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Change Management in Dairy Farming

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Abstract. Policy changes and the introduction of AMSs (automatic milking systems) have accelerated changes in the Norwegian dairy sector. Loose housing, joint farming operations and AMSs are in some cases introduced all at once or over a short period. Thus the ability to manage technical and organizational change successfully is becoming increasingly important for dairy farmers. To explore how farmers manage change we visited and interviewed four farmers who have invested in new loose housing and AMSs since 2003. Three of them have also entered joint farming. Further, we interviewed four dairy farming consultants. In this article we explore change using a change framework. We present and analyse four farm cases in depth and develop a conceptual model for change management on dairy farms. Our cases show that new technologies and farming systems can be introduced on similar farms with very different results. Continuous gradual changes, former experience with change, inner motivation, deliberate use of consultants, and careful planning of joint farming operations have a positive impact on farming performance during and after change. A key finding is that change should be recognized as a managerial challenge and not only as a matter of implementing new technology.

Introduction

> 'Dairy farmers and their families, in almost every industrialized country of the world, face an extremely uncertain future. The forces of change – locally, regionally, and globally – are formidable, persistent, and extremely complex' (Schwarzweller and Davidson, 2000, p. 1).

The dairy sector has been characterized as 'one of the most heavily capitalized and most tightly regulated of all the food producing industries' (Schwarzweller and Davidson, 2000). At the turn of the last century Schwarzweller and Davidson (2000) pointed to the lack of debate on the reshaping processes in dairying, their impacts and consequences. The strong political influence makes the sector vulnerable to deregulation and political shifts. In some regions, such as New Zealand, changes in policy have caused regional transformations where farmers have converted from sheep to dairy farming on a large scale (Forney and Stock, 2014). In this article we

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take a closer look at how farmers manage ongoing changes in Norwegian dairy farming. These changes, affecting both scale of production, milking technology, and cooperation between farmers are stimulated and framed both by agricultural policy and technological innovations.

Norwegian dairying is among the worlds' most highly subsidized. Average number of cows per holding grew from 5.3 in 1969 to 9.6 in 1979. Norwegian dairy farms are relatively small. In 2013 the 10 700 Norwegian dairy farmers produced 1,525 million litres of milk (TINE, 2013), and Norwegian milk production is based mainly on feeding roughage ad libitum supplemented with concentrate. In the period after 1983, milk quotas have restricted farm growth and investments in new technology in Norwegian dairy farming (Jervell and Borgen, 2000). By as late as 2005 the average dairy farm still had fewer than 15 dairy cows. Since then a combination of changes in quota regulation, affordable AMS technology and stimulation of cooperative farming has increased the rate of change in the sector. Changes in the quota system allow trading of quotas between farms, as well as larger quota sizes. Additional drivers of change are new animal welfare regulations that do not allow building of new tie-up barns after 2004, and require that all cows should be in loose housing by 2024.

Norwegian dairy farming is undergoing a period of rapid change. At present there are more than 1,200 AMSs operating in Norway (TINE, 2013), and the proportion of cows milked by AMSs increases rapidly. Some point to relatively small herds as one reason for the rapid adoption of AMS technology in Norway; one robot is enough to milk a herd of 60–70 cows. In regions with larger herds, for example in the US where herds averaged 61 in 1992, technologies such as milking parlours and carousels have been adopted at an earlier stage (Butler and Wolf, 2000). Parallel with the availability of affordable AMS technology, there have been changes in dairy farm and quota policies. One notable change is the stimulation of joint or cooperative farming; through pooling their milk quotas, farmers could achieve economies of scale and afford investment in new barns, with only moderate loss of individual farm subsidies. The number of dairy farmers involved in joint farming increased dramatically after the mid-1990 and, according to SLF (2014), joint operations dispose of almost one-third of the total milk quota volume in Norway. A large number of Norwegian dairy farms have changed their mode of production from small tie-up family farms to large, loose housing cooperative farming with AMS (Kjesbu et al., 2006; Stræte and Almås, 2007). The aim of this article is to study more closely the change processes as they unfold on different farms. First we discuss change management in a farming context based on previous research and theory on change management. Based on interviews with farm consultants and farmers we then present and discuss four illustrative and 'typical' cases of farmers that vary in age, motivation, change experience, and how the change process is managed. The cases are discussed and we search for factors that can explain why in some cases the changes in technology and organization cause few problems, while in other cases the change period is prolonged and characterized by significant drops in performance. The four case studies indicate that larger changes, such as when technology, size and organization are changed simultaneously, is more difficult to manage, and that former change experience, motivation, family resources, use of consultants and careful planning can ease the transitional phase.

