# Cultural bastions, farm optimisation and tribal agriculture in Aotearoa (New Zealand)

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**Abstract.** This paper outlines the influence of cultural factors (including tradition knowledge systems) on tribal agricultural organisations in Aotearoa-New Zealand (NZ); and then presents a conceptual framework that integrates several existing models and tools designed specifically for Māori farmer collectives. Traditional knowledge systems have a pervasive influence on NZs Māori agribusiness sector. However, they often go unrecognised; concealed beneath a land tenure system and legislative framework that is restrictive, cumbersome and has been responsible for widespread land loss since its introduction almost 150 years ago. In spite of these constraints, Māori agriculture in NZ is vibrant, diverse and has several unique characteristics that indicate the emergence of resilient farming system structures. The cultural construct of genealogical affiliation (*whakapapa*) and two associated principles of inter tribal/clan relationships (*whanaungatanga*) and inter generational environmental guardianship (*kaitiakitanga*) are outlined in the paper. These constructs underpin two developing trends in the Māori sector: the aggregation of smaller land titles into larger farming units, and the formation of multiple farm units into farming collectives. The advantages of scale efficiencies, enterprise diversification and greater capacity to capture value chain opportunities beyond the farm gate are evident. However, the tools available to the decision-makers within collectives are limited. The final section in the paper outlines the development of a modelling framework (Whenua) that includes multiple farm and value chain optimisation functions designed specifically for Māori collectives to explore viable future development and investment scenarios.

**Keywords:** Māori agribusiness, tribal agriculture, farm systems modelling, value chain optimisation.

## Introduction

The contribution of the Māori pastoral sector is estimated to be around at 8-10% of the national milk solids production and 10-15% of national sheep and beef stock units; but these statistics are difficult to verify given the lack of 'ethnicity' or 'ownership' identifiers in national industry datasets. A lack of accurate data on the Māori sector has restricted solid policy development. For example, the 80% of under-utilised or under-performing Māori land identified in the 2011 MAF report and the $8b potential increase in gross revenue estimated in the PricewaterhouseCoopers (PwC) (2013) report for Ministry of Primary Industries (MPI) are based on assumed utilisation on land use capability (LUC) units from fairly course (>1:50,000) resolution datasets. If the assumptions in these reports are correct, they suggest that almost 80% of Māori land is under performing. An obtuse conclusion such as this doesn't account for an alternative view that reframes this seemingly 'negative' characteristic to one where tribal agriculture in NZ has several advantages relative to the wider sector, namely: (1) the significant potential for smaller affiliated entities to collaborate and leverage their collective scale; (2) multiple layers of decision making within these entities that require input from expert consultants, thus providing reporting and monitoring disciplines not often found in typical family farms; (3) conservatism and risk aversion (because of inter-generational stewardship) that has led to low levels of debt and strong balance sheets; and (4) an underlying influence of *mātauranga* (traditional knowledge) and *tikanga* (cultural constructs, values and protocols) that are captured within a unique cultural bastion. The other issue that the PwC report highlights is the need for better sector data collection for informed policy development.

This paper explores the issues raised above in the following sections:

- provides an overview of Māori land tenure and the agribusiness sector including ownership structures;
- looks at the cultural construct of whakapapa (genealogical links or affiliations) which has a pervasive influence on the behaviour and decision-making among Māori. Two related cultural concepts are covered as well - kaitiakitanga (inter-generational stewardship) and whanaungatanga (intra/inter tribal relationships);
- includes a description of two collectives located in the North Island of NZ and gives a detailed description of one of these collectives and demonstrates the connection between genealogy, stewardship and tribal relationships and the structure and behaviour of these organisations; and
- the final section outlines conceptual model (Whenua) that has been designed specifically for Māori collectives and its capacity to incorporate the cultural concepts outlined above.

