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Understanding the perspective of New Zealand Sheep and Beef farmers: Some effects on the market orientation and farm performance in the red meat industry.

Angela
McFetridge

Contents

1. Executive Summary.....	1
2. Acknowledgements.....	2
3. Overview of the study.....	3
4. Overall aim and objective	4
5. Literature review.....	5
5.1 Market orientation and other considered orientations	5
5.2 Market orientation, supply chains and farm performance	8
6. Methods.....	9
7. Description of the data	11
8. Results and discussion	14
8.1 Cooperative members vs. non-cooperative members	15
8.2 Levels of education attained.....	18
8.3 End to end ownership of sheep through the marketing channel.....	20
8.4 Market orientation, farm performance and farmer attitudes and behaviours.....	23
9. Conclusions	25
10. Recommendations	27
11. References	28
Appendix A.....	33

1. Executive Summary

With debate surrounding the structure and strategy of the New Zealand red meat industry, the time is right to explore constructs around the market orientation and performance of New Zealand sheep and beef farmers. Market orientation was determined by studying customer orientation, competitor orientation and inter-functional coordination. These factors were considered alongside cooperative membership, level of education attained and ownership of sheep through the marketing channel.

Results indicate that there are some very moderate differences between cooperative and non-cooperative members, though there was no statistical difference between various levels of education attained and ownership of sheep through the marketing channel using principal components analysis, MANOVA and discriminant function analysis.

Redundancy analysis was used to analyse the variability in market orientation in relation to ten variables being price, production, quality, relationships, planning, innovation, learning entrepreneurship, trust and commitment. Planning, performance and relationships were the most powerful variables. The theoretical framework and model was applied to a usable sample of 131 sheep and beef farmers from all regions of New Zealand and is a study which is a preliminary step to gain insights for more in-depth empirical research in the near future.

2. Acknowledgements

My family are a constant source of encouragement and support while I am enjoying building my toolkit and their backing through the Kellogg Rural Leadership Programme has been no exception. Pete, Claire and Robbie, thank you – you are my rock stars and I would like to acknowledge ongoing your patience and interest.

The Kellogg participants and organisers have also had a huge role to play, not just with this research project, but the whole programme itself. I would like to acknowledge you for opening my mind, my network and many, many doors. I have really enjoyed using this project to use some great tools and to communicate some important farmer aspects.

Professor Hamish Gow first introduced me to the concept of looking sheep and beef farmer market orientation, and so thanks to him for debating, challenging and pushing me to do something different and important.

Professor Marti Anderson also deserves a worthy mention for her patience and guidance in teaching me the features and skills in multivariate statistics. It was no easy task to take a student like me who had never excelled at maths at school and guide, encourage and challenge me to complete your paper for which I can now use to unpack and create stories and insights from raw data and to create better survey instruments in the future.

3. Overview of the study

The New Zealand red meat industry is currently experiencing much media attention in terms of the structure and strategy of the industry and whether or not change should take place. Such debate and conflict within New Zealand agriculture is arguably evidence that the farming fraternity contains many different schools of thought about what the red meat industry should or shouldn't look like. Bearing this in mind, the ideal shape and strategy of the red meat industry is complicated due to the multiple lenses that farmers, groups of farmers and other industry players are looking through (Beus & Dunlap, 1991). This leads to an interesting point about how New Zealand sheep and beef farmers are segmented; how they identify and connect with the red meat industry and what their level of care and understanding is about matters which occur outside of their farm gates. Therefore, this study was conducted as a first step to firstly gain an empirical insight and understanding of the New Zealand red meat industry from the primary producers view point, at a time when there is limited objective information in the literature based on the social influences and decision making practices within New Zealand agriculture (Campbell, Rosin, Hunt, & Fairweather, 2012); and secondly to understand what strategic influences and behaviours have an impact on a farmers market orientation and farm performance outside of the known relationship between pasture growth, biological efficiencies and profitability (Chapman, Cullen, Johnson, & Beca, 2009).

Increasingly, there is a demand to understand farmers' perspectives from an objective point of view which is being driven by the growing interest in doubling export value by 2025 (Deloitte, 2011; Ministry of Economic Development, 2011), particularly if policy makers and industry leaders are to understand the red meat part of the primary industry value chain from end to end. Other studies have found that understanding market orientation, alignment of resources and being customer focussed are important pillars for building a sustainable and competitive edge. Being sustainable and competitive is vital for New Zealand's agri-food industry and is of utmost importance to our overall economy due to the heavy reliance that other elements of our economy have on the primary sector. (Micheels & Gow, 2008; Narver & Slater, 1990; M. E Porter, 1985; M. E. Porter & Millar, 1985). Agriculture is our economic engine room and generates a large percentage direct and indirect income. Most rural towns are very sensitive to the ups and downs of agriculture with many of their businesses and therefore employment stemming from the income that farmers bring to town. It hurts businesses when farmers suddenly do not have discretionary income to spend and so the view of this report is that it is of national interest that our primary industries are market orientated and in good heart if we are to be at the cutting edge of our market and consumer demands.

Market orientation has been used extensively to look at the links between firm performance and its relationship to strong and weak levels of market orientation, though it is also noted that in agricultural enterprises other factors such as planning, entrepreneurship, learning and innovation can also contribute towards organisational performance (Alegre & Chiva, 2013; Alpkan, Yilmaz, & Kaya, 2007; Farrell & Oczkowski, 2002; Grinstein, 2008; Han, Kim, & Srivastava, 1998; Hurley & Hult, 1998; Micheels, 2010; Narver & Slater, 1990). These factors will be considered in the literature review to highlight attributes that were considered in the design of the study and the resulting survey instrument.

4. Overall aim and objective

The purpose of this study is to gather a reliable empirical understanding about the relationships between market orientation and farm performance as a preliminary step within a wider objective to define future research opportunities so that we can begin to better understand New Zealand sheep and beef farmer's identity, commitment and behaviour within the red meat industry. Studies of this nature are important as they are conducted within the strict requirements of ethical standards and adhere to the obligation to provide apolitical validated and reliable information. As such, the information gathered will be of value to policy and decision makers within the agricultural sector alike and will contribute to the literature as a critical analysis of the red meat industry.

As some of the current debate in New Zealand is centred on whether or not our two biggest cooperative meat companies should merge, the data will be segmented to consider the relationships between cooperative and non-cooperative members:

H1: There is a difference in market orientation and farm performance between farmers who are cooperative members and farmer who are non-cooperative members.

Concerns have been raised in the media and by Lincoln, Massey and Waikato Universities about the small numbers of students who are choosing to study agriculture, and so the role of education on New Zealand sheep and beef farms will also be examined:

H2: There is a relationship in market orientation and farm performance according to the level of education level attained.

Integrative organisations such as Firstlight Foods® attracted the reports' attention due to the enthusiasm their farmers have for their market and their company. These farmers are very animated about the products that they produce and the end consumer both here and overseas. Organisational structure and cultures such as this lead to the interest in understanding whether or not there is a relationship between farmers who retain end to end ownership of their sheep through the marketing channel compared to those who do not:

H3: There is a difference in market orientation and farm performance between farmers who retain end to end ownership through the marketing channel and those who do not.

Finally, the level of market orientation plus performance which is explained by attitudes and behaviours will be examined using Redundancy Analysis. Attitudes and behaviours in this study are categorised by;

- Price
- Production
- Quality
- Relationships
- Planning
- Innovation
- Learning
- Entrepreneurship
- Trust and
- Commitment

The explanation, development and justification of the measurement scales for each of the variables are found in section five of the report.