Managing Change

Dairy farms are typically managed by families. On very small farms, such as in Norway, it is not uncommon for one or more family members to combine farming with off-farm work. In traditional milking systems there are strict demands on the timing of labour input over the day and week. Changing from tie-up barns to loose housing and from manual to robotic milking alters the nature of daily work and farmer–animal interaction. The increased flexibility that AMSs introduce is cited as one important motivation for adopting the system (Jacobs and Siegford, 2012). The same can be said about cooperative or joint farming; sharing responsibilities for daily chores among several farmers makes it easier for individual farmers to take time off or pursue other careers.

A combination of farm expansion and change of farming system can be challenging. Simensen et al. (2010) explored the interaction between herd size and housing system, and found higher yields in tie-up barns when herds are small (< 27 cows). Earlier US studies (Norell and Appleman, 1981) indicate an average drop in milk yield per cow when changing from tie-up to loose housing system. In contrast, a more recent study by Bewley et al. (2001) surveyed 252 dairy farmers that had expanded and found only small drops in performance and high levels of satisfaction, with those having the largest farm sizes (> 220 cows) and only new buildings the most satisfied. Bewley et al. (2001) attribute some of the success to improved practices in herd expansion and to farmers learning from other farmers' experiences. Gloy et al. (2002, p. 246) suggest that the negative relationship between performance and debt ratio found in their sample of dairy farms may be due to: 'a learning period during which the assets acquired with debt funds are assimilated into the business'. In a similar vein Sipiläinen (2008) report that many Finnish dairy farmers had difficulties maintaining technical efficiency in the adjustment process following from the Finnish EU membership.

Introduction of an AMS represents a huge change, in terms of removing routine contact between humans and animals, and of unsettling the usual ways in which farmers know and understand their cows (Holloway et al., 2014). Robots also allow the cows to reveal themselves to the farmer in new ways through the use of information technology and behaviour monitoring (Holloway et al., 2014). Further, introduction of an AMS unsettles the identities, roles and subjectivities of humans and animals and thus shifting the ethical relations (Holloway et al., 2013). Robotic milking opens up new possibilities for managing the cows without being present in the milking parlour. Thus stockmanship changes from looking at individual cows to looking more at herd averages, and there is a concern that reliance on the robot may lead to neglect of cows (Holloway et al., 2014). The technology transforms ways of knowing and spending time with cattle, such as reducing the amount of physical contact between humans and cows in the milking parlour while potentially increasing the amount of time humans can spend observing their cows (Owen, 2003). In addition to having a good stockman's eye the farmer also has to be computer literate. Thus conversion to a milking robot radically changes the work of the stockperson (Butler et al., 2012). This change requires a transformation of the whole management process.

The management of organizational change in general tends to be reactive, discontinuous and ad hoc, with a reported failure rate of around 70% of all change programmes initiated (Balogun and Hope Hailey, 2004). Studies of change in farming typically explore farm performance after change to a new technology or housing

system has taken place (for example, see Bewley et al., 2001; Simensen et al., 2010). According to Balogun and Hope Hailey (2004), the transition phase, during change, often gets too little attention during planning and decision-making. This may result in problems of finalizing the change and of post-change performance that do not meet expectations (Balogun and Hope Hailey, 2004). The 'classic change curve' (Elrod and Tippett, 2002) describes a typical period of low performance and despair during the transition. Successful change management should not only bring performance to a higher level after change, but also minimize the drop in performance during transition. To the best of our knowledge no studies have explored management on dairy farms using a change framework.

