UNIVERSITY of OTAGO

Te Whare Wānanga o Otāgo

THE CONVERSION OF FAMILY FARMS IN SOUTHLAND

A CASE STUDY FOR "RURAL FUTURES: BUILDING ADAPTIVE MANAGEMENT CAPABILITY TO DELIVER SUSTAINABLE PASTORAL FARM SYSTEMS"

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Final report, April 2012

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ACKNOWLEDGMENTS

The research project presented in this report has been funded by the Swiss National Science Foundation. I want to express my gratitude for this essential support. My thanks also to the Rural Futures project for having welcomed the young Swiss researcher and helped with the transcription of the interviews. I am grateful to the Centre for Sustainability (CSAFE) of the University of Otago for having hosted me for this 18 months postdoctoral research. It has been a wonderful place to work, think and learn.

I also want to thank all the people who helped in the development of this research. First, Paul Stock and Sue Peoples have been irreplaceable colleagues and friends. The exchanges we had so often have contributed in many ways in the analysis and conclusions presented here. The many discussions with the CSAFE members have been also invaluable moments of learning. I want to thank especially Hugh Campbell, Chris Rosin, and Rob Burton for their help and advices. Finally I want to thank Rupert Campbell and Marine Verrier who worked with me on this project as interns. Marine's comparison between dairy and sheep farm systems in Southland provides an important contribution to this report (see appendix 3).

SUMMARY

PROJECT DESCRIPTION

This research on farm conversions in Southland is funded by the Swiss National Science Foundation as an independent project. It has joined the RURAL FUTURES project (a MSI funded programme) to serve as a case study of the social aspects involved in farmers' decision-making.

The aim of the research is to identify non-economic motivators to farm conversion. Focusing on family farms, it contributes to a better understanding of farmers' decision-making and adaptive strategies. The case of family farm conversions in Southland provides a very interesting and valuable example of how major decisions are made within the family business.

The research is based on a sample of 31 in-depth interviews: 23 converted farmers, 4 sheep farmers and 4 professionals involved in farming. All the interviews were fully transcribed and analyzed using NVivo, software designed specifically for qualitative data. The results of the analysis are described below.

UNDERSTANDING CONVERSION FROM THE FARMERS' POINT OF VIEW

Farm conversion from sheep to dairy involves a range of major changes. This section summarizes how the interviewees describe — and sometimes mitigate — those changes at different levels of the farm business.

FROM SHEEP TO COWS

The transition from farming sheep to milking cows implies the acquisition of new stockman skills and understandings. From new animal health knowledge, to comprehending the technical operation of the milking shed, the learning is a broad process. However, many interviewees emphasize the similarities between sheep and dairy farming, for example that both are based on grass production and pasture management. Comparing the two farm systems, farmers often define dairy farming as more technical and science-based than sheep farming. For this specific reason, several interviews argue that a dairy farm is "easier" to run. The dairy system is based on precise schedules and a diverse range of specific measurements (grass growth, daily milk production, etc.), and thus provides regular feedback and opportunities to adjust the farm management. On the other hand, the running of a sheep farm is said to rely more on intuitive knowledge, with little feedback on progress or success until sending the lambs to the meat works or bales of wool to processors.

CHANGES IN SCALE: CAPITAL AND WORK

Farm conversion involves high capital investment that has to be financed, with a significant proportion of converters using borrowed money. This leads to high debt levels — compared to the average sheep farm — in turn results in increased pressure on the productivity and profitability of the farm. In the process of converting the farm, farmers often describe spending millions of dollars building the dairy shed and new lanes, purchasing cows and adapting the paddocks: even though these farmers know they are responsible for the investments, such expenditure is frequently a real trial. Furthermore, on both spending and earning sides, the economic scale of the business increases dramatically. Managerial tasks and skills in turn grow in importance. Consequently, farmers tend to step back from the daily work on the farm to focus on management.

Dairy farms are labour intensive and generally employ staff — aspect is unanimously mentioned as a central difference between dairying and sheep farming. With the conversion, farmers become employers and thus must learn about staff and team management. Finding good staff and making them happy enough to stay are central in the stability of the farm business. The farmers describe some of the challenges connected with this change: they have to learn to delegate tasks and responsibilities; they become responsible for the livelihood of several other families; and the balance between being people-friendly and ensuring the effectiveness of the staff is not always easy to find.

MOTIVATORS TO CONVERT: A MEANS TO AN END

Economic factors are essential in farm business strategies. However, human beings also refer to other dimensions of reality in order to make decisions. This research process has identified two major non-economic dimensions that play an important role in the decision to convert the family farm.

FARM SUCCESSION

With one accord, the interviewees put long term survival and farm succession at the top of their list of motivations to convert the farm. They emphasise the willingness to provide good opportunities to the next generation, and stress that they saw no way to do this within the sheep industry. Here, dramatic increases in land price have played a major role. Farm prices are now based on the potential inherent in dairy, thus making it very difficult to take over a sheep farm. More generally, the participants made many references to the importance of keeping the farm in the family.

On the other hand, the various types of job positions that exist in the dairy system, from worker to farm manager or sharemilker, progressively open new possibilities to involve a younger generation in the farm business. Sons and daughters, for instance, are directly employed in several of the farms visited. Again, the scale of the dairy farm allows the involvement of more than one successor, while increased capital growth makes it easier to buy out siblings who are not interested in the farm.

"GOOD FARMING"

Several recurrent patterns became obvious in the interviews: together they address a cultural and social definition of farming. According to the interviewees, core parts of this definition had been questioned in their former situation as sheep farmers. Farmers emphasize their incapacity to demonstrate their skills through good performances and to be rewarded for it within the sheep industry. Being good sheep farmers didn't change the frustration: they felt limited and cornered, being deprived of the ability to develop their business in the way they would have liked. In this sense, they say the conversion has provided the new and stimulating challenge they were longing for. Moreover, in their eyes, dairy farming provides better and clearer rewards for farmers' efforts and performances. So the conversion is described as a combination of challenges and rewards.

Furthermore, the global success met by the dairy industry produces a very attractive image. In strong contrast to the conflicts between meat companies, many farmers highlight the unity displayed within the dairy industry, stressing aspects such as trust in the industry and in the long term prospects of dairy production. Dairy farming has become, in the eyes of most of the participants, the way of success, both at the economic and symbolic levels.

CONCLUSIONS

Exploring the perception of sheep to dairy conversion by the converted farmers themselves and analysing their motivations to convert results in a better understanding of what is at stake for New Zealand farmers in the current context. In making the choice to convert, the interviewees showed a powerful ability to instigate change in farm organisation and production systems. At the same time, their motivations appear, in a sense, conservative. Indeed, they are all directed to protect fundamentals, which can be summarized as "farm succession" and "good farming".

The process of conversion significantly modifies the family farm, both in its physical shape and its general operation. However, there is no evidence of a decreasing family dimension in the converted farms. On the contrary, family labour sometimes increases, with a higher level of involvement by the wife and/or children. Indeed, in the interviews, non-family-based and corporate farming are often

presented as counter-examples, in order to criticize uncaring behaviours towards environment, communities or staff.

Dairy farming development is, however, led by economic principles such as increasing scale, high levels of competitiveness, high debt levels, highly intensive practices and high productivity expectations. The interviews reflect this general description. These principles are potentially in conflict with others, such as family ownership, community- and environmentally-friendly practices, and fair staff management. These tensions constitute a challenge for individual farmers who have to find a balance between the economic incentives and the social and environmental pressures for sustainable practices.

INTRODUCTION

PROJECT DESCRIPTION

Farm conversions — from sheep and beef to dairy — raise a number of important issues about farming in New Zealand today. While the dairy industry is of growing importance in the national economy, reports warn about decreasing water quality in connection with dairy cattle. Meanwhile, socially and culturally, rural communities have changed from a symbolically "sheep-based" social system toward more diverse and contested structures. This research aims to gain a better understanding about what leads farmers to convert their farm. Beyond the usual assertions assuming that all this is "just about money", what does the conversion mean concretely for the farming family — in terms of the structure of the farm business, the work load, and so on?

The North Island regions, traditionally oriented towards dairy, offer limited space for further conversions. But conversions to dairy are of immediate and dramatic actuality in the South Island. The focus on the Southland Region in this study is thus justified by the fact that while conversions began in the early 1990s, they remain a constant process in 2012. Moreover, the dairy industry plans further development in this area. Farm conversions in Southland were first led by "migrants" either from the dairy regions of North Island or from overseas. At this time — the 1990's — these "migrants" found cheap farming land and ideal climatic conditions. In many cases, they moved to develop the type of farming they were used to. With time, local sheep farmers effectively began to convert their own families. This study focuses on this group: family farmers who decide to convert their personal operations to dairying. These types of conversions have specific characteristics in comparison to conversions made by "migrants": these local farming people were formerly integrated in regional networks and communities, but upon conversion they had to learn a new way of farming, often in contradiction with all former developments made on the farm, either by themselves or their fathers and mothers. Conversion, then, constitutes a break, a rupture in the farm history. To decide to convert is not an easy thing to do. Looking closely at how farmers made this specific decision contributes to a better understanding of farmers' decision-making in broader terms. The case of family farm conversions in Southland, therefore, provides a valuable example of how major decisions are made within family businesses.

Generally, to convert to dairy means a change in the scale of the farm, both physically and financially: the farm system changes from a model in which most of the work is done by family members and where the capital is family owned, to a strikingly different model involving waged workers and high

financial investment. While describing and analyzing some elements of this broad change, this study addresses the actual transformations of family farming in the industrialized agriculture.

This research on farm conversions in Southland has been funded by the Swiss National Science Foundation as an independent project. It has joined a New Zealand research project on farm adaptation and land use change, called RURAL FUTURES. The RURAL FUTURES project is a MSI-funded programme (MSI: Ministry of Science and Innovation, previously FRST: Foundation of Science and Technology). Managed by AgResearch, it aims to provide a portfolio of tools, systems and processes to support the New Zealand pastoral industry to adapt and remain sustainable in response to the future pressures it faces. The projects' four objectives address social, biophysical, modelling and economic issues. This specific research on farm conversion serves as a case study for the objective 1: "Agricultural decision-making in New Zealand — Social Research". This objective represents collaboration between AgResearch and the Centre for Sustainability: Agriculture, Food, Energy, Environment (CSAFE, previously Centre for the Study on Agriculture, Food and Environment) at the University of Otago.

METHODS

This paper is based on 31 qualitative interviews with farmers and other people involved in dairy farming. They were carried out in 2010 and 2011 in the Southland district. The names of the participants were selected through a "snowballing" process, and given different entries in order to overcome the boundaries of individual networks. When possible, wife and husband were both involved. The qualitative interviews followed a general guide (appendix 2), but freedom was given the interviewees to develop other topics or arguments if they felt these were important or meaningful. This flexibility allows the interviewer to adapt to the specificity of every situation and reinforces a continuous discussion of the research hypothesises and focuses. Each recording lasted between 1.30 to 2.30 hours. All the interviews were then fully transcribed before being analysed using software for qualitative data (Nvivo).

Two thirds (19) of the interviewees had converted their own farm from sheep (or sheep and beef) to dairy at different dates between 1992 and 2011. The interviews illustrated that different historical moments of conversion resulted in different experiences of this process. Furthermore, the diverging stories illustrate the evolution of a social and economic context impacting on conversion in which dairy farming became progressively dominant. The interviews with converted farmers were guided through the story of the conversion, from making of the decision to convert to the current situation and potential future developments. In addition, a few sheep farmers (4) were interviewed in order to

diversify the points of view and to explore the alternative of non-conversion of family farms in a dairy area. These interviews were oriented towards an understanding of the changes made in farm management and organisation during the last decade, together with the perspectives and projects for the future. The remaining interviews (4) were carried out with professionals involved in Southland farming (a stock agent, a farm consultant, a dairy extension and a regional agency for environmental protection). These last interviews provided useful insight and comments on the broader trend of conversions in Southland.

Beside the qualitative interview, the farmers filled out a questionnaire providing data on farm structures and history. This added information has been helpful to situate every interview in its own agronomic and human context. A comprehensive list of the interviews is available at the end of the report (appendix 1).

DAIRY UPS AND DOWNS IN SOUTHLAND

The Southland region has been traditionally strongly connected to sheep farming. Dairy farming, however, also has a long history — on a New Zealand scale — in Southland. This next section aims to summarize the broad outlines of this history to shed some light on the present situation.

In rural New Zealand — and especially in the South Island — sheep farming has played a major role both in the economy and at the cultural level. As described by Hatch (1992) in terms of Canterbury and Wilson (1994) for Southland, the regional social life and local hierarchy were based mainly on sheep farming. Other forms of production, however, also existed in parallel. Thus, Southland hosted the first purpose-build dairy factory of New Zealand, which opened in 1882 in Edendale and produced cheese and butter. Many small-scale factories developed thereafter in the region, although dairy remained a secondary production, with low performances and small structures. From 1940, a drop back was seen in dairy in Southland. With sheep farming growing stronger, supported by the national policy, many farmers quit dairy production. Wheat production remained attractive as well, with guaranteed prices. This decline in dairy lasted until the 1980's and, in 1982, one hundred years after its opening, the Edendale dairy factory was the only one still active in Southland. Subsequent major political and economic changes, however, then reversed these trends and tendencies.

In 1984 the fourth New Zealand Labour government decided a range of reforms, which — notably — included the suppression of all kind of subsidies and/or state support to agriculture. This process is commonly referred as "deregulation" and offers a unique case to study the consequences of a drastic neoliberal turn in an industrial country (Campbell 1994; Cloke 1989; Cloke 1996; Larner 2000). While some scholars integrated New Zealand reforms in a broader analysis of the transformation of the

global agriculture (Le Heron 1993), research at the national level has shown a great interest in the destiny of family farming in a liberalized agriculture. The issue of how family-based agriculture could survive has thus been central in most of the sociological research on New Zealand deregulation. Authors directed their work to show the adaptations family farmers invoked in trying to cope with the new "rules", first in the years following the deregulation (Campbell 1994; Wilson 1994), and then also in following decades (Haggerty, Campbell, and Morris 2009; Johnsen 1999; Johnsen 2003; Smith and Montgomery 2003). In doing so, they directly followed a long tradition in the sociology of agriculture (described below). For some authors, the family character of New Zealand farming was renewed and became even stronger and better adapted to the face future pressures (Fairweather 1992). Others emphasize the redefinition of family farming (Johnsen 2004). Beyond these subtle differences, general agreement exists over the fact that family farming survived the crisis well. In the adaptation process, some survival strategies increasingly became accepted as normal behaviour — women's off-farm work provides a good example (Johnsen 2003). Agricultural practices were obviously affected. The first general reaction to the crisis has been to cut down the spending in farm inputs, labour and investments. Such "belt tightening" tactics had further impacts on the local economy, and participated in the general dynamic of the rural downturn (Wilson 1995). As an example, farmers' spending on "repairs and maintenance" decreased by nearly 60% (Campbell 1994). The farmers' conservative attitude forced many agribusiness companies to rationalize. At the same time, many public sector agencies that played a key role in the rural economy — the Post Office, New Zealand Forest Service, Department of Lands and Survey, and the Ministry of Energy — were privatised or restructured. Altogether, the 1980's reforms put the rural areas under enormous pressure and resulted in a contraction of the local and regional economy, particularly in Southland, and thus led to deep changes in the rural communities (Liepins 2000).

Back on the farms, the effect was an equally enormous effort to increase the profitability and the productivity of the business — resulting, in the long term, to a strong intensification of the agricultural practices. As an example, the lambs per ewe ratio (i.e. the average number of lambs a ewe give birth to for one lambing) increased by 19% between 1985 and 2009, while the weight of lamb carcass gained 39% (Institut de l'élevage 2010). The dairy farming productivity saw an even stronger increase, with an average dry matter production per hectare gaining 70% since 1980. These changes in farm practices challenged the former definitions of good farming, especially as intensification was often seen — and proved — as a means of economic success (Haggerty, Campbell, and Morris 2009).

In the lowland of Southland, this quest for profitability resulted in the development of dairy farming. In the early 1990's, North Island dairy farmers found Southland offered new opportunities to develop farming activities. There, they found good land, suitable weather and were able to purchase farms at low cost compared to what they could get in their own traditional dairying areas (Taranaki and Waikato). Active recruiting of North Island farmers by the dairy industry to convert farm in Southland helped to overcome any hesitation to go the coldest region of New Zealand (Stock and Peoples forthcoming).

This first dairy boom, initiated notably by two investing firms, Tasman Agriculture and Applefields, played a key role in the recovery of the regional economy (Wilson 1995). It created new jobs, attracted new families and investments and revived the local businesses. At this time, few local farmers had chosen to convert their farm. Conversion to dairy farming was seen as an imported practice and as a challenge to the "traditional" sheep and beef farming, which organized most of the social life (Stock and Peoples forthcoming). However, the history of farm conversions in Southland is not linear. If the region was primarily a sheep country in the 1980's, this was not always the case. In the first half of the 20th century, numerous dairy factories were found in the area: good lands and constant rainfalls provided a favourable context for dairy cattle, which was taken up by many agriculturalists. From the 1950s, however, high prices for meat and wool resulted in numerous conversions to sheep and beef farming. Local, small scale dairy plants closed their doors. Southland increasingly became a "sheep country", with the encouragement of state subsidies. In this sense, one could say that the resurgence of dairy farming was, partly, a logical outcome of the removal of state interventionism. Actually, dairy farming had been developing continuously since the 1950s, with local farmers increasingly joining the process, which now reached most areas suitable for dairy farming. The regional dairy factory in Edendale became one of the biggest in the world, and dairy organizations still plan to double the number of cows in Southland in the future. In fact Southland and Canterbury, the two South Island dairy regions, are the only places in New Zealand where dairy can still significantly develop.

This apparently exponential trend of conversions is directly connected to the deregulation of the New Zealand agriculture. In fact, the two sectors, meat and dairy, have been affected very differently by the withdrawal of the state subsidies, which were mostly concentrated on the meat and wool industries (Stock and Peoples forthcoming). Unarguably, dairy farmers had still to cope with the other effects of "Rogernomics", but they had already confronted a globalised free-market. On the other hand, marketing and exporting structures evolved with different success rates. While the NZ Dairy Board processed and commercialised the totality of the milk production, in contrast, the NZ

meat and NZ wool Boards lost their predominant role and influence (Campbell 1994). At the end of the process, the dairy sector emerged stronger both at the farm and the industry level. The "contrast in fortune" between the two sectors (Le Heron 2011) is strong, and partly explains the continuous conversions. 2001 saw the creation of Fonterra, the giant co-operative, which consolidated the dairy industry by merging the principal actors of the trading and marketing side (New Zealand Dairy Board) with the two major processors (New Zealand Dairy Group and Kiwi Co-operative Dairies). Today, Fonterra manufactures and markets more than 90% of the milk produced in New Zealand and creates on its own 7% of the national GDP. It has become so important in the national economy that Gray and Le Heron made this double proposition: "thinking about New Zealand is to think about Fonterra; thinking about Fonterra is to think about New Zealand" (Gray and Le Heron 2010).

The economic benefits from dairy farming cannot be contested. Other consequences of dairy farming are, however, highly criticized, primarily environmental issues. The intensification of farming practices, particularly the development of dairy farms, has resulted in important concerns about the decreasing water quality in New Zealand (Barnett and Pauling 2005). After the "Resource Management Act" (1991), regional councils are in charge of regulating and controlling these issues. On their own side, Fonterra has developed the "Clean Streams Accord", which should improve on-farm environmental practices (Blackett and Le Heron 2008). If the company has the "stated aspiration of being the 'world's most sustainable supply chain for dairy', and to become a world leader in sustainable and profitable farming systems" (Gray and Le Heron 2010), water quality remains one of its hottest issues in public debates about dairy farming in New Zealand.

Another source of concern connected with the economic success of dairy farming is foreign investments in New Zealand dairy farms. The turmoil around the possible selling of the giant Crafar farm group to a Chinese investor is a paradigmatic example, both because of its publicity and its size: this controversy reveals how dairy farming in New Zealand can become a financial investment at the global level (Le Heron 2011), participating in a global capitalisation of farming (McMichael 2011). On the other, the strong reaction in the public arena and the hesitation of the Overseas Investment Office whether to approve the selling or not testify[1] to the growing concerns at the national level about land acquisition by foreign investors. Fonterra, however, is developing the same kind of investment strategies in other countries and, in New Zealand itself, capital investment in dairy farming is already common. The "traditional" system of sharemilking (Blunden, Moran, and Bradly

[1] *NZ Herald*, 20.01.2012: www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10779984

1997)[2] — applied on 38% of the New Zealand dairy farms (DairyNZ 2010) — may conceivably and practically ease this process: in this scenario, it is common to have two different persons owning and actually managing the dairy farm.

Despite the apparently incontestable success of New Zealand dairy farming, environmental and land-selling concerns add to and complicate the continuous trend of conversions and therefore give a contrasting image of an unsettled agricultural landscape. Following Campbell and Lawrence, it is likely the "conjunctural crisis" created by the deregulation has led to a "structural crisis" involving broad social and cultural transformations in New Zealand (Campbell and Lawrence 2003).

THE SOCIOLOGY OF FAMILY FARMING

This project focuses on family farming adaptation and evolution and thus enters a long tradition in rural sociology.

Rural sociology and sociology of agriculture has historically been based on the understanding of social change in rural areas facing — either directly or not — 20th Century trends of industrialisation and modernisation. Typically, the underlying idea was generally that traditional ways of farming would disappear, or at least would be deeply transformed by the modernisation of agricultural techniques and rural economies. Great attention was thus paid to the survival and adaptation of existing modes of farming: peasantry and family farming. This study, therefore, follows a long research tradition[3].

An enormous body of literature exists examining the paradoxical survival of family farming within Western and industrialized agricultures. Initially, this was about understanding the impact of modernisation of agriculture on peasant communities or farmers' households. Progressively, the focus became wider, addressing various issues, such as farm typologies or evolving gender relations. In the 1980s, and more specifically connected with the topic of this paper, the rediscovery of the writings of Marxist authors — mainly Chayanov and Kautsky — resulted in a renewed interest in the concept of family farming, exploring how it was integrated, subsumed by — or resisted – industrial capitalism (e.g. Friedmann 1978; Reinhardt & Barlett 1989).

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[2] The sharemilker generally owns his herd but not the farm he runs. The milk pay is shared between him and the farm owner, usually following a fifty-fifty rule. The sharemilking is part of the so-called "dairy ladder" which allows young farmers to progress in their career, progressively gaining capital, assets and responsibilities. This scale includes a wide range of positions with different levels of responsibilities, effectively creating a wide range of possibilities in terms of dividing ownership, farm management, and farm labour.

[3] For a review of the literature on family farming in rural sociology, see Johnsen (2004) or Pritchard et al. (2007).

A recurrent question for rural social scientists has been how to give a precise and encompassing definition of what constitutes "family farming". Many studies have tried to describe the family dimension of farm businesses, to list characteristics, or to identify typologies of family farms. As an example, Gasson & al. base their definition on three criteria in their review on the farm as a family business in Britain: the kinship relations between the principals; business ownership combined with managerial control; and generational succession. They add that a "substantial proportion of the regular labour input may also be provided by family members but this is not necessary the case", which is why family farming "extends far beyond the family-worked farm" (Gasson, Crow, Errington, Hutson, Marsden, and Winter 1988). Overall, kinship relations between the people involved on the farm, generational succession and managerial control by the members of the same family are generally mentioned and accepted in this type of analysis. The debate over the importance of family labour on the farm is, however, connected with the scaling up of farm structures related to modernization, which often results in the need for hired labour. Most of the Anglo-Saxon authors agree that if the direct involvement of the farmer in day-to-day operations is important in the definition of farming, the growth in size and the use of waged workers does not necessarily indicates the end of the family farm (Marsden 1984; Reinhardt and Barlett 1989). In the French rural sociology, however, the specificity of labour organization within the family has been central in the analyses of family farming (Lacombe 1990; Lamarche 1987). As an example, Barthez shows how the labour forces of the kinship — mainly wives and sons — is a key factor in farm survival (Barthez 1982; Barthez 1984). It is possible that, because of the specificity of French farming evolution during the 20th Century, the family dimension of farming, including the centrality of family labour, has been taken as obvious in French literature and thus unquestioned (Purseigle and Hervieu 2009).

