Organic milk versus conventional milk: results of a literature review and recommendations for further studies

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Summary

One of the Massey University Dairy Farm began its conversion to organic milk production one year ago. Half of the farm is still conventional and half is in conversion to be organic. A research trial has begun to determine the differences between the two farming systems with monitoring and analysis of all aspects from the soils to feed to animal health. The monitoring and analysis of the milk to date has been that of its basic composition and quality. The opportunity exists to tap in to the food expertise of the Institute of Food, Nutrition and Human Health (Massey University) to carry out some innovative research on milk from the two systems to determine any differences that might be relevant either directly to consumers or indirectly to processors.

The first stage of this study is to establish a literature review to determine what research has been done in this area before.

The second stage is to determine the various analyses that the IFNHH should carry out on the milk to add to current knowledge of this niche product.

After submitting these results to researchers and industrials, the final aim of the project is to give the recommendations that will be used for any subsequent industry and science research fund applications.
Introduction

According to many reports, organic food is a growing business with good long-term prospects. Despite the heightened attention that organic agriculture has attracted during the last decade, it still only accounts for a small proportion of overall agricultural land: an average of about 2% for the countries of the European Union, 0.1% for the United States of America and 1.34% for Canada. Notably, organic agriculture is also gaining importance in a number of developing countries including China, Egypt, India, Philippines, Sri Lanka and Uganda.

In New Zealand, the interest in organic farming has been increasing, particularly since sizeable opportunities to supply overseas markets with organic produce have become apparent. At the same time, domestic consumption of organic food has arisen dramatically. Therefore, and whether producing for the domestic or international market, the numbers of organic farmers in New Zealand have increased rapidly in the last 8 years. Recent trade New Zealand figures showed that the area of organic production reached 49 000 ha in 2000, an increase of 201% in only one year. But there are still few certified organic dairy farms.

Milk and dairy products enjoy a thoroughly positive image as regards naturalness, originality, good taste and product safety, regardless of their method of production.

Nevertheless, according to a forecast, sales of organic milk as a whole are predicted to grow; there are claims saying it will triple until 2005. Therefore, the milk industry is really interested in investigating the modifications and risks induced by the conversion to organic farming.

Studies have been undertaken to investigate the reasons behind consumers’ purchases of organic products. Some points can be mentioned as major reasons for buying organic milk and milk products: the products seem to be healthier, organics help protecting nature and the environment, they cause less allergies, contain less residues and have an established origin…

However, while recent research suggested that many primary producers in New Zealand are thinking about organic production, few have actually taken the plunge.

One reason for this might be the lack of verifiable information both on the potential outcomes and risks and on the technological methods that can be used to make organic growing viable and sustainable.

Objective of this study

The Dairy Cattle Research of Massey University began its organic conversion period on the 1 August 2001: it was split into two farms, one a conventionally managed control farm and the other an organic farm. This research unit is a 40 ha pasture based, seasonal calving dairy farm: its herd is composed of 86 Friesian cows and 4 Jersey cows spring calved.
It will take up to three years for the organic farm to attain the full AgriQuality Certenz Standard.

The aim of the research unit is to monitor the difference between organic and conventional dairy farming and also to provide New Zealand dairy farmers with proven information on how to successfully run an organic dairy farm. Therefore, all aspects of the farm areas are studied, in particular the milk composition. Part of the trial is indeed to determine whether there are differences or not between the two kinds of milk produced, relevant either to consumers or to processors.

To this end, we have gathered results of studies that have been previously done on this subject in many different countries of the world. We have tried to create links between them to obtain clear conclusions, and then try to define some recommendations for the future experiments that will take place here at Massey.

I. Results from the literature

A- Milk components

Nutrient content

It is difficult to draw clear conclusions about the nutrients in general. The large number of factors influencing product quality further increases the difficulty of a significant distinction. In several cases, even when differences between the content of certain nutrients are statistically significant, they are only of minor importance. Further work needs to be carried out in this area to verify or clarify earlier results.