At the operational level, a key challenge is to implement change while daily operations are maintained simultaneously (Meyer and Stensaker, 2006). Because change does not happen in isolation, and is not a limited event or activity in the organization, balancing change-related tasks with daily operations is a crucial matter. In animal husbandry it is not an option to close down operations, even for a short period, to direct all resources towards managing change.

The magnitude of the changes involved will influence the capacity to manage change (Balogun and Hope Hailey, 2004). Where firms operate without significant investments or change over a long period, the need for large changes increases. Instead of continuous change the process becomes disruptive. In contrast, gradual expansion is change that only requires adjustments of existing working processes. The farmer can apply existing knowledge. On the other hand, large changes in technology and organization require a transformation of operation and management. A transformation entails a change in the routine assumptions and 'the way things are done around here' (Balogun and Hope Hailey, 2004). It is no longer sufficient to rely solely on existing competence and skills. This is similar to the multiple changes farmers experience when entering into joint farming or investing in a new cowshed and AMS. Many changes take place at the same time or over a short period. It is no longer sufficient to do a little bit more of the same, as is the case with gradual herd expansion. One has to put aside some of the old knowledge and acquire new, which can be a very demanding process at the individual level (Balogun and Hope Hailey, 2004). Thus a review of AMS studies suggests that differences in management and farm-level variables may be more important to AMS efficiency and milk production than features of the milking system itself (Jacobs and Siegford, 2012). Transformational changes require good planning and a lot of managerial resources in the implementation process.

A consequence of a long period of a stable dairy quota system and little scope for growth or large investments is that farmers acquire little competence in managing change processes. The successful management of change is crucial for the survival and success of small and medium-sized enterprises (By and Dale, 2008). Viewing change processes as isolated events presupposes that they have a clear beginning and end. However, due to the constant state of flux of the business environment in which contemporary organizations operate, organizational change management may prove more successful if focused on facilitating continuous change readiness rather than on implementing and managing specific change efforts. If managers adopt this approach, they are more likely to increase the successful management of change (By, 2007). It is perceived as crucial that organizations are continuously prepared to absorb and implement change as and when required (By, 2007). Making change happen without destroying well-functioning aspects in an organization

and without harming subsequent changes requires both capabilities to change in the short and long term and capabilities and capacities to maintain daily operations. Former experience in managing change will increase the capability to manage additional change (Balogun and Hope Hailey, 2004). Experience from earlier changes can make farmers better at handling the ambiguities and uncertainties that are common in change processes. They get used to being in a continuous state of change and to what it takes to overcome unforeseen problems that are unavoidable. They may be more motivated and prepared to make detailed plans for transitions, but also to handle situations that deviate from the plan. Former experience with changes contributes to change capacity, which can be defined as 'the allocation and development of change and operational capabilities that sustains long term performance' (Meyer and Stensaker, 2006, p. 220). As people gain experience with change they draw on their previous experience to interpret subsequent changes (Randall and Procter, 2008). People learn from experience and can potentially develop change capabilities either by transferring specific skills or knowledge, or by process-based learning, which means absorbing and applying new knowledge more efficiently (Schilling et al., 2003). Farmers with extensive experience of change processes acquire change capacity that makes them better at managing change than farmers with little experience.

Farmers need more than experience of or knowledge about a change to be able to succeed. According to By and Dale (2008), motivation is one of eight critical success factors for managing organizational change. Motivated farmers are more proactive and experience more control over problems than less-motivated farmers (Hansen, 2013). Problem-solving in unstructured contexts such as farm expansion involves unique challenges, and farmers must be motivated to develop additional cognitive and behavioural skills in order to succeed. Problem-solving skills mean little if a person is not motivated to use them. A high degree of motivation is required to solve problems in unstructured contexts such as farming because solutions require repeated physical efforts. Zimmermann and Campillo (2003) emphasize that intrinsic interest and high levels of motivation are necessary to sustain the many hours of practice that are needed to attain the necessary levels of skill. Motivation can exist at different levels. It can be rooted in intrinsic interest, e.g. a strong wish to be a farmer. Motivation can also be due to changes in the surroundings.

