discussion with the 1BT Programme representatives.

5.0 Mānuka and Apiary Management

Successful plantation establishment and operation requires an understanding of the growing conditions, soil type, overall weather patterns, flowering times of the manuka cultivars, expertise on seasonal bee behaviour for the regional area, and familiarity with managing bees on the site of consideration. The main goal of the plantation being to regularly produce high UMF™ mono-floral manuka honey, specifically honey of medical grade quality.

Note: DHA (Dihydroxy acetone) is the chemical precursor to MGO (Methylglyoxal) which forms the basis of consumer labelling, most notably the UMF™ scale, which directly correlates to MGO concentration in manuka honey.

5.1 Cultivar Choice

Makopua site is a cold site which regularly receives snowfall. Two varieties of manuka were chosen: 20% for a late-November flowering, and 80% for a December flowering. Due to the cold climatic conditions, both varieties now have delayed flowering by 1-2 weeks in comparison to when they were first planted. The cultivars were chosen for their flowering times, ability to withstand site conditions, their high levels of DHA in nectar, and similar soil conditions in their home range.

Choosing the correct manuka cultivar is essential for a successful plantation. Survival, growth, and blossoming of manuka should be the priority concern for the landowner who must see themselves as a manuka farmer first and foremost for any land that is dedication to a manuka plantation. Actions that promote health of the manuka trees should be considered against and in protection of future plantation returns.

5.2 Practical Beekeeping in Manuka Plantation

There should be no large differences between managing beehives placed on a wild manuka stand versus a planted manuka plantation. Practical advice for beekeepers is discussed below.

5.2.1 Central Hive Placement

Hives are best placed in the middle of a plantation. This forces the bees to encounter manuka first when they exit the hive and reduces their ability to find other competing sources of nectar. This comes down to making the energetic decision to collect non-manuka nectar unappealing to foraging bees. The bees will stay as close to their hives as possible to meet all of their nutritional and energy requirements.

5.2.2 Graze out competing clover

Utilize livestock in the surrounding farm (or ewes, hoggets, lambs within a plantation of sufficient age) to remove clover. This depends on good communication between the livestock manager and beekeeper on correct timing of grazing. Removal of the competing clover flowers will improve manuka honey purity, thus improving honey harvest value.

5.2.3 Consider track and apiary placement

Individual bees will live longer if they fly up to a nectar source, then return downslope to the hive with a full nectar load. “Up empty and down full” puts less strain on their bodies. Placement of apiaries in low, protected, but sunny spots can thus improve hive productivity as foraging bees can work for upto 50% longer. Tracks through the valley bottoms rather than along ridgelines are more attractive to beekeepers for this reason.

5.2.4 Know when manuka nectar is flowing and is attractive

Sugar, specifically sucrose, is what attracts honeybees to flowers. Honeybees constantly test the surrounding floral sources to see which nectar is providing the most sugar. For beekeepers to see when the manuka honey flow is occurring, they can watch the bees to see how long they are spending on manuka flowers. Visits of 5-6 seconds indicate that flowers are attractive and secreting sucrose while shorter visits (dancing from one flower to the next) indicate flowers as unattractive.

This can assist with timing of harvest as well as evaluating which manuka cultivars are best at drawing in bees through high sugar appeal.

5.2.5 Overwintering on a plantation

Good overwintering sites for hives are essential to maintain hive health and properly build-up bee numbers in the spring for a strong honey harvesting period. Creating overwintering on a manuka plantation may not be financially viable as many complementary bee forage species will need to be planted to ensure proper bee nutrition and support is achieved. The two key components to consider are: distance to already established overwintering apiary sites, and the cost of non-manuka bee forage species establishment. It is a discussion between landowner and beekeeper to determine placement of trees for bee forage which may achieve other land use goals on-site. It will be a long term investment.

6.0 Public Perception of Manuka Forestry

This site and project have a really positive relationship with the local community. They have said “it’s just a different type of farming.” The Tweeddales are not aware of any negative comments.

Reasons for this include locals being welcome to hunt on the site (with permission), the community is involved through employment and there is a perception that employment will be ongoing opportunity, and there is a family living on site at the Makopua homestead. Overall, the Tweeddale family has connections, community involvement, and history in the Taihape area. The business is well-established, well-known, and with local ownership that does not appear as a large corporate.

