

HARAKEKE: New Zealand Flax



An historical perspective and overview of current research into future use.

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Harakeke has been one of the most economically important native plant resources in New Zealand's history. With the use of early technology its fibre was extracted and put to many uses firstly by Maori, then by later immigrants.

A resurgence of interest in maori culture sees weavers in New Zealand learning older traditional techniques. From this, contemporary art is evolving and flourishing.

Current research seeks to revive a viable industry employing new technology to make innovative products; creating economic wealth with sustainable, environmentally sound practice. The structure of this industry must support those at primary industry level and create continued wealth to ensure its long term viability.

Hutia te rito o te harakeke

Kei hea te komako e ko

Ki mai ki ahau

He aha te mea nui i te ao

Maku e ki atu

He tangata, he tangata, he tangata.

If the centre of the flax is pulled out

The flax will die

Leaving no place for the bellbird to sing;

Although these conservation factors are important

If I was to ask

What is one of the most important things in the world?

I will answer

It is that person, that person, that person;

That is it is each and every person.

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Description

Harakeke, found throughout New Zealand on the major and outlying islands is also endemic to Norfolk Island. Commonly called flax, it was given this name by early Europeans as its fibres resemble that of the flax plant (*Linum* sp) grown in Britain and Europe for weaving into linen textiles. Harakeke, the name given to the plant by Maori derived from *hara* the Polynesian name for pandanus, is a hardy plant growing in a variety of aspects in its natural state - from sea coast to wetland to forest margins and mountainous areas. This plant was classified as *Phormium tenax* by Captain Cook's father and son botanist team George and Johann Forster, from *phormos* meaning basket in Greek and *tenax* in Latin meaning tough which refers to the fibre.

Phormium tenax is characterized by strong upright leaves; varieties growing from one to over four metres in height. Leaf colouration is of various green, blue-green and brown shades with leaf margins ranging from maroon to darker green to black. Leaves are shiny on the upper side with a thick waxy epidermis and the underside generally has a blue-green bloom, again of a waxy composition. The stiff mid rib can also vary in colour from yellow through to orange and red. The tip of the leaf may be pointed or rounded with many older leaves splitting back down the midrib. Elongated fibre cells within the leaf form a close fitting strand giving the plant its strength. The flowers of *Phormium tenax* are upright, red, yellow or orange in colour and seed pods 5 – 15 cm, straight and upright.

Of the family Hemerocallidaceae which includes lilies there are two species of the genus;

Phormium tenax and *Phormium cookianum* formerly known as *Phormium colensoi*.

Phormium cookianum or 'mountain flax' is commonly called wharariki by Maori. It is typically found in higher locations than *Phormium tenax* often on sea cliffs in both the North and South

Islands. The fibre structure is softer and the plant more drooping in habit – and as a result this lack of strength makes it less suitable for many of the uses that *Phormium tenax* is put to. The flowers of *Phormium cookianum* are paler, yellow and seedpods curled and drooping: nearly double the length of pods of *Phormium tenax*. The autumn temperatures preceding the flowering period influence the strength or success of flowering.

Both species grow as a leafy clump with leaves arising from the ends of rhizomatous roots. Leaves are arranged in a fan with the youngest leaves at the central growing point protected by the older ones arranged in opposite pairs either side. The flower stalk grows from the centre of the fan from November to February and afterwards the leaves die back. Older plants may consist of a ring of young fans around a deadened patch in the centre.

The nectar of harakeke is a much sought food of the tui, bellbird and saddleback and was also food for the now extinct huia. The plant is host to several native insect species resulting in an intricate ecosystem based around it. *Xanthorhoe praepecta* Window Caterpillar and *Melanchra steropastis* Notch Caterpillar are both nocturnal moth larvae. In milling times when swamps were drained, populations of these insects rose dramatically, resulting in considerable damage to the leaf and thereby drastically reducing fibre harvest.

Scale insects also attack *Phormium*, resulting in a weakening and ill thrift and the honey dew that is excreted by these insects can be attacked by a black sooty mould; also softening the leaf of the plant and reducing its health. Leafhoppers may also be vectors for disease.