People seek information as they become more motivated to solve a problem (Grunig, 1997). Thus, motivation increases information seeking and, therefore, the probability of solving problems. Inner-motivated farmers take more actions and explore more options than farmers motivated from external forces or opportunities. Thus they produce more variation, which provides better opportunities for selection, and thus better experiential learning (Campbell, 1960; Weick, 1979). Motivation rooted in inner interest is stronger and lasts longer than motivation due to external forces or opportunities. We expect farmers who are internally motivated to manage change to AMS and joint farming better than farmers who feel themselves forced by external forces or pressure from family or neighbours.

Farming is embedded in social relations, primarily the family, but also in the local and national farming community. The milk quota system has been the object of strong opinions on fairness (Jervell, 1993), and Norwegian farmer organizations negotiate directly with the government on farm policy. Social capital, such as that inherent in farm organizations, communities and agricultural policy institutions, is an important resource for individuals and organizations, as it complements other resources

that individuals and organizations control. We define social capital according to Lin (2001, p. 19): 'investment in social relations with expected returns in the marketplace'. This definition reflects most writings on social capital (Lin, 1982; Bourdieu, 1983; Coleman, 1988; Burt, 1992; Portes, 1998). Using social capital in problem solving augments and complements the knowledge of an individual. Drawing on their social capital, individuals may mobilize other people to help solving problems (Rogers and Larsen, 1984; Saxenian, 1994; Greve and Salaff, 2001). Farmers may differ in the degree of social capital they have and in their abilities to mobilize resources from their network to help overcome a demanding transition process. Resources mobilized from friends or extended family can help farmers through demanding and labour-intensive periods, while more specialized network resources can play a role in planning the process. Most farmers have limited experience of comprehensive change processes. In contrast, consultants can acquire experience and specialize on managing the implementation of new technology, information systems, or types of organization. Access to and deliberate use of consultants can supplement the managers' competence (Werr, 2012). Consultants can analyse problems and suggest solutions, or they can support the farmers in shaping their own solutions. It is important to ensure that the farmer feels ownership of the plans and the process (Beer and Nohria, 2000; Balogun and Hope Hailey, 2004). Thus, deliberate use of consultants can supplement the farmers' own competence and thus improve performance during and after change.

All our case farms have entered joint farming as part of the change. Some years ago the government decided to encourage joint farming, with some success. According to the Norwegian Agriculture Agency, there were 1,510 joint operations in the dairy sector in 2011 (SLF, 2014). Joint farming operations mean that up to five dairy farmers merge their milk quotas, their land and their cowsheds and collaborate on the farm work. Creating joint operations makes it possible to increase production capacity and carry greater investment costs, thereby taking advantage of economies of scale, as well as complementary skills and resources. Although there are advantages, collaboration in joint operations does not guarantee success. The challenges of collaboration in joint farming operations may be especially prominent where farmers have traditionally worked independently, and therefore have little experience with extensive and committed relationships. In general, not all of the farmers who enter joint farming are equally motivated to continue farming (Schei et al., 2012). Some of them just want to reduce the demands of the farm work. However, there is evidence that entering joint farming requires careful planning to perform well (Schei et al., 2012). Participants must spend time and discuss all aspects of the farming operation in detail, including economics, share of workload, daily routines and each farmer's goals and expectations. The participants must establish psychological contracts to clarify their mutual expectations and obligations (Sverdrup, 2012). Joint operations that plan their farming carefully are shown to perform better than joint operations that spend little time on planning (Schei et al., 2012).

Data and Methods

The qualitative data for this article were collected as part of a larger project dealing primarily with animal welfare aspects related to changes from tie-up barns to loose housing (e.g. Ruud et al., 2010). This project, which collected detailed data on farms, revealed an increase in health problems and lower yields during and after transition

to loose housing in many herds. The project raised our awareness and interest in the problems that may occur during transition to new systems. To develop the research problem we first conducted semi-structured telephone interviews with four advisors in different parts of the country who advise farmers during change processes involving major building investments. We asked them about the change processes, what characterizes a successful transition and a process with problems, and about the duration of the transition period. Transition to joint farming was also covered. The interviews with dairy farm advisors confirmed that there is huge variation in how farmers manage the change processes, both in post-change performance and in the length of the transition period. Many farmers have problems in the transition phase, especially those who combine technological and organizational change. Based on these interviews and prior knowledge, we developed a thematic interview guide directed at farmers who had been through a large transition, including new cowshed and AMS, from 2003 to 2011.