While some may think that organically grown crops contain more minerals and trace elements than the conventional ones, others consider that they lack of certain nutrients that are notoriously deficient in soils.

It would be interesting to do some tests to examine whether or not some differences can be found in the milk. However, this is a very limited approach because nutrient concentration do not give any indication on how these nutrients may be metabolized and hence their bioavailability

1- Proteins

Most of the eight studies we have mentioned earlier have found slight differences in the proteins contents between organic and conventional milk. However, Gedek et al observed that these differences were probably due to genetic differences between the animals. Only one of the studies (Gravert et al) took care to ensure that the cows were from the same breed.

Nevertheless, three studies have shown a significant difference between the two sorts of farming. Two of them have found less proteins in the milk coming from the organic farms (Guinot-Thomas et al, Jonsson). The other, on the contrary has reported significantly higher proteins level in organic milk.

In Sweden, a study has been done where milk samples were collected from KRAV organic certified farm tanks. The protein content was in the normal range.
Another two studies in Germany (Weber et al. 1993) and in France (ONILAIT 2000) show no difference in this point between organic and conventional milk.

The variability of these results is probably due to the presence of many other factors, not specified in these experiments and other than the choice of farming, that can influence the level of proteins found in the milk.

The intensity of the milk production and the exact food composition would help us to determine whether or not a significant difference exists in the protein level between organic and conventional milk.

2- Caseins, total N, NPN (Non Protein Nitrogen)

Few studies mention differences in casein and nitrogen contents between the two sorts of production.

A Danish research study found that the organically produced milk proved to have a significantly higher content of total N and casein, with a lower amount of NPN. On the contrary, Guinot Thomas published some results showing that the N was lower in the milk coming from the organic farms.

Concerning the casein, the same remarks on the choice of breeds and production intensity can be made. However, this study on casein seems more rigorous since the influence of these two factors was determined in the statistical analysis.

The conclusions are not clear, the intensity of the production and the amount of nitrate may have an influence on these results, some new tests would be interesting to achieve.

3- Fat content

The same remarks can be made as for the protein levels. The breed of the cows has a big influence in the results, and not all the studies have taken the precaution of choosing genetically identical cows. The conditions of the experiments aren’t always detailed and many other factors can influence the figures.


In Sweden, two different results have been found: Jonsson, (1996) found that the milk fat was higher in the organic group of cows, whereas a study carried out by the Department of Food Science (Swedish University of Agricultural Sciences) have showed the opposite trend.

4- Fatty acids

Two studies mention the fatty acids, talking about the importance of unsaturated acids on human health.
In the first study, more CLA (conjugated linoleic acids) have been found in organically produced milk than in conventional milk. The Danish research proved that the organically produced milk had a significant higher content of allocated fatty acids and CLA, but less monounsaturated fatty acids. They think that the difference in the composition of these acids between organic and conventional milk can be explained by the difference in the use of concentrates and their composition in the two production systems. In concentrates which are used on conventional farms and farms under conversion, the added fat is saturated technical fat, whereas the fat source in the mixtures of concentrates which are used on the organic farms come from unsaturated vegetable oil, primarily in form of linseed and rapeseed, which in very large quantities may affect the milk quality negatively.

5- Dry matter

Whereas a Danish research has found that organic products tend to be more concentrated than the conventional ones, the study done by Guinot-Thomas et al has found no difference between the two sorts of milk.

6- Vitamin C

Concerning the vitamins, the Danish Research Institute for Diary Industry carried out a study on raw milk about the vitamin C. The results mention that there is more vitamin C in organic milk than in the conventional one. But, this difference cannot be explained directly and therefore, it would be interesting to elaborate new experiments to examine this difference more thoroughly.

Anyway, this result is coherent with many other ones reporting that there is a significantly higher vitamin C level in organic crops in general than in conventional ones.