Diseases affecting plant health include the bacterium 'Yellow leaf' resulting in death of the plant, and *Fusarium* and *Septoria* both fungal in nature resulting in spotting or stripes of purple decay.

Recent plant breeding has evolved many coloured and variegated forms after selection from hybrids; raised by sexual reproduction from seed, or by selecting sports or mutations. These cultivars are raised by asexual propagation, by cuttings which grow readily. Margaret Jones of New Zealand Flax Hybridisers Ltd in Tauranga has been working at breeding these cultivars since 1978. She first discovered 'Cream Delight' a sport of *Phormium cookianum* 'Tricolor' which has been a hugely successful and very stable hybrid. Since then many other cultivars have resulted from her work.

Because of their smaller size *Phormium cookianum* hybrids are very suitable for smaller urban gardens. They have been popular around the world and are included in the arsenal of many landscapers as attractive and readily available plants.

An Historical Perspective

Common theory holds that the main reason Maori made permanent settlement in Aotearoa, New Zealand was their discovery of a plant so useful to their survival that without its presence and availability, the land would not have supported human habitation. That plant was harakeke. Indeed at times survival was tenuous with the main protein sources being bird flesh, tuna (eel) and kai moana (seafood) for those on the coast. Although harakeke was not primarily a food source, application of technology saw its fibres put to a multitude of uses, all important for survival. Like the pandanus plant in homelands north in the Pacific, harakeke was pliable and durable enough to be woven into shelters and whare, baskets for food gathering, cooking vessels and storage, sleeping mats, footwear, snares to hunt birds, nets for fishing, lashings for waka, weapons and adornments. The leaves of pingao *Desmoschoenus spiralis*, kiekie *Freycinetia banksii* and ti kouka *Cordyline australis* were also used by Maori.

In the main Maori collected leaf from harakeke plants growing naturally nearby for their use. As certain plants became recognized as having special properties they were collected and cultivated near settlements. They were transported to different areas and in some places these 'pa harakeke' or plantings of harakeke still show evidence of early habitation. Initially the harvested leaves were woven into mats and baskets and other useful items. Once it was discovered that muka (fibre) could be extracted from the flesh of the leaf, it was possible to create finer woven garments, resulting in warmer undergarments and intricate patterned cloaks, some still intact today. These provide a legacy for a people, showing sophisticated and artistic expression in everyday-useful and special prized clothing. A variety of garments were made. Piupiu a swirling skirt, maro an apron worn by both men and women, cloaks of various construction including korowai – adorned with black tassels, kahu kuri - incorporating dog skin tags, kahu huruhuru – feathered cloaks; the kahu kiwi being the most prized, kaitaka - unadorned cloaks with woven taaniko borders, kaakahu and others. Each had intricate design and a specific purpose many taking up to a year to complete. Extraction of the muka was a labour intensive process done by hand using the back of a mussel shell in a process called haaro. Firstly a cut was made across the underside of the leaf strip to the depth of the fibre about halfway along its length. The strip of harakeke was turned over and the makoi (mussel shell) held above the cut. The leaf strip was then pulled up and the muka exposed. Once extracted the fibre was made into hukahuka - twisted strands - by a process called miro that ran the fibres down the thigh and back onto themselves. The bundle of these strands was soaked, washed and dried then twisted into a hank. The fibre was then beaten using specially carved wooden beaters or stone patu and was then ready to dye using plant extract or by soaking in mud. It took a lot of effort to extract enough fibre for a garment and some of this work was done by helpers to free the master weavers to concentrate primarily on the construction of the garment.

Erenora Puketapu-Hetet; Te Atiawa, acknowledges the importance of the spiritual traditions for weaving and other Maori art, where the artist is a channel for the gods. 'Art is sacred and interrelated with the concepts of mauri, mana and tapu.'*

Most weavers were women. The skills were taught down the generations in a way that allowed the student to absorb information gradually. Interested girls were encouraged and led into weaving, spending time watching and absorbing instruction at the side of more experienced women. In fact many weavers today acknowledge the generosity of their tutors who traditionally gave their time freely. "I have been taught by a number of people over the years... I have been very lucky when I've been ready to learn there has been someone to teach me" *