We made a structured sample of farms with different experiences during a change that involved investments in new loose-housing buildings. These farms were visited by two researchers in 2010 and 2011. In three of the four cases we also visited the barns with the farmers and gained additional information. All farms can be characterized as family farms, and all had entered into some form of joint operation. In all cases we interviewed the primary farmer, the farmer who has the new barn on his lot (and close to the house). In one case two generations, the mother and son of the primary farmer, participated in the interview. The interviews were recorded and transcribed. We also made separate notes after the visits and compared these. All farmers have larger than average herds, and they are based in South-Eastern Norway (Akershus, Østfold, Hedmark and Oppland). The cases vary on other variables, such as farmer age, the number of people involved in daily operations, age of farmer, the use of family and hired labour. In two of the four cases the farmers have succeeded with change according to their own standards, while two have failed to achieve what they intended to accomplish.

The four cases represent variation with respect to key factors for successful change based on the interviews with farmers and advisors. How well the farmers have managed the change process and how satisfied they are with performance after change are measured primarily by their own subjective criteria, but also confirmed by herd recording data on production and health. All the advisors we interviewed mentioned that high milk yield is important for the economic result after large investments. One of the most experienced advisors put it this way:

> 'Yields are much more important after herd expansion than when you have 15 cows and most of your farm income is based on subsidies.'

We therefore use milk yield per cow as an indicator of performance during and after change. The farms also differ in how many heifers and cows they needed to purchase due to problems with the transition, and how many calves they lost. Calf health and calf loss are critical factors in dairy farming. We also use these figures as indicators of performance during change. The figures on milk yield per cow, the number of lost calves and the number of purchased cows were collected from the herd recordings.

In the following we first present short narratives of the four cases. In these we include typical citations from the interviews. Then we make a comparison of the cases with respect to key variables. Some of these are derived from the literature,

some from interviews with advisors who have experience of many change processes, while others have been identified through analyses of the case material.

Case 1: Young Farmer with Former Change Experience

This case involves a farmer in his early thirties who took over the farm 10 years ago after working actively on the family farm since early youth. Before taking over and making his own investments he was actively involved in a rebuilding of the barn to loose housing. He had a strong inner motivation to develop the dairy farm:

> 'I wanted to grow and I wanted to concentrate on one thing and to know I can do it well. It is more stressful to combine dairy farming with rented land for grain production.'

On taking over he was looking for a way to expand production, and bought quota where possible. When a neighbouring farmer quit dairying he saw a chance to buy quota and cows to almost double his herd and he decided to build a new addition to the barn and install an AMS. After some consideration of investments and how to use existing buildings, he decided on a solution requiring only a limited addition to existing facilities.

The building period was demanding, since rebuilding of the existing barn could not be carried out easily without significant involvement on his part, and he also had to take care of the daily work. Having his parents nearby on the farm was a good help in this phase. He emphasized the importance of not getting exhausted during the investment phase:

> 'The real work starts when the building process is finished.'

In spite of some initial problems of getting used to the new systems, he was able to keep the milk yield up during the transition phase to robotic milking and new feeding regimes. Getting used to the new management systems was a challenge, even for a relatively young person used to herd management systems. But at the time of the interview he found they give very good feedback, showing immediate falls in daily milk yields if he cuts down on the number of feedings for other activities. His deliberate choice of using existing facilities and buildings did not give the most practical of solutions, but he finds the extra time used for manure cleaning pays off. It helps him to stay familiar with the animals. Before building he carefully planned for herd expansion through recruitment from his own herd. This has helped him keep the facilities well stocked from the start. Due to this and careful control of investments, the economic results are satisfactory, and his vision for the future is to be able to build a completely new barn within 10 years, and to double his production.