5. Literature review

5.1 Market orientation and other considered orientations

The marketing concept has been an influential theory in both academic and practitioner spheres since Peter Drucker spoke of marketing from the point of view of the customer in the 1980's. The marketing concept was examined more closely through contemporary research during the same period when we first saw the term market orientation emerge which takes a wider view of up and downstream partners and their associated stated and latent needs (Hadcroft & Jarratt, 2007;

Kirca, Jayachandran, & Bearden, 2005; Siguaw & Diamantopoulos, 1995; van Raaij & Stoelhorst, 2008). There continues to be favourable and unfavourable debate about market orientation. However, there is a common theme within these debates which recognises that organisations which have a strong focus on identifying and understanding market intelligence, value creation and customers also have very good internal organisation that positions their day to day operations to complement their external environment (Griffiths & Grover, 1998; Lafferty & Hult, 2001; Micheels, 2010; van Raaij & Stoelhorst, 2008). In other words, those who embrace and cater to the external environment are able to adjust to act in a proactive manner rather than a slower reactive manner. Slater and Narver (1994) found that if superior performance is to be achieved, then the focus must shift from traditional product lines, economies of scale and market power, to a focus which is attentive to creating superior customer value. If we overlay this argument over the New Zealand sheep and beef farming context, it is suggesting that better performance is achieved when farmers understand their customers' needs and they then go onto tailor their farming practices, techniques and outputs to match those needs by aligning to their channel partners. Perhaps then, building a better value chain understanding should begin by testing whether our primary producers are able to commit to the process of delivering products with the end consumer in mind as the vital first step within the value chain process. If we are to ask why this is so, then as an example we may need to argue that instead of farmers being rewarded primarily for carcass weight, meat companies could be examining how to encourage and incentivise farmers to produce animals which are of a quality standard to match their marketing and therefore customer needs. There are studies which have found that activities occurring up and down supply and value chains are in fact, dependent on each other which emphasises that it is valuable to gain insights as to how farmers view the world inside and beyond their farm gates to understand how they are currently viewing these dependencies (or not) (Kibbeling, der Bij, & Weele, 2013). As previously mentioned, it is also important to understand different segments within the red meat farming sector aide in development and delivery of industry strategies.

We have considered marketing orientation, but there are other orientations such as innovation creation and innovation capability. These orientations have been found to be complimentary to market orientation, customer related performance and meeting downstream value partner requirements, identifying the need to also capture farmer insights on information gathering and dissemination, learning, planning, entrepreneurship and communication (Alpkan et al., 2007; Deshpandé, Farley, & Webster Jr, 1993; Grinstein, 2008; Han et al., 1998; Kibbeling et al., 2013; Micheels, 2010; Ngo & O'Cass, 2012). For this study the following definitions will be used for learning, planning and entrepreneurship:

- Learning is a mechanism which has impacts on behaviour and culture in the process of making improvements to culture, systems, abilities and skills (Alegre & Chiva, 2013)
- Planning is the ability to align an overall business goal with a plan of action, which could be a long term strategic plan or short term plan – both of which can enable a business to deal more effectively with external opportunities and threats through building better internal systems and approaches to capitalise and; build on strengths and mitigate or eliminate weaknesses (Alpkan et al., 2007; Grinstein, 2008; Matthews & Scott, 1995; M. E Porter, 1985; M. E. Porter & Millar, 1985).
- Entrepreneurship is the reflection of a willingness to assume some risk and to act proactively in light of innovation which has been discovered (Grinstein, 2008).

The macro or outside environment then, has the potential to provide beneficial prospects to farmers when they understand what is happening, especially if they can take this understanding into their own business and apply it. Such understanding places businesses in a position of being able to act proactively and therefore provide better value and seize opportunities quicker than those who believe that the market place is a static environment (Micheels, 2010; Senge, 1990; S. F. Slater & Narver, 1994).

Cooperative business structures have been cited as being a means to achieve greater market orientation within agricultural (Bijman, 2010). New-age cooperatives have been empirically linked to the increase of entrepreneurial and innovative cultures which can be complimentary to a stronger market orientation, bearing in mind that the overall culture of the cooperative is a key consideration (Kyriakopoulos, Meulenberg, & Nilsson, 2004). In other words, the culture of the cooperative is influenced by the alignment and wishes of its owners which brings to mind the importance of shareholder voting and decision making which in turn is affected by the level of togetherness or fragmentation amongst shareholders. If shareholders by and large agree with strategies which embrace a market orientation, then their voting behaviour will be more inclined to favour market orientation decisions and strategic direction.

Education as an orientation within agricultural contexts has been shown to have a positive effect on business performance – and more specifically, the level of education attained where higher education resulted in better performance (Nam, Ahn, & Lee, 2010). It is worth noting, however, that higher levels of education can also entice workers into non-farming occupations who tend to show a preference for the entrepreneurial opportunities that non-farming occupations can present (van der Sluis, van Praag, & Vijverberg, 2005). Education has also been shown to have an

effect on farmers' attitude towards risk and can result in increased levels of innovation (Knight, Weir, & Woldehana, 2010).

5.2 Market orientation, supply chains and farm performance

Because New Zealand farmers work in supply and value chains, the need for this study to understand the farmers perspective is vital because as with their physical counter-parts, value chains are as strong as their weakest link (Kotabe, Martin, & Domoto, 2003). The meat industry chain is a typical agri-food chain where often the primary producer and the end consumer have no direct contact with one another. Also, there are hierarchical approaches at every step along the chain that imposes different expectations, creating impediments to solving supply chain issues and may contribute to some internal looking views, mistrust and the performance of the overall industry (Bodlaj, 2012; Deshpandé et al., 1993; Grunert, Bredahl, & Brunsø, 2004; Han et al., 1998; Harris, 2002; Nadler, 1998; Narver & Slater, 1990; Zaltman, Duncan, & Holbek, 1973). This point of view means that some organisations to solely look after their own "patch" seeing collaboration and information sharing being reduced or worse, cease to occur altogether. So instead of having an end to end view of a supply chain, we have scenarios where there is lots of competition amongst value chain partners such as meat company vs. meat company, or procurement agents, logistics agents and business who supply farmers with goods and services. This behaviour may encourage strategies that can see such businesses think no further than their own balance sheets and financial performance instead of for complementary betterment of their upstream and downstream customers in terms of performance and relationship enhancement. It is acknowledged that it is neither feasible or desirable to have a one-size-fits-all meat industry, and so we cannot ignore the importance of good shared communication and the need for sound strategy through the use of traditional and new collaborative and technical advancements as we consider the New Zealand Government's export goals for 2025 (Deloitte, 2011; Ministry of Economic Development, 2011; Mulrony & Chaddad, 2005; Salin, 2000). We have a plethora of new technological research and innovation which spans from; in market research and consumer preferences, processing and manufacturing, packaging, food taste and presentation to animal and animal food genetics and animal performance. And so, conversations about the red meat sector and its performance will continue to gain momentum and importance in a world where customer segments are increasingly being influenced in their purchasing decisions and preferences which are being based on product attributes, how animals are being raised and treated and whether these same animals have been subjected to hormonal or antibiotic treatments; in addition to organics and processing information (Grunert et al., 2004; Thilmany, Umberger, & Ziehl, 2006; Xue, Mainville, You, & Nayga, 2010). Understanding the process for customer decision making is important. Once customer preferences

have been satisfied in terms of information and product presentation , only then can a customer make a second assessment of the product to assess taste, tenderness and versatility (Bekhit, Carne, Ha, & Franks, 2014). The point to be made here is that the New Zealand story has to be told in full, from one end to the other if we are to present ourselves and stand out as a world leading reliable and safe agri-food producer.

Farm performance is not easily tested in small organisations, and can be problematic in terms of the variability in this area due to the range of systems, performance expectations and constraints such as market exchange rates, seasonal weather impacts and access to resourcing such as supplementary feed, farm equipment, skills sets, or human resources (Huirne, 2002; Rougoor, Trip, Huirne, & Renkema, 1998). Research conducted on family farms shows strong evidence that although farms are businesses, it is also reasonable to assume that such farms have business like goals and objectives, however, on the other hand the performance of the family farm has been commonly linked to quality of life, family and lifestyle, the ability to manage farm assets, operational success and lastly an economic result (Ferguson & Hansson, 2013; Gasson et al., 1988; MäKinen, RantamäKi-Lahtinen, YläTalo, & VehkamÄki, 2009; Maybery, Crase, & Cullifer, 2005). Such variability about financial performance in agriculture is made more complex due to the blend of farm sizes and the mixture of ownership models – each which has different expectations of performance, risk tolerance, access to resources, skill and support systems. Performance is also enhanced or inhibited due to factors which can be farmer controlled such as stocking rates and selling arrangements; or uncontrollable factors such as market forces and seasonal climate (Kaine & Cowan, 2011; Magne, Cerf, & Ingrand, 2012).

6. Methods

Five point Likert scales were used to enable the participants to evaluate how they felt about each of these elements and were presented in each of the measurement scales. Answers ranged from strongly disagreeing to strongly agreeing with provided questions and statements. Weighting for all questions were allocated a score from -2 to +2 with all neutral answers being 0. The scores from these measurements were averaged to give an overall score for each set of scales so that the analysis was conducted on each category as a single item instead of each multi-item measurement scale for the different categories. All incomplete questionnaires were discarded. This gave a total sample size of 131 which was analysed using multivariate data analysis tools.