Beside these structural descriptions of the family farm, some writings examine the moral dimension of farming to characterise family farming. As an example, Reinhardt and Barlett refer to the "objectives of the operating unit" which is said to be more complex on family farm, where the farmer may consider also non-pecuniary aspects as rural lifestyle (Reinhardt and Barlett 1989). Gasson & al. address the same issue, drawing on a broader literature including non-farming family businesses (Gasson et al. 1988). Again, these conclusions can be related to Marxists precursors. Chayanov argues that peasants' behaviours were based on a distinctive logic in which the goal of production is determined by the consumption needs of household, rather than by the desire of profit (Chayanov 1986 [1925]).

Limitations to the usefulness of family farming as an analytical concept have been widely discussed. As an example, Whatmore & al. refuse it explicitly because of its unevenness: they argue that the

category of family farming artificially unifies a diversity of empiric situations and theoretic approaches (Whatmore, Richard, Little, and Marsden 1987). More recently, Purseigle and Hervieu have questioned the overemphasis on family farming in French rural sociology, suggesting this leads it to take it as the norm for agriculture (Purseigle and Hervieu 2009). By extrapolation, this resulted in a conceptual anachronism (directly inspired by previous peasant studies) where the "family farm" — diversely integrated to the market economy — becomes the standard used to assess any form of agriculture.

In comparison, other writings have addressed the binary aspect of classical studies of family farming which have opposed it systematically to industrialised and modern farming. Marsden (1984), however, contested this opposition arguing that, in North Humberside where he developed his research, the family dimension of the farm remained very actual, and central in the younger, modern and large-scale farmers' strategies and management. Marsden identifies synergies between strategies related to modernisation, industrialisation and capitalisation: on one hand the family dimension of the farm, and on the other, most notably the desire to ensure farm succession and to keep control over farm activity. As an example, expansion of the farm is generally related to capitalist logics, but can also be understood as an attempt to establish sons in the family business as well (Marsden 1984: 215). Similarly, Pritchard & al. (2007) propose the concept of "farm family entrepreneurs" to overcome the conceptual axis opposing farming family to corporate farming. They use the case of Australian tomato growers to illustrate "the situation where family units remain at the social and economic heart of farm ownership and operation, but in the context where they relate to their land-based assets through legal and financial structures characteristic of the wider economy" (Pritchard, Burch, and Lawrence 2007).

The focus on family farming in rural sociology, however, has distinctly decreased since the 1990s. The construction of "family farming" as a reversed image of the industrial model has proved a conceptual dead-end. Still, on the field, farmers themselves highlight the family dimension of farming, and family owned and operated farms still predominate in many countries. Logic related to kinship and household concerns is still determinant in farmers' decision making and choices, notably in the importance given to farm succession and in the capacity to resist to economic pressures. So, if this research does not try to constitute a new definition of "family farming" as an analytical category, it actively explores the family dimension of farm at the level of labour and ownership.

Beside their importance in the understanding of farmers' decision making, questions around the evolution of the family dimension in New Zealand farming have a role to play in very actual issues, and issues connected with global trends. As an example, family ownership takes on a new dimension

in a global context where the financialisation of farming becomes more important and, in itself, leads to new social and environmental issues (McMichael 2011)

CHANGE AND CONTINUITY IN THE SOCIOLOGY OF AGRICULTURE

As shown by a retrospective inspection of its history (Lowe 2010), rural sociology has been dedicated to the understanding of social change. Its development followed the modernisation and industrialisation of agriculture and the evolution of the rural communities in the context of urbanizing and globalizing economies and societies. The sociology of agriculture adopted the same general approach, describing the disappearance and/or the survival of passing modes of farming. Rural change has undeniably been dramatic during the last century. However, this focus on change, extinction and adaptation of former cultural and sociological forms often implied an epistemological posture that opposed change to permanence in a rather exclusive way. This dichotomy is reflected in common representations of the countryside, which rural sociologists described in generalistic terms. On one hand, permanence is typically related in positive terms and linked to tradition, nature and a type of rural idyll (Lowe and Ward 1997); on the other, it could be characterised in negative terms linked to moral conservatism, backwardness, and various other variations on the "hillbilly theme" (Bell 2006; Bourdieu 1977).

Change has also been ambiguously perceived: as modernism, innovation and progress, or as loss, degradation and corruption. In the context of farm extension, the opposition between change and permanence has funded an ideological divide between progressive and conservative farmers. This understanding of farmers' attitudes towards change has legitimated the extension project itself: that is, because the majority of farmers were conservative, there was a need to "help" them adapt to an ever-changing society. On the other hand, farmers adopting new technologies were generally praised in farming newspapers for their innovativeness and dynamism. This 'classical' model of extension has been long criticized (Vanclay and Lawrence 1994) and increasingly replaced by 'bottom-up' approaches since the 1990's (Darré 1996; Pretty and Chambers 2003). However, it appears harder to get rid of an underlying opposition regarding change.

The results of this study and the case of farm conversions in New Zealand illustrate that permanence and change may not be systematically opposed. While the trend of farm conversions from sheep to dairy farming that started in the 1990s can easily be described as a major change that significantly transformed the Southland region, it has simultaneously allowed family farms to survive deregulation of agriculture and revivified the regional and local economies. At the level of the farm, farmers' motivations to convert prove to be equally innovative and conservative. In order to understand the

complex relations between change and continuity in the farm conversion process, this paper first contextualises the development of dairy farming in Southland within the recent history of New Zealand agriculture. It then presents the results of the interviews outlined above and explores how farmers themselves describe the changes occurring in the farm business — which mainly affect the capital financing the farm; the labour organisation; and the intensification of farming practices. Finally, and following the farmers' point of view, the paper describes how such conversions have generally been a way to ensure continuity in the family farm in two main ways. Firstly, conversion is often led by concerns over succession. Secondly, farmers appear to revitalize their identity of "good farmers" by becoming part of the "dairy success story".

INCREASE IN BORROWED CAPITAL

As outlined above, converting a sheep farm to dairy production requires investing significant amounts of money. For example, a dairy shed must be built, incorporating a milking system often involving high technology installations. The converter must also build his herd by purchasing cows. Additionally, he has to rearrange the paddocks; adapt the fencing; build lanes that lead the herd to the milking unit; and sometimes cut down trees hedges. Even the grass is progressively replanted with varieties suited for dairying. Effectively, the farm has to be totally reshaped and reorganized. Furthermore, the conversion often goes with land acquisition. While all process costs naturally vary, in all cases, they sum up to several million NZ dollars. If sheep farmers already have a mortgage and debt, these may seem virtually incomparable with those of dairying, as this older farmer (who used to be an accountant) reports:

"I spent half of my time at that table doing book work, it's horrendous the amount of accounts that come in, it's big money, like I've never, in all the time that I was an accountant, ever had mortgages, any client I had had the mortgage now and the banker tells us that our mortgage is a minor compared with some, so it's just mind boggling in that respect." (Interview 103, male, 67 y.o.)

Compared to sheep farming, dairy involves far more money. So, the average dairy farm has a cash flow per hectare five times higher than the average intensive sheep and beef farm (MAF 2009a; MAF 2009b).

Obviously, no farmer can afford to invest this much money from his own savings. Conversion therefore goes systematically with borrowing to banks and high debt levels, and it is no surprise that several converted farmers mention their banker is one of their main contacts during the conversion process. Invariably, the bank's agreement is referred as the moment when the conversion turned from a project to real process. This step is not always easy to pass through. Many farmers tell about the difficulties they encountered with banks. In order to convert a farm, they had to learn how to deal with bankers and to gain confidence, as described by this farmer who converted early on:

"You see them [the bankers] probably a couple of times a year, and it's you developing that side of your business. It's something you've really got to learn. You've got to build relationships with your banker and you've got to be… I was speaking to someone the other day, probably about converting and they said 'you know the banks aren't too keen…'. I said: 'you know that's the wrong attitude to approach the banks. Get an eye of a mind to someone to do the report, make sure in your own head

it's a goer. And then go to the banks with the proposal and say look this is what I'm going to be doing, do you want to be a part of it?' You know, you're giving them an opportunity to sell their stuff selling their service." (Interview 105, male, 48 y.o.)

Skills and aptitudes in dealing with debt, money and banks are often said to be a condition of entering dairying. In the conversion process, therefore, first the farmer has to make an important decision involving a lot of money, sometimes without mastering all the financial ins and outs, and with limited times to think about it. Even when they had some experience in dairy farming, the farmers felt their lack of knowledge. As an example, they generally had no previous stockman skills with cows. Yet, purchasing the herd is one of their biggest expenses: every cow is expensive, and much will depend on the quality of the stock. Often, they rely on the knowledge and competence of stock agents. Having millions debt on the farm is not something that everyone can handle easily. This farmer refers to the stress that this kind of situation can cause:

"You've gotta go and buy cows… buy a million dollars worth of cows. And borrow all the money, borrow the whole lot. You're spending not far off a million dollars on building a cow shed. You know, you've gotta go and employ someone…you've gotta make a whole lot of decisions…and you've gotta write the cheque. I mean…if that doesn't get your blood pumping, you're not human really. And you're borrowing every cent. If you get it wrong, you're gonna lose your asset. So…that's…that's quite stressful." (Interview 107, male 48 y.o.)

Once the money is spent and the conversion completed, the family business has automatically grown. It is then common to find legal and financial structures such as trust and companies in order to secure the ownership and organize the management of the business. This adoption of structures characteristic of the wider corporate economy is described by Pritchard et al. as a "an accommodating modus operandi for farm units within neo-liberal agricultural governance" (Pritchard, Burch, and Lawrence 2007).

As described above, the scaling up on the dairy farm and the profitability of dairying has opened the way to external investment in farming. However, in the cases used in this research, the ownership of land has been mostly kept within the family, sometimes including two generations. What is more, the converted farmers position themselves in a strong opposition to this evolution in farming, insisting on the family dimension of their business. They despise the attitude of people investing in farming simply for financial interests. A newly converted farmer refers to the consequences for the local community in his criticism of syndicates' ownership:

"They don't live here, they don't care about here. They don't give anything to the district. They almost, not rape, they take, don't they and they take all their money back to Auckland or wherever and they would never live here they would just invest money in here. Well that's not the way farming used to be. And there's just getting more of it." (Interview 106, male, 39)

Another farmer uses the same argument to explain his choice in converting the family farm to dairy himself:

"I certainly don't want everything going corporate owned and Aucklanders owning… you know, people not actually living on the land, just lawyers in Auckland and different equity owners and absentee owners, putting managers on. I don't think it's the best way to go really. So that's one of the main reasons we converted." (Interview 113, male, 50 y.o.)

Thus, even if the financial and legal structures of the farm become more complex, often taking the shape of a more corporate business, the family ownership remains central in converted farms, both in the facts and the discourses.

INCREASE IN WAGED WORK ON FARM, MULTI-LEVEL WORK HIERARCHY

New Zealand sheep farming in often based on family labour. Workers or companies are contracted for specific tasks, as shearing, but the day to day work is the task of the farmer, with the help of family members. Dairy farming involves often waged labour, above all on large scale farms, like the ones found in Southland. All the converted farms visited include staff. The role and position of the waged employees varies, with very different level of responsibilities, from simple workers, often foreigners, milking in the shed, to herd managers. However, all employee responsibilities are connected with the milking and the herd, while the owner generally focused on office and management work, as well as maintenance of the farm and the pastures. The farmers milk sometimes, at least during the first years after the conversion, if only to learn about milking and cows. With the passage of time, however, they tend to step away from the day to day work on the farm and from the milking. The transition to the role of business and staff manager is progressive. It generally follows the development and growth of the farm business. At the first stage of the conversion, most farmers are involved in the milking and assume a large part of the work on the farm. The more the farm grows in size, however, sometimes including several dairy units, the more the farmer has to change his role. This man, head of a large farm, explains this change:

"We added on to this place one, two, three times, four times to the home farm, so we own about 12 houses now and we have about nine, ten full time staff. So, one day you wake up and you realise that

you can't do all the work, that if something goes wrong today you can't do it you have to have other people to do the work so you go from owner operator, totally in control, to working with people to do the work for the day, and that is quite a difference just to do that. And you realise that you have got all these houses you have got to maintain you know 12 houses… And then you realise that the people you employee, this is their solid income. You are it, when they take their pay each week. That is the money they have to raise their family to do the things they want to do." (interview 118, male, 52 y.o.)

Similarly, when asked about what changed with the conversion, most of the farmers emphasise becoming an employer. Beforehand, they were used to doing most of the work on the farm by themselves, and thus to have a global control on every elements of their farm. Within the new dairy farm, however, family labour was no longer enough to handle the increasing workload. Having regular staff becomes a necessity and forces the farmer to delegate work and to entrust some responsibilities to others. According to the interviewees, this has been generally a hard experience. Furthermore, such farmers had to learn how to manage people. For the ones who developed their farms into several dairy units, often having more than ten individuals involved on the farm, these skills become central. As one farmer explains: "it's not just about the cows, it's about being able to manage your staff" (Interview 105, male, 48 y.o.). To employ staff presents different challenges. The first is to find people you can rely on and you can trust. The interviews contain many descriptions about the difficult process of selecting candidates, and a few farmers tell of bad experiences with incompetent or unreliable employees. Being used to relying mostly on themselves doesn't help the farmers in this process of trusting others:

"But you have to trust that they're going to do the job. But that's quite a big thing because we'd always done everything ourselves, and then to have to you know get up in the morning and think has somebody actually milked the cows, you have to actually trust that they're going to do that." (Interview 115, female, 48 y.o.)

Once the farmer found good staff, he has to encourage them to stay. Again, many interviewees mentioned how important it is for them to ensure their employees are happy enough to stay. The first reason for this is the time needed by every new staff member to learn his job on the farm and to become really effective. This represents an investment that has to last long enough to be worthwhile. Secondly, farmers frequently repeated the idea that happy staff do a good job and feel more involved in the general business. A good work environment is beneficial both for people and for the farm as a business too. In opposition, to be a bad employer and getting a "bad name" within the industry might make harder to find new staff. On the other hand, several farmers refer to benefits that are not related with the farm business, but belong to moral and social values. Such benefits

make people settle down and stay on a same farm for longer, which is better for them and for the community. As an example, this farmer emphasizes the importance of being good at employing staff:

"A lot of owners aren't very good at employing staff, so staffs aren't always very happy with conditions they're working under. (…)Farm XX are a classic, that is one of the corporate managers where they might turn over 4 or 5 different staff in one season, simply because the pressure they put them under, the wages and the environment they try to make them work in. Well obviously… perhaps they need to step up and actually say, or be told, guys you need to straighten this out because it's having, not only an effect on your business or the business that you're trying to manage but on the local communities as well. So you know that's a big part of it, yeah, yeah, 'cause if you create the right environment and you've got the right people, then those people will stay, 'cause no-one likes moving on and on and on and on, you know it's pretty unsettling for children, it's pretty unsettling for adults." (Interview 114, male, 48 y.o.)

It is interesting that, his example refers to a corporate farm, underlining the unquestionable difference between his own family farm and this kind of business. This echoes the repeated criticism addressed to absentee farm owners, who are said to take no real interest in the way the farm is managed, other than the financial balance. Several interviewees describe the actual involvement of the owner on the dairy farm as having important consequences for community life and environmental issues as well: if left alone, waged staff just "don't care". If the accuracy of this statement may be arguable, once again discourses about "other kinds of farmers" tells much about how family farmers perceive themselves and about the image they want to give of themselves, in opposition to other categories.

First impressions when looking at a converted farm, would probably lead to the conclusion that family work has declined. The integration of sons and daughters in two farms, however, challenges this assessment and further investigations on the role played by wives show no decline of their participation with the conversion. On the contrary, as women often are in charge of part of the office and book work, and, as the volume of these tasks increased with the conversion, a tendency to an increased participation can be identified. This trend is clearly illustrated by this woman, when she addresses the development of the farm over the years:

"From my point of view, I do all the accounts, order books and things and it's gone from like one GST return to seven GST. It's got like… it's a full time job really for me to do the books." (Interview 116, female, 48 y.o.)

In some examples, the conversion process allowed the wife to be more invested in the management of the farm business, when before she was working in town. On the sheep farm, her husband was in charge of all the work and management, having done that all his life. The switch to a new farm system faced the couple with new challenges and created new spaces for the woman to invest:

"I see now with the conversion, yeah probably having a lot more say, not probably on the little day to day where does this mob go, it might be more on the bigger things, maybe like purchasing capital items or employing staff, things like that, some of the bigger stuff, yeah, you don't care what paddocks they go into, you know." (Interview108, female, 44 y.o.)

So, there is no evidence of the conversion to dairy farming leading to a lower involvement of family members in the farm work, at least in the cases analysed here, which are all owner-operated farms. The situation of sharemilking may also not be so different, given that sharemilkers are often young couples trying to walk up the 'dairy ladder' (Blunden, Moran, and Bradly 1997) until they can access the ownership of a farm. Moreover, some interviewees explicitly claimed that women tend to be more involved in dairy than in sheep farming:

"I would say that one of the big differences for women; women didn't have a strong role in sheep farms at all. It was very stereotypical, the husband would be out on the farm, women would be at home and cooking all the meals and doing all the beautiful food for them, but with dairy farming both doing everything together. Like you'll see young couples and they're both working on the dairy farm but you just don't see that with sheep farming at all. That is a major difference." (Interview 106, female, 36 y.o.)

The traditional masculine definition of farming connected to sheep farming can be confirmed by the literature (Campbell, Bell, and Finney 2006). But the generality of more egalitarian gender relations in dairy has still to be confirmed.

INTENSIFICATION, TECHNICISM AND SPECIALISATION

Deregulation resulted in a general intensification in the New Zealand agricultural sector, and especially in dairy farming. Though based mainly on pasture, New Zealand dairy farming also relies on intensive use of fertilizer and high stocking rate. The rotational pasture system is made to gain maximal grass production, both in quantity and quality. This increase in productivity and production is generally well perceived by farmers, as put simply by this female farmer:

"Probably the other things would be just the productivity nature, like dairy farming is so much productive like you grow more grass you um you just you're sending out more out the gate and I just like…" (Interview 117, female, 34 y.o.)

The valorisation of maximized production is a common and stable feature among farmers in industrialized countries, as shown by a wide literature addressing the development and evolution of productivist attitudes and behaviours (Burton 2004; Evans, Morris, and Winter 2002; Shucksmith 1993; Ward, Jackson, Russell, and Wilkinson 2008; Wilson 2001). These attitudes and behaviours appear to be quite strong in New Zealand dairying.

Along with the agronomic intensification, farmers mention an increasing use of technological tools and calculations in the running of the farm. Many of the former sheep farmers associate dairy farming with a control of the production on a daily base that they had not exercised on the sheep farm. The control is made possible by the feedbacks of the daily milk production. The results can be known and followed through the computing system and provide precise indications about progress:

"And the other thing that I find with dairy farming that you haven't got with sheep and beef is that you know every day in the VAT, it tells you, whether you're doing it right or wrong. You put the cows into a paddock that they don't like; their milk will just go [down] like that. It's instantaneous." (Interview 103, male, 67 y.o.)

These forms of regular feedback do not exist on a sheep farm, where the farmer has to assess the results in more approximate and non-formal ways. Farmers explain the difference between the two systems by referring to an intuitive knowledge that characterized sheep farming as opposed to the planed and formalized approach of dairy farming. Often, they judge the latter to be easier, as this farmer suggests:

"You know we've got a book. We do our grass every week. We measure our grass and we know our growth rates, and we know what the cows need… and it's just very simple maths to be able to work out. Whereas with sheep… your sheep is probably a lot more intuitive. It's a lot more on instinct than hard facts and figures, because you haven't got them in front of you. The cows we doc them every second day which tells us we've done a good job or not you know. Sheep, you don't find out until you start sending your lambs [to the meat work], or at lambing time when you're down, lambing percents down or whatever so." (Interview 111, 32 y.o.)

The different measurement used on a dairy farm help to have control and, somewhere make it "easier" than sheep farming. This control is necessary to maintain the production level to its best,

which is actually the condition of profitability. Dairy farming involves high levels of expenditures that demand good return to be absorbed. Moreover, the scale of the production multiplies the effects of mishaps at the level of production or market. This puts the production system under a particular pressure, where there is no place for errors. This farmer expresses the same idea, talking about farm consultants:

"As a sheep farmer you probably can't afford them [consultants], like they're not worth having. As a dairy farmer you need them because um, for instance like if you see your paddock needs fertilizer, as a sheep farmer, it's OK you can put the fertilizer on. But when you can see it as a dairy farmer that it needs fertilizer, you're too late." (Interview 116, male, 47 y.o.)

Another factor playing in this issue of knowledge and farm conversion is the novelty of dairying for the farmers and the fact they could no longer rely on their former experience, at least for the husbandry aspect of farming. Most of them were born on a sheep farm and have been involved in the work on the farm from a young age. Through this participation, they gained skills in an informal way, skills that could be seen as intuition, because of their progressive and implicit learning. On the other hand, the conversion required them to swiftly learn how to run a dairy farm. Farm extension services provided them with the formalized knowledge they needed to be effective as fast as possible. So, the economic necessity of control and a learning process based on a formalized industry based knowledge result in a tendency to technicism, where questions and solutions are formulated within the language of technique and numbers.

Along with the intensification and technicist knowledge, farm conversion leads to specialization. At the level of income, sheep farmers sell lambs and wool and often have beef production in addition. The development of dairy farming provides new possibilities of diversification for these farmers who often started to graze dairy cattle during the winter period or supply fodder to dairy farms. On the other hand, an average Southland dairy farm earns 95% of its incomes from milk (MAF 2009a). The tendency to send out the cattle for wintering further amplifies the specialization of farm work. Production of hay or silage and the care of the young cattle are also delegated by contract to others, while the farm focuses on the milk production. However this concept of specialization has to be mitigated. First, sheep farming is in many ways specialized as well: within the areas where dairy exists, 84% of farm incomes depend on sheep (MAF 2009b). Secondly, among the interviewees, several farmers still maintain sheep production beside the main dairy farm. That said, if the conversion actually meant a step towards a more specialized farm system, the importance of the change might be different in every situation.

To convert to dairy also means building a specific relationship with a dairy company. Contracts with companies are designed for the long term. In the dominant example of Fonterra, producers have to buy shares that require them to deliver a given amount of milk. This represents a long-term investment that cannot easily be retracted. Even the milk price itself is calculated on a yearly basis, with a complex systems based on an adjustment at the end of the milking year. For these reasons, dairy farmers are linked to only one company and stay generally with it. Conversion could be seen then as a further step in the process of industrial integration, or, referring to Whatmore & al ideal-types, as a transition from a "transitional, dependent enterprise" to a "integrated enterprise" (Whatmore, Richard, Little, and Marsden 1987). In contrast, the meat industry is more fragmented. Farmers can choose to sell their lambs to different companies, seeking out a better price. This kind of practice, however, is largely despised by the interviewees as a primary cause of the bad situation in which the meat industry finds itself. In this conceptualization, internal competition and petty interests are opposed to the unity and solidarity that is said to prevail within the dairy industry (i.e. Fonterra). In this sense, a strong connection with one company is unanimously seen as beneficial and, moreover, as the cause of Fonterra's success. Several farmers even explicitly mentioned the internal division of the meat industry as a reason of turning to dairy. Integration is thus not seen as a weakening of the farmers' position, but rather as the mean to ensure the health of the all industry. This commitment, materialized by shares, found strong echoes in the co-operative structures of Fonterra. Despite a multinational dimension, the farmers still fell part of it:

"Farmer: Yeah, so no the links are pretty, and I think we felt that we're a bit more involved with these guys than we ever were with Alliance when we sheep farming.

Interviewer: Why is that do you think?

Farmer: Just because they make you feel more involved, they actually work it, well now, I'm not sure whether they have done in the past but now they, well I feel that they do, yeah if you chose to look and follow up information, you can find it, you know it's all there and they're quite pro-active in getting that information out, so yeah, the sheep industry's been a long time sort of looking inwards…" (Interview 114, male, 48 y.o.)

The emphasis put on strengthening of the farm leads us to describe the conversion from another point of view. Rather than focusing on the changes that occur, we will now move to look at the conversion as a mean of maintaining the farm — of ensuring continuity.

CONVERSION AS A WAY TO MAINTAIN THE FAMILY FARM

The economic incentive to convert to dairy has been strong during the last decades, with the success of Fonterra, good milk pays, and a struggling meat industry. The farmers interviewed never masked the important factor of money in their decision making. As put clearly by one: "whether we like it or not it's all to do with money" (Interview 106, male, 36 y.o.). However important money has been, it remains a mean to an end. Within and beyond money, the farmers also referred to other goals that will be addressed here. After all, if it was only about profit, most of them would have sold the farm and could be presently retired millionaires. It is a concept precisely opposite to selling that the interviewees want to explain. The conversion, for example, is sometimes described as a matter of "survival":

"So we went [to dairy] because of survival. It was farm survival: family farm, you were tied to it. And we thought: 'No we don't want to lose this thing. It has treated us pretty well, we know the farm and this is the life style etc.' So we converted. Yeah, 225 cows…" (Interview118, male, 52 y.o.)