Traditions surrounding the harvest of harakeke which are honoured in the present have foundations in conservation. The relationship between the natural materials and the people is important in ensuring that the resource continues to be available to use. Sustainable harvesting is the key. Tradition dictates that only the outer leaves are harvested, leaving the growing shoot and its adjacent protective leaf sheath. This growing tip is called the rito and those either side matua or awhi rito meaning 'to embrace' the rito. Metaphorically the rito is likened to the baby and the awhi rito the parents, again recognizing links between the plant and the people. Unused plant material is returned to Papatuanuku (the Earth) to complete the life cycle. In the past this material was placed at the base of the plant to return nourishment to it, however this can lead to a build up of pests and diseases and it may be better to compost the material first.

* Erenora Puketapu-Hetet in conversation with Megan Tamati- Quennell, 1993. Pu Manawa.

The timing of plant harvest is also important. Rain, frost and wind affect the plant fibre and its workability. Respect for these and other traditions today gives the weaver a connection to the past. By continuing to honour them the cultural significance of Harakeke is kept alive.

The Flax milling Industry.

With the immigration of European peoples from around the world to New Zealand the significance of harakeke was to take a further step. Here was a resource comparable to sisal and manila. By 1818 the first export of harakeke fibre - sixty tons at a value of £2600 - left for London. By 1830 this trade had reached many thousands of pounds with £50 000 worth being auctioned in Sydney alone between 1828 and 1832. At first Maori were willing to harvest and prepare the muka by hand in their traditional way with payment being in goods, most importantly guns and ammunition. The price for one musket was set at one ton of muka. With the rate of preparation being 1 to 4 pound of fibre per day, this represented many hours of work. The demand for harakeke led to some tribes moving closer to swamp areas often to the detriment of their health. The Maori War finished the trade in fibre extracted by Maori and renewed efforts were put into developing a process to extract it by machine. Some experimentation was done with chemical cleaning. However, a move to strip the leaf using a percussion action against a fixed plate rather than rolling it between rollers meant chemicals were not necessary; the fibre being better extracted from the vegetative material in the process. This was a valuable development because there were no poisonous by-products to be disposed of. If there had been chemical waste, the resulting pollution most probably would have had a detrimental effect on the surrounding environment and the health of the flax mill workers.

1868 saw the first mechanical flax stripper in commercial use.

This led to a booming industry with demand during the American Civil War for rope bringing the price up to an economic level. In 1871 'New Zealand Flax' was relabeled 'New Zealand Hemp' resulting in increased demand.

In 1907 the Government passed the Flax Grading and Export Act and employed agents to grade and label all fibre for export in an effort to raise the standard of the exported product.

In 1907 Miranui, the largest mill was established near the Makerua Swamp at Shannon. The 'Nui' brand was developed and over the twenty six years of its operation Miranui exported £1 mn worth of fibre.

The mill closed in 1933 after the disease 'Flax Yellow Leaf' decimated the swamp. A bacterium that is carried by a leaf hopper vector, yellow leaf is thought to be similar to the disease which is causing 'Sudden Decline' in Cordylines at present.

The Moutoa Swamp near Foxton, of 2000 ha and much smaller than the Makerua Swamp, however produced for a far longer period. Fibre was harvested from there from 1869 until 1985 when the mill was finally closed. In 1939 the Government purchased the Moutua Swamp and the land was gradually drained. This was named 'The Moutoa Estate Phormium Development Area'. Rows of selected cultivars were planted in this dryland area and essentially farmed in rotation. The whole plant was cut at harvest and took four to five years to grow back to size suitable for harvest. This system, along with the rise in disease and pest damage, weakened the plants leading to reduced harvests. In present times the area is farmed primarily for dairy having been subdivided and sold. Only a small wetland remains on the banks of the Manawatu River.

From the 1940s onwards New Zealand's exports dwindled to less than 1000 ton of fibre per annum with much less than this being exported in the latter years.

Products made locally included upholstery padding, under felts, woolpacks, baling twine and fibrous plaster. Although the Government legislated to protect and subsidise the flax industry to safeguard supply in New Zealand, the development of synthetics and cheaper sisal imports has relegated these products to history and currently nothing is made from fibre on a commercial scale. Donaghy's were one of the last NZ manufacturers to use flax, making twine and rope: only finishing production of the well known baling twine in the last fifteen years. The Foxton Museum still operates machinery to demonstrate this once flourishing mega industry.