## Māori land tenure and the Māori agribusiness sector: An overview

Māori ancestral land or Māori freehold land as it is referred to under the Māori Land Act (Te Ture Whenua Māori Act-TTWMA), 1993 is around 1.5 million ha or 5% of the total area of New Zealand. Individual Māori own 'general land' (land available on the open land market) while holding interests in their ancestral lands. Māori land is almost exclusively owned by the descendents of the original owners, handed down through successive generations to the current owners (Kingi 2009a). Current owners have inherited land interests; but these interests to land titles have become increasingly fragmented (or fractionated) (Kingi 2009b; 2008). Title fractionation occurs where additional owners (or successive generations) receive a diminished fraction or portion of a fixed land area.

In an effort to contain the negative effects of title fractionation (*i.e.* too many owners to be effective) the legislation enables the establishment of ownership structures where representatives are elected to administer the land interests on behalf of owners – these could number in their thousands. The consequence is the establishment of hundreds of corporate-styled structures where decision-making is run by committees of absentee owners. Two main structures are prevalent: Ahuwhenua Trusts and Māori Incorporations. A third entity is the Whenua Topu Trust (where ownership lies with a specified clan (*hapu)* rather than individuals with registered interests); but its use among Māori is limited. The regions in NZ with the highest proportion of Māori land are Tairawhiti, Arawa and Mataatua. Figure 1 shows the main *iwi* (tribes) for Aotearoa NZ.