In fact, few farmers were really facing such an extremity. Most of them could have kept on with sheep, at least for a while. But all of them speak about conversion as a way to maintain what they cared about. And this is can be summed up in two connected issues which will be developed: farm succession and "good farming". The equation becomes paradoxical given what the farmers say: it appears that the big shift to dairy — this apparently major change in the farm, shape, strategies and organization — has frequently been guided by a desire for continuity.

CENTRALITY OF SUCCESSION

One of the main problems facing sheep farms located in areas where dairy farming is possible is the land price. The development of dairy farming has resulted in a dramatic increase in the market value of convertible land: as outlined above, dairy productivity and profitability per hectare is significantly higher. Dairy farmers are then in a better position to buy land, because they can afford to invest more money than sheep farmers. This puts strong limitations on the possible development of sheep farms: it would be very difficult for them to produce benefits with the same investments as a dairy farm. This unfavourable position is explicitly mentioned by this farmer talking about the possibility of financing the purchase of neighbouring land:

"And when that came up here, the only way for us to fund it was to milk cows off it, we couldn't buy it and put sheep on it and fund it… Well the banks, it wouldn't have stacked up with the bank, the only way to actually cash flow it was with dairying and the banks would lend the money. They wouldn't

lend you money if it was with sheep because the income from sheep wouldn't have covered the mortgage, you see, so…" (Interview 109, male, 37 y.o.)

As long as a farmer does not seek to develop the farm by purchasing new land, the issue of land price can also have a positive side, which is increasing the value of the existing farm. Yet this process itself can become problematic when the time comes for the next generation to take over the farm. Because of a combination of laws and tax regulations, the successor must buy his or her parents' farm at the market price. In a place like the lowland of Southland, this means paying a price based on dairy productivity value. For many farmers, there was no way this could be done while maintaining sheep production: the only real choice was to convert to dairy, or to sell the farm to someone who would then convert it. The importance of succession is a classical feature in studies on family farming and has also proved central in the understanding of farm-decision making in modern and industrialized agriculture (Burton and Walford 2005; Inwood and Sharp 2012; Ward and Lowe 1994).

The literature on family farming survival in New Zealand refers to succession, mostly indirectly. McCrostie Little and Taylor, for example, describe the modalities of farm succession, and report the importance given to the farm remaining in the family (McCrostie Little and Taylor 1998). In the process of farm conversions in Southland, the issue of succession plays a key role. In the interviews, most of the farmers explicitly describe the conversion as a means to allow the next generation to take over the farm. Many of them say this constituted their first and major motivator, as exemplified by this farmer:

"I was given the opportunity to take over the home here and so maybe you know we want to perhaps try and do the same for our kids. Or one of them you know and pay others out a bit or whatever you can do. And we weren't going to be able to do it the way we were sheep farming, like we were just sort of you know we're the bank the bank was on our backside all the time, not all the time but we were a at risk customers to the bank." (Interview 120, male 46 y.o.)

As suggested here, farm succession is not only a uni-directional process. In this sense, the farmers see themselves both as successors *and* as predecessors. While they extensively describe the importance of allowing the children to take over a sound family farm, the interviewees also refer to their own parents and to feelings as duty and fidelity to the family history. As this farmer explains, succession is about both transmitting and receiving:

"Like it's hard to explain, when I was little, I used to go out and help my grandfather. Now, this is a whole lot of history but he fought in the First World War, came back. He and his brother bought a farm at Heddon Bush and in the Depression, it wouldn't support two families, so he walked off. He

worked for another 15 years to scratch up enough money. When he started here, they milked 7 cows and he had 20 sheep, so you know, that's where it started. So that's what you're trying to drive forward, well for me, I want my family to know where they've come from but also for them to have something to take forward." (Interview 114, male, 48 y.o)

The farmers regularly mention the work of their predecessors, mainly their own fathers or grandfathers. They acknowledge what these predecessors have accomplished, and what they have inherited from them. When they felt that this inheritance was threatened, they converted the farm to an economically more viable production model.

When asked about the actual succession perspectives on their farm, however, farmers invoke elements that challenge the classical definition of farm succession which assumes the successor will take over the ownership of the farm and become a farmer. Talking about the future, several farmers underlined the new possibilities offered by the conversion, mostly the fact that their children might take over the ownership of the farm business without having to work on the farm. The different employment options existent in the way a dairy farm is run in New Zealand would allow these successors to choose their level of commitment in the farm business. They could run the farm themselves or delegate to a farm manager, or enter the share milking system. The conversion to dairy multiplies the possibilities of succession, playing off a flexible relationship between ownership, management and work. While this suggests a major change compared to the interviewees' own experience of taking over the family farm, they still refer to it as a way to maintain the family dimension of the farm, as this farmers explains:

"But what, none of the guys are overly interested in milking cows but the idea is if you build a business with the right sort of structure and it's large enough, then they won't have to milk cows. You're actually running a corporate enterprise rather than actually running a farm, if you understand what I'm saying, so that's where, you know the growth strategy comes from so that, it's still family interest but it doesn't have to be physically hands on milking cows." (Interview 114, male, 48 y.o.)

In this understanding of the farm succession, the ownership of the farm business appears to obliterate the transmission of a professional status or identity. Some interviewees go even further, describing options where the "farm" is described as a capital that would allow the children to grow their own projects or businesses in any economic sector they like.

However, others elements in the interviews contradict this focus on ownership and capital. Entering the dairy work system is said to give more opportunities to the children to step progressively into the profession. On a sheep farm, there is little place for the next generation as long as the parents stay

engaged with the farm. The potential successor has then to work elsewhere and to build capital on his own, waiting for the time when his or her parents will retire. The so called “dairy ladder” — the succession of positions a person might assume on a farm, progressively gaining capital and responsibilities — facilitates the integration of the successor at an earlier stage. He/she might work for his or her parents for a few years until they have built enough capital and experience to run a farm independently or take over the family business. In the sample used in this research, two farms illustrate this process perfectly. Both are large-scale farms including several dairy units. In both cases, at least two sons and/or daughters work full-time on the farm, some as contract workers, and some managing one of the units on their own. Beside these specific examples, many references to future, potential, involvement of the children in the farm business are found. As it has been shown in other contexts, increasing the size of the farm can then be seen as a mean to set up one — or several — successors into farming (Burton and Walford 2005; Marsden 1984).

So conversions to dairy farming challenge the common idea that the capitalisation and “scaling-up” will necessarily lead to a weakening of the family dimension of the farm business. The emphasis placed by converted farmers on intergenerational objectives contrasts strongly with the first analyses in terms of intensification, capitalisation and industrial integration. The involvement of sons and daughters in the farm running leads us to look more closely at the question of family labour on a converted farm.

TO REMAIN A GOOD FARMER?

Beside the continuity of the physical family farm, the interviews reveal another range of farmers’ motivations closely connected with their definition of what farming is or should be. Many of them mention the challenge of dairy farming as a reason to convert. This idea of challenge is often opposed to that of boredom in the sheep production, the sense of a need for change:

“So I wanted to basically be a dairying farmer. I’m nosey. I like to learn things and know things so I wanted to do it, to for those reasons really. It’s another challenge you know… I was probably getting or starting to get a little bit bored with sheep farming because we were sailing along doing that reasonable well and just every year sort of banging our reasonably consistent good results. And we’d been developing the farm and just basically getting more of what we were doing so. So it was another challenge that was a big part of it, too. If we wanted to probably live a nice easier life, we could have just sheep farming and just cruised along.” (Interview 111, male, 32 y.o.)

Some of the farmers added their frustration of getting no real reward of the effort they were putting into sheep farming, because of the ineffective industry. These farmers were generally very successful

at sheep farming beforehand. Obviously, this identity of "excellent farmer" was under threat because of the difficulties in the meat industry outlined above. If sheep farmers had been once the top of the rural social hierarchy, they have since progressively been pushed out because of the economic and productive success of dairy farmers. Therefore their conversion has been, partly, an attempt to maintain this identity of "successful farmer". At the same time, to forego an excellent sheep farm clearly constitutes a risk and provides yet another pressure to succeed in dairy. This young farmer suggests:

"It was a very good sheep farm and my parents had won sheep farming, South Island Sheep Farmer of the Year… awards… and so they were very good sheep farmers as well and so suddenly converting to dairying, it's like all these relatives and neighbours are thinking: 'What are you doing to that good farm?' So now we are trying to make it a good dairy farm because we took a good sheep farm and we want to make it into a really good dairy farm. So there's a lot of pressure… not pressure with self pressure. I'm thinking you know I've got to get this right otherwise the next generation's not going to have the opportunities that we've had." (Interview 109, male, 37 y.o.)

For farmers who were not particularly successful, however, the conversion has been a way to stay in farming in the long term; in that sense, it also provided a way to maintain a professional identity. Failing to convert could have resulted — in the long term — in selling the farm or, alternatively, in taking an off-farm job to compensate the low profitability of the sheep farm. And to become a part-time farmer would have further compromised these farmers' identity (Johnsen 2004). Again, the conservative aspect of the conversion has been appears to be determinant. In this sense, changing the farm production constitutes a relatively minor change in comparison to the implications of failing or quitting farming completely. Actually, most of the interviewees emphasize the similarities between the two types of farming, as much as — and sometimes more than — the differences. Typically, they put grass at the centre of the farm activity. After all, they still manage pastures and breed animals to eat it:

"Um you know at the end of the day there's not a huge amount of difference between farming one type of stock and another type of stock, they're all animals and they all need food, water and you know the basics and we've been doing that and quality pasture and all the rest of it, we've been doing that all my life, so that's not too much different." (Interview 111, male, 32 y.o)

Some farmers even used the words "grass cropping". Doing so, they minimize the objective changes in order to underline the similarities. The conversion thus allows them to confirm and reformulate a professional ethos inspired by productivist values — notably maximized production, technicism, and

specialization — that has been largely described not only for New Zealand but also in other national contexts (Burton 2004; Droz and Forney 2007; Forney 2011; Gravsholt Busk 2002; Haggerty, Campbell, and Morris 2009; Jay 2007).

CONCLUSION

This study has first described the conversion from sheep to dairy in terms of change. To convert a farm means to significantly increase the proportion of borrowed capital in the farm business. At the same time the conversion generally leads to contract waged workers, while on the sheep farm most of the work was done by family members. Finally, the converted farmer has to apply a different kind of knowledge in farm management. On the sheep farm, practical and embodied knowledge — "intuitive skills" — were crucial in decisions, while on the dairy farm these give way to technical controls and tools, precise measurements and codified processes.

However, when converted farmers describe their motivations to convert, they tend to minimize these aspects of change and express ideas that indicate they seek a kind of continuity within a regional context that has evolved dramatically during the last twenty years. They insist on two particular points: firstly, to allow the farm's duration and succession, and secondly to preserve a professional identity based on full-time farming and high productivity.

In this sense, the stories of farm conversions in New Zealand challenge a common dichotomy that has been central in representations of rurality and farming. This dichotomy opposes two set of ideas gravitating around two centres: permanence and change. These issues have been extensively described and critically documented and this paper is not the place to review such a long debate. What is more interesting, however, is that the conversions described in this paper do not fit into this binary opposition. If they are unarguably expressions of a deep social change in Southland, they were, at the same time, undertaken by farmers looking for some kind of continuity, through (as suggested above) farm succession and their identities as "good farmers". According to different moral or ideological points of view, the general process could then be described as a change either positively, as the result of progressive and future oriented farming strategies; or negatively, as the development of an environmentally-harmful model of production. However, one could choose neither position, and instead emphasize the continuities, whether the extension of a professional identity extending from productivist values or the survival of a family-based agriculture. So, farm conversions in Southland show that change and continuity are not exclusive, but have to be considered simultaneously, as two sides of the same coin.

Moreover the results of this research do not fit with another, related dichotomy that has been influential in such academic debate. In this binary, two types of agriculture have often been opposed in literature, even if not always explicitly. The first is based on family structures and relative independence from industry and capital, while the second is increasingly led by market logics under

the dominion of financial and industrial powers (van der Ploeg 2008). Conversions, however, cannot be understood within such a binary opposition. Rather, their logic can be interpreted in terms of both a "peasant principle" (family work, autonomy and self-controlled resources) *and* an "entrepreneurial logic" (market integration and competitiveness) (van der Ploeg 2010) — with neither of these two interpretations proving sufficient in itself. The farmers who converted their farms to dairy in the recent years refer to a complex mixture of the two principles, demonstrating that they are not exclusive and, furthermore, that there are sometimes synergies between them. The relation between farm succession and conversion is highly revealing in terms of this ambiguous relationship. Scaling up the farm on one hand results in a further dependency on external capital and on the industry, and on the other hand — in contrast — improves the chance of succession and increases the possibilities of involvement for family members.

Conversion to dairy also challenges the classical definition of family farming by blurring divisions between the main characteristics generally associated to this farm type. As Pritchard and al. demonstrate with the case of Australian tomato growers, the binary opposition between family and corporate farming does not reflect the reality of highly capitalised and industrial integrated farms in the Antipodes. Dairy farming in New Zealand similarly shows clear signs of a move towards more capitalised and corporate farms, but at the same time, does not demonstrate any decline in the family dimension. The transformation of family farms through conversion to dairy can also be described using the typology offered by Purseigle and Hervieu (Purseigle and Hervieu 2009). These French sociologists distinguish three types of family farming: peasant farming, modern family farming and family-corporate farming[4]. The latter refers to family farm businesses where the role of family is generally limited to the general management and the ownership of the farm assets. With conversion, the farms studied here moved to an intermediate stage between the classical family and the family-corporate models. Possibly these farmers insist on the differences between themselves and corporate farms and/or absentee owners because these differences are themselves becoming less obvious. However, in many cases the conversion of family farms to dairy has led to more family and more corporate forms of farming, at least so far. The question of future developments, however, remains open. The increase in capital involved in an average Southland dairy farm might lead to growing external investments in the farm assets, notably once the actual head of the farm retires. Such scenarios are corroborated in some interviews by allusions to the next generation potentially limiting its involvement in the farm to capital investments. The future of dairy farming in New

[4] The original names for the categories are in French: "agriculture paysanne", "agriculture familial moderne" and "agriculture familiale de type sociétaire". Those three family farming types are opposed to corporate farming and subsistence farming.

Zealand might then follow a very different pathway depending on the ability of farmers to reproduce a specific “ethos of farming” (Marsden 1984; Ward and Lowe 1994), where farm succession is more than capital inheritance.

Increasing land prices and farm sizes — and thus the increasing investments that are necessary to develop a dairy unit — could slow down the trend of conversions. Furthermore, other critical events or shocks, at the regional, national or global scale, could modify a context which is at present propitious for dairy farming. Those shocks could then, clearly, have a strong impact on conversions. In some aspects, dairy farms are more exposed to such crises — above all in their first years — than other types of farming businesses, which depend less on borrowed capital and high productivity. The high levels of debt and the obligation to high productivity (in order to pay back investments) place some farms under enormous pressure. A significant drop in the milk payout or an increase in interest rates could therefore make such ventures untenable. If many converted farms are strong businesses that could overcome such crisis and adapt, others are unarguably more vulnerable. More generally, this perspective could reduce the attractiveness of conversions to dairy. However, looking at the farmers’ motivations to convert their farms, it is likely farm conversions will continue in the Southland region in areas where the land quality and topography allows it. This is at least the explicit intent of the industry, which plans to double the number of cows in this part of the country in order to meet the growing demand for dairy products, notably in the Asian markets. The structural pressure on land price will thus persist and sheep farmers located on “convertible” farms will face the same dilemma as many before them: to sell the farm to someone who will convert it or to do it themselves — at least when the time comes to think about farm succession. The fact that the actual dynamics within dairy farming fit well with farm reproduction goals and a professional identity based on productivist values will likely drive more sheep farmers to change to dairy.

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APPENDIX 1: TABLE OF INTERVIEWS

INTERVIEWS

No	Participants	Farm type / function	A1		A2		Farm acquisition	Effect. farm area	Stock numbers			
			Gender	*Age*	*Gender*	*Age*			*Sheep*	*Beef Cattle*	*Dairy cows*	*other*
101	A1+A2	converted from sheep to dairy	M	58	F	56	1970	225	0	0	370	99 heifers, 73 calves, 6 bulls
102	A1	stock agent	M	50								
103	A1	converted from sheep to dairy	M	67	F	58	1980	546	0	0	800	190 heifers, 270 calves
104	A2 (F)	sheep	M	45	F	46	1995	130	2000	3	0	0
105	A1	converted from sheep to dairy + sheep	M	48	F	49	1982	0	1000	0	900	240 heifers, 220 calves
106	A1+A2	converted from sheep to dairy + sheep	M	39	F	36	1995	0	7000	0	800	150 heifers, 250 calves
107	A1+A2	converted from sheep to dairy	M	48	F	44	1988	411	0	0	900	0
108	A2 (F)	converted from sheep to dairy	M	45	F	44	2000	204	0	0	300	0
109	A1	converted from sheep to dairy	M	37	F	35	2002	340	0	0	1025	0
110	A1	Farm consultant	M	55								
111	A1	converted from sheep to dairy +sheep	M	32	F	30	2002	500	5500	0	650	150 replacement
112	A1+A2	Environment Southland	M	55	M	55						
113	A1	converted from sheep to dairy	M	50	F	47	1994	0	8	0	600	141 heifers, 150 calves
114	A1+A2	converted from sheep to dairy + sheep	M	48	F	48	1983	420	2000	0	900	190 heifers, 190 calves
115	A1+A2	converted from sheep to dairy	M	51	F	48	1984	2300	0	0	3200	1400 replacement
116	A1+A2	converted from sheep to dairy	M	47	F	42	2001	220	0	0	425	
117	A1+A2	converted from sheep to dairy + sheep	M	38	F	34	2006	550	2000	0	525	135 heifers, 47 bulls
118	A1+A2	converted from sheep to dairy + sheep and beef	M	52	F	51	1990	1050	1000	550	1600	
119	A1	Dairy NZ	M	45								
120	A1	converted from sheep to dairy	M	46	F	44	1992	380	40	0	760	240 replacement
121	A1	leased out to dairy (+ manage parents sheep farm)	M	35	F	34	2008	55	0	0	0	
122	A1	Sheep	M	46	F	45	1995	800	5000	80	0	0

INTERVIEWS FROM RURAL FUTURES PROJECT USED IN THIS RESEARCH:

No	Participants	Farm type / function	A1		A2		Farm acquisition	Effect. farm area	Stock numbers			
			Gender	*Age*	*Gender*	*Age*			*Sheep*	*Beef Cattle*	*Dairy cows*	*other*
004	A1	converted from sheep to dairy	M									
008	A1+A2	converted from sheep to dairy	M	52	F		1996	500				
012	A1	dairy	M	63	F		1993	330	0	0	540	280 calves
013	A1	converted from deer to dairy	M	47	F	43	1994	580	0	0	1500	0
014	A1	converted from sheep to dairy	M	45	F	45	1988	580	0	0	700	210 heifers (+ 700 cows wintering)
015	A1+A2	dairy (coming from abroad)	M		F							
016	A1	dairy	M									
072	A1+A2	sheep	M	62	F							

Rural Futures
Interview Schedule

The following questions are to provide us with an overview of your farm business. Please read through and answer the following questions. If you are unable to provide exact details, an approximate figure or label will do. Please ask if you are unsure about what is required.

SECTION ONE: BASIC FARM DATA	
1. Year acquired this property?	_____
2. Number of other properties owned previously? Now?	Prev _____ Now _____
3. Total size of this property (ha)	When acquired _____ Now _____
4. Effective farm area now (if diff)	
5. Description of unproductive land area	
6. Topography - % land area	Flat land (%)= _____ Rolling hill country (%) = _____
7. Main landcover (e.g. managed pasture; scrub; forestry (exotic); native bush; cropping)	Flats = _____ Rolling hills = _____
8. Av. dry matter production/ hectare (include range from _____ to _____)	Flats = _____ Rolling hills = _____
9. Soil Type (dominant)	Flats = _____ Rolling hills = _____
10. Average stocking rate (e.g. cows/ha)	Flats = _____ Rolling hills = _____
11. Stock numbers (sheep, cattle, deer, other)	Sheep _____ Cattle _____ Deer _____ Other _____
12. Land Tenure (owned/leased/rented) please explain	

SECTION TWO: FAMILY CHARACTERISTICS	
13. Family members on the property	*Adult 1 Gender _____Age _____* *Adult 2 Gender _____Age _____* *Children* *C1 Gender _____Age _____* *C2 Gender _____Age _____* *C3 Gender _____Age _____* *C4 Gender _____Age _____* *Other _____*
14. Extended family members involved with farm operations and/or decision making	*EF1 Gender _____ Age _____* *EF2 Gender _____ Age _____* *EF3 Gender _____ Age _____*
15. Farming experience in total	*A1 _____ years* *A2 _____ years* *EF1 _____years* *EF2 _____years* *Other _____years*
16. Farming experience on this farm	*A1 _____ years* *A2 _____ years* *Other _____ years*

17. Education: (please tick the highest formal level of education/qualification)

	A1	A2	EF1	EF2
No formal schooling	☐	☐	☐	☐
Primary school only	☐	☐	☐	☐
Secondary School (no qualification)	☐	☐	☐	☐
Secondary School (qualification)	☐	☐	☐	☐
Technical training	☐	☐	☐	☐
Some University education	☐	☐	☐	☐
University Degree/diploma	☐	☐	☐	☐

INTERVIEW GUIDE

On networks:

- Who is taking part or helping with farm work (for free/paid)? (Who, profession, age, gender…)
- Who would you turn to for farming advice (meetings, talks, exchanges…)?
    - Friends
    - Professionals
    - Literature, Medias, newspapers….
- With whom are you dealing/meeting/discussing in the everyday work on the farm? (Stock agent? Vet? Sellers? etc)
- Are you meeting with other farmers?
    - Which one? Where are they living/farming? What kind of production?
    - Where and how often are you meeting? At what kind of event?
- Do you volunteer for something in the local community? Elsewhere?
- Are you engaged in clubs, groups or committees?
- Are you (or a family member living on the property) working off-farm? In town?
- About all these relationships with people and organisations, what were the changes in the last 5-10 years?

A: For converted:

The conversion:

- How has it been? (narration)
- What were the main reasons for change?
- What helped?
- What didn't help?
- Who helped and how?
- Who didn't help?
- Are you happy with the change?
- Difficult times?

B. For non-converted:

1. How is your farm different now than it was in 1980? What has changed? Have there been major land use changes? Farm system changes? *[main commodities produced (wool, meat, milk); breed/stock type changes; key income source]*

    a. So, what changes occurred in the 1980s? Why?

    b. In the 1990s? Why?

    c. Since 2000? Why?

2. Have these changes affected your relations with friends, family… have they lead to new collaborations or new engagement, news activities?

APPENDIX 3: AGRONOMIC COMPARISON BETWEEN SHEEP AND BEEF AND DAIRY IN SOUTHLAND.

Centre for the Study of Agriculture, Food and Environment

[Farm Conversion in Southland]

RURAL FUTURES: Building adaptive management capability to deliver sustainable pastoral farm systems

Marine VERRIER,

January 22- June 15, 2011

AgroParisTech,

Paris *Institute* of Technology for Life, Food and Environmental Sciences

UNIVERSITY of OTAGO

Te Whare Wānanga o Otāgo

Acknowledgment

I would like to say thanks you to CSAFE to have welcome me during this internship and and also say thank you to all the persons I met in CSAFE for their kindness.

I also would like to say a special thank for Jeremie first for his availability and his advices,but also for all the time we spend together.

And finally I would thank all the person I met during the interviews. Their stories have always been really rewarding.

Contents

Introduction

This internship has conducted at CSAFE, center for the study of Agriculture, Food and Environment from the 22th of January until the 15 th of July with the supervision and help of Jérémie FORNEY. The subject was related to the study of farm conversion in Southland.