There is also goodwill around the idea of planting a native species from an environmental perspective. The idea that one of the major goals of the project is to leave a good ecological legacy improves the reputation of the project with the wider community.

7.0 Carbon Storage and ETS Management

The New Zealand Emissions Trading Scheme (ETS) forms the framework for carbon storage revenue from forestry activities. The amount of carbon stored in manuka plantations is still relatively unknown given there is little data available from plantation manuka and considering the range of growing conditions present across New Zealand. Forest sites registered to the ETS are measured every five years with most data available being from naturally regenerating manuka rather than plantation established cultivars.

When considering carbon storage as a revenue stream for manuka, forest owners need to be cautions when selling their carbon units and receiving payout to avoid overclaiming. Due to the lack of data on manuka and recent revision of calculations by MPI and ETS managers, there have been issues of overstating the amount of carbon stored by manuka and ending a ETS commitment period with carbon liabilities if a forest owner sells their carbon before ensuring a proper, government-matched carbon record is established for a manuka forest. The current carbon tables for mixed indigenous species is vastly different than what is being measured on manuka in the field, ranging from approximately 50-66% lower in comparison to the default tables. As more data becomes available modelling carbon returns will improve.

With the complexities of the ETS system, it is recommended to work with a professional ETS consultant or manager to handle ETS registration, field measurements of the registered forest, and to complete annual returns. Communication around new plantings, tree harvest, or changes in property/forest ownership is essential for consultants to be effective in their role and to follow the legal protocols of the ETS system. More complex ownership of properties will increase cost of professional management.

8.0 Financial Expectations and Outcomes

Purchasing the property was a major investment at $6.2 million with an additional $1.3 million for site preparation and establishment. The government funding via the 1BT Programme is in addition to this. The 1BT funding of $ 1,800 per ha (up to a max of 300 ha) is estimated to cover 70% of establishment costs.

Overall, the plantation is expected to have a net return of $4 million per year from year 10 from honey, with the potential to increase the profit margin via honey storage and retail packing. Carbon is the second largest income stream at approximately $200k per annum and also has the potential to increase dependent on the pricing of carbon into the future.

8.1 Revenue Streams

Several revenue streams exist for this property and are discussed below.

8.1.1 Grazing Lease

Sheep have been put into the planted mānuka once the mānuka is 3 years of age. It is stocked at approximately 50% of normal stocking rates for hill country. Specifically, there are 600 ewes/lambs on 370ha. Sheep are expected to be on the land until the mānuka is 10 years of age. As the canopy closes in (year 7-10), it is likely the number of sheep will have to be reduced further. The current income from this is $5,450/month.

8.1.2 Rent and Land Value

As the development of the plantation continues, certain employees (fencers, managers, etc.…) have lived on site and pay rent. While not a huge amount of income, it does assist with public perception and social license as that opportunity offering is seen as good for the local community in keeping things tidy and looked after.

The value increase of the property is unknown at this point, but as mentioned previously, there is growing competition around access to sites which produce mānuka honey so there is likely be significantly increased interest in purchasing an established, productive mānuka honey plantation.

8.1.3 Carbon

Carbon storage is a significant revenue stream to access for landowner with mānuka plantations. It is likely essential for landowners to access the returns from the ETS for mānuka plantation development to make sense financially.

At Makopua, the carbon return is estimated at approximately $200 - 240k per annum or approximately $125 - 150/ha per year. This is likely to increase as the price per tonne of carbon also rises with climate change policy and demand for carbon offset of emissions to increase.

8.1.4 Honey

The honey production per hive is estimated to fall between 36 – 43kg/hive per year. This is higher than the national average and is a direct result of the confident, and bee-centric operational practices and best in class plantation establishment and management

practies that have been developed by the Tweeddales over many years of experience. The plantation is expected to begin generating cash flow from honey when the mānuka is 5-7 years old and estimated to come into full production at year 10.