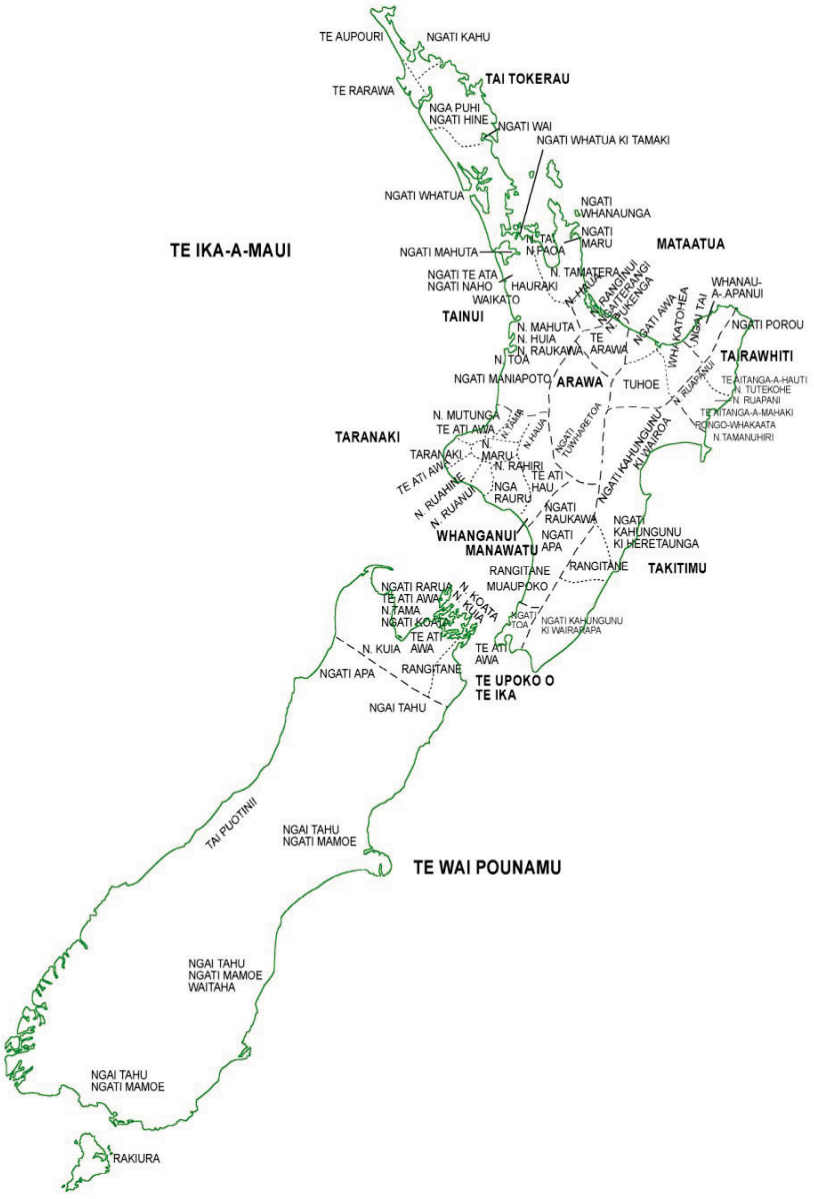


**Figure 1: Major tribes within New Zealand (Source: www.takoa.co.nz)**

The majority of trusts and incorporations are owned by *hapu* (clans) – not shown in Figure 1; and it is not uncommon for the trustees (or committee members in the case of Incorporations) to either donate their time or accept low meeting attendance fees. Reasons vary from a willingness to reduce overhead costs, but also the recognition that election to a decision-making position carries with it a cultural responsibility as *kaitiaki* (stewards/guardians) to protect and maintain the land in addition to their fiduciary duties under the TTWMA, 1993. Absentee ownership structures are inherently expensive and cumbersome but the high communication and reporting costs are necessary to inform owners on two key aspects - farm business performance (against physical productivity and financial indicators) and land/environmental performance. The latter is often under reported because of the difficulties of identifying relevant and measureable indicators. With the increase in spatial mapping and environmental modelling tools this reporting component is improving. The final section below demonstrates how this information can be incorporated into a framework that improves the planning and monitoring functions of these organisations.

Close to 60 percent of all Maori land is under the Ahuwhenua Trust structure (approximately 5,000 control around 750,000 hectares). Māori Incorporations are lower in number; 166 that control 210,000 hectares (MAF 2011). The distribution of land administered by these two structures is skewed with a small number dominating. A recent report by Te Puni Kokiri (2011) recently identified 40 incorporations that control nearly 80 percent of incorporation land and 100 trusts that control over 60 percent of trust lands. However, the vast majority of structures are small in scale. Approximately 2,000 trusts manage less than 5 hectares and an even greater number manage land between 6 and 50 hectares. The need to amalgamate smaller trusts into larger, economic units, is pressing. So too is the statistic that over 60 percent of land titles representing approximately 20 percent of Māori land (or over 280,00 hectares) has no formal structure (MAF 2011). Fractionated land titles, small land areas and a substantial area of Māori land without a formal structure, highlights a significant constraint to the sector. The PricewaterhouseCoopers (2013) report to MPI (previously MAF) that identified almost 1m hectares of underutilised and low productive land and proposed that this could produce an additional NZ$8b in gross output between 2103 to 2022 underscores the potential, but the challenges and barriers are significant.

## Cultural Constructs

### *Whakapapa, whanaungatanga and kaitiakitanga*

*Whakapapa* literally means 'to layer' (Williams 1971) or to recite the interconnected layers between humans, the natural environment and spiritual realms. Genealogical recitation is not restricted to 'family trees' but extends to cosmogony (creation myths) and the personification of natural phenomena. *Whakapapa* is central to Māori thought processes and is described by Marsden and Henare (1992) as a pervasive tool for transmitting knowledge:

*Every class and species of things had their own genealogy. This was a handy method for classifying different families and species of flora and fauna, of the order in which processes occurred and the order in which intricate prolonged activities or ceremonies should be conducted etc.* (p. 10).

The capacity to maintain the knowledge of genealogical connections to humans and the natural environment provides a prevailing linkage across time and space; or the eternal present as Shirres (1997) described it. Genealogies are taxonomic structures that attribute order and meaning to existing patterns in nature (Attran 1993; Berlin 1992) and they not only help to explain the origin of the universe and the creation of life, they also define the relationship between humans and the natural environment. Although the details vary from tribe to tribe, the general structure of the central creation story – the separation of earth mother (*papatūānuku*)and sky father (*ranginui*) – remains fairly consistent (see Best 1982a, 1982b; Buck 1987; Smith 1913 for detailed descriptions). The deity credited with the creation of humans is also the deity for the natural environment - *tanenuiarangi*. Figure 2 below illustrates the genealogical linkages between *papatūānuku*, *ranginui*, *tanenuiarangi* and humans, animals, insects, rocks and trees [see Haami and Roberts 2002 and Roberts *et al.* 2004 which illustrates the genealogy of plants, animals, and insects based on the *kūmara* (*Ipomea batatas*)].