7- Ca, K

These two elements were investigated in only one study (Guinot-Thomas et al), and the result is that no difference has been found between the two kinds of milk.

8- Selenium

A study only shows some results about this parameter. Patricia Toledo, Anders Andrén and Lennart Björck carried it out in Sweden. It shows that the averages values in organic milk were lower than those found in conventional milk, but this difference was not statistically significant. Anyway, it appears clearly that the selenium concentration depends mainly on the selenium intake of the cows, and therefore on the richness of the diet. The determination of the selenium composition may be of some nutritional importance since dairy products are significant sources of selenium in human diets.
9- Metals

Concerning the zinc, Guinot-Thomas et al study showed that there was less of this element in organic milk compared to conventional milk.
However, a difference has been found neither for the iron nor for the copper.

B. Milk contaminants

1- Pesticides residues

The following three studies deal with pesticide residues in organic products in general.

In 1996-97, SETRAB, *(French processors and distributors association of organic agriculture)*, was managing a national study on pesticides residues in raw and prepared organic products. In fact, 66 % of the spread pesticides are herbicides and fungicides. More than 9 100 results from analyses about 10 types of products (cereals, fruits, vegetables, milk, soya, meat, oils, aromatic and medicinal plants, alcoholic drinks, other products) were collected from professionals and certification bodies.

The results are that there is no really high contamination of organic products by pesticides. It also shows that contamination is essentially originated from environmental pollution. The main conclusion is that professionals need to improve their way of production and processing by focusing on cleaning process when activities are not exclusively organic.

In the twenty second FAO regional conference for Europe, it is also pointed out that studies have been carried out to investigate the relative presence of pesticides residues on organically as opposed to conventionally grown products. It confirms the reduced presence of pesticides residues in organic although it may not be defined as pesticide-free. This presence can be explained in terms of chemical sprays drifting from conventionally managed farms or by contamination from previous land.

The third study (Professor Tony Nader) doesn’t give any precise figures, but explains its concern about conventional products. Pesticides have been linked to higher brain cancer, leukemia, learning disabilities and other disorders especially among young children, according to the American Public Health Association.

Therefore, it would be interesting to test the presence of these residues in the milk to evaluate the impact of exterior pollution on the crops given to the organic herd, and to compare how lower it is than the conventional milk.

2- Polychlorinated Biphenyls (PCBs)

They focused on the quality of milk from conventional and organic production. In two of them, there was an additional or sole focus on the quality of dairy products, butter and cheese (Kypke Hutter, 1987 and Chemische Landesuntersuchungsanstalt Stuttgart, 1993).

The results concerning the contamination by PCBs are that there were not any greatly differing concentration of PCBs found.

The concentration of PCBs does not differ between conventional and organic milk because it depends on the PCBs soil levels. So, in the same area, the amount of PCB swallowed by cows and that passed from the gastrointestinal tract into the bloodstream is almost the same in the two kinds of production.

Therefore, it may not be such an interesting undesirable ingredient to check.

3- Nitrate

A study was conducted to evaluate the nitrate contents of both conventional and organic milk. It appears that organic milk tends to have a higher nitrate level. But this finding is thought to have arisen from contamination from equipment cleaning agents. Anyway, four studies reveal a lower nitrate content in organic crops. Therefore, it could be interesting to evaluate whether or not this difference can be found as well in the milk from cows fed with such crops.

4- Urea

As for the pesticides, the use of urea is not allowed in organic farming in the diets. Only one study was found on this parameter. It was carried out in Sweden (Patricia Toledo, Anders Andrén and Lennart Björck). The results show a big difference between organic and conventional milk. All the organic farms have lower urea levels than the conventional ones. This can be explained by the fact that in general cow diets are richer in nitrogen in non-organic than in organic farming systems or at least richer in highly degradable nitrogen, which can induce a higher concentration of urea in the milk.