Tweeddales presented three value add scenarios:

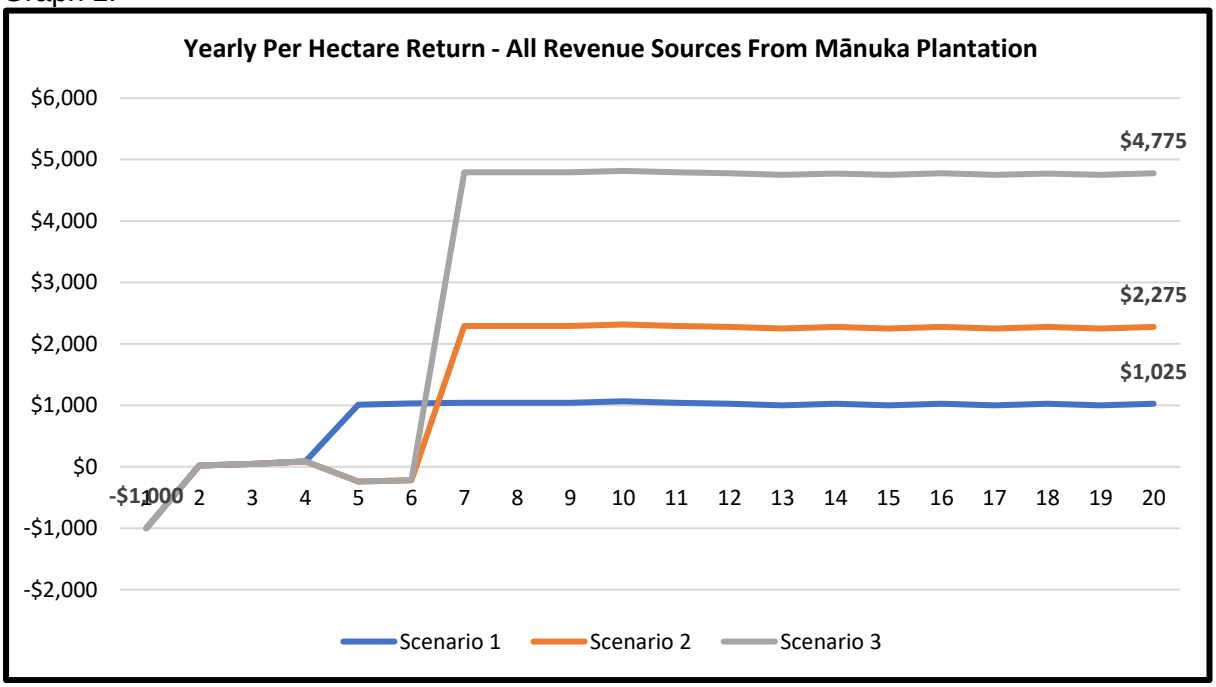
1. Scenario 1 – For fresh mono-floral mānuka (un-aged, lower UMF) sold as a bulk commodity, where the estimated revenue is $ 1,250/ha per year

2. Scenario 2 – For stored mono-floral mānuka (aged 1-2 years, 17-18 UMF) sold as a bulk commodity, where the estimated revenue is $ 2,500/ha per year

3. Scenario 3 – For stored mono-floral mānuka (aged 1-2 years, 17-18 UMF) sold in retail packs, where the estimated revenue is $ 5,000/ha per year

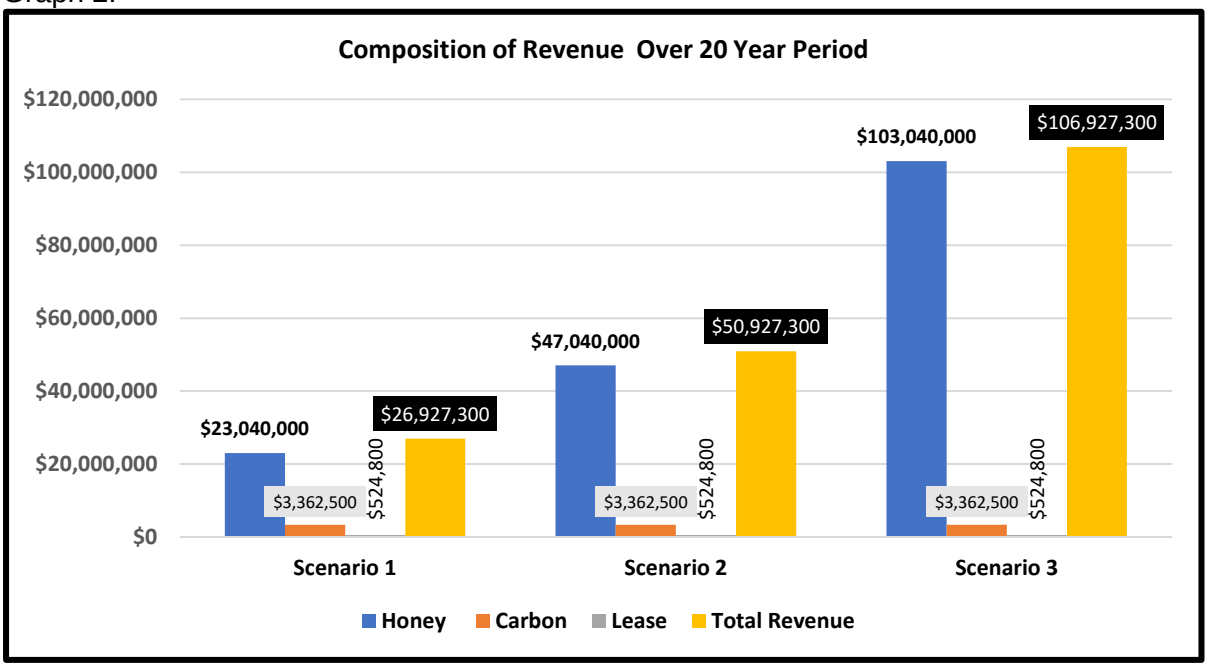
The following graph summarises the estimated returns per hectare from all revenue sources directly attributable to the mānuka plantation ie: (Grazing Lease, Carbon, Honey) for each of the scenarios described above:

Graph 1:



The graph below shows the composition from each revenue source, and the total revenue from all three sources over a 20 year period for the 1,600 hectare Makopua Mānuka Plantation

Graph 2:



The normal fees that would be payable to landowners for hive placements have not been included, as in this instance, the Tweeddales are the landowners. These estimates do not take into account seasonal variations in yield or quality and have been simplified to provide a broad indication of probable performance rather than a high degree of accuracy. The latter is not yet possible as the plantation still must fully mature.

Further details of the financials can be found in Appendix 1 of this report.

8.2 Sharing Risk Between Landowner/Investor and Beekeeper

8.2.1 Sharing Profit and Contracts

A 30+% profit share for the landowner is likely to be an unsustainable structure for beekeepers. This is due to the high price of accessing manuka production sites alongside the boom-and-bust nature of honey production from season to season. While the landowner holds the investment risk of a plantation, the beekeeper holds all of the financial risk from season to season.

Usually landowners like to receive a fixed revenue and sometimes considers a percentage share of honey profit to be too risky.

In general, a 20% share of honey profit is seen as reasonable and sustainable. This can be improved with a top-up payment in years of high production or in years of high UMF™ honey production. All parties should be wary of longer supply contracts, especially those that are 10+years. 3-5 year agreements are most common.

8.2.2 Choosing the right beekeeper

It is likely that landowners do not have the skill to be their own beekeepers. Beekeeping is a specialist profession that requires years to experience to become an expert and local knowledge is essential. Beekeepers should be independently audited for best practices before considering entering into a joint business venture. The success of a plantation depends on good bee husbandry over the long term. Ongoing independent monitoring hives may also be an option.

Independent expert auditing will help to ensure good bee husbandry, good recordkeeping, and transparency are developed as part of a supportive and successful landowner-beekeeper partnership.

8.2.3 Storing Honey and Bulk Production

The current market is skewed towards those that can store and extract the additional value of aged manuka honey as the UMF increased with age. Often the price of aged manuka honey can double or triple the value of fresh manuka honey. Many beekeepers do not have the financial ability to start storing as they are in immediate need of cashflow.

There is an opportunity to fund that first year of storage for the beekeeper and landowner to unlock extra value for those entities that operate early in the honey value chain. There may also be an opportunity to lower overall storage costs and improve overseas market access of many smaller production beekeeping operations come together to achieve critical mass.

9.0 Conclusions

The Makopua Station is an example of how to develop a high-performance manuka plantation under current market pressures, with full understanding of the current honey industry in New Zealand, and create a property that will leave a business and ecological legacy for the next generation.