The data were analysed using RStudio (R) which is an open source statistical software package (RStudio Inc, 2009-2015). R was used to examine the different segments of interest in order to examine the effects of cooperative members vs. non-cooperative members, the level of education attained and end to end ownership of sheep through the marketing channel. Survey participants were asked to respond either yes or no in response to the question about whether they were a cooperative member and yes, no or don't know to whether they retained ownership of their sheep through the marketing channel. Levels of education were categorised as High School, Undergraduate, Postgraduate or PhD whereby respondents were asked to indicate what their highest attained education level is. Farm size was also used as a segmenting factor when analysing market orientation and farm performance according to farmer attitudes and behaviours.

Four multivariate data analysis techniques were used to analyse the data set on the basis of Euclidean distance, these being:

- Multivariate Analysis of Variance (MANOVA)
- Principal Component Analysis (PCA)
- Discriminant Function Analysis (DFA).
- Redundancy Analysis (RDA)

It was not necessary to transform the data, as it was already collected on the same scale basis and that transforming these data may compromise the interpretability of the results. The data were analysed on the basis of the Euclidean distance measure because the same quantitative scale was used and the zeros in the data set are meaningful to the analysis.

Principal Component Analysis (PCA) was used as it is a very good tool that can be used to simplify the descriptions of sets of interrelated variables (Afifi, May, & Clark, 2012). PCA is a method that is used for identifying patterns within the data and then expressing it in such a way so that we can look the differences and similarities between those patterns (Smith, 2002). All variables in the Y axis were centred when using the PCA technique.

MANOVA and Discriminant Function Analysis (DFA) were selected in order to examine the relationships between categorical variables and the Y variables. MANOVA is a useful technique to assess differences between groups that can be conceptually related or differ by looking at the means between the groups (Harlow, 2014). Put another way, MANOVA or multivariate analysis of variance is a way to test the hypothesis that one or more independent variables, or factors, have an effect on a set of two or more dependent variables. Discriminant function analysis is useful in determining

whether a set of variables is effective in predicting category membership (Green, Salkind, & Akey, 2008).

For this study, PCA, MANOVA and DFA were used to assess the differences between, cooperative members vs. non-cooperative members (*H1*), level of education attained (*H2*) and end to end ownership of sheep through the marketing channel (*H3*) in relation to market orientation and farm performance.

DFA is a worthwhile follow-up technique to MANOVA and identifies which discriminating variables are differentiating between the groups the most powerfully (Harlow, 2014). No significance tests in the R statistical software were provided for RDA, however, they can be found in the MANOVA analysis.

Because the Euclidean distance measure has been used throughout the study, Redundancy Analysis (RDA) was used to find how much variation in **Y** is explained by **X**, to regress matrix **Y** (the responses), on matrix **X** (the predictors). In using RDA, the data were split into predictors which were attitudes and behaviours (**X**) and market orientation plus farm performance which were the responses (**Y**). RDA was selected as a technique that could find a linear combination of **X** variables that is best at explaining the variation in **Y** where the maximum number of RDA axes will be $\min[p, q, (N - 1)]$, where q = the number of variables in **X** and p = the number of variables in **Y**.

7. Description of the data

The raw data for this project were collected from a sample taken from the target population of sheep and beef farmers throughout New Zealand. Federated Farmers New Zealand provided a means to operationalise the data collection by emailing a link to the survey website Survey Monkey® which was accompanied with background information about the study. The email was sent by Federated Farmers to their meat and fibre members (N=4,770) during May 2014 which is a quiet time of the year for farmers; the timing was important as farmers are less inclined to respond to surveys during their busy times of the year (Pennings, Irwin, & Good, 2002). Though it would have been preferable to conduct the survey through an interview framework to gain additional insights and create more farmer engagement, the time and cost of such a project made this an unsuitable method in terms of constraints relating to time and cost. Statistical analysis provides a systematic method for the purpose of gathering information from a sample of a larger population, however,

and so the sample was gathered from a geographical spread which gained a response from all regions of New Zealand (Groves et al., 2009)

The survey instrument was pretested prior to being sent to the survey sample to ensure that the questions were understandable and the instrument could be strengthened on the basis of feedback received. Words such as “customer” and “competitor” were given explanations so that the participants could make sense of them within the context of the study. Though pre-tested multi-item scales already existed, the wording was made more applicable to those working in farming contexts. Some examples include changing words as “firm or business” to “our farm or farming business”. Because the project was interested in the red meat industry specifically, the term “meat company” was used to ensure that responses were aligned to the red meat industry context. It was important that the questions were asked using terminology that was understandable and meaningful to the survey sample.

Market orientation has more than one set of measurement scales, with the main two being MKTOR from Narver and Slater, and the MARKOR measurement scale devised by Kohli and Jaworski . Both sets of scales have attracted criticism and praise based on theoretical grounds (Kohli, Jaworski, & Kumar, 1993; Oczkowski & Farrell, 1998; Siguaw & Diamantopoulos, 1995) and methodological grounds (Micheels, 2010; van Raaij & Stoelhorst, 2008). However, the MKTOR scale was the preferred scale for this study as it has been successfully used and adapted for measuring market orientation amongst farmers previously and focusses on customer orientation, competitor orientation and inter-functional coordination (Micheels, 2010; Streeton D, 2011). Micheels (2010) and Streeton (2011) both selected subjective questions using measurement scales about pricing, quality, relationships, planning, learning, entrepreneurship, trust and commitment which were adapted to this study. Though similar research has been conducted in the past, until now, there has been no empirical understanding built on a New Zealand-wide basis in the sheep and beef farmer segment.

The learning scale was used to gain insights into the values and culture in relation to learning and was used as it is linked to innovation and firm performance (Farrell & Oczkowski, 2002; S.F. Slater & Narver, 1995). The original scale by Farrell and Oczkowski (2002) contained 11 items, however, this report only considered the five most relevant items to the project.

Entrepreneurship data was gathered to examine the attitudes of farmers towards risk and opportunities and to assess whether or not farmers used innovation in their farming operations or

preferred to play it safe based on scales by Covin and Slevin (1989) and Matsuno, Mentzer and Ozomer (2002).

The innovation scale is based on the scale developed by Hurley and Hult (1998) to assess the levels of innovation that occur inside of the farm gate. It was originally designed to measure the to what extent innovation is embraced as a means of understanding how innovation is used to enhance farm performance.

The level of trust between farmers and their channel partners is considered to be an important element and is currently a topical issue within the New Zealand farming industry. The trust scale which was developed by Doney and Cannon (1997), examined the levels of input that farmers are prepared to let their suppliers and buyers have in their farming operations. Commitment and trust were deemed to go hand in hand in this project and is also a very topical element in the current red meat sector debate as industry critics use fragmentation as an argument to support industry change. A four item commitment scale, which was developed originally by Morgan and Hunt (1994), was used to gather this information.

The planning scale was devised for this project so that the effects of planning horizons and goal setting could be better understood. It was thought that planning is an important element in farm performance through goal setting and the establishment of long term strategic plans.

Performance is not easily measured and may be affected by the halo effect as discussed by Micheels (2010). Therefore the three item scale which was used asked the respondents to react to subjective questions in order to remain consistent with the scale used in market orientation research by Micheels (2010) and Streeton (2011), and also because it was thought that respondents would not like to divulge personal and sensitive financial figures.

Other scales that were developed for this study are pricing, production, quality and relationships. The pricing scale contained five items to determine the importance of pricing in terms of costs and revenue. Production was measured using a four item scale to evaluate farmers' approach and attitude towards farm production. Questions about quality focussed on channel alignment and quality vs. production questions using a four item scale and relationships were examined using a three item scale to assess the importance of relationships with channel partners.

No personal information was collected and all responses were anonymous in keeping with the conditions of the Massey University Human Ethics Committee requirements for a low risk notification and approval under which the data was collected. All respondents were made aware of this and the assurance of confidentiality was clearly described in the covering survey briefing email.

The survey instrument is found in Appendix A

8. Results and discussion

An analysis of market orientation considering cooperative members vs. non-cooperative members, levels of education attained by farmers and those who own their sheep right through the marketing channel will be considered first. Next market orientation will be considered with the 10 attitude and behaviour variables. Both sets of analysis will be conducted using the 131 usable responses.