That internship was part of a larger research program, called Rural Futures: Building adaptive management capability to deliver sustainable pastoral farm systems.
This research program aims to provide a better understanding of agriculture and its industries. And then develop tools for farmers to help them to adapt and remain sustainable deal with recent developments in agriculture. This internship was notably part of Objective 1: conducted in collaboration between AgResearch and CSAFE (University of Otago), its main purpose is to understand how decisions are made on farms from a social perspective. This objective includes three levels of study: through the literature understand the theories of decision-making, on the scale of the farmer during the interviews and finally at the regional level understand how communities are dealing with these changes

Having more an agronomical background than a social one, the aim of that internship was mainly to try to enlighten the study of farm conversion in Southland through an agronomical point.
For this I had the opportunity to work on different aspects:
• from the data of statistical reports, have a look at the evolution of agriculture and production over the past 20 years, and highlight the history of conversions at the regional level.
• Make a comparative analysis the industries of meat and dairy products
• Make technical and economic analysis of dairy farms and sheep the Southland, including a financial analysis from budget models.
To complement the information issued from literature I also had the opportunity to achieve interviews with farmers.

I-NZ's AGRICULTURE

1- New Zealand: a perfect land and climate for the agriculture

The climate of New Zealand is mostly temperate with a strong maritime influence. So there is not a large variation of temperature and the rainfalls are spread evenly all year around. The grass growth is important throughout the year. That climate is ideal for pasture what can explain that ¾ of the usable farmlands are in prairies in New Zealand. Moreover, thanks to NZ climate, in most pastoral regions, animals could be left outside on grass that grew pretty well year round, without the need of sheltering buildings because belts of trees can do the job. Best conditions are here, to allow NZ to have a leading role in the market of herbivorous.

Southland is New Zealand most southern province with approximately 1.7 million hectares.
Southland's strengths lie in its climate, soils and topography. Compared with most other regions of New Zealand, Southland has a severe climate: summers are warm, not hot and winters are severe by New Zealand standards. Frosts are frequent inland during winter. In coastal regions they are less common and less severe , but everywhere pastures are closed off and stock are fed on fodder crops such as Swedes and turnips. The Southland plains comprise mostly yellow-brown earths, the product of river deposits, with the most recent soils in the lower valleys of the Mataura and Ōreti rivers.
Southland's climate and soils make the region well suited to dairy farming. With the availability of affordable, highly productive land an increase in numbers of dairy farms happened around the region. Water supply is ideal for farming in Southland due to consistent, evenly spread rainfall. In fact, irrigating is rare within Southland, although there is some need for irrigating in northern areas. Pasture production is characterized by low growth rates through the winter (5kg /ha /day) but reliable summer growth between 50 kg/day. Total production is around 12 to 14 tons of dry matter per hectare (Teara Encyclopedia).

2- An agriculture cheap and productive

With a high land price and production costs among the lowest in the world, New Zealand has a way of farming unique allowing them to be economically interesting on world markets. This system is based on large herds on pastures with very low production costs and high efficiency of work. Animal farming is pasture based, cows and sheep are rarely housed or fed large quantities of grain but grass based supplements such as hay and silage during feed shortages

In 2010, "l'Institut de l'elevage" had published a report concerning the agriculture of NZ. Within that report a brief comparison with the French system is made. Data from a region of western of France have been taken, because this region is comparable in terms of climate, precipitation and land. Some figures have been introduced following to highlight the special features of the New Zealand system by comparing it with others. The contexts are very different between the two countries. The figures proposed in this section are not to be taken as exact but as rough estimate.

The predominance of pastures

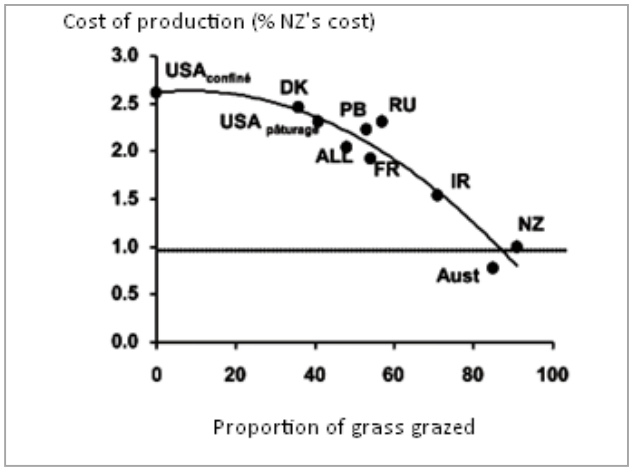


Figure 1: *Cost of milk production (expressed as % of NZ's cost) depending on the proportion of grazed grass in the diet of cows – illustration from Institut de l'elevage, 2010*
Legend: Denmark (DK), Holland (PB), Germany (ALL), Russia (RU), France (FR), Ireland (IR)

NZ has one of the lowest costs of production in the world. The main point to explain the low costs of production is the predominance of the pasture all around the country. The grass represents 80 to 90% of the ration. That way of feeding is really cheap to produce and do not need to be harvested and distributed to animal. Moreover even the complementary feed such hay and silage brought directly into pastures.Since the last 10 years a development of the supplementation of the ration by oil or cake silage appeared especially in the dairy farms. Although the prices of production are increasing they stay far lower than European's ones.

	New Zealand	West of France
Land value (euro per hectare)	12000-15000	3000-6000
Nitrogen price (per kg)	0.75	1.2
Complementary feed (cts/kg)	25-30	20-25
Milk price (cts of euro per liter)	20-25	25-35

Figure 2 *: Prices of main inputs, Table from Institut de l'elevage, 2010*

Pastoral farming in New Zealand

With high land prices and a high fertility of soils, the intensification of the production has naturally been driven per hectare more than per animals. The herb is cultivated like any other crop, the grazing is maximized and the stocking rate is high. The European model would tend to make the production per animal more than per hectare:

	New Zealand	West of France
% Holstein cows	57	72
milk production/cow (liter)	3710	6231
Fat rate (%)	4.74	4.16
Protein rate (%)	3.6	3.3
Usable dry matter (kg/cow)	318	464
Stocking rate (cows per hectare)	2.83	1.6
Milk/ surface of crops +pasture	10560	9970

Figure 3*: Dairy farms performances between New Zealand and France (from Institut de l'elevage 2010)*

In New Zealand the animals are rustics and resistant with a low production capacity. Conversely pastures are intensive compared with European criteria. Another feature of pastoral farming in New Zealand is the ultra-specialization of work within the farms. This allows carrying very large herds and having a high efficiency of work. The seasonality of calving and of leaving the animals all year round on pastures allows to handle large herds with little work force. A human labour unit in France produces an average of 150,000 litters of milk whereas 600,000 will be produced in New Zealand. Also the equipment in a dairy farm is reduced: a milking machine, a tractor and a mowing machine. With the milking machine, about 400 cows can be milked in 2 hours (Institut de l'elevage 2010).

3- The agricultural sector: a mainstay of NZ's economy

History

Before the arrival of refrigerated transport in the early 1880's, agriculture was mainly used to feed the little population of New Zealand. Then in 1880 refrigerated transport made the exportations possible and significantly developed the potential of NZ's agriculture. The excess of production could be exported to world markets. Due to their common history England was quickly a prime market. In 1974 Britain joined the European Economic Community which put an end to that preferential trade and New Zealand saw a significant market disappear. During the 1970s the government offered a number of subsidies to assist farmers after the United Kingdom joined the European Economic Community and by the early 1980s government support provided some farmers, especially in the sheep and beef industry with 40 percent of their income.

In 1984 the Labour government ended all farm subsidies and started a program of economic restructuring. NZ deregulated her economy, opening up her borders to the full blast ok market competition. This ended the orderly pastoral of NZ dairy farming. By 1990 the agricultural industry became one of the most deregulated sectors in New Zealand and to stay competitive New Zealand farmers had to increase the efficiency of their operations.

Economic weight

Agriculture in New Zealand is the largest sector of the economy. The New Zealand agricultural sector is unique in being totally exposed to the international markets since subsidies, tax concessions and price supports were removed.

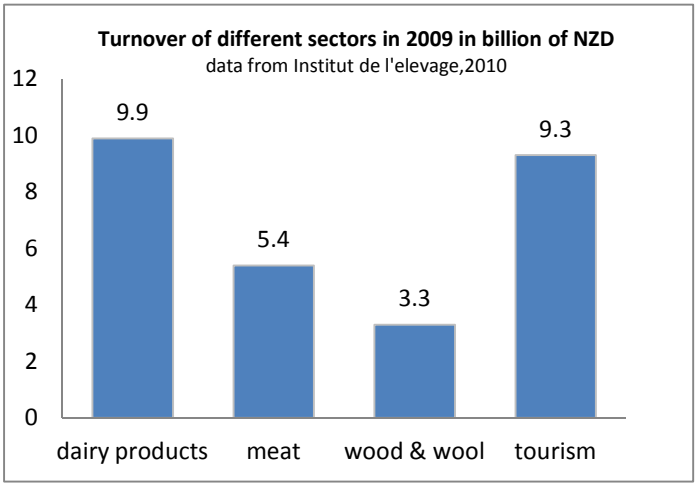


***Figure 4**: Weight of the different sectors in NZ's economy (data from institut de l'elevage, 2010)*

The agriculture and forestry sector is one of the largest sectors in the New Zealand economy. Together with its support and processing components it regularly contributes more than $21 billion per year, or about 20 percent of Gross Domestic Product.
It also represents up to 7 percent of total employment in New Zealand.

	Production (1000 t)	Contribution to world production	Production (millions $NZ)	% exported production	% world trade
Wool	205	14%	$569	91%	15%
Sheep meat	598	7%	$3,361	92%	45%
Beef meat	634	1%	$2,426	83%	7%
Milk	16573	3%	$10,026	96%	33%
Other ruminant	34	-	$784	96%	.

***Figure 5**: Economic importance of the different agricultural sector, data are for the year 2009, figure from Institut de l'elevage 2010*

Regarding the future New Zealand agriculture is expected to growth thanks to the fast-rising consumer demand in India and China and New Zealand is well placed to take advantage of this.
But to remain competitive in view of the new dairy countries and keep meeting the growing demand, farmers will either have to intensify production which could lead to environmental issues.

II- THE INDUSTRIES

1- The sheep and beef industry

History of the sheep and beef industry:

Sheep farming has been crucial in the development of New Zealand's economy. Until 1880's the exportation of wool allows the economic growth of New Zealand. From 1882, the frozen meat industry and the improvement of genetics created new opportunities for sheep farmers.
From 1856 to 1987, sheep farming was the most important agricultural industry in New Zealand. The combined income from wool and sheep meat dominated New Zealand's agricultural earnings from the mid-1880s until the late 1980s. But in 1985, deregulation and the end of government's support hit heavily the sheep industry. Since then, dairying has overtaken sheep farming. From 1992, returns from the dairy industry have surpassed those of sheep production. However today, NZ remains the leader country in meat exportation, with as a major market the EU.

Economic weight in figures:

- The meat industry is the seventh economical sector of NZ with **4% of the GDP** (gross domestic product)
- NZ represents only **7% of the world production** of sheep meat but about **50% of lamb meat on the international markets.**
- 87 percent of NZ's lamb production is exported.

New Zealand's sheep meat industry is very dependent on international meat prices and market access. The predominance of the exportations in its economy made NZ particularly sensible to the volatility of the prices and the rate of exchange.

The meat companies

The 3 main companies in NZ are:
-SILVER FERN FARM, in Christchurch, with a total of 2000 members that is 1/3 of the total farmer's number and represents 30% of the sheep slaughters.
-ALLIANCE, in Invercargill, with 500 members and 25 % of the sheep slaughters.
-AFFCO in the North Island.
There was an attempt to merge ALLIANCE and SILVER FERN FARM but because of too many disagreements it failed.

2- The dairy industry

History of the dairy industry:

The first dairy factories in New Zealand were opened in the mid-1880s, in Taranaki and Waikato. In the 1880s, the development of an export industry based on butter and cheese encouraged the growth of dairy farming in Southland. Before the advent of refrigeration, almost all of New Zealand's dairy products were consumed locally but from the early 1880s refrigeration made it possible to export dairy products produce to the United Kingdom and energized the economy. Small dairy factories began to be established. In the 1930s there were around 500 cooperatives but after World War II, improvements in

transports and processing technologies led to a trend where the co-operatives merged and became larger and fewer in numbers.
Since the 1980s milk production has grown in response to the relative profitability of dairy farming compared to other land uses in New Zealand. But the domestic demand is low, just for the inhabitants. So exportations are important and dairy products are marketed around the world. 1961, the New Zealand Dairy Board (NZDB) was established, and operated as sole export marketer for 40 years. The Dairy Board grew from a distributor of butter and cheese to the UK to a multinational dairy foods company. 1985, the dairy industry was deregulated and legislation passed to liberalize exports, with the aim of making New Zealand more competitive on the world market. 2001 NZDB disappeared and Fonterra was created.

Economic weight in figures:

- With **3% of the world production** in 2009 New Zealand produces a relatively small proportion of the world's total milk however its share of **world dairy trade with 33%** is far more significant.
- **NZ exports 96% of its dairy production**, which represents 23% of the total value of exportations.
- EU (34 percent), New Zealand (33 percent) and Australia (13 percent) together provide 80 percent of dairy products traded on world markets."
- **The value of dairy products exportations has been multiplied by 5 since 1990**. The EU and particularly United Kingdom are the main markets and absorb 20% of the production. A wide range of dairy products are exported: low fat and fat powder, butter, cheese, caseins, whey

If there are still 3 main operators in the dairy industry, Fonterra represents 97% of the production. It remains the world's largest single exporter of dairy products. There are 2 other companies of exportation in NZ, Tatua in the North Island and Westland in the west of the South Island. An emerging competitor is Open Country Dairy.

A giant called Fonterra

Creation of Fonterra:

1990, a complaint is deposed in the World Trade Organization against the monopole represented by NZDB (New Zealand Dairy Board) and its corner on dairy industry. As a result the disassembly of NZDB happened in 2001. Then, the New Zealand Dairy Board merged with the New Zealand Dairy Group and Kiwi Co-operative Dairies, previously the two largest in New Zealand, and formed Fonterra Co-operative Group under the control of the government. The aim was to create a world leader in the dairy industry compatible with WTO's rules. So in 2001 was also created the DIRA (Dairy Industry Restructuring Act). The DIRA promotes the efficient operation of dairy markets in New Zealand by regulating the activities of Fonterra. Since, Fonterra kept getting more and more international to reach an importance today fundamental for the NZ economy.

Fonterra in figures:

- **First private company in NZ**, with annual turnover of 16 billion of NZD, with 15,600 employees.
- Fonterra **collects 92% of the milk production** in New Zealand and **exports more than 95%** of the milk collected.
- Transforms a little less than **3% of the world production** and represents **25% of NZ's exportations**, in more than **140 countries**. 40% of the exportations are made without customs duty.
- Edendale is currently the largest dairy factory in the world by milk intake.

III-THE EXPANSION OF DAIRY FARMING

1984, the end of the government support in the agricultural sector affect heavily the sheep and beef industry whereas by that time, there were improved prices in dairy products. This partially led to a shift across New Zealand from the sheep industry toward dairy industry. Thanks to the emerging exportation markets and the success of a well structured industry, the dairy production remained increasing at the rate of 5 % per year since 1990.

The number of cows sharply increased and the size of the herds as well: since 1980 the dairy herd has double (today 4.600 000 cows) and the dairy production has treble (in 2010, 1 30 000 liter of milk). This success led to a redistribution of agricultural land toward dairy farming, but also to a sharp increase in land prices. This situation is particularly striking in Southland.

(Institut de l'elevage 2010, Wilson 1994)

1- An increase in the dairy herd

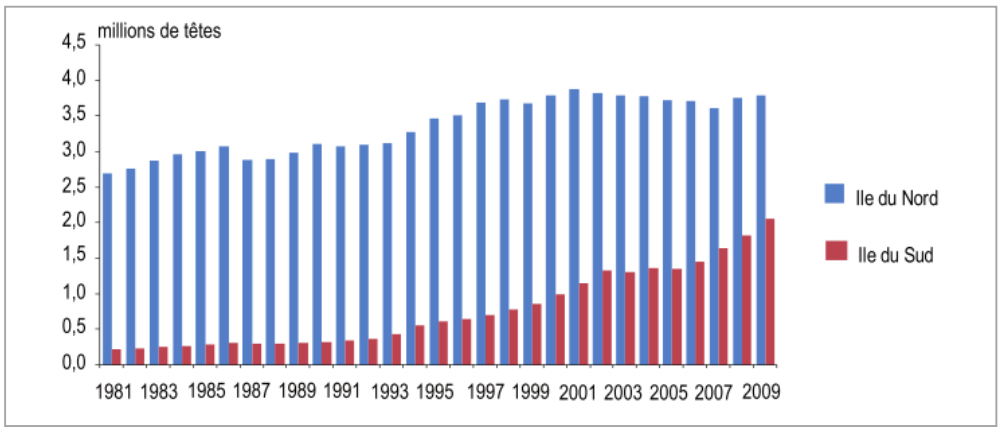


***Figure 6**: Evolution of New Zealand's dairy herd (in millions) since 1980 in the North Island (blue) and in the South Island (red), Figure taken from Institut de l'elevage 2010*

As it can be easily see on the figure 6, the national dairy herd remains increasing since 1980. This increase mainly happened in the South Island where the dairy herd fallows an exponential progression. If at the national level the number of cows raised (+34.5 for the 20 last years), the number of herd decreased (-16%). So, that increase of the number of cows is mainly due to a bigger size of the farms and also the size of their herd (figure 7).

In Southland, the number of cows knew a progression of 132% since the season 1999/2000. This increase is due to a bigger scale of the farms and their herd but also an increase in the number of herd (figure 8). Moreover, while the area for dairy farming progressed by 11.3% at the national level between 2001 and 2010, the Southland recorded an increase of 68%. This reflects in particular the large number of conversion which took place in Southland and the development of the farms already present.

Finally, both in Southland and at the national level, intensification in the dairy practices resulted in the increasing number of cows per hectare

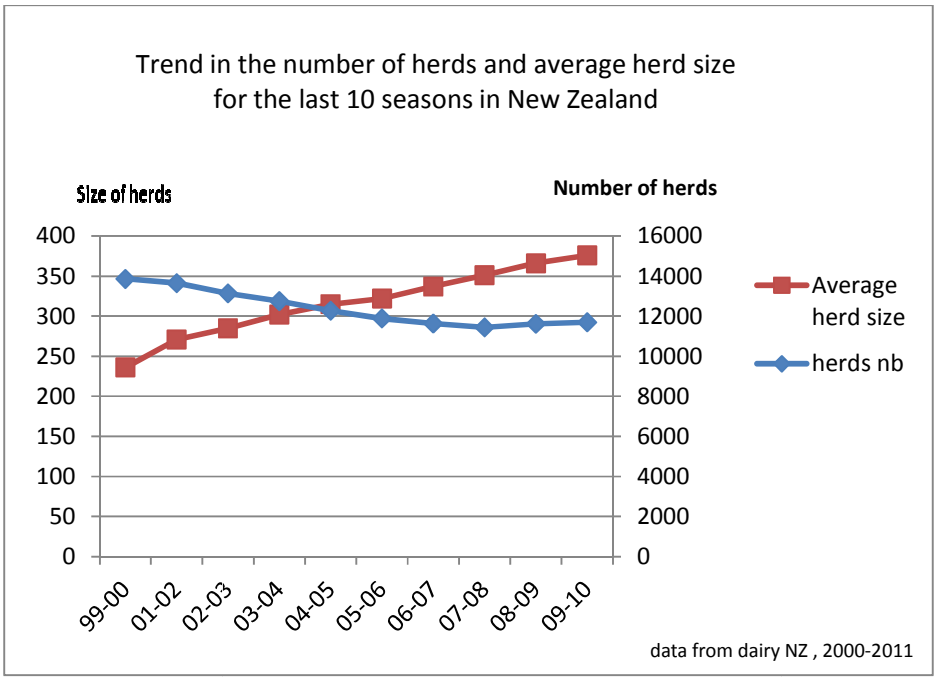


***Figure 7**: Herd evolution in New Zealand since 2000*

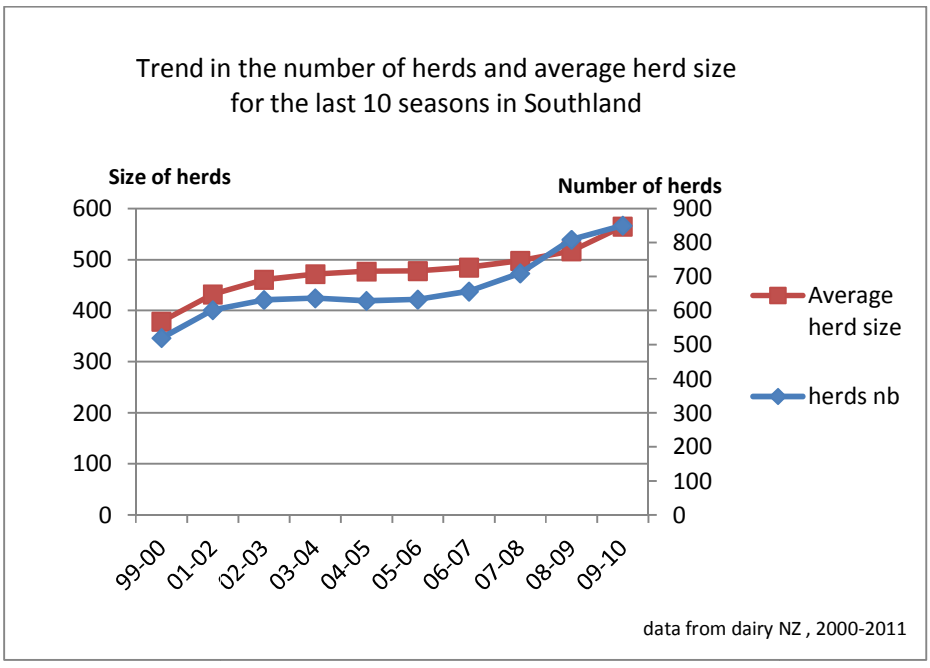


***Figure 8:** Herd evolution in Southland since 2000*

year	Total herds			Total cows		Average herd size		total effective area		Average effective per hectares		average cows per hectare	
	Southland	% of NZ's	NZ	Southland	NZ	Southland	NZ	Southland	NZ	Southland	NZ	Southland	NZ
season 99-00	520		13861	196864	3269362	379	236			146	93	2.7	2.7
season 01-02	602	4.4	13649	260132	3692703	432	271	100658	1404930	167	103	2.59	2.67
season 02-03	632	4.8	13140	291139	3740637	461	285	113730	1463281	180	111	2.6	2.61
season 03-04	637	5	12,751	300821	3851302	472	302	112378	1421147	176	111	2.67	2.75
season 04-05	629	5.1	12271	300047	3867659	477	315	111120	1411594	177	115	2.7	2.78
season 05-06	633	5.3	11883	302607	3832145	478	322	112308	1398966	177	118	2.68	2.77
season 06-07	657	5.6	11630	318482	3916812	485	337	118145	1412925	180	121	2.7	2.81
season 07-08	710	6.2	11436	353323	4012867	498	351	130073	1436549	183	126	2.72	2.83
season 08-09	809	9.8	11618	418337	4252881	517	366	155436	1519117	192	131	2.73	2.83
season 09-10	850	10.4	11691	458306	4396675	565	376	169749	1563495	194	134	2.91	2.81
Relative increase (+ %)	+ 63 %		-16%	+132%	+34.5%	+49%	+59.3%	+68.6%	+11.3%	+32.9%	+44.1%	+7.7%	+4.1%
standard deviation	97.8		899.70	74951	308318	49.1	43.9	23005.2	57333.95	13.45	12.5	0.087	0.074
DEVST/mean	0.15		0.072	0.234	0.079	0.103	0.139	0.184	0.04	0.076	0.108	0.032	0.026

Figure 9: *Statistics concerning dairy expansion at the national and Southland level.*

Table built by a compilation of information from the reports "New Zealand dairy statistics" made by Dairy NZ, from the season 99/00 to the season 09/10. The relative increase is the increase between the season 09/10 and 99/00 (except for total effective area)

2- A redistribution of agricultural land: from sheep and beef to dairy production

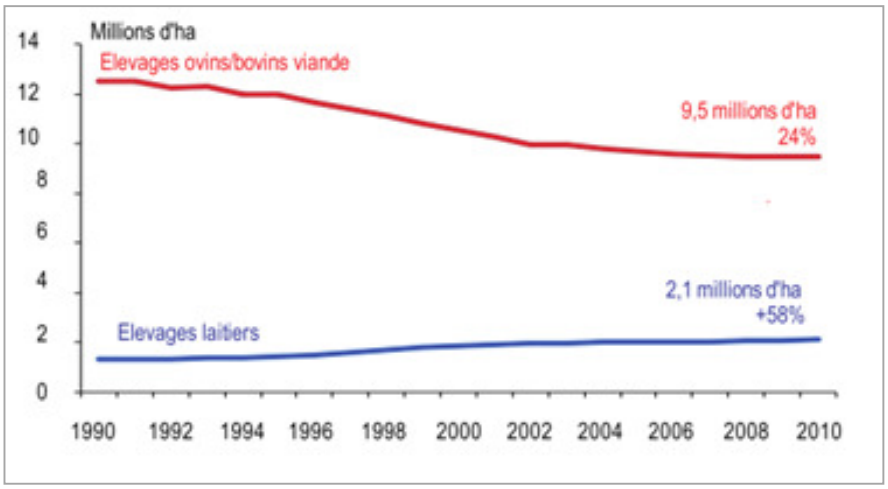


***Figure 10**: Evolution of surface by farm type in NZ.*
Sheep and beef farmland in red and dairy farmland in blue (Illustration from Institut de l'elevage 2010).