The Harvesting Process

Flax was harvested by hand with sickles then tied into 90 lb bundles. Horse and cart brought it to the mill where it was weighed. Harvesters were paid by weight. This job was very physical, wet and dirty work and both the cutters and transporters ended the day grimy and sticky from the gum. Trams took the place of horses in the larger swamps although the engines proved too heavy in the wet ground and the horses returned to haul wagons along the tramlines to the mill. The 'trammies' spent the day moving tramlines across the swamp as it was cut. In time tractors and trucks took the place of horses. At the mill the flax was sorted into leaf length and stored for a couple of days so that the leaves were more easily fed into the stripper. This machine, run by traction engine, needed an experienced operator to keep the feed even. Dangerous and noisy work, several of the men lost fingers in the mechanism. A person was employed to catch the fibre as it fell underneath the stripper, a very dirty job indeed.

Once stripped from the green matter the fibre was washed with water. After drying in the sun for five or six days, providing the weather was fine, the fibre was taken to the scutching machine. Here any dry vegetation and dust was finally removed, the fibre polished and the

'tow' twisted into hanks and baled ready for market. A valuable by-product from this process were the shorter fibres, the 'stripper-slips', dried and sold for furniture upholstery and the green material used for stock feed.

By trialing new ideas the milling process was gradually mechanized further with some of the dirtier, more dangerous work being taken over by machines.

All the same a very labour intensive process; flax milling supported a lot of families and there are still memories of those days with many older people around the country. In addition to the larger mills in the Manawatu, other areas such as Northland, Taranaki, Golden Bay, Marlborough and Southland operated smaller often portable mills during the boom period before World War One. The characteristic whine of the stripper could be heard for many miles in the surrounding districts.

Revival of Interest

Traditional

Boom times post World War Two until the 1960s and 70s was a time when traditional maori ways were forgotten by many in a country that was becoming increasingly urbanized.

Although older Maori on marae kept the knowledge, many younger people moved to the cities and embraced modern living. Gradually there was an awakening that without taking the time to acquire the elder's knowledge many cultural traditions and indeed Te Reo Maori, the language would die. Rene Orchiston of Gisbourne was one who realized that there would come a day when Harakeke weaving would once again be popular. She saw that the work being done was often using inferior quality harakeke and she began a quest to search for the special cultivars so they could be preserved into the future. What enormous foresight! It is

thanks to this woman, now in her eighties, and others who shared their knowledge, that the weavers of today are able to produce such high quality work. Orchiston traveled the North Island of New Zealand visiting marae, talking with people. She was given plants and began to distribute these freely; spending time searching remote areas that people remembered had a clump or two of harakeke. These were special pa harakeke as outlined previously, plantings of valuable cultivars collected and planted by Maori for their use near to their pa.

In 1986 Geoff Walls and Sue Scheele met Orchiston while researching under the Commonwealth Science Council's Programme on Biological Diversity and Genetic Resources. They were searching for plants and information in an effort to preserve native plant genetics following worldwide concern at the disappearance of genetic diversity. Here was a whole collection of material, already collated and being grown as a collection in Gisbourne. With Orchiston's help, duplicate plantings were made at DSIR Research in Havelock North and Lincoln. The 'Orchiston collection' is now in the care of Landcare Research- Manaaki Whenua and has been distributed to other areas for use in weaving.

Indeed there has been extensive revival in weaving across the country.

Golden Bay women formed a group to share knowledge and enjoy working together creating art works and caring for plantings of Harakeke. In 1990 Hazel Walls initiated a commemorative project to celebrate the 150th anniversary of the signing of Te Tiriti O Waitangi, The Treaty of Waitangi. The project would have bicultural significance and be meaningful for the two races. With the help of her daughter-in-law Sue Scheele and son Geoff Walls two plantings were made of the Orchiston collection, one at Onetahua Marae and the other at a popular rock climbing reserve at Payne's Ford. Te Awhi Rito Hou Weavers

maintain the collection and are currently exhibiting work at Monza Gallery in Takaka after a successful entry in the World of Wearable Arts in Nelson.