*Whānaungatanga* is the bond of kinship through common ancestry that defines inter and intra tribal relations. *Kaitiakitanga* derives from *tiaki*, meaning to guard or keep watch, so *kaitiakitanga* is the responsibility to nurture and care for the *whenua* (land) and natural environment, through time *i.e.* intergenerational. The influence of these constructs on the behaviour of Māori agribusiness organisations is significant; in particular the enveloping affect they have on the decisions relating to investment, diversification and collaboration.

## Collectives, collaboration and organisational resilience

The formation of collectives within the Māori agribusiness sector has increased in recent years. Two recent examples are the Taumata Collective located in Tairawhiti region (East Coast of the North Island) established in 2007; and Te Arawa Collective, located in the Arawa region (Central North Island) established in 2011 (see Fig. 1). Taumata has around 12 members with approximately 16,000 ha in pasture, 88,000 sheep and beef stock units, and 2,200 ha in plantation forestry. The Te Arawa Collective has 22 members (as of April 2013) but these numbers are increasing. This collective has a range of structures although the majority are Ahuwhenua Trusts (Trusts AW), one Whenua Topu (Trust WT), one Māori Incorporation and two limited liability companies (Table 1). One company is a joint venture between two Māori Incorporations and the other a subsidiary of an iwi authority (organisation formed under the Te Arawa Lakes Settlement Act, 2006). Table 1 below gives the descriptive statistics for 17 members. There are three points of interest that emerge from this table (genealogical affiliation, diversification and resilience). These are discussed below.

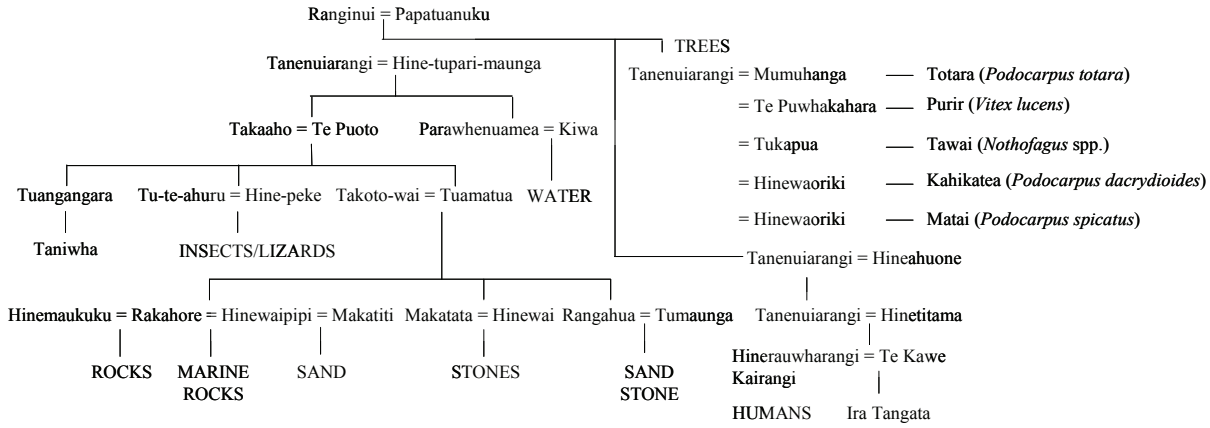


**Figure 2. Genealogy of humans, the natural environment and spiritual deities (adapted from Best 1982a 1982b, and Buck 1987. (Source: Kingi *et al.* 2013a)**