5- Mycotoxins, aflatoxin M1

Three studies have examined the relative presence of mycotoxins in foods produced organically and conventionally. Two of them found lower levels of Aflatoxin M1 in organic milk and the other one found no aflatoxin at all in organically produced milk whereas both conventional farms and farms under conversion had milk samples with aflatoxin.

And in general, there does not appear, to date, to be any documented evidence of increased risk of aflatoxin contamination from organic foods compared with conventional foods, as it could be supposed. A study has also concluded that the sort of growing system does not have a significant effect on mold or mycotoxin
This might be an important point because mycotoxins are one of the most threatening problem of organic food.

6- Cow health and milk quality

Cow health can affect the milk quality. Illnesses as mastitis can indeed make the somatic cells count (SCC) be high and ketosis can seriously damage the milk composition.

Several studies were conducted to evaluate the animal health in organic farms. Their aim was to investigate whether or not there were differences in production diseases incidence between organic and conventional herds.

Some of them found an advantage in organic herds, judging by the incidence of diseases as mastitis, ketosis and milk fever. But the results vary greatly between the organic farms.

So, there is globally a huge heterogeneity between the results.

Benefit in organic

In Denmark, a survey in 13 organic and 18 conventional farms showed a lower incidence of mastitis in organic systems (Kristensen and Kristensen, 1998). A two-year study of 22 Norwegian organic dairy herds (Ebbesvik, 1993) revealed that although milk production was considerably lower than in conventional herds, the organic herds had a lower incidence of mastitis, milk fever and ketosis. As a part of the same research project, Olesen (1996) studied the concentration of ketone bodies in the milk and blood of organically managed dairy cows and found that the levels were significantly lower than in conventional dairy cows. This suggests that the organic feeding regimes were successful in maintaining energy balance during lactation.

Weller and Cooper (1996) studied eleven UK dairy herds converting from conventional to organic production. They identified clinical mastitis as the main problem on most farms, with an incidence rate higher than national average, while the incidence of lameness, milk fever, ketosis and post-calving problems was lower than reported elsewhere in UK herds. The means clinical mastitis incidences were lower before than after conversion.

Another study was carried out in Sweden (C. Hamilton) in order to evaluate the status of the animals in 26 organic herds. The results are that the incidence of disease was lower in organic herds than in conventional ones in the same area. The incidence of clinical mastitis was lower and there were fewer cows with a high somatic cell count. Milk acetone levels were generally quite low in organic herds.

No difference between organic and conventional

In the Netherlands, Offerhaus et al (1994) found lower incidence of lameness, ketosis and milk fever in organic dairy herds. Mastitis levels were similar to conventional farms.

A French study conducted by ISARA (French Agricultural Institute of Rhone-Alpes) showed that milk quality was similar in organic and conventional dairy farms but that for a big part of them (40%) there were important variations in the SCC, but this phenomenon can be controlled.
Disadvantage in organic

First, it appears that mastitis was the only disease that was ranked as a serious problem on the organic farms (Roderick et al., 1996).

In an experimental study in Germany, 60 dairy cows were housed under similar environmental conditions and divided into two groups: one managed and fed according to organic standards and the other conventionally (Von Weber et al, 1993). No significant differences were detected in the health parameters, apart from higher somatic cell counts in the organically managed cows. The fertility parameters, however, were significantly more favourable in the organic group.

A survey of mastitis in 16 organic dairy herds in England and Wales found that mastitis incidence varied greatly between the organic farms. The overall results suggest that mastitis incidence is similar on organic and conventional farms and that dry period mastitis is a problem in many farms. Moreover, the SCC levels are significantly higher than on matched conventional farms. Homeopathy was the main alternative to antibiotics in both treatment and prevention of mastitis on most farms (Hovi and Roderick, 1999).

Conclusion

To conclude, it is important to notice that organic milk production differs from conventional in several ways, some of which may influence the health of the herd, as for example restrictions of the use of antibiotics or urea, a generally older herd and a more complex breed composition.