Principal component analysis, MANOVA and Discriminant Function Analysis

MANOVA is used to test relationships between the group's variables and was preferred because of the implicit use of Euclidean distances. Pillai's V trace statistic was used for MANOVA to examine distribution under H_0 where $V: F_v = \frac{(v_E - p + s)V}{d(s - v)}$ is approximately distributed as an F with sd and $s(V_E - p + s)$ degrees of freedom, where: $d = \max(p, V_H)$ and $s = \min(p, V_H)$. Pillai's trace was selected for its balance of power it is not overly influenced by non-normality. In addition type I errors are not badly affected by assumptions.

Commencing with preliminary analyses of the market orientation variables and farm performance, we find that that customer focus and inter-functional coordination have a relatively strong positive correlation with each other (see Figure 1).

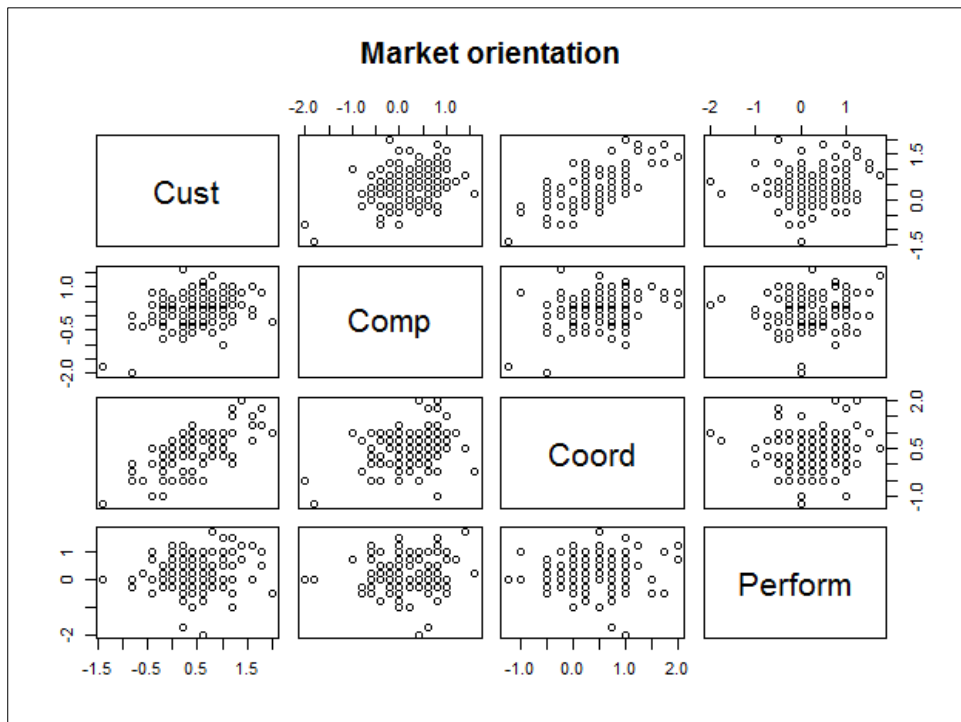


Figure 1. Market orientation showing relationships between customer orientation, competitor orientation, inter-functional coordination and farm performance

8.1 Cooperative members vs. non-cooperative members

This construct was intended to represent whether farmers who are cooperative members are different to farmers who are non-cooperative members with respect to market orientation and farm performance.

There was no visual distinguishable difference made between the centroids of cooperative members vs. non cooperative members when examined against market orientation using PCA, as seen in figure 2a. This plot indicates that cooperative membership bears no discernible difference between New Zealand red meat farmers in terms of focus on customers, competitors, coordination or farm performance. Both groups share similar dispersions, locations and shape. *Figure 2b* indicates that customer orientation and inter-functional coordination drive explained variation on the PC1 axis and performance is driving explained variation on the PC2 axis.

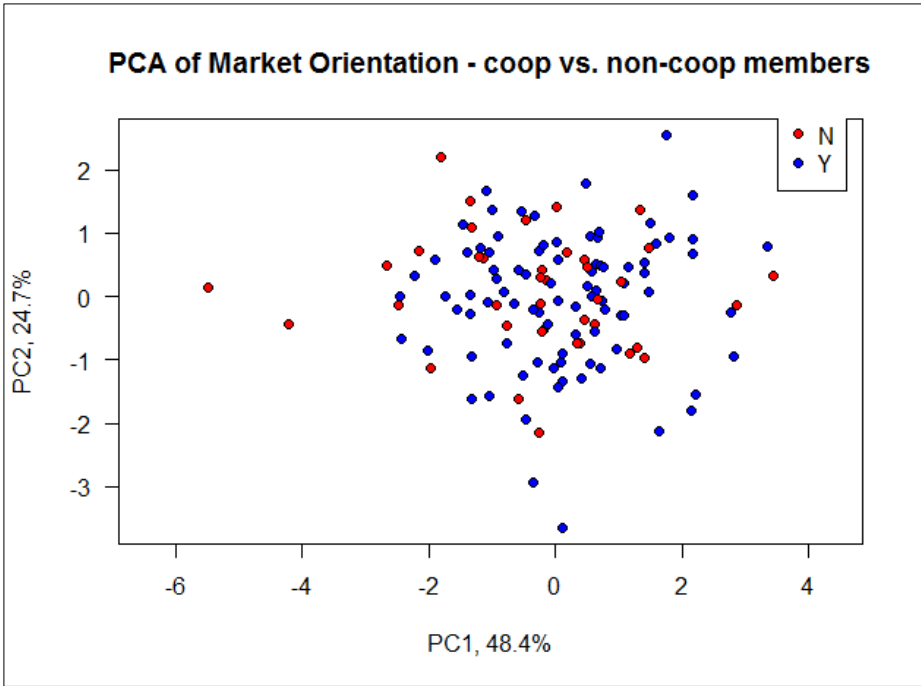


Figure 2a. PCA plot of market orientation = NZ farmer meat company cooperative members vs. non-cooperative members. The two axes account for 73.1% of the four original variables.

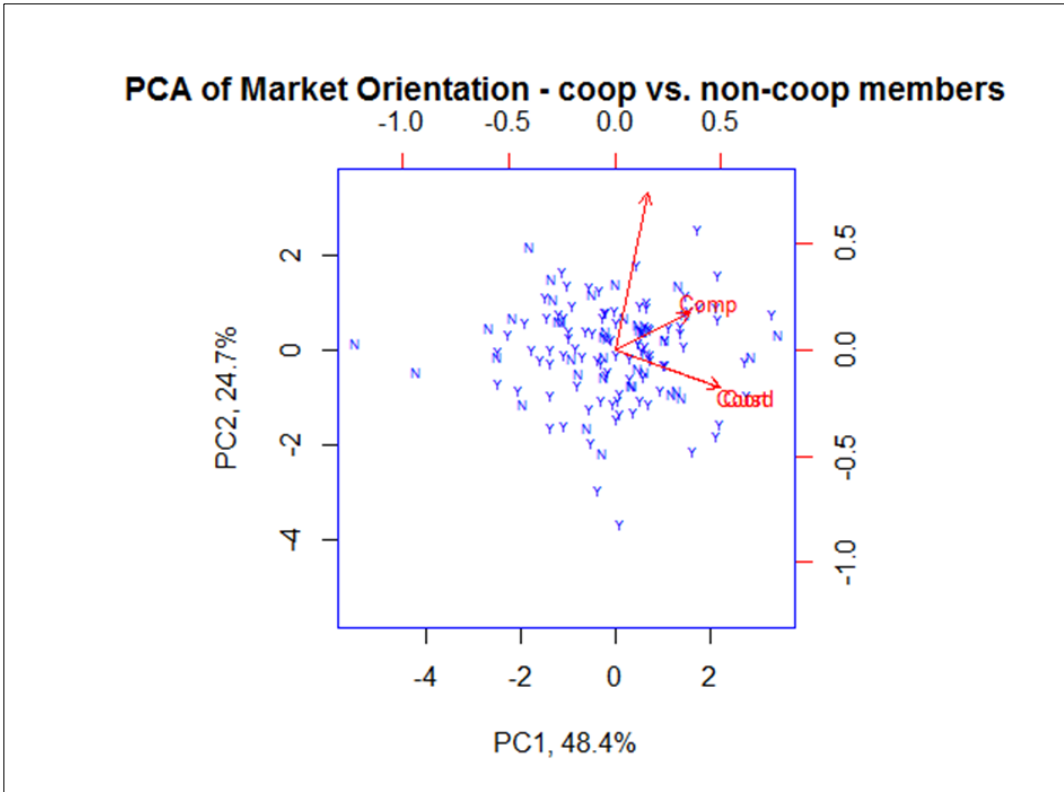


Figure 2b. PCA biplot of market orientation = cooperative members vs. non-cooperative members showing drivers of explained variation on PC1 and PC2.