Case 2: Farmers in Their Fifties with Large Changes after 20 Years in Business

On this farm the decision to invest in a loose-housing barn was taken by a couple in their fifties after more than 20 years of dairy farming in a barn built by the husbands' parents. The quota system had halted earlier plans of dairy expansion, and the couple had diverted instead their resources to other activities in off-farm work (him) and on-farm tourism (her). Investment had become a necessary condition to continue dairy farming, and new regulations on housing of young stock also required

changes. In this case expansion based on the old barn was not an option, since the floor and manure storage space could not be used. This required planning a whole new facility, and large investments.

Looking for ways to expand production, the family joined forces with another dairy farmer situated 10 km from their own farm. The new partner was in his sixties and had run a tie-up barn with 15–20 cows for many years. Thus both partners had little experience with change. The plan was to join herds and quotas, and finance the new dairy facility jointly. The partner was supposed to both be in charge of the building process and take his share of the workload in the new barn. After a short planning period without use of consultants they started building, and finally moved in six weeks after the estimated date. The new partner did not manage the building process well, so they had to hire an external person for the job. The delay was a critical incident that hampered confidence between the two partners. Another critical incident was the severe problems they experienced with the calves due to badly coordinated feeding routines. The new facilities also caused problems for cows used to tie-up barns, and culling rates were high, making it difficult to fill the milk quota:

> 'We moved in six weeks later than plan, right before Christmas. The cows reacted to the new surroundings and I think they sensed that we were stressed by the new technology. They were afraid to lie down, and many lost their milk.'

Thus joining the two herds reduced yields dramatically, also because the incoming partner had a low yielding herd:

> 'We had 70 cows altogether, and some had to be culled, his yields were 1,000 kg lower per cow, but we can't say we didn't know that.'

There were also large problems with manure handling and feeding systems. Since the reason for choosing a milking parlour rather than a robot was unfamiliarity with computerized systems and a preference for milking and contact with the animals, they had problems with using and understanding the new systems:

> 'None of us wanted to deal with a robot, and we almost panicked when we realized that also the milking parlour was computerized.'

The partnership did not work out well and was over by the time the barn was finished.

Case 3: Young Farmer in Joint Farming with Experienced Partners

The interviewed farmer was very motivated in farming. It had always been his wish to take over and develop the farm. He now runs the leading farm in a joint operation of three farms. In 2008 they built a new cowshed with an AMS, and the third member came into the partnership. Before this lies a long history of continuous change. The principal character's parents, who were still the owners of the farm, and participate actively in running the farm, built a new cowshed back in 1977. In 1996 they converted it to a loose housing barn with milking parlour. In 2005 the parents started joint operation with another farmer, and took over his cows. The other partner now keeps the bull calves for fattening at his farm.

Two of the partners are carpenters, while the principal farmer is a graduate in constructional engineering. These joint skills were crucial in planning and running

the new cowshed in 2008. The principal farmer planned the building himself with assistance from one of the others, and was also responsible for negotiations with the contractors. Earlier on he had worked as an engineering consultant in a firm similar to the one who was now engaged in building the new cowshed. To reduce costs they decided to use the buildings from 1977 and 1997 for calves and young stock. During the planning process, special attention was paid to ease transition from the 'old' to the new cowshed, and to keep production running during the change. The principal managed the building process himself, but engaged a local entrepreneur with good records to do the work. Like the farmer in Case 1 he was aware of the danger of getting exhausted during the building period.

The transition to the robot was done gradually. Before the cows were introduced to the AMS, they were milked in the old milking parlour for some weeks. Thus they could adapt to the new environment gradually. Nonetheless, the transition period was not without problems. The building process was delayed by two months, and they also lost some calves. However, as they were used to handling change, they did not get overwhelmed by the problems but solved them quickly and managed to fill the milk quota already in their first commercial year. Thus they capitalized on their experience with continuous change:

> 'We had similar problems earlier when we changed to free stall housing.'

All three partners knew each other well in advance and during the planning process they were very open-minded, also concerning their private economy. According to the principal farmer, this is crucial:

> 'Both chemistry and economy is important.'