These factors are really important to consider. A Norwegian survey (F. Hardeng and V. L. Edge, 2001) showed that incidences of mastitis, ketosis and milk fever were up to three times lower in organic herds than in conventional ones. But, there was no marked difference in milk SCC between organic and conventional herds.

However, it was found that organic cows had lower mean SCC in first and second lactations. Above sixth lactation, the mean SCC was significantly higher in the organic group. In fact, the risk of disease increased with lactation number. This shows that many factors are to be considered.

7- Toxic metals

Mercury was found in several samples of milk from conventional farms, but not in organic milk.

Some lead was found in a few organic samples of milk (Danish study) as in conventional ones.

Cadmium was found in both organic and conventional milk. This is caused by the fact that Cd originates from pollution of the milk after it has left the cow.

About the milk properties, some studies have been carried out too, but with no real conclusive results.
C- Milk properties

1- Sensory properties


In its twenty-second conference for Europe, the FAO explains that many of the sensory studies that have been carried out have suffered from flawed experimental design.

On the whole, they indicate that there is no clear difference between the two.

The main problem is that the results are quite difficult to interpret: in the descriptive analysis studies it is difficult to know the meaning of the attributes given to the products, and in the preference studies it has been demonstrated that labeling associated with a food can create expectations regarding its sensory properties and ultimately its acceptability.

The studies suffer also from the same limitations as other studies in this area, utilizing a variety of meanings of ‘organic’ as well as study designs that differ in their suitability to make the appropriate comparisons.

2- Cheese making


It seems to be the same for other dairy products.

It’s important to notice that besides some considerations (allowed origins, ingredients and additives), there are no differences between the processing of conventional and organic foods, and this maybe because the little differences with organic milk were ignored.

3- Microbiological quality

The same eight studies show that there are not any differences either in respect of microbiological conditions.

Another study was carried out in Denmark. Monthly, samples of tank milk from 18 farms were collected, of which 9 were organic, 6 conventional and 3 under conversion. No significant difference was found in the bacteriological quality.
4- Allergenic properties

In comparative experiment of allergenic properties, all the test persons or their blood reacted to the milk whether it was conventionally or organically produced. Some people with diffuse allergic reactions to casein claim that these conditions are improved by change to organically produced milk.

II- Discussion and recommendations

A- Discussion about the literature review

The main evidence emanating of the literature review is that there is absolutely no certainty about any of the milk components, not because of a lack of studies, but because of contradictory results or imprecision in them.

First, ways of sampling were different in the studies: some farms have taken monthly samples of milk during a year, while others have taken them in a precise moment that is not necessarily representative of the whole lactation period.

Then, there is an interaction of many factors that makes it difficult to determine when a difference in milk can be due only to the way of farming. These factors concern the cows (difference in age, breeds, stage of lactation), or it can be also some environmental factors such as hygienic practices and climatic conditions if the samples haven’t been taken in the same moment in the different farms.

Another imprecision is the one concerning the organic labeling: lack of standardization, variety of meanings of “organic”, variations between the countries, huge differences within the organic farms depending on the motivations (financial or ideological) of the farmers.

Finally, some studies have been working on already processed milk: it can be interesting if we want to compare the final product we are buying but it doesn’t give any significant information on the quality of raw organic milk.

B- General recommendations for further studies

As regard to these studies, it seems to be necessary to make sure that some parameters are controlled.

First of all, the breed has to be the same in the two herds because milk richness depends on it. The mean age of the herd and the stage of lactation affect the quality of the milk and therefore have to be similar in both herds. Then, the environmental factors, such as pollution (beside pollution due to conventional management) and hygienic conditions must be equivalent. Both herds have to be fed with equivalent diets: the composition of the food should be the same.

1- Nutritional evaluation

Several milk components need to be carefully looked at because of their nutritional effects.
First, the **protein amount** since cow’s milk is recognized as an excellent source of high quality protein, mostly because it contains in varying amounts all of the essential amino acids that our bodies cannot synthesize and in proportions resembling our requirements. Its relative surplus in lysine is really a considerable advantage.