The MANOVA analysis indicates that there are differences between the two centroids with Pillai's trace of 0.081374 with approximate F of 2.79 and p -value of 0.02917 and degrees of freedom of 1. The p -value indicates, however, that this relationship is only very moderate if it was significant then the p -value would have been 0.000 or smaller.

Discriminant function analysis yielded a single canonical axis to discriminate between cooperative and non-cooperative members having followed the three market orientation variables (customer orientation, competitor orientation and inter-functional coordination) and farm performance. There is only one discriminant axis due to $(g-1)$ axes being required to discriminate the positions of g centroids in Euclidean space. The coefficients in *figure 3* suggest that inter-functional coordination is the most important variable for discriminating between cooperative and non-cooperative members. The default of falling in the cooperative member group is 0.6946565 and 0.3053435 for the non-cooperative member group.

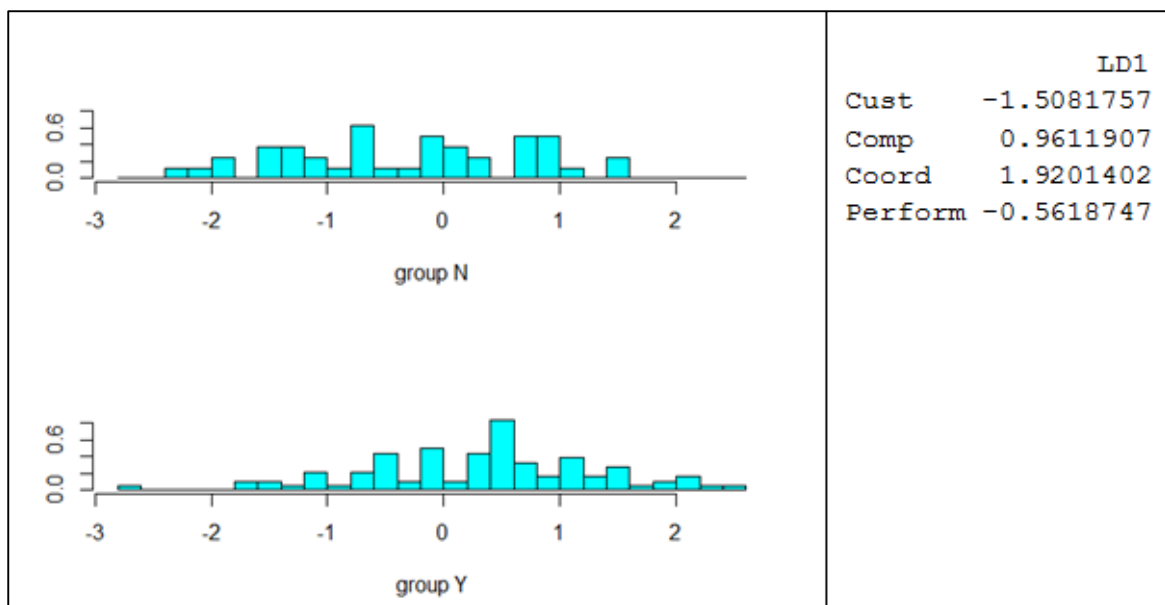


Figure 3. DFA of market orientation – cooperative members vs. non cooperative members.

The overall mis-classification error associated with the linear discriminant analysis using cross-validation (see table 1) was estimated to be 32.8% using the leave one out prediction method. The individual error rates for the different groups were dramatically different to each other with the proportion of errors for the non-cooperative members being 85% and the cooperative members being 9.9%. Therefore, the analysis is indicating strongly that the non-cooperative members have a much higher probability of being mis-classified.

Table 1.
Cross validation of cooperative vs. non-cooperative members using the leave-one-out predictions for each observation

	No	Yes
No	6	34
Yes	9	82

The overall analysis shows that there is a weak relationship between cooperative members and non-cooperative members in terms of their market orientation and farm performance. This difference is very moderate, however, and so should be treated with an element of caution.

H1: There is a difference in market orientation and farm performance between farmers who are cooperative members and farmer who are non-cooperative members. Retained

8.2 Levels of education attained

The market orientation according to levels of education attained construct is intended to represent the effects of market orientation plus farm performance when considered with the level of a farmer's education level. It was thought that perhaps education levels may have some influence on a farmer's market orientation and farm performance

The examination of the principal components plot (figure 4a) shows that there is no distinct difference between the groups according to the different levels of education attained by farmers showing similar dispersion and no evidence of the groups according to education level occurring in a similar place, in other words, there were no groupings which suggest that there is a distinct patterning which may indicate that there are some visual relationships between the variables. *Figure 4b* indicates that customer orientation and inter-functional coordination are driving explained variation on the PC1 axis and performance on axis PC2.

MANOVA analysis indicated that there are no differences between the five centroids with Pillai's trace of 0.082864 with approximate F of 0.66636 and *p*-value of 0.8278 and degrees of freedom of 4. This is supported with the observations in the figures 4a and 4b where the different levels of education attained projected do not show any distinctive patterning.

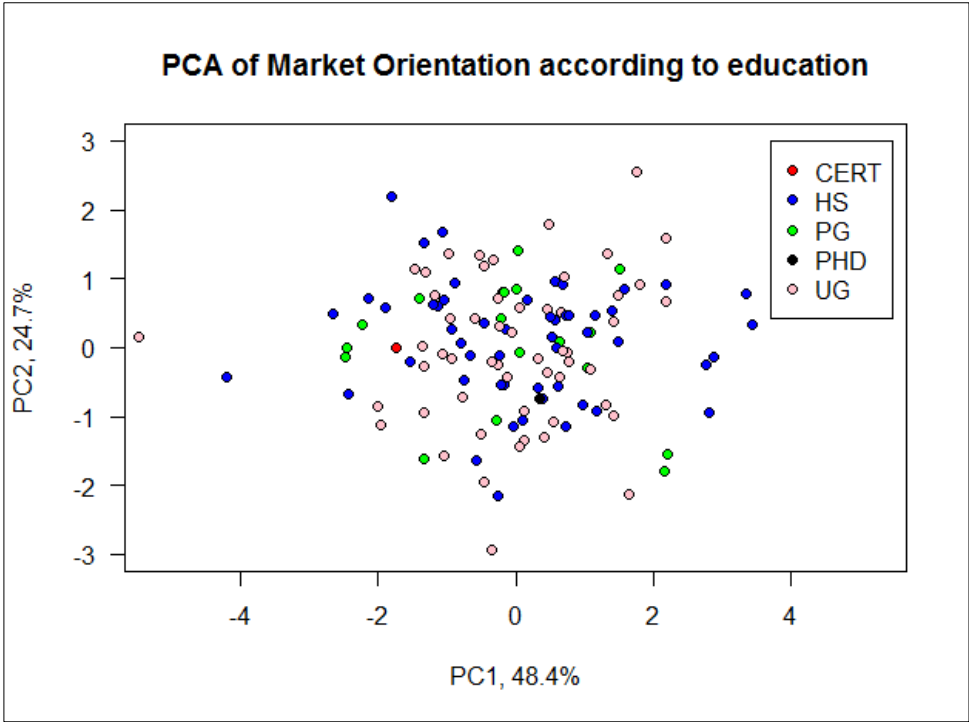


Figure 4a. PCA of market orientation according to the level of education attained by farmers. The two axes account for 73.1% of the four original variables.