Like Golden Bay, other areas across New Zealand have interesting work evolving. In Tauranga Jan van de Klundert, weaves artistic pieces, some very large, exhibiting and selling these around the country. His interest in weaving harakeke comes from his mathematical background and his love of the tactile feel when working the pieces. Erenora Puketapu-Hetet and her whanau have opened a Maori Treasures complex in Waiwhetu where people can experience the Maori traditions of harakeke. A contemporary gallery in central Wellington showcases their stunning works.

And there are many others working in ways to enhance learning and showcase the beautiful work being done in New Zealand.

Both Maori and Pakeha are learning the traditional ways of weaving harakeke. There has been some debate about non-Maori learning these skills and some in the Maori world are not happy that this is happening. I believe it is important for the traditions to be kept alive and interest from many peoples will ensure that this does happen. With all art it is the melting pot of ideas that leads to new art forms in a contemporary world. A strong marae base will ensure that Maori have the chance to learn and pass on knowledge as has been the past tradition. After all, due to Rene Orchiston, not of Maori descent herself, the future of harakeke weaving using old materials was secured. All of the Pakeha weavers I have spoken with in my research have been passionate about the tikanga or protocols that govern harakeke care and use.

Emily Schuster; and Diggeress Te Kanawa are two Maori who have contributed greatly to knowledge of weaving. In 1988 they travelled to Britain and America to study preserved

artifacts that had been collected by early European explorers. Techniques demonstrating forgotten skills were recorded and have been revived. Te Kanawa learnt much from her mother, Rangimarie Hetet; Ngati Maniapoto. Hetet wove until shortly before her death at 103 years. She produced exquisite work and tirelessly shared her knowledge. A truly amazing New Zealand woman. Many of her descendants are weavers in their own right.

Cath Brown; Ngai Tahu, of Christchurch is an individual I would also like to acknowledge for the incredible work she did. Her obituary in the Christchurch Press earlier this year outlined her many years of work in Canterbury sport, teaching as a Maori art adviser around the country and weaver and artist of nationally and internationally exhibited work. When at training college twenty years ago I was fortunate to be in a group of trainee teachers who she taught kete weaving to. She was an excellent teacher, very humble, with a calm, supportive and respectful way of demonstrating her skills. An excellent role model for trainee teachers. Only later did I realize her standing as an artist and although I never met her again I followed her career, reading of her work and viewing exhibitions of her beautiful weaving.

Brown was one of many who have worked at national level in Te Roopu Raranga/ Whatu O Aotearoa the national weaving committee of Toi Maori. Aotearoa Moananui a Kiwa is another group and there are many other regional collectives of weavers.

Fibre Extraction

One of Rangimarie Hetet's granddaughters - Rangi Te Kanawa is working to revive a fibre industry on a larger scale in this country. Te Kanawa is a well respected textiles conservator working preserving ancient woven pieces at Te Papa Tongariro in Wellington. She has travelled extensively advising in this field and has a passion for harakeke in particular. Te Kanawa has a background in chemistry and is currently completing her Masters of Chemistry

in Textile Conservation. Her ideas and research at present see revival of the fibre for use in finely woven cloth in the international fashion industry. Working with scientists at Industrial Research, she is seeking to refine a process that will split the fibre along its length, making the resulting cloth finer and softer than is possible at present. In addition they are selecting cultivars with finer harvestable fibre.

A fibre with similar properties is found in the hemp plant however costs of compliance involved with growing this crop are high due to its close relation the marijuana plant.

Harakeke has none of those issues and is New Zealand's unique plant. Interest in natural, environmentally-friendly products increases as people become aware of the benefits, and have the disposable income to afford premium products. As we move away from petroleum based synthetics we may also find the health benefits are huge. Along with cotton, wool and linen, harakeke will hopefully soon be a preferred choice. It has excellent insulation properties and can 'breathe' which makes it more comfortable to wear against the skin. Rangi Te Kanawa believes that a harakeke industry would have quadruple sustainability. That is - benefit culturally, socially, environmentally and economically. She sees an opportunity for Maori, particularly in rural areas having a way to help themselves to economic independence. To develop meaningful employment out of the city, in ways that reconnect people with their culture.