Then, milk is an important source of **carbohydrates** too. Galactose and lactose seem to have an interesting role in the infant developing and therefore are worth being looked at. Milk fat contributes unique characteristics to the appearance, texture, flavor and satiatability of dairy foods.

Nevertheless, **milk fat** contains several components such as conjugated linoleic acid (CLA), butyric acid and sphingomyelin, which may play an important role in human health, protecting against major chronic diseases. So, a higher concentration of these components in the organic milk could be a considerable advantage that public health considerations might promote.

Moreover, several **vitamins** are associated with the fat components of milk: vitamins A, D, E and K. They are all known to have properties that are essential in human health. In addition, milk also contains some water-soluble vitamins in varying amounts required by humans, such as vitamin B1, B2, B6 and B12.

Milk is also an important source of major **minerals**, particularly calcium, phosphorus, magnesium, potassium and trace elements such as zinc, iodine and selenium. Calcium amount seems to be the most important to determine since it is one of the minerals being removed and replaced throughout life with dietary calcium, and so the need is important. This fact explains why calcium is showing the greatest deficiency in the world population. Moreover, milk is a particularly rich source of calcium of superior bioavailability versus calcium from other sources. But other minerals are also important in milk, even if they are only trace elements, such as selenium and iron that are maybe important as regard to the national health preoccupations.

But those general considerations can be precised as regard to some milk industrials advice on the subject. Two components of nutritional importance were mentioned: first, the composition of **milk fat**, and more precisely the proportion of **saturated and unsaturated fatty acids**, unsaturated acids being more desirable for human health. Secondly, the **concentration in calcium** is a preoccupation for the milk industrials, but the difference between organic and non-organic shouldn’t be too important, as its amount is quite highly regulated in the cow’s udder.

Then, some infants and young children exhibit allergic reactions to cow’s milk protein. Prevalence of the sensitivity varies between 0.3 and 7 % of infants and young children. Therefore, it seems to be important to try to investigate the differences between these two kinds of milk as regard to their allergenic properties.

### 2- Milk transformation

Considering any milk transformation, it seems to be interesting to determine whether or not there are differences in some precise milk components that could affect processing. The importance of these elements depends of course on the type of transformation that we consider.

In general, richness in **casein** seems to have the higher importance, maybe not in the usual drinking milk because small variations in its amount don’t have such a big effect on the nutritional quality, but at least in other dairy products. In yoghurts for
instance, a higher amount in casein may give more firmness to the texture. In cheese, a small variation (1 to 2 g/L) in its content can lead to variations in yield of about 5 to 10 % and may affect the stage of curding and draining. Therefore, it is important to determine the overall concentration of protein and its quality, and the amount of casein and whey protein.

The fat content also has an impact on the processing and the yields, but less than the proteins and it is usually technologically standardized.

Another important element is the Non Protein Nitrogen. It may affect the thermal stability of the milk, but only when the treatment is severe (UHT milk), and the speed of acidification in yoghurts.

Concerning the butter, it seems to be interesting to evaluate the factors that the consumers can directly appreciate. The principal ones are the hardness of butter (with the standard method) considering that the softer the butter is, the most desirable it is.

Finally, the dry matter of the milk has a significant effect on the removal of the water for the milk powders. If there is the same amount of water or a lower one in the organic milk, there will not be any problem for the processing, but if it is higher, it will induce higher energy consumption for the dehydratation, and therefore some extra costs.

This explains why tests on these elements are interesting to make: the differences found between organic and conventional milk will give us some indications on whether or not the processing may be affected.

However, we don’t really think there will be problems if we change to organic milk if we follow the recommendations, as the gross composition of raw milk is primarily determined by a combination of animal breed and feeding regimen: differences might even be more important between milk from two different conventional farms.