Between 1990 and 2010, sheep and beef farmland decreased by 24% (to reach 9.5 million of hectare today). By that time dairy farmlands increased by 58% and represent today 2.1 million of hectare in New Zealand. During the last 20 years (1990 and 2010), 3.000.000 ha of sheep and beef farmland have been lost including 800.000 ha converted into dairy farmland But the decrease in sheep and beef farmland is also related to the development of other productions such deer and to the expansion of the area in wood for the production, the green house gases compensation, and the protected environmental area (Institut de l'elevage, 2010).

3- A rise in land value

A direct consequence of the dairy expansion and the increasing demand for farmland suitable for dairy farming is the rise of land value, especially in Southland where there is still prairies suitable for dairy farming.

Evolution of land price at the national level

At the national level, dairy land prices per hectare have increased at the rate of $500 per ha and per year in inflation adjusted terms since 1980. However the rate of growth in land prices between 2000 and 2007 has been considerably higher ($+2.096) driven by low interest rates, availability of credit and strong demand for dairy land in New Zealand. (DairyNZ 2008-2009)

Between 1990 and 2010 the price of one hectare of sheep and beef farmland has been multiplied by 8 whereas the farmer's income didn't follow this trend. The increase of dairy farms made the price of land higher. The purchase of land by sheep and beef farmers became really hard and the incentive to sell high. That is why after retiring some farmers sell their farms, in order to convert them into dairy farms.

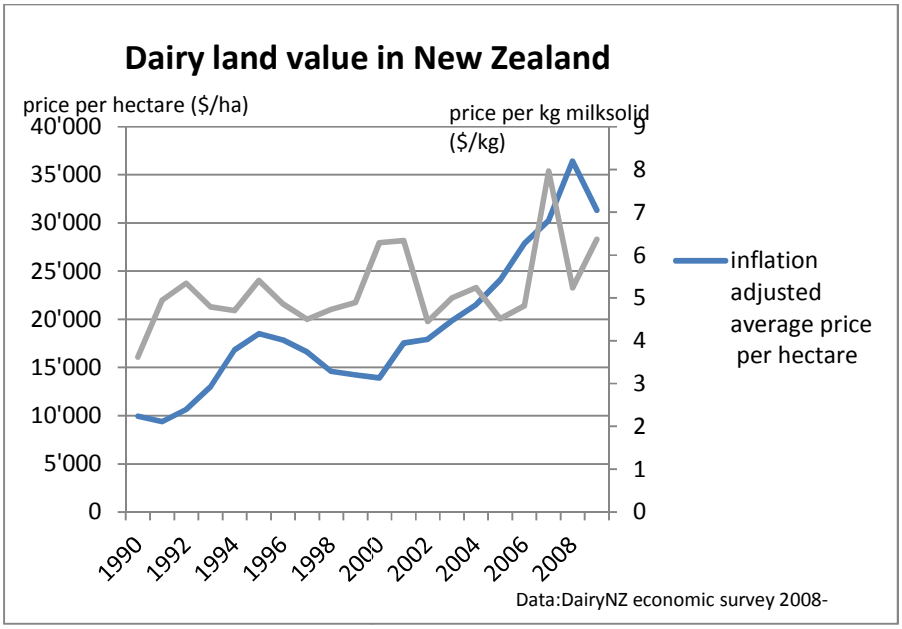


Figure 11: *evolution of dairy land price in New Zealand*

But farmland prices are not the same everywhere. For example, some place as flatlands are good for dairy so are more expansive. Other steeper places as hills aren't really suitable for dairy farming and remain cheaper. Since 2009 the gap between the prices of the different farmlands widened.

- sheep and beef land in mountains = 900 NZD/ha or 500 euro/ha
- sheep and beef land in the plains =18,000 NZD/ha or10,000 euro/ha
- land for dairy production = 28,800 NZD/ha or 16 000 euro/ha

(Institut de l'elevage 2010, *With the equivalence 1 euro =1.80 NZD -capital.fr)*

The rise in land value in Southland

In his article "Making the big shift south", Mike Horgan (2011) tells his experience as a dairy farmer from Taranaki, North Island moving to the South Island in 1994. He bought a sheep and beef farm in Southland in order to convert it into a dairy farm. According to him, Southland presented many opportunities notably the one to find a productive land at a sensible price. In 1994, a hectare of good quality land was worth around $5.000 whereas in Southland a hectare of the same quality was around $1.600. To his point of view, in 2010 dairy farms in Southland only involve 10% of the land area and there is still a significant amount of suitable lands available for dairy farming.

Southland's relatively affordable land prices and higher returns have attracted corporate farm investment, including North Island farmers and international investors but also local sheep and beef farmers seeing the opportunities of dairy. That is why during the last 20 years, there was a wide expansion of dairy farming in Southland, more than the national average.

With the increasing land price the number of farms sold at the national level has decreased. This also coincides with a scarcity of available land. That situation is somewhat different in Southland where dairy lands are still available and where conversions into dairy are still frequent.

4- Farm sales in NZ:

Year	Number of farms sold	Average sale price $	inflation adjusted average sale price $	average hectares	averages price per hectare
1990	868	373,553	573,894	58	6,467
1991	538	362,819	542,257	58	6,283
1992	897	446,979	661,745	62	7,183
1993	834	543,984	794,665	61	8,903
1994	784	704,245	1,017,963	61	11,640
1995	672	775,110	1,071,132	58	13,400
1996	784	785,510	1,064,115	60	13,187
1997	520	674,809	904,129	54	12,388
1998	496	704,309	927,832	64	11,076
1999	600	769,606	1,017,508	72	10,759
2000	576	856,374	1,109,554	80	10,740
2001	941	1,032,618	1,296,666	74	13,959
2002	704	1,049,939	1,283,259	72	14,658
2003	722	1,347,676	1,623,706	82	16,498
2004	800	1,550,792	1,824,461	85	18,287
2005	728	1,833,049	2,096,002	87	21,085
2006	576	2,208,693	2,429,562	87	25,308
2007	699	2,541,870	2,741,232	91	28,035
2008	662	3,267,025	3,387,114	93	35,143
2009	277	2,641,186	2,641,186	84	31,323

Figure 12 : *Dairy farm land sale values in NZ for the last 20 years data (New Zealand dairy statistics 2009/2010)*

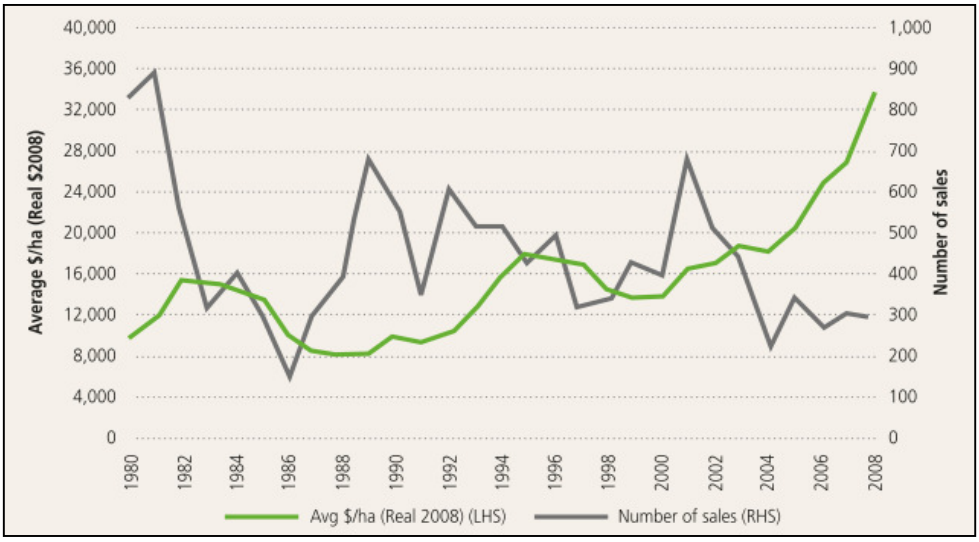


Figure13 : Dairy Land Prices and Farm sales at the national level (Dairy NZ Economic Survey 2008/2009)

IV-FARMS DESCRITPION

1- Sheep and beef farm

General points:

Today in New Zealand the average sheep and beef farm is about 2 200 sheep and 140 beefs on 600 ha, with 2 people working on the farm. Most of the sheep and beef farms are owned and operated by farming families with the help of contractors to realize specific tasks. Historically, most of the farms made sheep and beef farming. The cows were used to finish grazing the pasture with lesser quality and taking part to contend with parasitism. Today, some sheep farms moved from cattle to provide services to dairy farms such as heifers hosting or supply grazing.

NZ's sheep breeds are still quite rustic. That is why animals could be left outside on grass without the need of sheltering buildings. Lambing and calving can happened outdoor without human's help. Sheep and beef farming is essentially based on pasture and don't need a lot of workforce. Only few interventions are made on animals. Theoretically the farmer could handle the herd only few times in the year: for the scan, for the tailing and for the weight-in at the end of the fattening. Work on sheep farms is largely regulated by the seasons:

- In winter, most sheep farms carry their lowest number of stock. Farmers feed hay and silage to supplement the animals' diet. Ewes are scanned to check for pregnancy.
- In spring, farmers shear their ewes before lambing. Farmers try to time lambing to match the grass growth, as ewes need good feed to produce milk. A week or two after lambing, there is the tailing.
- In summer, lamb are fattened and sold at the end of the summer.
-Ewes are mated in autumn. The mating is often selective.

(Te Ara Encyclopedia of New Zealand, Institut de l'elevage, 2010)

Deregulation and improvement in farm performances

1985, deregulation and the end of government's support caused a collapse in sheep population (-55% between 1985 and 2009).But the meat production remained up 17% thanks to the improvement in farm management practices. Before deregulation, the subsidies from government could represent until 40% of the total incomes of a sheep and beef farm. With the loss of incomes caused by deregulation, technicians and researchers looked into animal's performances amelioration as the only way possible to compensate the end of government's subsidies. Deregulation led to a real improvement in farms performances. Big progresses have been made notably in genetics, reproduction and cattle feeding. (Institut de l'elevage, 2010)

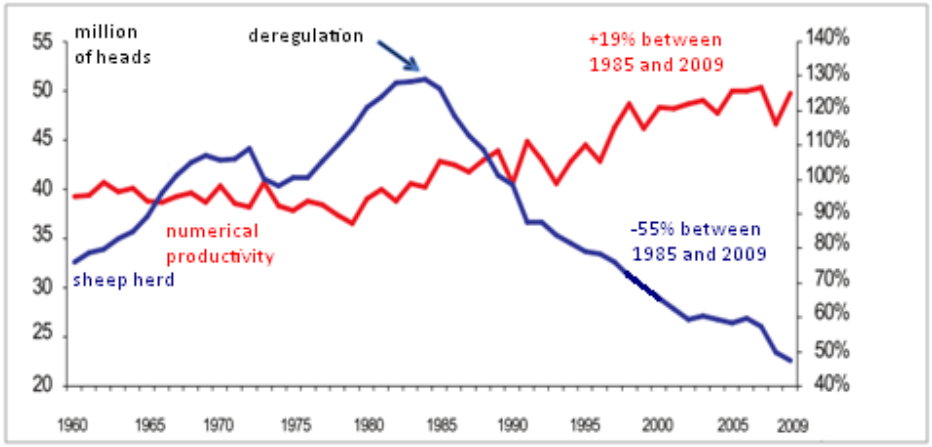


Figure 14: *Comparative trends of the number of sheep (in million) and productivity numerical. Figure from Institut de l'elevage 2010*

-Numerical productivity of ewes:

The increase in numerical productivity is mainly due to a change of breed. Thanks to inbreed, researchers developed new breeds more prolific: Romney and Coopworth. The reproduction management became also more efficient and conducted to a rise of the prolificacy of 19% between 1985 and 2009. Scans are made on ewes to predict twins or triplets. Then the ewes are put on the best pastures, to reduce lamb's mortality.

- **Weight of carcass:**

Whereas the average weight of lamb's carcass was around 13 kg in 1980 it increased to 17 kg in 2009, that is +39% in 25 years. Real progresses have also been made in the cattle feeding and pasture management. The grass is measured when the herd enters and leaves the prairie. The concept of fodder transfer (silage and hay) from periods of plenty to periods of scarcity is now recognized as a key tool for high production. Whereas the use of irrigation and fertilizers combined increases both total yield and total annual spread of grass growth.

Lamb price and revenue

Based integrally on the pasture, the meat production is seasonal with 75% of the production produced between December and May. Contrary to the dairy industry the exact price of lamb is not known until the delivery to the butchery. The butcheries have ranking grids for the meat payment depending on the gross weight and the state of fattening.

The gross revenue of a sheep and beef farm is often more diversified than a dairy farm. The gross income of an average sheep and beef farm is composed by: sheep meat for a little less than 50%, beef meat for about 25%, wool for about 11%, and crops for 12 %. To provide services to dairy farms became also more and more usual. (Institut de l'elevage, 2010)

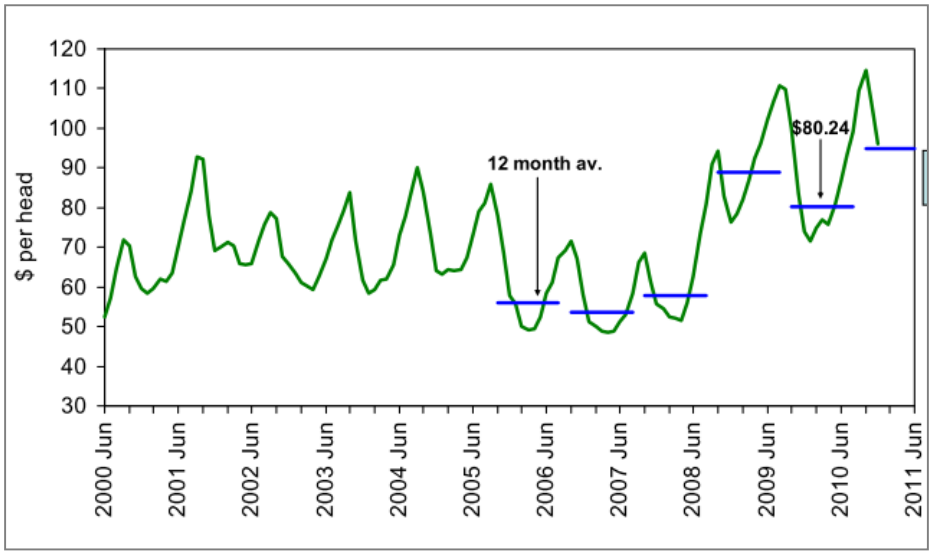


Figure 15: *Evolution of Lamb prices since 2000. All grades lamb $ per head (source: Beef+ Lamb $ New Zealand Economic Service). The prices are not inflation adjusted.*

However, despite the fact of having one of the lowest costs of production, NZ's farmers have relatively low and particularly volatile incomes. Two criteria affect the incomes:

-The number of lambs sold (numerical productivity)

-The price of a lamb (depends on the rate of exchange: when the NZD goes up, the outcome of farmers goes down)

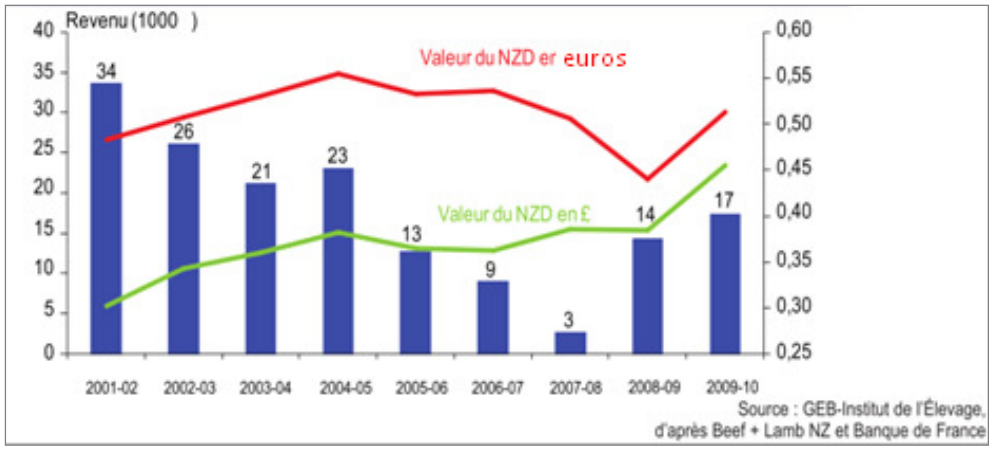


Figure 16: *Comparative trends of sheep and beef farm income and the value of the NZD (figure originally from Institut de l'elevage 2010)*

Sheep and beef farms in Southland

Two main types of sheep farms can be identified:

- Those on the flatlands often suitable for dairy farming. Lands located in the flatland of Southland are fertile. Sheep and beef farms of this area are smaller but quite intensive.
- The ones located in the rolling hills, often large with less intensive farming practices than the average.

Southland has the highest lambing rates in the country with 134% and this number has grown steadily through improving genetics and better ewe mating. Although dairy farming has increased dramatically in

Southland, sheep and beef farming remains a substantial contributor to the Southland economy. Total sheep numbers in Southland dropped 4.8% from 5.951.000 to 5.662.000 from 2002 to 2007.Total beef cattle numbers have remained relatively steady, having risen 2% from 204.000 to 208.000 between 2002 and 2007. Southland farmers benefit from the number of meat processing plants in southland and port Chalmers for the exportation.
(Online Southland Regional Economic Profile, MAF pastoral monitoring 2009, Agricultural census 2007)

2- Dairy farms

General points:

Traditional dairy production areas are the wetter areas of the country: Waikato, Taranaki, Southland, Northland, Horowhenua, Manawatu and Westland.
The dairy production is principally based on the pasture management with a production thought per hectare more than per cow. This trend can be explained by the fruitfulness of the soils, the improvement in pasture management but also by the high prices of dairy lands.

The seasonality of the production: The calving are pooled during 6 weeks at the end of the winter, in order to make the feed needs of the herd coincide with the grass growth. The vast majority of New Zealand dairy herds (97 percent) supply milk seasonally for manufacturing. Cows are milked in spring, summer and autumn, but dried off in winter when pasture production is lower. The remaining three percent of the herds supply milk year-round for the domestic liquid milk industry.

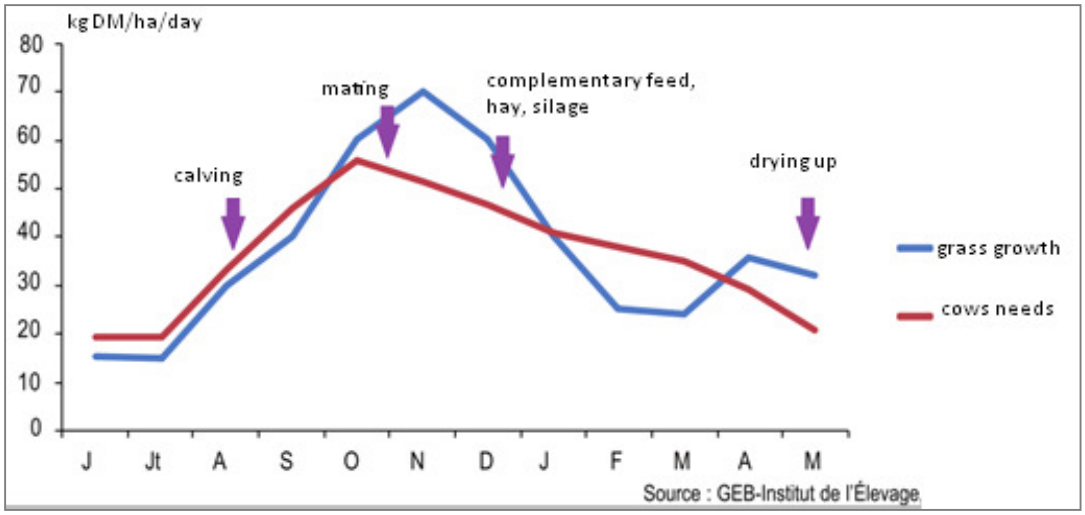


Figure 17: *Grass need of a dairy herd and growth of grass on the pastures of New Zealand, Institut de l'elevage 2010*

Breeding and genetic:

The dairy production in New Zealand use small size and rustic cows with a limited production capacity (around 3700 liters/year). Three main dairy breeds are used in New Zealand: Holstein-jersey for 33%, Jersey 14%, Holstein-Friesan 45%, and others 8% (LIC statistics, 2008).
These breeds are resistant so the cows can be left outdoors all year round and there are low costs of veterinary treatments. Then expenditures related to the cows are reduced which allows New Zealand to have one of the lowest cost of production in the world.

	2001/2002		**2009/2010**	
	Cows	%	Cows	%
NZ	216415	83.2	334520	73
Southland	2946427	79.8	3152627	71.7

Figure 18: *Artificial breeding statistics (Dairy NZ statistics, 2009)*

The herd testing is also widely used in New Zealand: 67.3% of the herds (64% of the cows) of the national herd are tested against 55.1% at the Southland level (49.7%).

Dairy production and performances:

More than the quantity of milk, the most used indicator to describe the dairy production is the "usable dry matter / ha" Since 1980, this indicator increased by 70% at the national level. Since 1980 the dairy production has also treble to reach 1.438.496.707 kg of milksolids in 2010. Two main reasons explain this increase in dairy production (Institut de l'elevage 2010):
-the geographic growth: At first, dairy farming was essentially located in the North Island. But since 1990 the number of dairy farms and their size highly increased in the South Island and represent today 36% of the dairy production. That percentage remains increasing.
-the fodder intensification: The increasing use of fertilizers and the development of maize silage led to an intensification in the production. This intensification doubled during the last 10 years.

Improvement of performances over the last 10 seasons:

The growth in the dairy production happened mainly in the South Island. In average, dairy farms in the South Island are bigger than in the North Island (546 cows as against 314) but also more productive (350 kg of milk solid in the South Island as against 314 in the North Island).This reflects a combination of larger herd size, a higher stocking rate, and higher kilograms of milksolids per cow. The progress made concerning the machinery also allowed to increase the production within a farm. The rotary milking machine has become the standard. It is often made of 40 to 50 places allowing milking about 400 cows in two hours.
Since 2001, LIC then Dairy NZ, produces each year a report summarizing the data of the season. This report is made at the national level and by regions. These data have been extracted and compiled to provide these tables.

	Average liter per herd		Average MS/herd		kg MS/ha		kg MS/ cow	
	Southland	NZ	Southland	NZ	Southland	NZ	Southland	NZ
99-00	1503047	839066	.	.	.	.	.	.
01-02	1799542	996904	151578	84436	920	824	358	307
02-03	1811970	1058307	153911	90621	885	828	341	315
03-04	1956351	1144937	167602	98321	965	889	355	322
04-05	1937221	1149262	165749	98825	948	862	351	308
05-06	2097791	1237228	180088	106660	1021	907	383	325
06-07	2146307	1301308	186438	113182	1049	934	389	330
07-08	2093169	1289337	181174	111033	1004	873	371	307
08-09	2181185	1381573	189807	119966	1017	921	374	323
09-10	2303559	1409875	202689	123043	1015	920	376	327
trend (+%)	53	68	34	46	10.3	11.6	5.02	6.51

Figure 19: *Evolution of the production performances -Data from Dairy NZ statistics season 99-00 to 09-10*

Dairy farms in Southland:

Southland is today an important region for the dairy industry. It represents 7.3% of the national number of herds and 10.4% of the national number of cows. Southland's farms are characterized by their size bigger than the national average and the relatively low average of cow per hectares (2.7 cows per hectare against 2.81 for the national average). A typical dairy farm in Southland milks around 550 cows on 200 ha. This has grown over the past decade due to advances in milking shed technology and farming efficiency. The production of MS/ herd in Southland's farm is 65% higher than the national average. This is mainly explained by the size of the herd. But, if we consider production per hectare or per cow, farms in Southland produce more milk that the national average. Southland also has one of the best rate of protein and milkfat of the country.