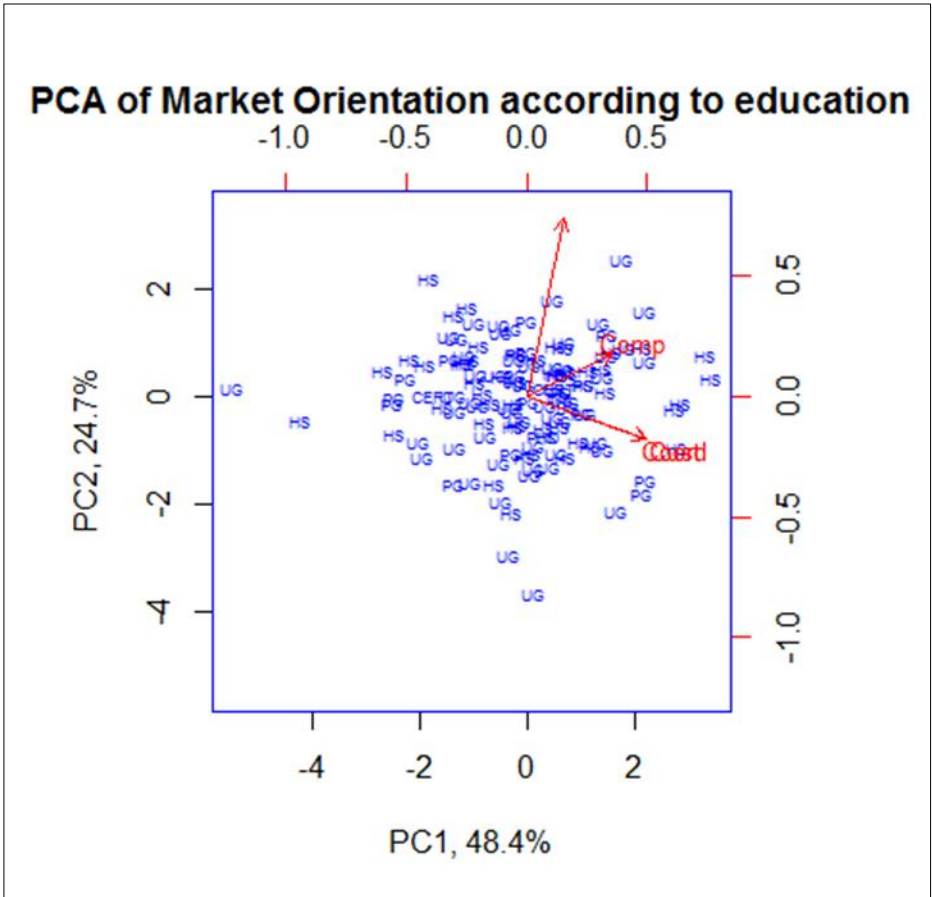


Figure 4b. PCA biplot of market orientation = level of education attained showing drivers of explained variation on axes PC1 and PC2.

Discriminant function analysis yielded four axes. The LD1 axis accounted for 76.1% of the trace and customer orientation was the most important factor in that axis. The prior probability of falling in the certificate group is 15.3%, high school is 42%, postgraduate is 13%, PhD is 0.76% and undergraduate is 42.7%. The overall mis-classification error associated with the linear discriminant analysis using cross-validation (see table 2) was estimated to be 63.08% using the leave one out prediction method. The individual error rates for the individual groups were very high revealing that high school had an 54.5% error rate and undergraduate had an error rate of 58.9%. Certificate and postgraduate had 100% error rates and PhD was nil as no PhD data were observed in the LD1 axis.

Table 2.

Cross validation of education attained using the leave-one-out predictions for each observation

	Certificate	High School	Postgraduate	PhD	Undergraduate
Certificate	0	1	0	0	1
High School	0	25	0	0	30
Postgraduate	0	9	0	0	8
PhD	0	0	0	0	0
Undergraduate	0	31	1	1	23

*H2: There is a relationship in market orientation and farm performance according to the level of education level attained. **Rejected***

8.3 End to end ownership of sheep through the marketing channel

This construct represents market orientation and farm performance in consideration of farmers who retain ownership of their sheep through the marketing channel.

Principal component analysis indicates that there is some positive correlation structure with those who retain ownership of their sheep through the marketing channel with one outlier; those farmers who do not retain ownership of their sheep through the marketing channel do not show any obvious clustering with the points being quite spread out as with those who didn't know (see figure 5a). *Figure 5b* illustrates that there is a mixture of ownership models projecting onto the eigenvectors on axes PC1 and PC2.

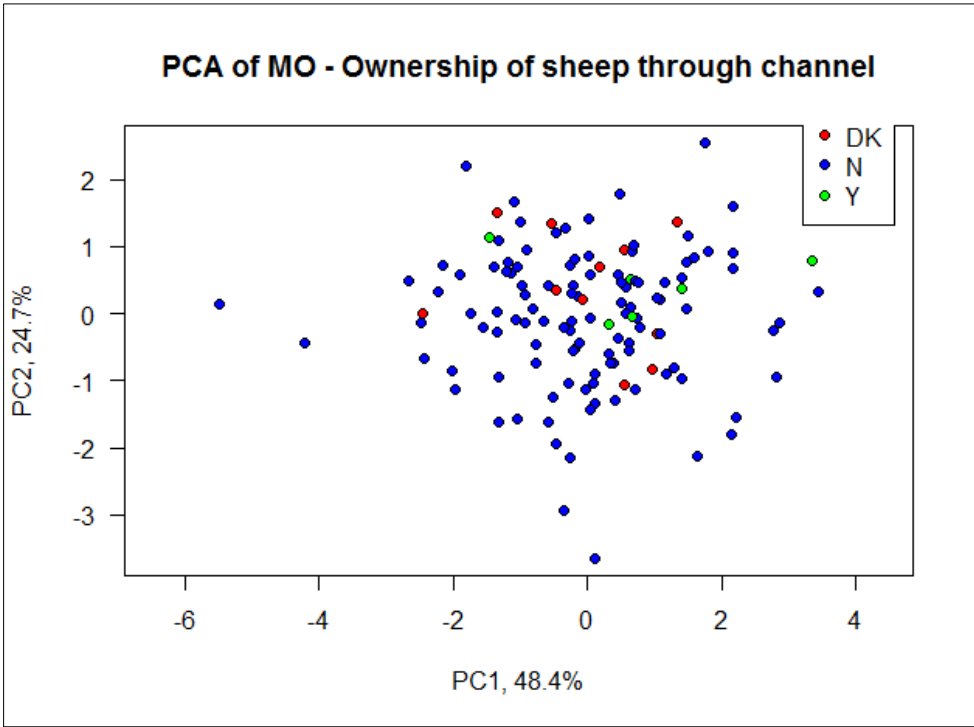


Figure 5a. PCA of market orientation according to farmers who own their sheep through the marketing channel.

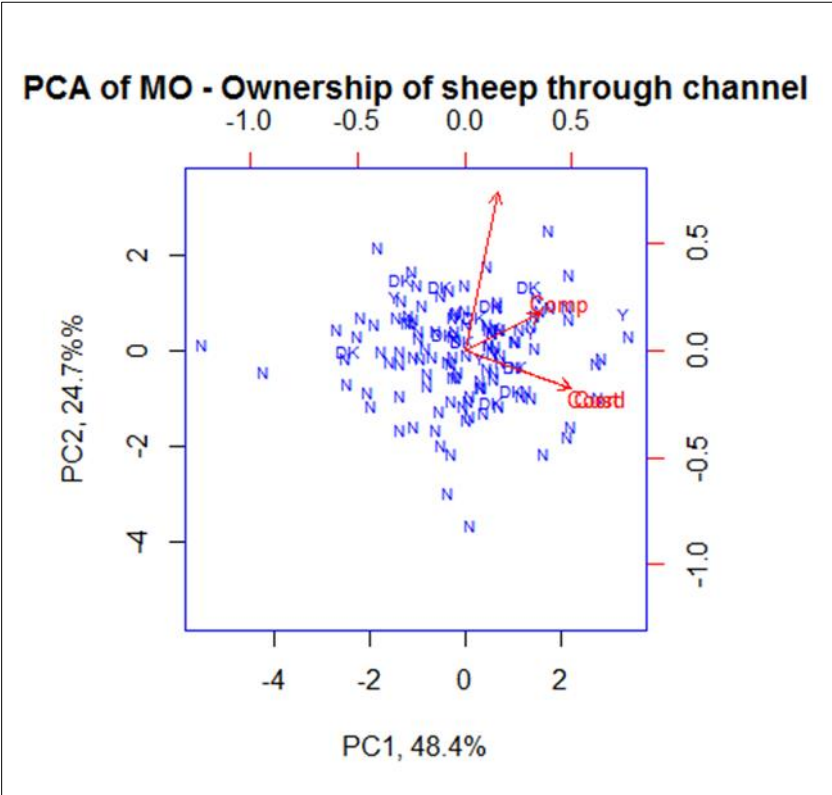


Figure 5b. PCA biplot of Market Orientation = ownership of sheep through the marketing channel showing drivers of explained variation on axes PC1 and PC2

MANOVA analysis, that there are no differences between the group's centroids with Pillai's trace of 0.064228, the approximate F -value is 1.0452 p -value of 0.4026 and 2 degrees of freedom.