3- Sensory properties

For each one of the dairy products, it seems to be necessary to evaluate the flavour with trained panels to examine the differences that may appear from a change of diet and influence the choices of the consumers.

The first test should be a discrimination study repeated several times. If a difference is found they could move on to a descriptive analysis realized by another trained panel and to a preference study from the consumers.
C- Study schedule

The sampling should be realized during at least a whole lactation period. It would even be interesting to repeat it during two to three years to confirm the results and because the farm is actually in conversion.

Concerning the tests, most of the elements can be analysed by using the International Dairy Federation methods. For the proteins, the caseins, the nitrogen, the non-protein nitrogen, the fat content, the fatty acids composition, the dry matter and the calcium, these reference methods, as well as some routine methods, can be used in the biochemistry laboratories of the IFNHH.

As for the pesticides or the nitrates, the tests could probably be set up (a sample of the pesticides used in the farm should then be needed), but they would induce an extra cost due to the specific equipment necessary in such experiments.

Other departments or clusters may also be required for some of the tests. For instance, the counting of the SCC should be directly done in the organic farm, while the technological properties, such as the curding of the milk, the sensory tests or the hardness of butter, should be tested in the Dairy cluster of the IFNHH.

Conclusion

Given the lack of knowledge in this area, the upcoming conclusions of this study will be useful for every level of the milk chain, from the producers to the consumers, and would give some more precise information on the real properties of organic milk.

As the results can be of a national interest, the funds for this project may be attributed by an association such as the Australian Public Good Association.
References


25. SETRAB, and Bitaud, C. Study on pesticide residues in organic food products in France.

26. Skaug, M A, Department of Agriculture and Natural Science, Hedmark College


32. Weller, R F; Davies, D W, Institute of Grassland and Environmental Research, Trawsgoed Research Farm Aberystwyth Ceredigion. Somatic cell counts and incidence of clinical mastitis in organic milk production, The Veterinary Record.


Annex

About Massey University.

Massey University is New Zealand's largest educational and research institution, with campuses in Auckland (Albany), Palmerston North (Turitea & Hokowhitu) and Wellington. Massey University has a proud 80-year tradition of academic excellence and a strong national and international reputation. Massey University is also well known for its unique extramural course deliveries, which have provided distance-learning opportunities for over 40 years.

The Institute of Food, Nutrition and Human Health is located within the Turitea (Palmerston North) University's College of Sciences. The College, which is internationally recognised, has a reputation for innovative courses, excellent student support and has many international linkages. The Institute of Food, Nutrition and Human Health is progressive and forward-looking. Staff members actively pursue fundamental, applied and commercial research. Teaching programs emphasize both sound animal nutrition and welfare, in addition to the operation of commercially successful enterprises. While the human nutrition courses include human health and well being through lifestyle adjustments involving food and exercise.

The Milk & Health Research Centre (MHRC), one of the progressive research centres of the IFNHH, is a joint venture between the Fonterra Research Centre Ltd (former New Zealand Dairy Research Institute), Massey University and the New Zealand Dairy Board. The Centre collaborates extensively with research groups in related areas, both nationally and internationally. In addition, the Centre’s staff provide independent advice and are actively involved in technology transfer within the New Zealand dairy industry, as well as contributing to postgraduate training programmes.

The Centre’s role is to undertake scientific research into the nutritional and health-promoting properties of milk components and dairy products. Milk is an essential component of a well balanced diet. It is a natural source of a wide variety of nutrients and physiologically active components. Scientific studies are needed to substantiate the health benefits that result from consumption of dairy ingredients and foods. The Milk & Health Research Centre provides strategic research for the New Zealand dairy industry’s "Nutrition for every stage of Life" philosophy and contributes to both new product development and to marketing in support of this strategy.

We spent two months working in that structure, on a project part of the organic and conventional milk comparison trial. Our project was framed by Ms Nicola Shadbolt, senior lecturer in farm business management.