(Dairy NZ 2009, Southland regional Economic profile 2010, MAF pastoral monitoring 2009)

	Southland	NZ
Total milksolids	172.285.585 (12%)	1.438.496.707
Average liter per herd	2.303.559	1.409.875
Average kg of milkfat per ha	569	522
Average kg of milk proteins per ha	446	398
Average kg of milk solids per ha	1015	920
Average kg of milkfat per cow	211	186
Average kg of milk proteins per cow	1665	141
Average kg of milk solids per cow	376	327

Figure 20: *Comparison in production performances of farms in Southland and at the national level (Dairy NZ statistics, season 2009/2010)*

Collect and payment of the milk:

Because of the seasonality in the calving, there is an irregular milk production during the year. The production is very low between June and August and reaches its peak between October and December. So, equipments and infrastructures in the dairy industry are over exploited during the high season and underexploited the rest of the year.

Price of milk since 1990 :

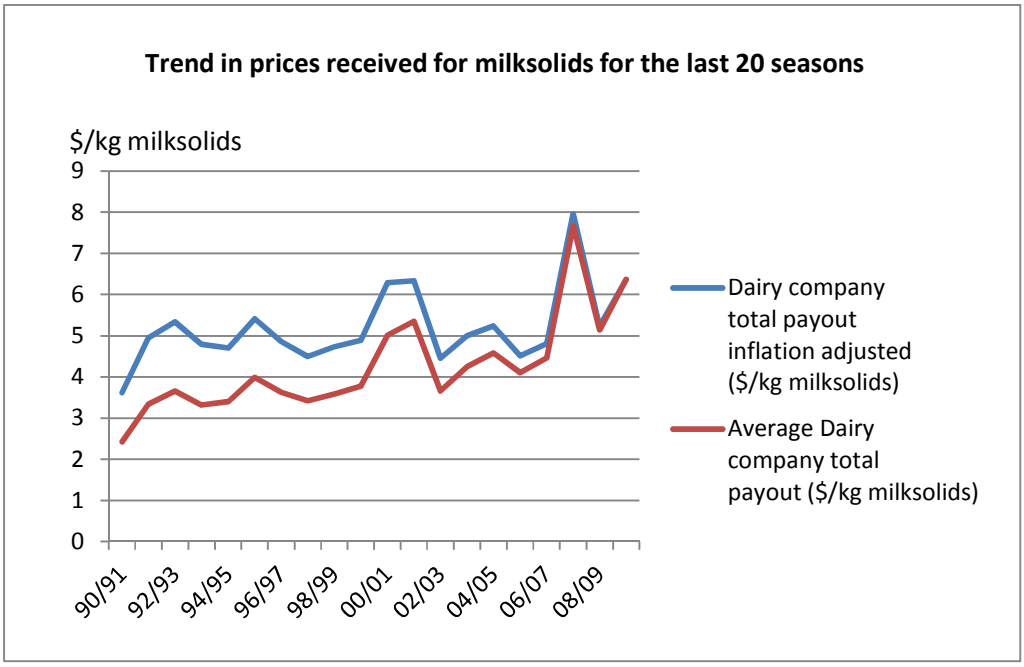


Figure 21: *Trend in prices received for milksolids for the last 20 seasons (Dairy NZ 2009/10)*

The price of milk solids rose dramatically in 2007, but has since drop back from that peak. The milk price is quite volatile with a standard deviation of 1.19 between 1990 and 2010.

Milk payment calculation:

The price is determined for the entire year at the beginning of the tax year (August 1st – July 31th) which is also the dairy year. The projected price is in Usable Dry Mater. 1 kg of usable dry mater corresponds to about 11.5 liters of milk. Then, during the year the price is adjusted to be closer to the reality. In July 2010, the price was around 0.32 euro/liter. Payments are based on the "A+B±C" system, which incorporates payments for milkfat (A) and protein (B) with adjustments for milk volume (C). The payment system may vary between companies.

To sell their milk to Fonterra farmers have to buy shares in the company. The share is proportional to the quantity of milk sold to Fonterra. So farmers are shareholders of Fonterra and can receive refunds in addition to the down payment (figure 22). These refunds depend on the results of the fiscal year of Fonterra. Shares purchased by farmers are also investment funds necessary for Fonterra to grow. They are used to face the increase in dairy production and develop the exportations in the emerging markets. (Institut de l'elevage 2010, Dairy NZ 2009/10)

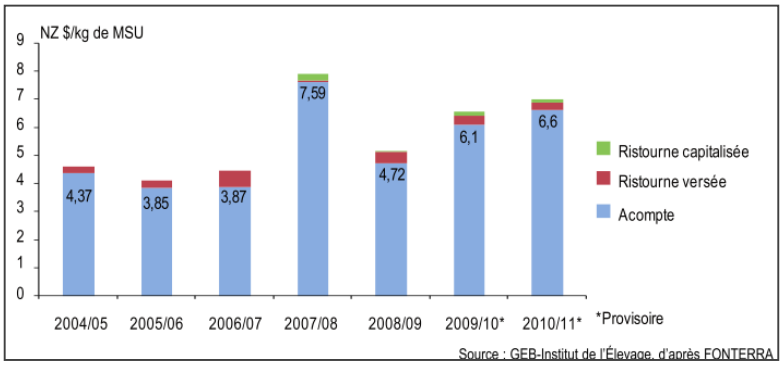


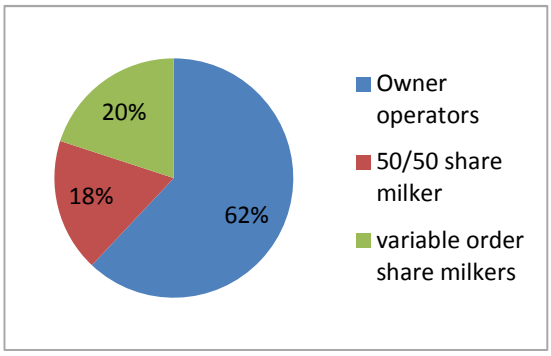
***Figure 22**: Price for the milk collected by Fonterra, figure from Institut de l'elevage 2010*
(Down payment in blue, given refund in red and capitalized refund in green)

The sharemilking: a special feature of dairy farming

This model of farming is particularly common in New Zealand. It begins with practical training as a farm worker, followed by responsibility as a herd manager, and then cow ownership and sharemilking. So the dairy farmer works in several farms during his career. At first cowman, then he buys a herd and becomes sharemilker. After a few years he can have his own farm and finally hire a sharemilker. The farm owner, usually an older and experienced dairy farmer, offers a contract to a sharemilker who owns all or part of the herd, operates the farm, and shares the income. They have equal share of the revenue in the common '50% sharemilker agreement more details concerning the responsibility of each party under a 50% sharemilker agreement are presented in annexes.

With the average high price of a farm, plus the cost of cows and dairy-company shares, it is difficult for young people to acquire properties. So, many New Zealanders use the sharemilking to achieve the farm ownership. Sharemilking allows someone with little money to invest in cows, accumulate expertise and finance, and eventually buy a farm. Sometimes the sharemilker is a son or daughter of the owner so they can take over the family farm. (Teara encyclopedia of New Zealand, DairyNZ 2008/09)

Sharemilking in Southland



The main operating structures found on New Zealand dairy farms are owner-operator, sharemilker and, to a lesser extent, contract milker. In 2008/09, not all farms with contract milkers could be identified, and consequently any farms with contract milkers are included with owner-operators.

***Figure 23:** Repartition of operating structures in Southland, Dairy NZ economic survey 08/09*

	southland %	southland	NZ %	NZ
Owner operators	62	520	65.3	7616
50/50 share milker	18	156	19.7	2303
variable order share milkers	20	174	14.9	1738

***Figure 24**: Operating structure in Southland. Dairy NZ economic survey 08/09*

V- FINANCIAL ANALYSIS

1- Material and method

Objectives:

This financial analysis has different objectives.

- Assess the financial situation and the budget structure of different kinds of farm in Southland. The calculation of economical results helps to better understand how farmers run their farm, how the production system works, but also possible prospects for the farm development, if the farm is likely to reproduce and grow or not at the end of a farmer career.
- Compare the different farm models in order to have an overview of the farms economical situation in Southland, and obtain some data and ratios to have a better understanding of the economical side of farm conversion.

In order to realize the financial analysis, the budgets of the Farm monitoring reports have been used. These reports are made by the Ministry of Agriculture and Forestry in New Zealand each year.

Material: the Farm monitoring report:

The Farm Monitoring program provides a short-term view of the financial and production status of a range of farm types throughout New Zealand. It examines revenue and expenditure for the past seasons. The program collects data from a range of farm types throughout New Zealand, and notably within Southland region. Then these data are used to produce model budgets (attached at the end of the report). Each model budget is representative of a farm type in a given region. They are then adjusted with feedback gathered from regional industry meetings and other information sources to best represent the current situation and expectations in each region.

Each pastoral model is created from information drawn from between 15 and 45 farms (depending on the model) and a wide cross section of agribusiness representatives. The aim of each model is to typify an average farm for the region. [1]

Details and limitations about the financial analysis

-Two groups have been created by the MAF among sheep and beef farm models. The farm located in the high country and the farm called intensive farm, often located on the flat land. These two models are quite different by their characteristics and their system of production. Intensive sheep and beef farms are located on an environment and soils often also suitable for dairy farming, and are similar by their size to dairy farms. So, it is interesting to compare them.

-Because of the methodology used by MAF to create the model, it is possible that dairy farms examined are in average younger than the sheep and beef farms. Indeed, because a lot of farm conversions into dairy are happening for the last ten years, a random group of dairy farm should be younger than a random group of sheep and beef farm. As it is explained in the dairy farm model description, many of

[1] To get more information about the methodology and calculations used in the model, one can refer to the webpage fallowing http://www.maf.govt.nz/news-resources/statistics-forecasting/statistical-publications/methodology-and-calculations-used-in-the-models.aspx or contact trish.burborough@maf.govt.nz who is in charge of the models in Southland.

them have been producing milk for less than 6 years. This difference of age and stage of development within the different farm models, have big implications on financial results (as indebtedness, profitability...) which are important to consider when comparing the farm models.

-By creating average farm model, the variability of farm within a group is not taken into account. National results made on dairy farms (Dairy NZ economical survey 2009) show a normal distribution between farms with a large variation. So, there might also be a large variation between farms studied in the models.

-Most of the time when comparing the farm models, an average between the season 2008/2009 and 2009/2010 have been made within the following analysis. This has been done in order to reduce the variability between seasons.

Farms models characteristics:

Southland Dairy Model (in 2009)	
Effective area (ha)	183
Cows wintered (head)	569
Replacement heifers (head)	140
Stocking rate (cows/ha)	2.8
Total milksolids (kg)	201 300
Net cash income ($)	1 009 900
Farm working expenses ($)	616 000

The Southland dairy model represents approximately 660 dairy farms in Southland that supply milk to the Fonterra factory at Edendale. This model has significantly increased in size, stocking rate and production over several years.Due to continuing dairy conversions and an increase in the average size, the model is now 183 hectare milking platform with a 68 hectare purchased run-off. Many farms in the model have been producing milk for less than 6 years. The size and production from these farms is still increasing.

Southland/South Otago intensive sheep and beef model (in 2009)	
Effective area (ha)	194
Opening sheep (stock units)	2 171
Opening cattle (stock units)	90
Stocking rate (stock unit/ha)	11.7
Net cash income ($)	212 335
Farm working expenses ($)	12 920

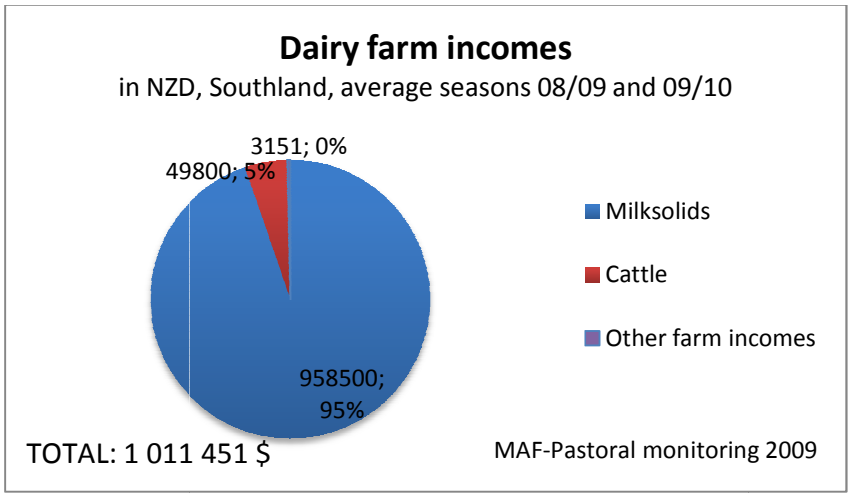
This model represents 1600 intensive sheep and beef farms in Southland and South Otago. Some farms do finish lambs rather than sell store and sell dairy grazing rather than finish beef. These farms are on the plains and downlands and typically have good seasonal rainfalls. Historically, this class has been challenged by the expanding dairy industry making heifer grazing and sale of surplus feed options readily available.

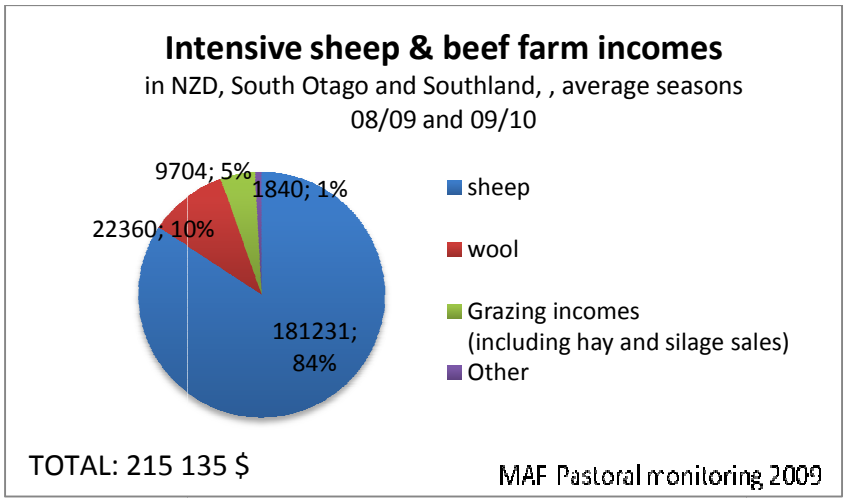
Southland/South Otago hill country sheep and beef model farm (in 2009)	
Effective area (ha)	723
Opening sheep (stock units)	4 733
Opening cattle (stock units)	974
Stocking rate (stock unit/ha)	7.9
Net cash income ($)	463 611
Farm working expenses ($)	256 821

This model represents 720 farms in the moderately rolling clay downlands to steeper hill country of South Otago and Southland. The typical production system is breeding ewes with some hogget lambing, and the majority of lambs finished but some store lambs can be sold each year. There is a herd of breeding cows with their best calves finished. There may also be some trading of cattle.

Figure 25: *Description of the farm models, data from MAF, 2009*

2- Farm incomes





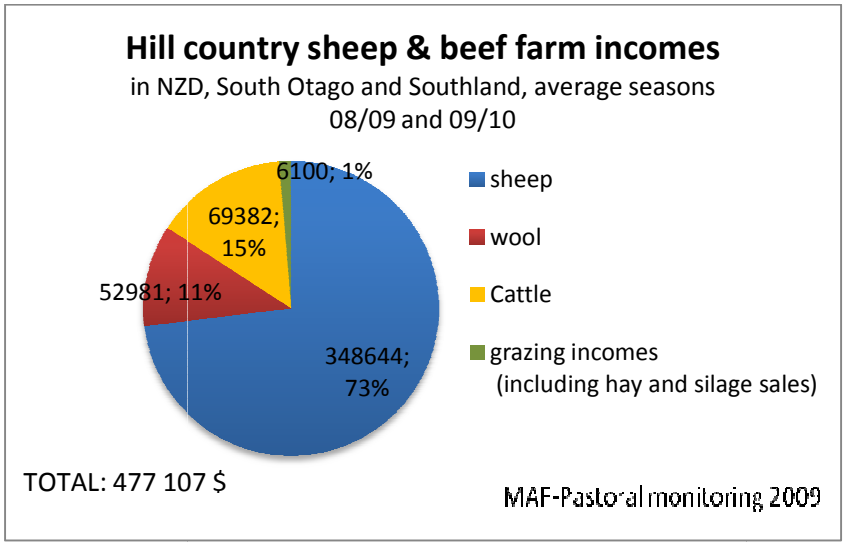


Figure 26: *Source and distribution of incomes within farm models, MAF 2009*

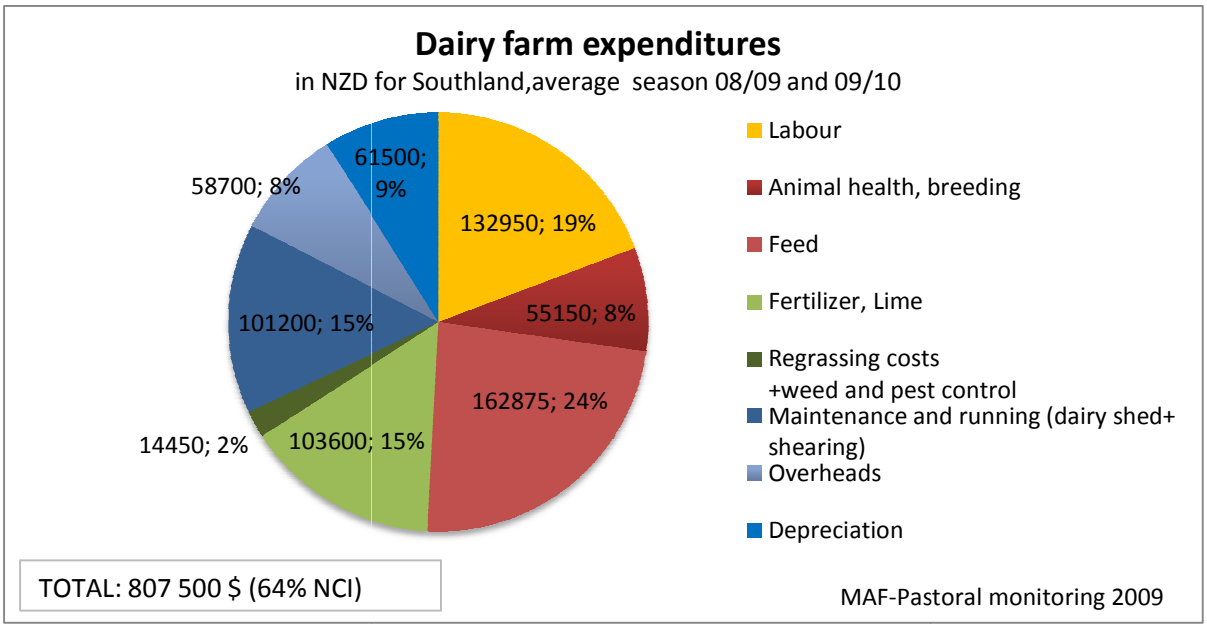
One can see that dairy farms make a much higher profit than beef and sheep farms. This could be partially explained by a good efficiency of dairy farms but also an advantageous milk payout. Regarding the intra annual variations in the incomes (thanks to the ratio standard deviation/ mean calculated over the last 5 years), the ratio is higher for dairy farms with 0.25 against 0.09 for intensive sheep and beef farms and 0.11 for the sheep farms located in the rolling hills. These variations between years are even more important as dairy turnovers are high (figure 26).

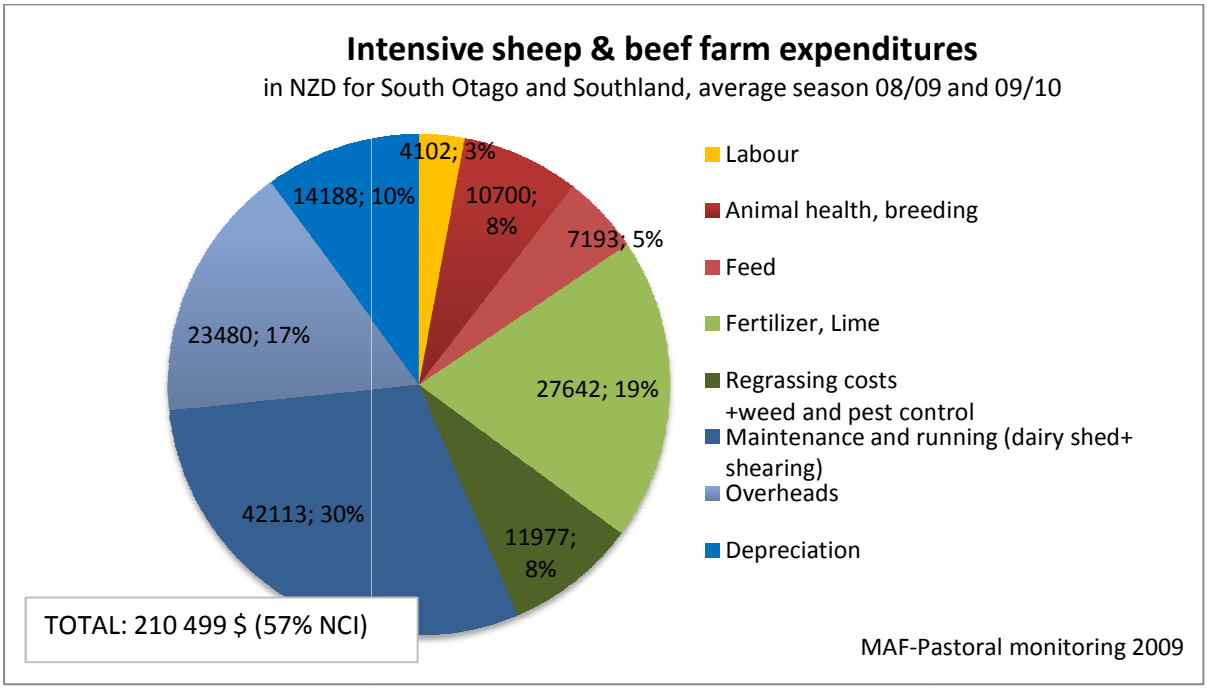
Concerning the intra-annual variation in the price of productions, meat prices variations are quite similar to milk's ones with a relative standard deviation around 0.25 (standard deviation/ mean over the last 5 years).

The incomes per hectare in dairy farms reached 5527$/ha, while intensive sheep and beef farms, comparable to dairy farms in matter of size and geographical environment had an incomes per hectare of 1109$/ha (average of seasons 08/09 and 09/10).Sheep and farms located in the hill country generated an incomes per hectare of 660$/ha, but thanks to a larger scale and a bigger production they finally have higher incomes than the intensive sheep and beef farm model.

With 95% of the net cash income, the milk's sale represents the main source of income. Sheep and beef farms have a wider range of products: the meat but also wool's sale, cattle, silage's sale and also services they provide to dairy farms. Intensive sheep and beef farms located in the downlands host dairy heifers or supply grazing for dairy cow. While sheep and beef farms located in the rolling hills, more distant from dairy farms stayed on a "traditional scheme" where cattle and sheep complement each other.