Discriminant function analysis yielded two axes. The LD1 axis accounted for 87.67% of the trace and farm performance was the most important factor in that axis (see figure 6). The prior probability of falling into the "no" group is 87%, "don't know" is 8.4% and the "yes" group is 4.5%. The overall misclassification error associated with the linear discriminant function analysis using cross validation (see table 3), was estimated to be 12.9% when using the leave-one-out prediction method.

Figure 6. DFA of Market orientation according to ownerships of sheep through the marketing channel

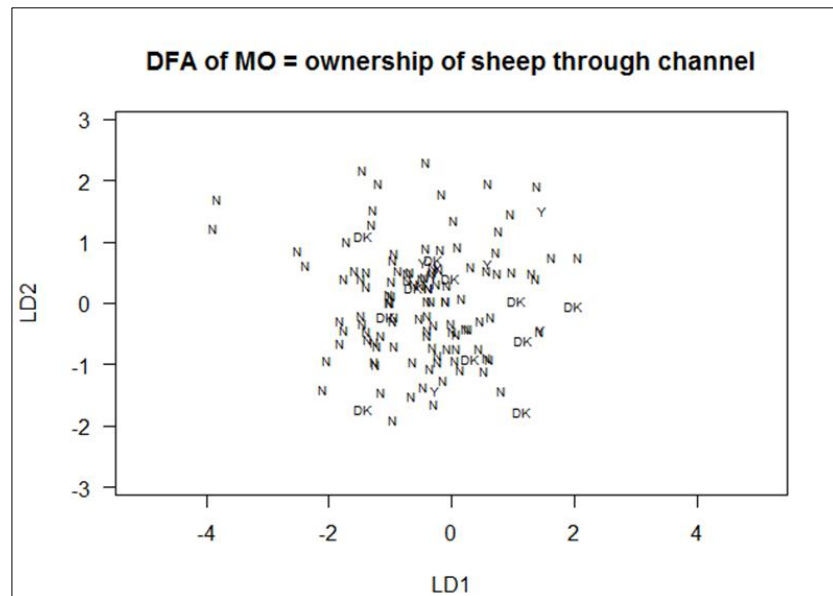


Table 3.

Cross validation of end to end ownership of sheep using the leave-one-out predictions for each observation

	DK	No	Yes
DK	0	11	0
No	0	114	0
Yes	0	6	0

*H3: There is a difference in market orientation and farm performance between farmers who retain end to end ownership through the marketing channel and those who do not. **Rejected***

8.4 Market orientation, farm performance and farmer attitudes and behaviours

RDA of X variables

The maximum number of RDA axes will be; $\min[p, q, (N - 1)]$, where q = the number of variables in X and p = the number of variables in Y . Market orientation (Y , p = four variables being customer orientation, competitor orientation, inter-functional orientation and farm performance) and farmer attitudes and behaviours (X , q = ten variables being price, production, quality, relationships, planning, innovation, learning, entrepreneurship, trust and commitment) for $N = 131$ different farm sizes in hectares. Farm size was selected as it was a unique identifier in the data set. Farm size can also be an indicator of the number of people working on farms. For instance, a small farm may have a single operator who completes all farm tasks such as stock work, administration and repairs and maintenance. Larger farms often lend themselves to having a team where members can specialise in the different farming functions and have a management structure which monitors and reviews best practice. The $q = 10$ predictor variables together explain 23.74% of the raw data. The predictor variables explain a statistically significant proportion of the variation in the market orientation data (pseudo- $F = 3.74$, P -value = 0.001, 999 permutations (see table 4)), though the percentage of market orientation explained by behaviours and attitudes in the survey is not a very high figure suggesting that other variables may need to be identified in future research.

Table 4.

RDA partitioning and results of Market Orientation + Performance.

Source	df	SS	Pseudo- F	P-value
X variables	$q = 10$	123.5	3.735816	0.001
Residual	$N - q - 1 = 120$	396.5		
Total	$N - 1 = 130$	520.00		(999 perms)
% var in Y explained by X = 23.74%				

Production, planning and relationships look to be the primary driver of explained variation along RDA axis 1, however, there are no salient patterns observable in light of the size of farms measured in hectares as shown in *figure 7*.

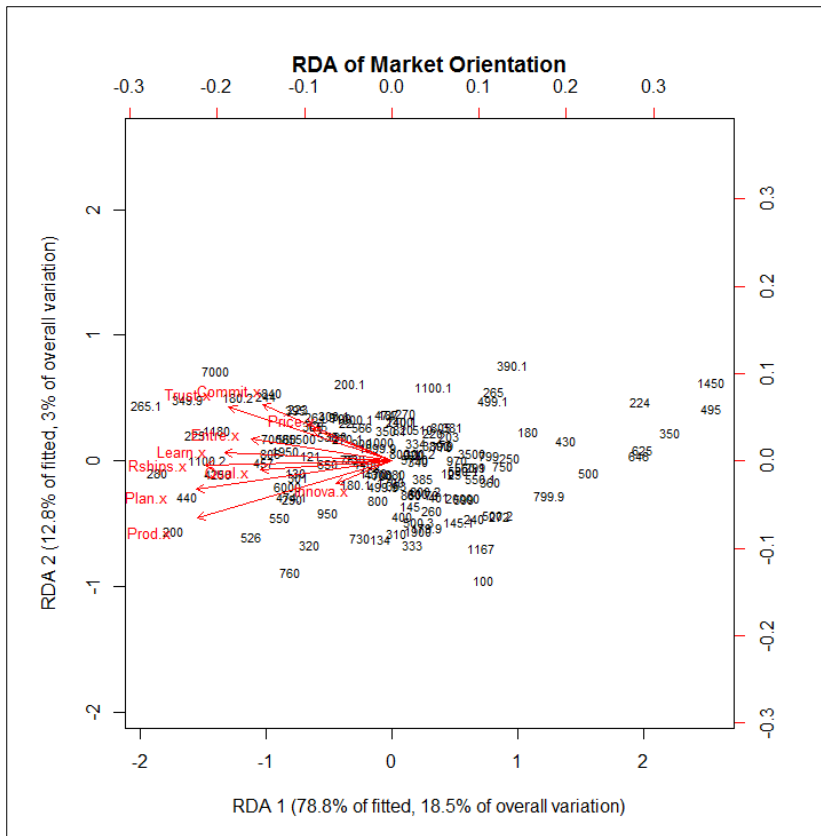


Figure 7. RDA showing drivers of market orientation in relation to attitudes and behaviours and farm size.

When considering the unconstrained plot, inter-functional coordination and customer orientation seem to be the primary drivers of variation along PC axis 1, and farm performance is the primary driver of variation along PC axis 2 (see figure 8). Farm size does not highlight any obvious salient patterning in relation to the market orientation eigenvectors.

evidence indicated that inter-functional coordination and customer orientation are the most variable of the market orientation factors and these two variables were positively correlated. This suggests that farmers are more guided by the elements which contribute towards inter-functional coordination and their customers than competitor focus. Inter-functional coordination was centred on immediate suppliers and buyers in terms of team work and communication and customer orientation evaluated end consumers and meat companies. Perhaps competitor focus was not a strong variable due to the inflexibility of what red meat farmers produce – red meat. This may also indicate that red meat farmers do not consider that other protein sources such as dairy, chicken or soy beans are a threat to their business as one example. Another example may lie in the limited knowledge that farmers have in terms of the ability of other countries to produce red meat and become our direct competitor. Competition should not be glossed over as the world is getting better at producing food for their own countries with lowering costs as they catch up. Brazil is a good example of this and more recently China's cost of producing food is also reducing.

Results from the RDA analysis detected that planning, production and relationships were deemed to be the drivers of market orientation. In particular, the results indicate that farmers are inclined to react more favourably to factors which they can directly access, influence and contribute towards. This may be why variables such as planning, performance, relationships, inter-functional coordination and customer orientation are viewed as more powerful variables for understanding farmer identity and commitment indicating are worthy of more reflection in the future. It would seem that energy is not given to influences and factors which cannot be controlled by farmers and they may be left to industry bodies who negotiate big issues such as marketing, terms of trade and trade entry into new markets. In other words, farmers do what farmers to best as primary producers.

10. Recommendations

These results represent an opportunity to further develop the value constructs which consider farm performance and farmer behaviour in light of the intrinsic and extrinsic drivers of these factors. Other factors such as the lifestyle and family may also be worthy factors to consider exploring empirically to understand their roles in farm performance. In addition, social and business orientated behaviours and commitment and attitudes towards the industry are also not well understood from an empirical view point.