Pharmaceuticals

Harakeke has value for its medicinal properties. These were well known by early Maori and information passed on to early European settlers was well documented. In the late 1860s chemists sought to analyze parts of the harakeke, along with other native plants, in an effort to understand the chemical constituents. They found that many New Zealand plants contain alkaloids which are responsible for their medicinal value; these give a characteristic bitter

taste. The gum at the leaf base is composed of organic acids and has proved beneficial in the treatment of burns and cuts and has antiseptic properties, helping to keep wounds clean. Leaf bases were used as splints to support broken bones and the fibre to tie them in place. The fibre was also useful in stemming blood flow. Roasted roots were pound to make poultices for swelling and arthritis and a tonic made from boiling roots and leaves cured constipation.

Taken internally, harakeke has effect on parasites and when used externally can treat ringworm.

Current interest in harakeke for pharmaceutical use is leading to investigation of these properties outlined and may result in commercializing their use. There may be possibilities of cures for other modern diseases, with international significance.

Cosmetics

Suzanne Hall is adding harakeke extract to several of her skincare products being made in Kerikeri under the *Living Nature* brand. These are being marketed overseas in Britain and Europe. The philosophy of the company is to formulate natural products that feed the skin. This is a popular marketing platform and increasingly important to consumers.

Others in New Zealand are making soaps and lotions and also emphasizing the 'naturalness' of their product.

Ecological Use

In Masterton Liz McGruddy of New Zealand Flax Farmers Group is leading a three year study looking at returning harakeke to the thriving industry it once was. The research financed by the Sustainable Farming Fund, now into its second year, plans to look at several aspects. It

will collate information currently available and develop a network of interested landowners and iwi groups to disseminate information. Biomass trials looking at nutrient stripping properties of different varieties in differing situations are underway. McGruddy recognizes that in order to be an efficient soak for effluent the harakeke will need to be harvested to remove the nutrient from the system. Pressure is coming on to landowners in regard to water quality, methane emissions, and effluent recycling. Compared to willow and poplar, commonly used plants in these situations, harakeke has real potential in this way with the added benefit of all parts of the plant being useful.

McGruddy initially planted trial plots of harakeke on her property in 1998. These and plantings in other places are being assessed in the research. McGruddy, as project manager, is working with scientists at Crown Research Institutes and universities as well as iwi, regional councils and people working with similar interest such as Rangi Te Kanawa. This multi faceted approach is leading the way; focusing direction, attracting funding and achieving results.

Study of anthelmintic properties on nematodes, nutritive value for cattle and biomass/ nutrient trials are being done scientifically and the data processed. Preliminary results show that harakeke is somewhere between willows and poplars in efficiency at removing nutrients from a land/ waterway system but harakeke has other benefits. It withstands flooding of rivers and creeks, generally lying flat then coming back up once flood waters recede. In contrast willows and poplars can be uprooted and cause blockages in river systems resulting in greater erosion and permanent damage. In addition, harakeke is a valuable ingredient in enhancing the biodiversity of our landscape. It is valuable in creating corridors of food and shelter for bird and insect life to travel within areas, enhancing thriving populations. As a pioneer plant harakeke will act as a nursery for the seedlings of other species that grow from bird distributed seeds.

McGruddy has also identified benefit in researching fibre cell extraction for use in a multitude of ways. This has huge potential for our biochemistry industry. Investigative work is underway to use fibre as a component in fibreglass, building panels, furniture and boat building, and vehicle components.

Manipulation and extraction of cells to create new bio materials is cutting edge technology with unlimited potential.

Like Te Kanawa, McGruddy is interested in creating a sustainable industry that has real benefits to communities. Her work with iwi and regional council seeks to balance the research with this.

Others working at regional level are to be found the length of the country. At Whaingaroa the harbour's health is being nurtured thanks to the Whaingaroa Harbour Care Group initiated by Fred Lichtwark of Raglan. Waikato District Council and Environment Waikato have enabled mixed riparian plantings of native species, including harakeke, alongside streams and swamps that feed the harbour. The World Wildlife Fund for Nature also allocated grant money; eight years on the health of the harbour is definitely strengthening - resulting in improved fishing and shellfish harvests. Farmers have come on board as the project has progressed as they have seen the benefits. Their involvement in fencing stock from waterways is the key to success.