When considering the lessons for other sites there are several key takeaways:

1. Timelines for manuka plantation establishment is dependent on government funding.
2. Forest/Landowners should see themselves as manuka farmers and prioritize the health and well-being of the manuka trees
3. Good establishment practices require professional management
4. The right manuka cultivar needs to be matched to the growing conditions and to the local bee environment
5. There are practical actions for both the landowner and beekeeper that can improve plantation productivity
6. There is good public perception of largescale manuka plantation development
7. Multiple revenue streams will assist with landowner cash flow prior to commercial honey production
8. Carbon storage, while still not fully understood in manuka, is likely an essential piece of revenue for the landowner
9. Storage of manuka honey can double or triple the value
10. A good relationship between a professional beekeeper and the land owner is essential for success.

Appendix 1 : Financial Modelling Details

	Year >	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total	%of Revenue over 20 yrs
Scenario 1	Honey	$0	$0	$0	$0	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$1,440,000	$23,040,000	86%
	Carbon	$0	$37,500	$75,000	$112,500	$150,000	$187,500	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$3,362,500	12%
	Lease	$0	$0	$0	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600										$524,800	2%
		$0	$37,500	$75,000	$178,100	$1,655,600	$1,693,100	$1,705,600	$1,705,600	$1,705,600	$1,705,600	$1,705,600	$1,640,000	$1,640,000	$1,640,000	$1,640,000	$1,640,000	$1,640,000	$1,640,000	$1,640,000	$1,640,000	$26,927,300	
	Plantation Cost	-$3,680,000	-$1,500	$0	-$40,000	-$40,500	-$40,000	-$40,000	-$40,000	-$40,500	$0	-$40,000	$0	-$40,000	-$500	-$40,000	$0	-$40,000	-$500	-$40,000	$0	-$4,123,500	
	Govt Funding	$2,080,000																				$2,080,000	
	Net Returns/Yr	-$1,600,000	$36,000	$75,000	$138,100	$1,615,100	$1,653,100	$1,665,600	$1,665,600	$1,665,100	$1,705,600	$1,665,600	$1,640,000	$1,600,000	$1,639,500	$1,600,000	$1,640,000	$1,600,000	$1,639,500	$1,600,000	$1,640,000	$24,883,800	
	Rtns/ha	-$1,000	$23	$47	$86	$1,009	$1,033	$1,041	$1,041	$1,041	$1,066	$1,041	$1,025	$1,000	$1,025	$1,000	$1,025	$1,000	$1,025	$1,000	$1,025		
	Cum Returns	-$1,600,000	-$1,564,000	-$1,489,000	-$1,350,900	$264,200	$1,917,300	$3,582,900	$5,248,500	$6,913,600	$8,619,200	$10,284,800	$11,924,800	$13,524,800	$15,164,300	$16,764,300	$18,404,300	$20,004,300	$21,643,800	$23,243,800	$24,883,800		
																						Total	%of Revenue over 20 yrs
Scenario 2	Honey	$0	$0	$0	$0	-$560,000	-$560,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$3,440,000	$47,040,000	92%
	Carbon	$0	$37,500	$75,000	$112,500	$150,000	$187,500	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$3,362,500	7%
	Lease	$0	$0	$0	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$524,800	1%
		$0	$37,500	$75,000	$178,100	-$344,400	-$306,900	$3,705,600	$3,705,600	$3,705,600	$3,705,600	$3,705,600	$3,640,000	$3,640,000	$3,640,000	$3,640,000	$3,640,000	$3,640,000	$3,640,000	$3,640,000	$3,640,000	$50,927,300	
	Plantation Cost	-$3,680,000	-$1,500	$0	-$40,000	-$40,500	-$40,000	-$40,000	-$40,000	-$40,500	$0	-$40,000	$0	-$40,000	-$500	-$40,000	$0	-$40,000	-$500	-$40,000	$0	-$4,123,500	
	Govt Funding	$2,080,000	$0																			$2,080,000	
	Net Returns/Yr	-$1,600,000	$36,000	$75,000	$138,100	-$384,900	-$346,900	$3,665,600	$3,665,600	$3,665,100	$3,705,600	$3,665,600	$3,640,000	$3,600,000	$3,639,500	$3,600,000	$3,640,000	$3,600,000	$3,639,500	$3,600,000	$3,640,000	$48,883,800	
	Rtns/ha	-$1,000	$23	$47	$86	-$241	-$217	$2,291	$2,291	$2,291	$2,316	$2,291	$2,275	$2,250	$2,275	$2,250	$2,275	$2,250	$2,275	$2,250	$2,275		
	Cum Returns	-$1,600,000	-$1,564,000	-$1,489,000	-$1,350,900	-$1,735,800	-$2,082,700	$1,582,900	$5,248,500	$8,913,600	$12,619,200	$16,284,800	$19,924,800	$23,524,800	$27,164,300	$30,764,300	$34,404,300	$38,004,300	$41,643,800	$45,243,800	$48,883,800		
																						Total	%of Revenue over 20 yrs
Scenario 3	Honey	$0	$0	$0	$0	-$560,000	-$560,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$7,440,000	$103,040,000	96%
	Carbon	$0	$37,500	$75,000	$112,500	$150,000	$187,500	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$3,362,500	3%
	Lease				$65,600	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600	$65,600										$524,800	0%
		$0	$37,500	$75,000	$178,100	-$344,400	-$306,900	$7,705,600	$7,705,600	$7,705,600	$7,705,600	$7,705,600	$7,640,000	$7,640,000	$7,640,000	$7,640,000	$7,640,000	$7,640,000	$7,640,000	$7,640,000	$7,640,000	$106,927,300	
	Plantation Cost	-$3,680,000	-$1,500	$0	-$40,000	-$40,500	-$40,000	-$40,000	-$40,000	-$40,500	$0	-$40,000	$0	-$40,000	-$500	-$40,000	$0	-$40,000	-$500	-$40,000	$0	-$4,123,500	
	Govt Funding	$2,080,000	$0																			$2,080,000	
	Net Returns/Yr	-$1,600,000	$36,000	$75,000	$138,100	-$384,900	-$346,900	$7,665,600	$7,665,600	$7,665,100	$7,705,600	$7,665,600	$7,640,000	$7,600,000	$7,639,500	$7,600,000	$7,640,000	$7,600,000	$7,639,500	$7,600,000	$7,640,000	$104,883,800	
	Rtns/ha	-$1,000	$23	$47	$86	-$241	-$217	$4,791	$4,791	$4,791	$4,816	$4,791	$4,775	$4,750	$4,775	$4,750	$4,775	$4,750	$4,775	$4,750	$4,775		
	Cum Returns	-$1,600,000	-$1,564,000	-$1,489,000	-$1,350,900	-$1,735,800	-$2,082,700	$5,582,900	$13,248,500	$20,913,600	$28,619,200	$36,284,800	$43,924,800	$51,524,800	$59,164,300	$66,764,300	$74,404,300	$82,004,300	$89,643,800	$97,243,800	$104,883,800		