The results in this study should be treated with some caution due to the small sample size in relation to the total farming population size. However, the small sample size is also an indicator that future research survey instruments need to be succinct and relevant in order to increase the uptake and participation by farmers. Consideration should also be given to the style of delivery of the survey instrument if a larger proportion of the target population is to be accessed – this research relied upon farmers seeing and reacting to emails which were cost effective and able to be collected quickly. A suggestion for future research in this area may require that a longer time frame is used and more effort is placed in engaging with farmers through various networks to improve the number or useable responses and to produce more statistically dependable analysis and information. There is a suspicion that a valuable segment of farmers who are quietly going about their work and are happy with their own performance, do not participate in such research readily, yet an insight into these very farmers' values, behaviours and channel commitments would be very valuable in light of the current red meat industry debate. Future research also needs to carefully consider the use of unique identifiers for the purpose of creating more segments as a source of creating comparisons. Farm size was the only useable unique identifier that was used in this study and it is thought at the conclusion that through a better designed survey instrument, that the analysis of this data set could have been wider and thus gained more value from the data and consequent analysis.

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Appendix A

Market Orientation and farm performance

Unless otherwise instructed, please select the answer that **best** describes your answer

	Are you a farmer of sheep and beef in New Zealand?	Yes/No		If no, please skip to the end
	What are you currently producing?	Sheep and beef		Buttons
		Only sheep		
		Only beef		
	Are you currently a member of a meat company cooperative?	Yes/no		Buttons
	Do you sell your sheep and beef through more than one company?	Yes/no		buttons
	Do you have a contractual agreement with your meat company for beef?	Yes/no		buttons
	Do you retain ownership of your beef through the marketing channel?	Yes/no/don't know		buttons
	Do you have a contractual agreement with your meat company for sheep?	Yes/no/don't know		buttons
	Do you retain ownership of your sheep through the marketing channel?	Yes/no/don't know		buttons
	Do you regularly subscribe to or read agricultural publications	Yes/no		buttons
	In the next five years, is your farm likely to	Decrease in size		buttons
		Stay the same		
		Increase in size		
		Unknown		
	Are you part of a farm discussion group?	Yes/no		buttons
	Are you a member of a farm support/lobby group?	Yes/no		buttons
	Pricing			
	We prefer to sell our stock in the spot market	Agree/disagree		5 point Likert
	We are paid above the market rate because we understand and meet our meat companies specific requirements	Agree/disagree		5 point Likert

	We are paid more than the market rate because of the number of animals we can supply	Agree/disagree		5 point Likert
	We are always looking at or using technology to attract higher prices for stock	Agree/disagree		5 point Likert
	Producing more kilos of meat is more important than meat quality	Agree/disagree		5 point Likert
	Production			
	We are always looking at developing or using technology to lift production	Agree/disagree		5 point Likert
	We willingly change our farming practices to meet the specific needs of our meat company	Agree/disagree		5 point Likert
	We lift our production through improving,	Animal genetics		Buttons
		Pasture & grazing		
	We time lambing and calving around;	Seasonal factors		Buttons
		Market factors		
		other		
				(specify)
	Quality			
	We adapt our farming practices with the end consumer requirements in mind	Agree/disagree		5 point Likert
	We adapt our farming practices with our meat company requirements in mind	Agree/disagree		5 point Likert
	We invest the minimum required level of inputs to produce a target weight	Agree/disagree		5 point Likert
	Quantity of kilos produced is a more important measure than quality	Agree/disagree		5 point Likert
	Relationship building			
	We believe that solid relationships with our supplier and buyers is important	Agree/disagree		5 point Likert
	We generally don't think it is important to build relationships with our buyers and customers	Agree/disagree		5 point Likert
	We believe that our relationships with our buyers and sellers is valuable to our performance	Agree/disagree		5 point Likert
	Customer Focus			

	We work closely with our meat company to understand their needs and requirements	Agree/disagree	5 point Likert	
	We have unique meat attributes which may benefit our meat company and their brand	Agree/disagree	5 point Likert	
	We understand who the end consumer of our meat products are	Agree/disagree	5 point Likert	
	We take part in discussions around catering for our customer's needs	Agree/disagree	5 point Likert	
	Our product is going to quite different customers than it did five years ago	Agree/disagree	5 point Likert	
	Competitor Focus			
	We are aware of our competitors strengths and weaknesses	Agree/disagree	5 point Likert	
	We have competitors who can threaten our profitability	Agree/disagree	5 point Likert	
	We understand where our competitors are succeeding and failing	Agree/disagree	5 point Likert	
	Our understanding of our competitors influences our farming practices	Agree/disagree	5 point Likert	
	We don't track what our competitors are doing	Agree/disagree	5 point Likert	
	Coordination			
	We work as part of a larger team to cater for the end consumer of our products	Agree/disagree	5 point Likert	
	We offer feedback to our suppliers and buyers to improve our business	Agree/disagree	5 point Likert	
	We receive feedback from our suppliers and buyers that helps us to provide extra value for our buyers	Agree/disagree	5 point Likert	
	We feel comfortable sharing information and experiences with everyone who provides services and products to us	Agree/disagree	5 point Likert	
	Internal Operation/Cost focus			
	We have an ongoing goal to reduce our operating costs	Agree/disagree	5 point Likert	
	We are always looking for ways to work smarter to increase value to our buyers and suppliers	Agree/disagree	5 point Likert	

	We understand what practices and policies on our farm are the most effective	Agree/disagree	5 point Likert	
	We run our farming business based on a long term strategy	Agree/disagree	5 point Likert	
	Innovation			
	We like to look for new innovation to improve what we do in our farming business	Agree/disagree	5 point Likert	
	We tend to stick to tried and true farming methods	Agree/disagree	5 point Likert	
	We have a tendency to watch new innovation to see if it works or not	Agree/disagree	5 point Likert	
	We look more closely at innovative ideas when we hear about them from someone we trust	Agree/disagree	5 point Likert	
	Learning			
	We see that learning is an investment and not an expense	Agree/disagree	5 point Likert	
	Our goals and practices are influenced by new learning experiences	Agree/disagree	5 point Likert	
	We are always looking at how we can learn and change in order to do things better in our farming business	Agree/disagree	5 point Likert	
	We feel that learning is an important element of future performance and profitability	Agree/disagree	5 point Likert	
	We feel that learning and change go hand in hand on our farm	Agree/disagree	5 point Likert	
	Entrepreneurship			
	On our farm, we like to “play it safe”	Agree/disagree	5 point Likert	
	New policies and processes are only introduced here when we know that they will work	Agree/disagree	5 point Likert	
	We tend to see problems within new opportunities	Agree/disagree	5 point Likert	
	We value risk reduction as a management strategy	Agree/disagree	5 point Likert	
	Taking a risk may mean that we can find new and innovative solutions	Agree/disagree	5 point Likert	

	The current market place is full of opportunities	Agree/disagree	5 point Likert	
	Trust			
	Our buyers and suppliers should be treated with caution	Agree/disagree	5 point Likert	
	We believe that our buyers and suppliers have our best interests in mind	Agree/disagree	5 point Likert	
	When we are making important decisions, we like to get input from our buyers and/or suppliers	Agree/disagree	5 point Likert	
	Commitment			
	We are fully committed to our meat company	Agree/disagree	5 point Likert	
	We have no plans to change to another meat company	Agree/disagree	5 point Likert	
	Our contact person is more important than the meat company and its brand	Agree/disagree	5 point Likert	
	Whether or not we have a relationship with our meat company is of little importance to us	Agree/disagree	5 point Likert	
	Farm Performance			
	We were very happy with our farm performance last year in relation to others in our area	Agree/disagree	5 point Likert	
	Our performance exceeded our expectations last financial year	Agree/disagree	5 point Likert	
	Our returns were below what we were expecting last year	Agree/disagree	5 point Likert	
	We think that benchmarking with similar farms is useful to gauge our own performance	Agree/disagree	5 point Likert	
	In a few words, what farming practices set you apart from other farmers?		Info box	
	General			
	Please indicate your position	Owner	Buttons	
		Equity Partner		
		Manager		
		Stock manager		
		Other	specify	
	Please indicate the size of your farm in hectares		specify	

	Please indicate what the effective hectares are			specify	
		Tertiary degree			
		Post graduate diploma			
		Post graduate degree			
		Doctorate			
	Where in New Zealand do you farm?	Northland Auckland Waikato Bay of Plenty Gisborne Hawkes Bay Wanganui Manawatu Taranaki Wairarapa Wellington Marlborough Nelson West Coast Canterbury Otago Southland Steward Island		Buttons	
	How many years have you been farming?			specify	