In the Auckland region a 14 km area formerly part of the Mangere sewage ponds is being restored with coastal plantings grown from seed sourced in the district and grown at Tauranga's Naturally Native Nursery. Mark Dean, as project overseer, worked to grow 250 000 plants, including 12 000 harakeke, in the first three years of this project with few fatalities after planting.

In Tasman District Nelson Mick Park; Te Atiawa, based at Te Awhina Marae in Motueka is working in a similar field. He also believes that harakeke has a future and is keen to create a collection of valuable cultivars on DOC land near Riwaka. The Puketawai project aims to become a storehouse of valuable native plants including harakeke. Park has publicised his quest for species special to the region and aims to collate a planting there as a resource for the future. Already a rare harakeke from the Whakapuaka area may have come to light and DNA testing will help to identify if this is so.

Park sees a revival of interest in harakeke in the Nelson region having value for iwi, offering employment and an opportunity to develop uses for the sustainably harvested plant. His involvement with schools and wetlands to develop pa harakeke is also of great benefit. Parks also works in a consultative role under the Resource Management Act. Political restraints govern some outcomes.

The Whakapuaka wetland, proposed to enhance the sewage treatment process in Nelson, has undergone heated debate before being approved to be developed as one step, rather than over a longer time period, at an estimated cost of \$1.5 –2 mn.

Some opponents state that wetlands are not effective at 'polishing' effluent in the final stages of treatment before it enters the estuarine system and others cite successful projects around the world. More needs to be known about the necessary standards that must be reached to ensure their effectiveness, and energy should be concentrated on this, not political point scoring. The other ecological benefits of enhancing natural systems must also be weighed in the balance.

The Shape of a Future industry

In order to create a future industry the pathway is not yet set. Work is being done to identify valuable varieties of harakeke. Possibilities for new technology to reshape the way the fibres may be utilized are evolving. For the plant to be attractive for landowners to plant there needs to be a recognized value. Ecological, social, cultural and economic values are all important and will have different priority depending on people's value set. Is a regional approach the most manageable, with links nationally to ensure knowledge continues to be shared? Or should direction come from a national body with the links forming beneath it? I believe that in order for there to be continuing raw material available within a strongly structured industry, landowners and harvesters must have a share in the value-added products. Those primary industries that have not maintained links from the beginning of a process to the marketed product, reducing the cut to the middle man are struggling in today's economic climate. In effect the family on the land is reduced to peasant status when ownership of the whole industry is lost.

The cooperative model is sound. It can be innovative and use modern marketing approaches. For rural communities and iwi to maintain the wealth base the industry must be set from the bottom up. This is the next step and provides a new challenge. Capital input is necessary. The government directive is clear – there will be no subsidies for primary industry and although some government money is funding research at present, the likelihood of long term support is low. The industry must be self sustaining.

Conclusions

Harakeke has a very important place in New Zealand's history. For both Maori and later European settlers it provided raw material for products that made survival in this country possible. Developments in synthetics post World War Two saw the death knell and harakeke fell from favour.

Traditional weaving techniques became less important to an increasingly urbanized population. Thanks to a network of women across New Zealand the importance of recording and sharing knowledge was realized, and work done in this field. A number of authors and publishers also put resources into these projects.

The world has reawakened to a realization that traditions are important. That knowledge must be preserved for the future and uniqueness celebrated in an increasingly globalised world.

That people can share this knowledge freely without always seeking personal monetary gain. That from these traditions art will evolve and new techniques be incorporated in a contemporary way. There is a realization that products using natural materials in a 'sustainable' way are preferable for the long term health of planet Earth.

In the search for these natural materials harakeke has emerged, and with the use of new technology has promise for an economic future. The role of biochemistry is integral to its success and gives credence for the need to honour science and research in New Zealand.

The next challenge is to set the shape of the industry in a way to benefit those at primary industry level. This will ensure an exciting, thriving, long term future for harakeke in its place of origin, New Zealand.

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