3- Expenditures





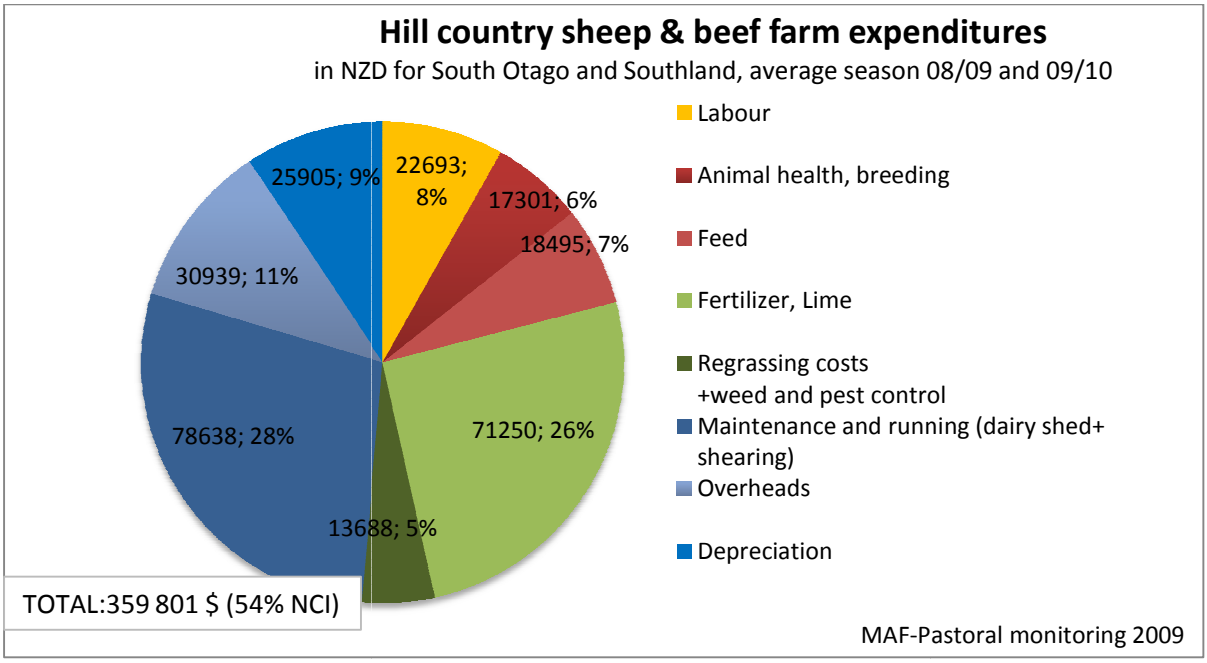


Figure 27: *Source and distribution of expenditures within farm models, MAF 2009*

Legends description: (correspondence between budget's raw)
Labour: permanent wages, casual wages, AAC
Feed: hay and silage, feed crops, grazing, other
Maintenance and running: repairs and maintenance, fuel, vehicles costs, electricity, shed, shearing
Overheads: administration, accountancy, legal and consultancy, insurance, AAC and rates
NCI: Net cash incomes

Dairy farms are the farms which spend the more money, with expenditures reaching $ 807,500. This can be partially explained by the daily handling of animals, with milking twice a day. That is notably why an important labour force is needed in dairy farms. Sheep and beef farms have less important expenditures thanks to a less important demand of labour for animal care. The way to manage the pasture and feed animals is also simpler.

The diagrams showing the distribution of expenditures in model farms illustrate a way of farming more intensive in dairy farms with a quantity of input per hectare much higher than in sheep and beef farms. An interesting point to consider is the ratio Expenditures /Net Cash Incomes: this ratio is better for the sheep and beef farms (with 57% for the intensive ones and 54% for those located in the rolling hills) than in the dairy farms. In dairy farms this is notably due to a high quantity of input (fertilizers, complementary feeds) leading to important expenditures compared to the NCI. However, the NCI is much higher in a dairy farm. So despite that ratio, the gross profit (NCI-expenditures) remains more important in a dairy farm.

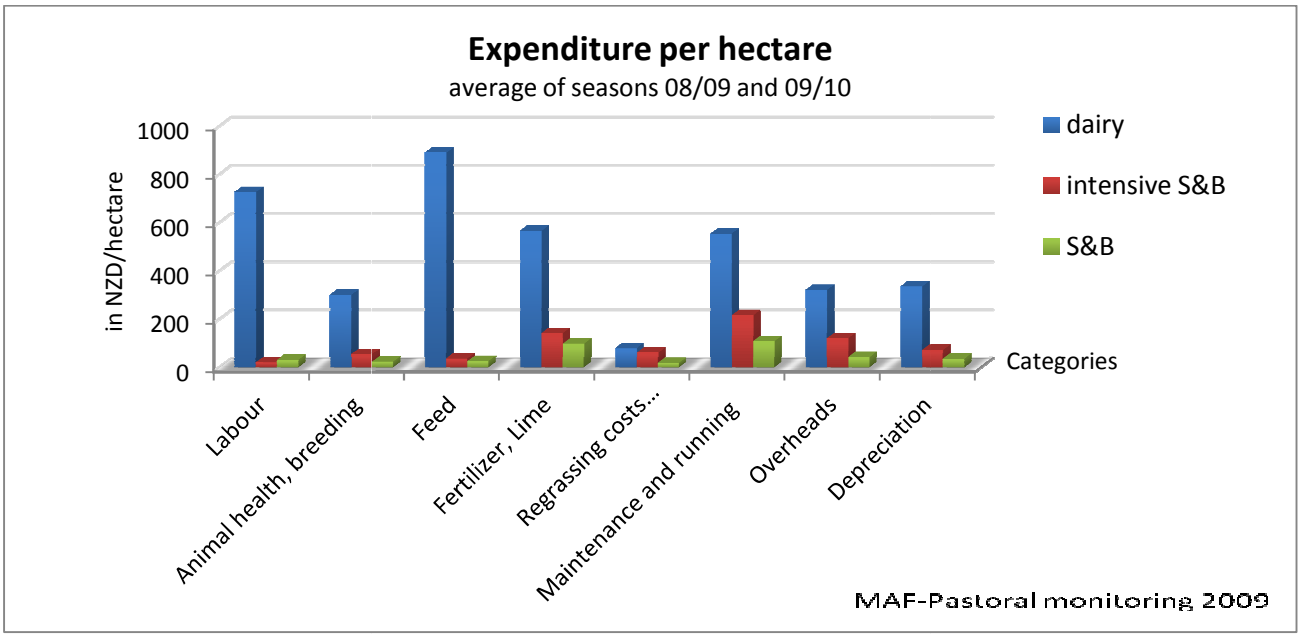


Figure 28: *Expenditures per hectare in farm models, MAF 2009*

An average dairy farm in Southland spend in average 3,774 $/ha, while an intensive sheep and beef farm will spend 728 $/ha and a sheep and beef farm located in the rolling hills 387 $/ha. This diagram underlines well the importance of expenditures linked to the labour, the pastures and feed in a dairy farm, contrary to a sheep and beef farm. Some expenditures per ha (notably those concerning animals care) can be distort by the scale of the farm and should be considered per animal.

Labour:

Because of the milking twice a day, the demand of labour force is more important in a dairy farm than in a sheep and beef farm. The organization of work is also quite different between the two types of farms.
In a sheep and beef farm the labour force would involve mainly family members and sometimes the employment of a contractor to realize specific jobs (corresponding to the raw "casual wage" in the budget). Whereas in a dairy farm, there is commonly one or more people employed to realize the day-to-day work on the farm (corresponding to the raw permanent wage in the budget). So managing the staff is also part of the work of a dairy farmer. To some extent, we can also find permanent employee on the large scale sheep and beef farm located in the rolling hills.

Feed:

Feed and pasture management is maybe one of the biggest difference between a sheep farm and a dairy farm. While feed became the main source of expenditures for a dairy farm it remained low in the sheep and beef farms. Sheep and beef have a feeding system relatively simple based only on the pasture with a low utilization of hay and silage and sometimes feed crops (mainly in intensive sheep and beef farms)
Conversely, dairy farms have a feeding system more complex and diversified. In addition to the pasture, dairy farmers use hay and silage along with feed crops and buy complementary feed. Moreover, dairy farmers can pay to make their herd graze on other farms (often in sheep and beef farm during winter period). According to DairyNZ Economic survey 2008-2009, labour has typically been the major per cow operating expense for dairy farms, ranging between 21 and 33% of total operating expenditure over the past 10 years. From 2007/2008 feed became the largest category of expenditure. This could be taken as a will to lift the performance of the herd by a more complete and rich alimentation.

Pasture management:

The strength of NZ agriculture lies mainly on its pastures. So growing grass and pasture management is an important source of work and expenditure. However these expenditures per hectare are bigger for dairy farms than sheep and beef farms where pasture seems to be more intensive: Dairy farm fertilization costs 566 $/ha against 142 $/ha for an intensive sheep and beef and 99 $/ha for a sheep and beef farm located in the rolling hills. The costs of regrassing are also slightly higher for dairy farms; it could be explained by the will of having good pasture with better seeds. The dairy farm model applies in average the equivalent of 104 kg of nitrogen per ha.

Stocking rate:

Livestock grazing comparison is a method of comparing the numbers and density of livestock grazing in agriculture. Various units of measurement are used, in New Zealand this measure is based on the grazing equivalent of one adult ewe. Different species (and breeds) of livestock do not all graze in the same way, and this is also taken into account when deciding the appropriate number of units for grazing land. According to New Zealand Livestock Units on Ruralfind, a dairy cow is equivalent to 7.3 S.U. This corresponds to dairy cattle of 400 kg with a fat yield production of 180 kg per of fat matter hectare and per year. Then, the ratio S.U/ ha can be calculated on each farm models from the farm models information.

	Stocking rate	Eq S.U	S.U. / hectare
Dairy farms	2.8 cows/ha	7.3	20.4
Intensive sheep and beef farms	11.7	1	11.7
Rolling hills sheep and beef farms	7.9	1	7.9

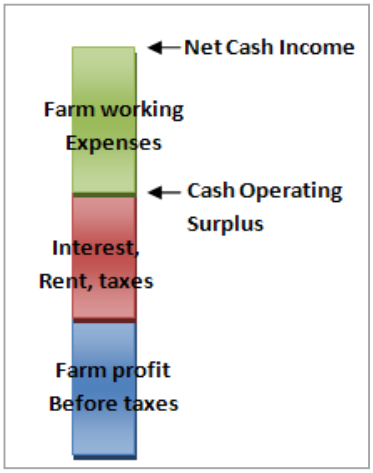
Figure 29: *comparison of stocking rate between farm models, MAF 2009*

The stocking rate is much higher in a dairy farm than in a sheep and beef farm. That comparison of the stocking rate and the use of fertilizer could partially explain the actual debate about the Dirty Farming and the increasing environmental concerns about the development of dairy farming in Southland.

Maintenance and running, overheads, depreciation:

These expenditures linked to the everyday running of the farm can be regarded as fixed. The predominance of that category in the sheep and beef farm's expenditures gives evidence of the efficiency of the NZ's agricultural system, with low expenditures thanks to the grazing and few animal handlings.

4- Cash flow and liquidity



Terms and definitions:

-Net Cash Income is the gross revenue of a farm

-Working expenses is the expenditures necessary for the production

-Cash operating surplus is the difference between net dairy cash income and farm working expenses. The cash operating surplus decreased

-Interests, rent and taxes. Farms who have high farm working expenses and/or high levels of interest and rent payments per kilogram milksolids are more at risk from a liquidator perspective

-Once rent, interest and tax are removed and net income from non-dairy farming activities is added, the amount left is **farm Profit before taxes**. This cash is use for the drawing (farm family living) or business growth as reducing debt (borrowings) or for capital development and purchase.

-Farm surplus for reinvestment: It represents the cash available from the business after meeting living costs, which may be invested in the business or used for principal repayments. Reinvestment can sometimes delay or reduce capital gains taxes.

Comparison of cash flow and liquidity between the different farm models:

In order to compare the composition of cash flow and liquidity within the different farms models budgets, several diagrams have been made. The data come from the 2009 pastoral monitoring reports made by the Ministry of Agriculture and Forestry. They have been collected over the last 5 seasons (from 05/09 to 09/10).

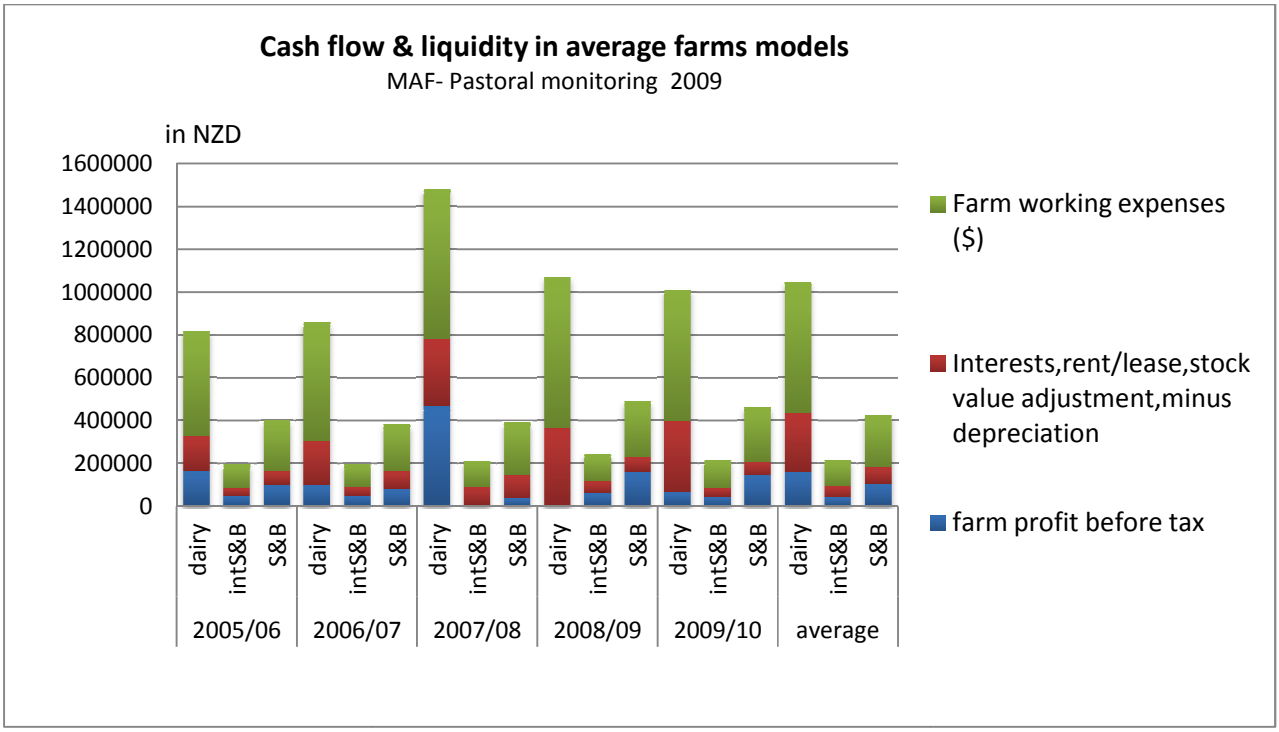


Figure 30: *Cash flow and liquidity in farm models, MAF 2009*

That kind of graphic in stacked column compares the contribution of each value to the total of the NCI. The gross sums also allow us to compare farms between them. The Cash flow is more important in a dairy farm than in a sheep and beef farm. A lot of money circulates in a dairy farm: if the net cash income is higher, there are also bigger working expenses as well as expenses related to interests and lease. If in a sheep and beef farm, the profit before taxes remains quite stable, there are important variations between years in a dairy farm.

In order to measure the intra-annual variations, the ratio standard deviation/mean has been calculated over the last five seasons within each group of farms. As it can easily be seen on the diagram, the fluctuations between years are much higher in a dairy farm (around twice as much).But these fluctuations cannot be fully explained by the variability in the productions price because meat prices and milk payout have a similar relative standard deviation . Greater influence of climate on milk production or/and a greater dependence on external services (banking, veterinary, food ...) in a dairy farm could also influence these variations.

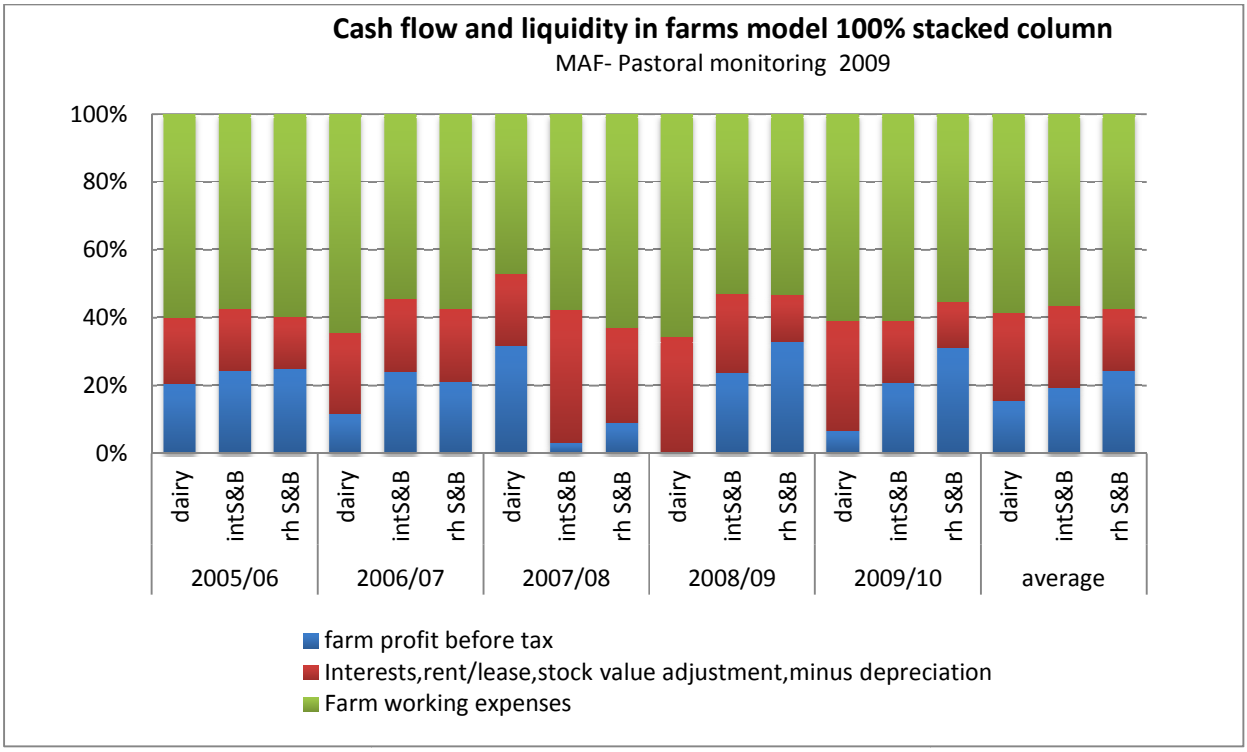


Figure 31: *contribution of each category to the cash flow, MAF 2009*

The 100% stacked column diagram is used to compare the percentage that each value contributes to the total NCI across categories. One can see that the ratio working expenses/NCI is much higher in a dairy farm than in a sheep and beef farm. There is also a similar trend for the ratio interests & rent/ NCI. Regarding the cash flow expressed in % of the NCI, dairy farms could seem "less efficient". But, because of an NCI much higher than in a sheep and beef farm, the profit generated by a dairy farm remains often higher.

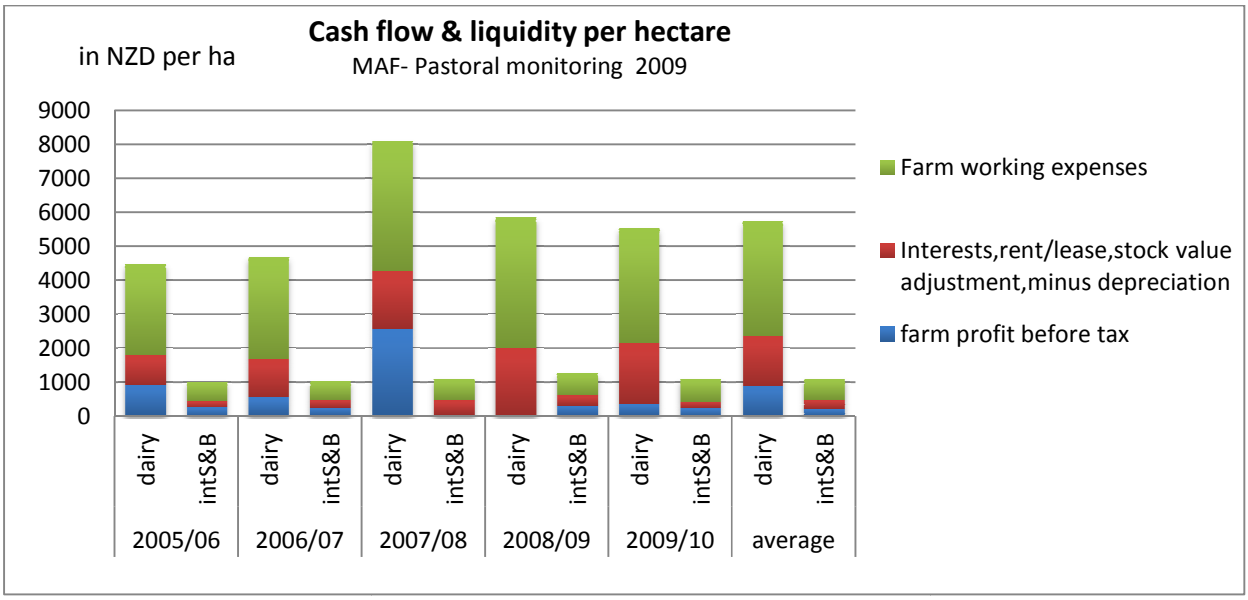


Figure 32: *distribution of cash flow and liquidity per hectare, MAF 2009*

A diagram per hectare has been drawn in order to compare the components of cash flow per hectare between a dairy farm and an intensive sheep and beef farm which are approximately the same size. Because it is much bigger in size, the model for sheep and beef located in the rolling hill has been removed. The high level of interests and rent per hectare in dairy farms could be partially explained by the stage of development of the farms. Indeed many dairy farms conversions occurred during the last decade. One can guess that dairy farms of the model are in average younger than sheep and beef farms. So they might carry higher debts and have made more investments recently.

Liquidity risk:

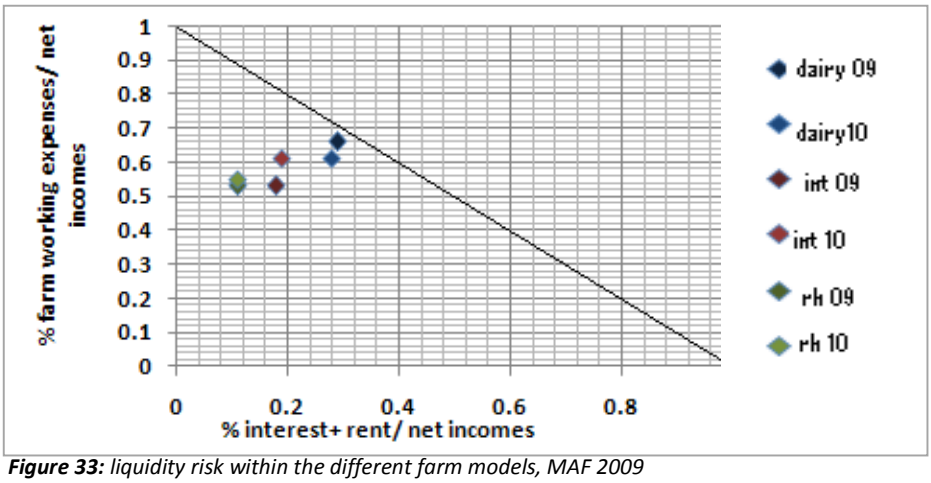


Figure 33: *liquidity risk within the different farm models, MAF 2009*

Farms who have high farm working expenses and/or high levels of interest and rent payments are more at risk from a liquidator perspective. The chart above shows the positioning of the different farms models. Above the line (y= -x +1) it's mean that there is no cash remaining after paying for farm working expenses, interest and rent. This means other funds would be required for drawing, tax, capital, development and principal repayments or a large loss would result. Dairy farms are the one which have the higher liquidity risk, because of more important working expenses, interest and rent.

Discretionary cash:

Once rent, interest and tax are removed and the net income from non-farming activities is added, the amount left is farm discretionary cash. This can be used for the drawing (farm family living) or business growth as reducing debt (borrowings) or for capital development and purchase.

	Dairy		**Intensive sheep & beef**		**Sheep & beef rolling hills**	
	Average($)	% discr.	Average($)	% discr.	Average($)	% discr.
Net capital purchases	56 450	36	14 940	18	33 350	29
Development	25 700	16	7 950	10	3 600	3
Principal repayments	0	0	2 647	3	0	0
Drawings	74 350	48	57 087.5	69	77 700	68

Figure 34: *allocation of discretionary cash -Average made with the results of the seasons 2008/2009 and 2009/2010*

For the dairy farm model, nearly half of the profit made have been reinvested in developing operations (net capital purchases, development) while in sheep and beef farms the discretionary cash is mainly used for the family life.
Several reasons could explain this trend:
-This can be linked to the financial health of the farm. The posts net capital purchases and development are areas where farmers invest when their business goes well.
- It could also reflect the age and stage of development of the farm. Dairy farms in Southland are in average younger than sheep and beef farms and have a greater need for investments and infrastructures.
-Finally, this trend could also be related to the dynamic within the farm. Measurement of the quantity and the quality of the milk can be done during the milking twice a day. This gives the dairy farmers a better overview of the farm and the day-to-day performances. Milkers have more directs contacts with the animals as well, which could offer more opportunities to lift the performances.