Source For Graph 1:

	Net (after Direct Costs and Govt Funding) Per Hectare Return - All Revenue Sources																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Scenario 1	-$1,000	$23	$47	$86	$1,009	$1,033	$1,041	$1,041	$1,041	$1,066	$1,041	$1,025	$1,000	$1,025	$1,000	$1,025	$1,000	$1,025	$1,000	$1,025
Scenario 2	-$1,000	$23	$47	$86	-$241	-$217	$2,291	$2,291	$2,291	$2,316	$2,291	$2,275	$2,250	$2,275	$2,250	$2,275	$2,250	$2,275	$2,250	$2,275
Scenario 3	-$1,000	$23	$47	$86	-$241	-$217	$4,791	$4,791	$4,791	$4,816	$4,791	$4,775	$4,750	$4,775	$4,750	$4,775	$4,750	$4,775	$4,750	$4,775

Source for Graph 2:

	Total Profit over 20 Yrs		
	Scenario 1	Scenario 2	Scenario 3
Honey	$23,040,000	$47,040,000	$103,040,000
Carbon	$3,362,500	$3,362,500	$3,362,500
Lease	$524,800	$524,800	$524,800
Total Revenue	**$26,927,300**	**$50,927,300**	**$106,927,300**
Less Plantation Cost	-$4,123,500	-$4,123,500	-$4,123,500
Add Govt Funding	$2,080,000	$2,080,000	$2,080,000
Net Returns/Yr	$24,883,800	$48,883,800	$104,883,800
Avg per year	$1,244,190	$2,444,190	$5,244,190
Land Cost	$6,200,000	$6,200,000	$6,200,000
Avg Yearly ROI on Land Cost	20.07%	39.42%	84.58%

Contact

Maggie Olsen

Plantation and Apiary Performance Manager, MFNZ Ltd.
Phone: 022 422 7280
Email: maggie@mānukafarming.co.nz