**Table 1. Arataua - Te Arawa Primary Sector Collective.**

| Organisation | Total Area (ha) | Pasture (ha) | Dairy (ha) | Cows | Stock (units) | Forestry (ha) |
|---|---|---|---|---|---|---|
| Trust (AW) | 8,590 | 165 | 115 | 298 | | 8,425 |
| Trust (AW) | 3,645 | | | | | 2,532 |
| Incorporation | 2,750 | 2,120 | | | 25,608 | 450 |
| Trust (AW) | 2,430 | 1,595 | 627 | 1,770 | 11,883 | 121 |
| Trust (AW) | 2,375 | 1,515 | | | 15,022 | 860 |
| Trust (AW) | 1,890 | 1,456 | 334 | 994 | 10,543 | 100 |
| Trust (AW) | 1,290 | | | | | 1,290 |
| Trust (AW) | 1,024 | 475 | | | 4,550 | 549 |
| Trust (AW) | 900 | | | | | 900 |
| Trust (AW) | 869 | | | | | 578 |
| Trust | 849 | 600 | | | 4,625 | |
| Company | 832 | 762 | 400 | 1,150 | | 600 |
| Trust (AW) | 810 | 598 | 352 | 949 | | |
| Trust (AW) | 768 | 227 | 924 | | 1,116 | 48 |
| Trust (WT) | 713 | 466 | | | 5,978 | 60 |
| Company | 380 | 310 | 310 | 1,200 | | |
| Trust (AW) | 355 | | | | 700 | |
| Total (17) | 30,470 | 10,289 | 3,062 | 6,361 | 80,025 | 16,392 |

## *Genealogical affiliation*

The population of Te Arawa is estimated to be 42,159 (2006 census) and each of these individuals can trace their lineage to a single eponymous ancestor, Homaitawhiti (approximately 30 generations to around 1200AD). While the membership of these 17 organisations is unknown (to the author) and difficult for many trusts and incorporations to determine with inaccurate Māori Land Court ownership records, it would number in the tens of thousands. Many of the individuals would have multiple ownership linkages to several of the organisations listed, thereby strengthening the underlying genealogical structure. With over 85 percent of Māori residing in urban cities, the vast majority of owners do not live on their ancestral lands, nor derive employment from it. In spite of the lack of direct contact with their lands, the inter-clan linkages are a powerful reminder of the collective responsibility to maintain the integrity of these organisations as viable farm businesses as well as mechanisms to protect the *mana* (authority, control) of the *hapu* (clan) land owners.

## *Diversification and multiple enterprise businesses*

Land utilisation diversity with multiple enterprises is common among the group. The average size is 1,792 ha, with an average of 857 ha in pasture and 1,366 ha in plantation forestry. Of interest is the relatively small number of organisations that are single enterprise: 3 forestry only entities and 3 without any forestry. The rest have a mixture of dairy, drystock and forestry. The average dairy farm size is 857 ha with 437 cows (note this includes dairy support areas; dairy stocking rate in the group is around 2.7 cows/ha). The table does not identify areas of indigenous forestry nor does it list those organisations with geothermal investments. However, the rise of honey

extracts from indigenous trees (*e.g.* manuka), nutraceuticals and access to natural flora for cultural purposes has seen an increase in potential (and actual) revenue streams from indigenous forests. Additionally, several members of the Collective are situated on geothermal fields; one member has entered into a joint venture with a state-owned power company and others are exploring options with potential partners.

### *Organisational resilience*

Diversification is often a deliberate risk reduction strategy and a key element in development plans that extend to much longer timeframes in comparison to farmers that rely on capital surplus revenue from the future sale of land assets. In general, Māori do not sell their ancestral land. The legislation makes it difficult and extensive historical land loss means that sale is unacceptable to the majority of current land owners. Investments that produce sustainable revenue are preferred. While resilience to external impacts (*e.g.* climate uncertainty – the 2012/2013 drought is a recent example; nutrient emission regulation etc.) may not have been at the forefront of the decisions by these organisation to diversify 40 -60 years ago, the consequence is that they fare much better (cf. single enterprise farms) under adverse conditions. For example the ability to harvest production forestry plantations early; or the ability to move stock from a dairy platform to dairy support or drystock areas of the farm to minimise nitrogen emissions is an option only open to multiple enterprise farms.

Collectives, offer an extension to the advantages of diversification by facilitating trading and joint arrangements between multiple farm units thereby increasing the capacity to improve efficiencies through scale and to capture value chain opportunities that are out of reach of individual farm unit (Kingi 2013, 2013b). The availability of tools and models to facilitate discussion among multiple farm units is very low.