5- Assets

Asset: They are economic resources. Anything tangible or intangible that is capable of being owned or controlled to produce value and that is held to have positive economic value is considered an asset. Simply stated, assets represent ownership of value that can be converted into cash (although cash itself is also considered an asset).

Dairy	value	%
Farm, forest building	9 020 000	81
Plant and machinery	190 500	2
Stock valuation	779 000	7
Dairy company shares	1 091 700	10
TOTAL	11 081 200	

Intensive sheep & beef	value	%
Farm, forest building	3 255 000	91
Plant and machinery	94 587	3
Stock valuation	222 887	6
TOTAL	3 572 474	

Sheep & beef Rolling Hills	value	%
Farm, forest building	4 702 685	86
Plant and machinery	137 700	2
Stock valuation	638 856	12
TOTAL	5 479 241	

Figure 35: *Sharing out among assets Results based on seasons 2008/2009 and 2009/2010- MAF Pastoral monitoring 2009*

The land value and the farm buildings represent the major components of the farm models assets, with more than 80%. This notably can be related to the farming land price which highly increased the past ten years. So farms went up in value, and could now be sold for more than $11.000.000 for a dairy farm.
In order to deliver their milk production to Fonterra, farmers also have to buy company shares. These shares represent up to 10 % of a dairy farm assets, i.e. around $1,000,000.

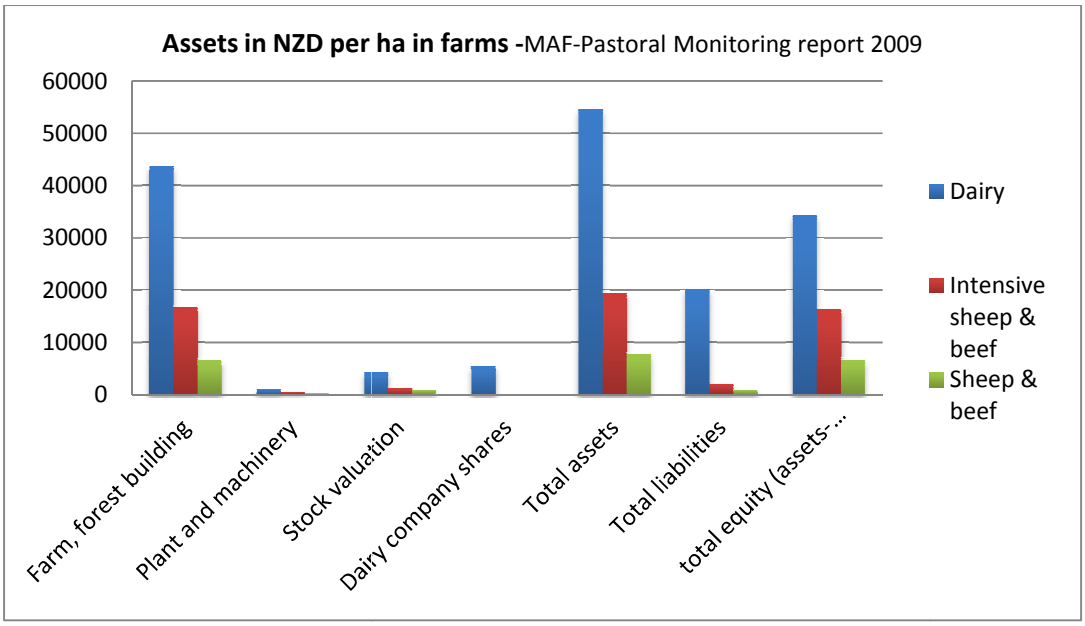


Figure 36: *source and contribution of assets in farm models, MAF 2009*

Rate of Return on Farm Assets (ROA):

Return on Assets (ROA) = Net Incomes/ Total asset

This ratio measures the pre tax rate of return on farm assets and can be used to measure the effective utilization of assets on the profitability of the business.

	ASSETS	Net incomes	ROA
Dairy farms	11 081 200	1 039 700	0.09383
Intensive sheep and beef	3 572 474	228 340	0.06392
Rolling hills sheep and beef	5 479 241	476 181.5	0.08691

Figure 37*: rate of return on asset, average seasons 2008/2009 and 2009/2010- MAF 2009*

The ROA is really different from an industry to another. Although dairy farms have higher assets value than sheep and beef farms models, they also have a higher ROA. In proportion to the facilities they have, dairy farms are those who produce the more income.

6- Liabilities and Debt Servicing

Liabilities:

Liabilities represent a business obligations not discharged and shown as balanced against assets on the balance sheet. Liabilities include debts, mortgages, other term liabilities and borrowing from family. National results show a relatively normal distribution of term liabilities between farms with a large variation (DairyNZ Economic survey 2008-2009). This is reflective of both the stage in career of the farmer and individuals assessments and appetite for risk. Dairy farms have 5 to 10 times higher liabilities than a sheep and beef farm. This could be partially explained by several reasons:

- The farming land value: dairy farms are often located on the flat land of good quality and easier to run. These past few years the prices of the land went up in value. That is why today buying a dairy farm, often means deeply run into debts.
- A greater need in infrastructure and machinery: dairy farmers have notably to build a shed and a milking platform, as well as buy dairy companies shares to deliver their milk, which could represent another debt.

Finally, the method of construction of the model could also be part of the explanation. Sheep and beef farms converting into dairy farms are quite recent in Southland. Because the model has been built by analyzing groups of farm in Southland, we can guess that dairy farms are in average younger than the farms in the sheep and beef model and then carry more debts.

	Dairy	Intensive sheep & beef	Rolling hills sheep & beef
total liabilities	3700000	395189	662500
liabilities per ha	20218	2037	916.5
lia. per stock unit	987.5	174.745	117.19
(Interest+rent+lease)/NCI	28.5	18.2	10.65

Figure 38: comparison of liabilities between the farm models

Results based on the average of the seasons 2008/2009 and 2009/2010- MAF Pastoral monitoring 2009

In this table, a cow has been considered as equivalent to 7.3 stock units

Debt servicing:

Debt Servicing= (Farm interest expenses + intermediate and long term principal payments) /NCI

This ratio measure the proportion of value of farm production that must be used to meet financing costs and debt obligations

This cost of rent and interest represents 29% of gross farm revenue for a dairy farm, 19% for an intensive sheep and beef and 11% for a sheep and beef farm located in the rolling hills. Therefore, for every dollar of gross income earned, that percentage is required to pay interest and rent. That ratio is much higher in the dairy farm model, notably because of greater indebtedness. Concerning the dairy farm that ratio “interest and rent/NCI » was 13% for the season 2000/2001 and reached around 30.3% in 2008/2009 with wide variation between seasons (DairyNZ Economic survey 2008-2009).

7- Equity

Assets= liabilities + Owner equity
Equity (shareholders funds or net worth) is the net value of the assets owned by the farm business

Total equity	2008/2009	2009/2010	average	assets	% assets
Dairy	7 431 300	5 111 400	6 271 350	9 971 350	63
Sheep & beef intensive	3 517 927	2 836 643	3 177 285	3 744 974	85
Rolling hills sheep & beef	5 258 920	4 374 563	4 816 742	5 568 242	87

Figure 39: *Equity in the different farm models - MAF Pastoral monitoring 2009*

This table shows the more important financial value of dairy farms (equity) but also their higher indebtedness (% assets). The equity value of the average dairy farm business has increased $1.36 million from 2004 to 2009. This growth has been driven by increases in the value of land and building (+$ 1.661.000), dairy company shares (+$ 83.000). Liabilities have increased $919.000 to enable the purchase of more assets (DairyNZ Economic survey 2008-2009).

8- Profitability

Operating Profit (formerly known as Economic Farm Surplus or EFS) is a key indicator of dairy farm profitability.
The economic farm surplus (EFS) depicted in the model budgets is calculated as follows:
Net cash income - working expenses (excluding interest, rent and lease costs) +the change in pastoral livestock value (if applicable) - depreciation - wages of management (WOM).This measure is particularly useful for comparing the profitability between farms.

	Dairy			Intensive sheep and beef			Rolling hills sheep & beef		
	2008/09	2009/10	Aver.	2008/09	2009/10	Aver.	2008/09	20/2010	Aver.
EFS	231 000	264500	247750	31215	20410	25813	138224	117424	127824
EFS / ha	1262	1445	1353.5	161	105	133	191	162	176.5
EFS/ stock unit	173	198	185	13.8	9.03	11.415	24.67	20.57	22.62
EFS/total farm assets	2	2	2	0.8	0.6	0.7	2.3	2.3	2.3
(EFS-interest-lease)/equity	-1	-0.4	-0.7	-0.3	-0.7	-0.5	1.6	1.6	1.6
EFS/NCI	22	26	24	12.8	9.6	11.2	28.6	25.3	26.95

Figure 40: *Profitability ratios- MAF pastoral monitoring 2009*

According to dairy NZ-Economical report, in the farms models, operating profit is normally distributed around the mean with a high standard deviation reflecting the wide range between farms. This table summarizes several criteria of productivity. It highlights some points:
-Dairy farms are the one which have the highest EFS
-Sheep and beef farms located in the high country seem to be more profitable with better EFS ratios per hectare and per S.U. than an intensive sheep and beef. - Concerning the productivity, the sheep and

beef farm model located in the high country seems to be the more "efficient" with the best ratios of productivity.

However the productivity is calculated for a given time and doesn't take into account the opportunities to develop the farm. For example, the dairy farm model would be a priori younger in average, so today they carry more debts related to investments and farm development which decrease the productivity.

9- Budget

	Dairy farm		**Sheep and beef farm (intensive)**		**Sheep and beef**	
	whole farm	per ha	whole farm	per ha	whole farm	per ha
REVENUE						
Net Cash incomes	1 009 900	5 518	212 335	1 095	463 611	641
Farm Working expenses	616 000	3 366	129 720	669	256 821	355
CASH OPERATING SURPLUS	393 900	2 152	82 614	426	206 790	286
Interest	283 700	1 550	39 732	205	49 158	68
Farm profit before tax	65 700	359	43 950	227	143 266	198
discretionary cash	99 900	546	40 565	209	119 761	166
ASSETS AND LIABILITIES						
Total Farm assets	8 861 400	48 422	3 227 250	16 635	5 114 263	7 074
Total liabilities	3 750 000	20 491	390 607	2 013	648 500	897
Total equity	5 111 400	27 931	2 836 643	14 622	4 374 563	6 051

Figure 40: *farm budget summary table – MAF Pastoral Monitoring 2009*

DAIRY								
	2005/06	2006/07	2007/08	2008/09	2009/10	mean	standard deviation	stdev/ mean
Milksolid payment	4.24	4.15	7.43	5.15	4.79	5.152	1.337	0.26
Net cash income ($)	816 300	857 500	1 478 000	1 069 500	1 009 900	1 046 240	263 046	0.25
Farm working expenses ($)	490 500	553 000	699 000	705 900	616 000	612 880	93 061	0.15
Farm profit before tax ($)	164 600	99 500	466 500	3 400	65 700	159 940	180 997	1.13
Farm surplus for reinvestment ($)	670 000	-6 900	323 500	-41 200	30 400	195 160	302 400	1.55
INTENSIVE SHEEP AND BEEF								
	2005/06	2006/07	2007/08	2008/09	2009/10	mean	standard deviation	stdev/ mean
Average lamb price ($/head)	51.5	52	56.04	90.11	77.26	65.382	17.4	0.27
Net cash income ($)	195 686	197 326	211 385	244 345	212 335	212 215.4	19 544	0.09
Farm working expenses ($)	112 668	107 868	122 453	129 451	129 720	1 20432	9 872	0.08
Farm profit before tax ($)	47 256	47 003	6 075	58 083	43 950	40 473.4	19 962	0.49
Farm surplus for reinvestment ($)	3 605	9 557	-12 247	15 536	-23 790	-1 467.8	16 208	-11.04
SHEEP AND BEEF								
	2005/06	2006/07	2007/08	2008/09	2009/10	Mean	standard deviation	stdev/ mean
Average lamb price ($/head)	51.28	49.83	48.82	82.85	71.49	60.854	15.45	0.25
Net cash income ($)	400 241	383 390	392 091	488 752	463 611	425 617	47 383	0.11
Farm working expenses ($)	239 309	220 958	246 975	260 971	256 821	245 006.8	15 883	0.06
Farm profit before tax ($)	98 989	80 101	34 482	160 730	143 266	103 513.6	50 467	0.49
Farm surplus for reinvestment ($)	5 707	26 228	-12 042	90 533	31 291	28 343.4	38 807	1.37

Figure 41: *Cash flow and liquidity in farms models budgets – data from MAF Pastoral Monitoring 2009*

	DAIRY			INTENSIVE SHEEP AND BEEF			INTENSIVE SHEEP AND BEEF		
	mean	standard deviation	stdev/ mean	mean	standard deviation	stdev/ mean	mean	standard deviation	stdev/ mean
Net cash income (($/ha)	5 717	1 437	0.25	1 093	101	0.09	588.68	65.53	0.11
Farm working expenses ($/ha)	3 349	508	0.15	621	50.88	0.08	338.87	21.9	0.06
Operating profit($/ha)	2 368	1 072	1.13	473	68.6	0.49	249.8	48.3	0.19

***Figure 42**: Liquidity risk, average of the 5 past years*

	Dairy			Intensive sheep & beef			Sheep & beef		
	2008/2009	2009/2010	average	2008/2009	2009/2010	average	2008/2009	2009/2010	average
Interest and rent	312 500	283 700	298100	43 309	39 732	41 520	52 494	49 158	50 826
Interest and rent/ha	1 707	1 550	1628	223	205	214	72.6	67.99	70.29
GFR	1 069 500	1 009 900	1 039 700	244 345	212 335	228 340	488 752	463 611	4 761 81.5
Interest & rent en % GFR	0.292	0.281	0.287	0.177	0.187	0.182	0.107	0.106	0.107
Term Liabilities$	3 650 000	3750000	3 700 000	399 771	390 607	395 189	676 500	648 500	662 500
Term Liabilities$/ha	19 945	20492	20 219	2 060	2 013	2 037	936	897	916

***Figure 43:** Liabilities and debt servicing*

VI- THE ENVIRONNEMENTAL IMPACT

(Data from Institut de l'elevage 2010 and Paula Blackett 2008)

With its pasture system and its green landscapes, NZ's agriculture has a "green and clean" brand image on the international market. Having an environment of good quality is notably essential for the sector of the tourism which represents today the same sales than the dairy industry. However, the agricultural sector remains the main sector of NZ's economy and during the last decades, an intensification of the agriculture happened leading sometimes to environmental issues.

1- The environmental issues

Nitrogen level:

With the intensification of farming and the increasing use of fertilizers (+50% during the last 10 years) the quantity in nitrogen in water has sharply increased. For examples in winter, with intensive conditions of pasture, losses around 40 and 60 kg N/ha can happen. In some places, like in the Waikato basin, concentrations up to 50mg/liter have been found. There is also more and more enrichment of water in lakes and rivers due to the phosphate level.

In order to reduce the nitrogen level some measures have been taken:

- Stock and spread by irrigation the milking effluents on at least 25% of the total area.
- Try to make nitrogen balance calculation become the rule and restrict the loss to 25 kg N/ha/year
- Limit the pasture during the winter period.

Irrigation

Irrigation alters the rivers flows and leads to conflicts between the users of water. The surfaces irrigated have increased by 30% between 2002 and 2007. Recently, authorities have required a decrease of 20% in the water exploitation rights. This situation doesn't really concern the Southland but more the Canterbury.

Climate change and green house gases:

On the occasion of the Kyoto protocol, NZ took a commitment to keep the green house gases emissions stable at the 1990's level. But the intensification of agriculture and notably the development of dairy farming lead to the increase of 25% of the emissions between 1990 and 2005. So today NZ set oneself to reduce of 25% green house gases emissions as an objective. The government created in September 2009 an "Emission Trading Scheme" in order to reduce the emission of green house gases by the allocation of emission units. Moreover in 2015, the dairy sector will enter on the emissions trading. Then, the dairy industry will have to reduce its greenhouse gases emissions by developing measures or buying rights to pollute on the emissions trading. The question of the "food miles" and the carbon footprint of NZ's exportations have also been bringing up.

2- The dirty dairying debate

During the past 20 years a high expansion of dairy farming happened through New Zealand. The high rate of conversion in New Zealand and particularly in Southland led to an increase in the number of cow and a higher pressure on the environment (figure 41).

	1990			2006		
	sheep	dairy	beef	sheep	dairy	beef
Number of heads (in million)	57.8	3.4	4.6	40.1	5.2	4.4
Enteric methane CH4 (millions of tonne)	537	239	232	442	410	267
Nitrous oxide N2O	11.5	5.4	4.7	9.5	9.1	5.2
Equivalent CO2	14704	6628	6273	12113	11321	7156
TOTAL	27605			30590		

***Figure 44**: Estimation of greenhouse gases emissions of the herbivorous sector, Institut de l'elevage* 2010

The dirty dairying debate was started by fish and Game New Zealand (a nation-wide fishing and hunting recreation group). The public debate exposed issues involving scientific evidence of a degradation of the water quality related to the development of dairy farming. At its heart, it centers on the collision of values and interests between various actors. (Paula Blackett 2008). It is argued that industry regulation of dairy farming environmental practices is the most sensible and practicable alternative to the current situation.

3- Regulation of on-farm practices

History of regulation of on-farm environmental practices:

-1953: Enactment of the water pollution

-Water and Soil conservation Act 1967: controls were initiated and enforced at the regional level and were based on implementation of two stage oxidation pond.

-Resources Management Act 1991: modify the characteristics of standard pond. Regional council is able to specify how dairy shed effluent is to be managed. This includes several enforcement alternatives, as abatement notices, fines and prosecution, to make the rules effective.

Diffuses inputs have never been subject to regulation, instead Regional Council tend to rely on voluntary action to mitigate the effects of dairy farming practices. This is generally encouraged by providing information, using financial incentives or promoting collective community based action. Financial incentives in the form of subsidies, are commonly used to encourage retirement and planting of stream margins. Most regional council run a cost share scheme where planting and fencing costs in priority catchments are partially funded.

Dairy farm conversions require authorization by the way of resource consent under the resource Management act 1991. This process ensures any adverse effects of the land use are avoided, remedied or mitigated. The disposal of dairy effluent is regulated in Southland to protect the region's natural environment. Authorization for building structures, such as milking sheds, is also obtained through the local councils.

To control an activity, there are a number of options available including statutory regulation, economic instruments, voluntary actions and industry regulation. To date, a mix of these approaches has been used to manage on-farm environmental practices.

The industry regulation: the clean stream accord:

The dairy industry has two key concerns:

-that consumers will avoid products because they perceive production as unsustainable

-that environmentally based tariffs may be imposed on exports and Imports

The industry control of on farm environmental management practices evolved with the signing of the clean streams accords by Fonterra. The Dairying and Clean Streams Accord is an agreement signed in 2003 in New Zealand between Fonterra, Ministry for the Environment, Ministry of Agriculture and Forestry and regional councils. The Accord was created after the "dirty dairying" which highlighted water pollution due to the intensification of farming. The purpose of the accord is to provide "a statement of intent and framework for actions to promote sustainable dairy farming in New Zealand. It focuses on reducing the impacts of dairying on the quality of New Zealand streams, rivers, lakes, ground water and wetlands."

The Accord sets a series of timeframes for farmers:

Targets	Objectives
Cows fenced out of streams, rivers and lakes and their banks	50% of streams, rivers and lakes fenced by 2007, 90% by 2012
Farm races include bridges where stock regularly cross a watercourse	50% of regular crossing point have bridges or culvets by 2007, 90% by 2012
Farm dairy effluent is appropriately treated and discharged	100% of farm dairy effluent discharges to comply with Regional Council rules immediately
Nutrient are managed effectively to minimize losses to ground and surfaces water.	100% dairy farms to have adopted nutrient budgeting systems by 2007
Existing regionally significant or important wetlands are fenced and natural water regimes are protected.	50% of regionally significant wetlands to be fenced by 2005, 90% by 2007

Progress is measured by:

- The results of Fonterra's annual Environmental and Animal Welfare assessment
- Regional council monitoring of compliance with regional plans and resource consent requirements for dairy effluent disposal. In the Dairy environment review group 2006, different regions are compared with a standardized system for reporting dairy effluent compliance.

The 3% of growth expected by the dairy industry for the next 10 years seems to be hardly attainable if we consider the development of environmental concerns.

Except for Southland, where usable lands for dairy farming are still available to be converted, the geographic expansion of dairy farming seems to have reached its peak .Moreover the expansion of dairy farms could be curbed by the environmental constraints to the benefit of sheep and beef farming less polluting.

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Categories	OWNER/ at owner's expenses	SHAREMILKER/at sharemilker's expenses
Dwelling	-Suitable accommodation for the sharemilker and his employees	-The cost of electricity in the accommodation
Provisions for cows and other stock	-Define rules concerning the management of the herd (dates, min and max numbers of cows…) - If requested by the owner, the sharemilker have to provide the production details (calving, insemination, herd test result, deaths...)	- verify to his own satisfaction and at his own expense, the animal health status (e.g. tuberculosis, brucellosis) - own the bulls. - have to comply with the owner's rules for the herd management
Care of stock	-Depending on the agreement, the receipt from the sale of cows can be split or entirely for the sharemilker -Define rules concerning the mating period, the size of the herd and its replacement	-Control the animal health status with his criteria and his money supervise the milking -Control and management of diseases like tuberculosis, brucellosis -Have to call the veterinarian at his own expenses
Implement and Plant	Shall provide at the owner's own expenses the milking shed, plant, engines, and facilities for heating and cooling milk. -provide also fences, gates, drains, hedges (cut by the owner), tanker roads... -all materials for repairing tanker roads, fences, and general maintenance shall be supply by the owner. -Is responsible to obtain the necessary authority from the local body to dispose effluent and for any failures to comply with the rules -to provide the systems for the disposal of such effluent	-have to pay the operating costs -Have to pay the costs of the maintenance and reparation for the shed, the cleaning, the reparation of damages and oil fuel electric power -Have to maintain the building in the same order and condition
Supply of milk		-Have to comply with Dairy company rules and prevent the contamination of the milk -is responsible of any produce and grading losses. Have to pay a compensation to the owner (except unpredictable events)
Weeds and pest control	-In case of contamination,must supply chemical and other material required	-as far as possible, the responsibility must be confined to prevention, -shall provide the spraying equipment and the necessary labour.
Water supply	-Have to provide an adequate supply of water for stock, cowshed and domestic purpose -Have to pay the cost of the material	-Cost for pumping water, fuel, oil, electric power
Fertilizer	-Responsible for the dates of application, quantity and specifications -Soils tests and results -Expenses for fertilizer and lime transport	-Cost (if made by a contractor) or the labour of spreading fertilizers
Supplementary crops, harvesting & grazing off	-Subject to consultation between the parties and final decision taken by the owner -The cost of seeds, sprays and fertilizer for supplementary crops is shared 50/50 -Regard to the extent of autumn-saved pasture, should there be insufficient hay or silage on the land at the commencement of this Agreement the owner will provide promptly at the owner's own expense the additional supplementary feed required.	-All work in connection with the cultivation and sowing of these crops shall be done by the sharemilker -Pay the work done by the contractors or provide the labour necessary to do the work related to the supplementary feed production. -The agreement also determines minimal results to reach.
Pasture renewal	-Where a pasture renewal programme is to be undertaken the owner shall provide all necessary sprays, seeds and fertilizer	-The sharemilker shall complete all work associated with spraying, cultivation and sowing of the new pasture for the owner.
Farm management	-the management and control of the land and any stock -despite a consultation, the owners is the only one to take the decisions	-The sharemilker, in the absence of directions or instructions from the owner, shall in all things observe and follow recognized farming practices.
Labour		The sharemilker shall devote his labour and that of his employees to the efficient carrying out of this Agreement
Milk Cheques	-receive any credits paid by the Dairy Company as a return on shares held by the owner in the Dairy Company	The owner shall lodge with the responsible Dairy Company an automatic payment to a (___%) of the income to the sharemilker in respect to the milk production.

***Appendix**: liabilities for a 50/50 sharemilking contract*

Source: http://www.grazinginfo.com/freestuff.php