## Whenua: conceptual model specification

Māori collectives wanting to explore potential post-farm gate collaboration within their collective membership (and with other collectives) often find themselves with several unanswered questions and a lack of information on how to move forward. Red meat collaboration questions asked by a group of farmers might include: What does our product supply base look? What is the temporal distribution of these product lines? What are the current supply contracts in place within the membership? Who buys our products and could we produce to specific market requirements? What is the range of farming systems within the group and what is involved in integrating these farms? How flexible are these farming systems to be adapted to new market channel requirements?

There is currently no strategic modelling platform in NZ that successfully links multiple farm systems analyses with value chain optimisation. Similarly, there is no modelling platform that incorporates cultural parameters including long time frames for decision-making and pay-back periods; and a desire to collaborate within and across tribal boundaries. In an effort to fill this gap, a conceptual model has been developed by AgResearch farm systems modellers to answer the following question: How should tools and models be designed, integrated, customised and delivered in order to be effective in tactical and strategic decision making by Māori entities that want to collaborate and grow their businesses? Answering this question will provide the tools to answer the questions asked above Māori farmers.

A conceptual model or integrated platform is under development: Whenua – Integrated Farm and Value Chain Optimisation (see Fig. 3). Whenua is in conceptual form only but draws on two current research projects. The first is the development of a red meat value chain model that builds on the work of Dake and Montes de Oca (2004) and Montes de Oca *et al.* (2003). The second is the

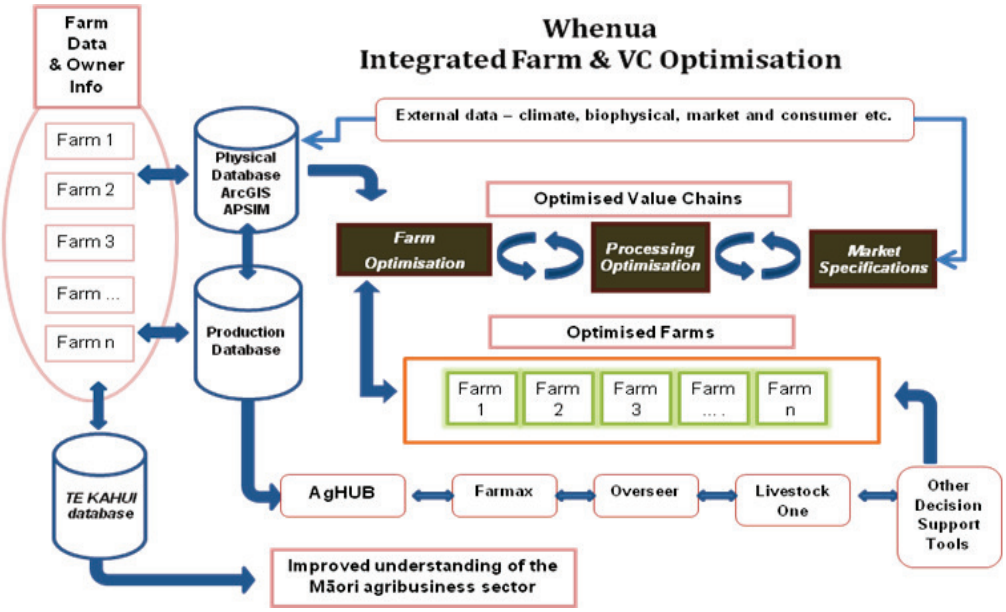


**Figure 3. Whenua: Integrated farm and value chain conceptual model designed for Maori collectives.**

development of an integrated whole farm planning tool (iWFP) that is being developed within the Pastoral 21 research programme.

The Whenua platform contains existing farm system production tools, financial and environmental models, geophysical databases, spatial models, along with networking and value chain models. Whole-farm system optimisation that meets end-user objectives will be facilitated by the development of a user-friendly interface. No modelling platform currently available meets these specifications. Manual interfacing of the various component tools is possible but not practicable for multiple simulations comparing scenario options with different assumptions. Instead, the Whenua platform will provide a structural interface where data is shared between the models (*e.g.* using lookup tables) and the models run independently. This is the most cost effective approach and it maintains the integrity of the separate components.

The purpose of Whenua is to produce strategic decision support tools that can capture potential collaboration between Māori producers in a dynamic and visual format that is easy to access and comprehend. Understanding what potential collaboration may look like is an important starting point to forming partnerships. The decision to partner is based on a number of factors including a clear depiction of the entire value chain from customer requirements, market channels, processor and other intermediaries requirements back to the producers.

## Methodology

Development of Whenua will be guided by Te Kāhui or 30 Māori agribusiness entities selected from the Taumata and Arataua collectives along with other collectives around NZ. The Whenua platform has a number of models and tools indicated in the concept. These are not fixed. The linkages between the models have not all been tested and different applications will require different tools. Figure 3 above provides examples of potential models that are relevant to a range of applications. Central to the platform is a biophysical database will be developed utilising a spatial model - ArcGIS (http://www.esri.com/software/arcgis) and a biophysical simulation model – APSIM (http://www.apsim.info/) where required. Value chain models in the pastoral sector have historically focused on the processing component of the value chain with minimal descriptive information of the farm suppliers. Whenua will integrate farm supply information using on-farm monitoring tools such as Farmax$^{TM}$ (http://www.farmax.co.nz/) and AgHub (http://www.aghub.co.nz/) and nutrient management tools such as Oveseer (http://www.overseer.org.nz/). Livestock performance and product traceability will be monitored using LivestockOne (http://www.livestockone.co.nz/). Other decision support tools include horticultural, forestry and statistical models where required by the end users.

Whenua is not a substitute for discussion among collective members. It does, however, provide a framework for discussions that focus on collaborative strategies beyond the farm gate. The emphasis is on identifying and designing optimal farming and value chain systems and supporting decision-makers to assess investment into systems reconfiguration to, for example, improve the logistical coordination of product through the system from producer to buyer. For this to take place a user-friendly interface that facilitates interaction, exploration, learning and evaluation is needed. Exploratory processes would incorporate interactive and participatory processes that could include all, or some, of the components of the Whenua platform. The models in the Whenua platform coupled with exploratory processes combine to make up the Whenua Framework. Once a decision is made to explore specific opportunities *e.g.* red meat supply collaboration to target a specific market, individual farm units can be identified, production systems described, and monitoring and evaluative tools (*e.g.* Farmax) applied to produce outputs that will contribute to the development of a value chain model to further explore investment and options. The two prototype models, currently under construction - red meat value chain model and integrated farm planning tool, can be used as both strategic tools to explore collaborative possibilities and monitoring tools to evaluate the system implementation.

## Conclusion

This paper attempts to join two very diverse and often conflicting world views. The first is the Māori construct of *whakapapa* which proposes that humans and the natural environment share common ancestry. An individual does not necessarily have to 'believe' in this concept to accept that there is a shared, common understanding behind the statement. Recent DNA sequencing has identified a very high percentage of homologous animal genes with humans; enough evidence for some to show that humans and the natural environment share common building blocks. The corollary to this is a relatively high weighting on the importance of family and tribal linkages and a much greater tendency to protect the natural environment for future generations. Two collectives were introduced and one examined in detail to identify the various configurations of its member organisations. It showed that: (1) genealogical affiliation can lead to a higher likelihood of successful collaboration; and (2) enterprise diversification can lead to improved farm resilience. Further research is however, needed to test these propositions. The paper concludes with a description of the Whenua Framework - an ambitious concept that aims to integrate several existing systems models and two prototype optimisation models into a platform that is configured specifically for Māori collectives, but is relevant to farmers anywhere in NZ or internationally. The effectiveness of this model lies in its platform functionality – linking the outputs of models within a cohesive framework rather than integrating the models; in other words, getting the models and tools to talk to each other rather than being joined at the hip. Whenua, in time, will be a major technical achievement. Not only will it overcome the gap in the current range of strategic multi-farm, value chain tools, but it is configured specifically to meet the needs of farmers that operate outside of what the industry typically describes as normal.

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