All three farmers share a common interest in budgeting and cost control. However, they realize that they have limited competence in farm economics, and therefore they hired a consultant to set up a budget every year. The consultant helps them to follow up the budget as soon as the farm accountants are available:

> 'Budgeting provides confidence', the principal expresses it. And he adds: 'It is motivating to set goals, and to reach them.'

The last update showed that they were considerately better off than budgeted.

Case 4: Farmer in His Fifties Enters Joint Farming as A Way to Expand

The interviewee is in his fifties, and has run the farm together with his father from the early 1980s. In addition they had a hired employee. Around the year 2000, he planned to build a new loose housing barn because the old tie-up barn needed replacement. However, the plans were put aside. In 2003 he and some other dairy farmers attended a meeting arranged by the dairy company, and a discussion on collaborative farming came up. During the summer of 2003 he had a discussion with two other dairy farmers, and with the help of a consultant they settled an agreement. The planning period was approximately half a year, a very short period of time considering they did not know each other in advance. The second partners in the collaboration were two brothers in their seventies, and the third a dairy farmer who was about half their age. In the spring of 2004 they built a new loose housing shed with robotic milking and automatic feeding. The building period was delayed due to an overestimation of their own work effort. The cost of the automatic feeding sys-

tem was well above budget, and in spite of high costs it did not work well. The firm who delivered the system had been responsible for the planning, and it turned out that they had underestimated the quantity of roughage necessary. In addition, the farmers experienced extensive problems with the manure handling system and with calf mortality. It took a long time for the cows to adapt both to the free barn and to robotic milking. The responsibility naturally fell heavier on the principal farmer who had the new building close to his house, and to him the AMS was a huge change:

> 'With a robot you are never completely off duty. Your mobile can go off anytime, reporting problems.'

The three herds that were merged came from tie-up barns, and a lot of cows had to be culled because they did not adapt to their new environment. Due to these adjustment problems the milk yield was reduced significantly, and they did not manage to fill the milk quota. The manure handling system was planned by the firm who delivered it, and they ended up with a system that was new in Norway at that time. After considerable problems the farmers themselves finally managed to improve the system to make it function. When we asked the principal farmer whether he would have done anything different, he answered:

> 'I would have bought or leased quota and gone alone. Instead of a robot I would have preferred a milking shed and a hired worker.'

Comparison of the Four Cases

In this section we compare the four cases, and start by presenting some farming results before, during and after change. In Figure 1 we present the milk yield per cow on the four case farms.

Our case farmers differ a lot in how well they perform during and after change. We notice that Cases 1 and 3 have a higher milk yield than the two other case farms, particularly in the year of change and the first year after the change. The farm in Case 1 actually increases the milk yield in the year of change, then drops the first year after change and recovers the second year. In Case 2 the milk yield drops sig-

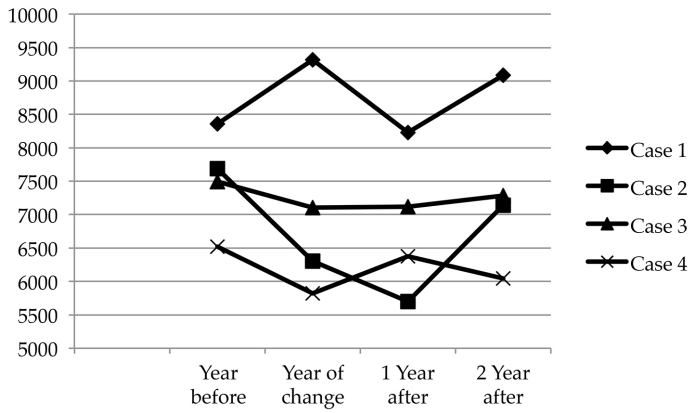

Figure 1. Milk yield per cow in kilogram energy-corrected milk in the year before, during change and the first two years after change for the four case farms.

nificantly in the year of change and the following year, approximately 2,000 kilo per cow. In Case 4 the yield also drops in the year of change and does not recover even in the second year after change. In Case 3 the yield drops, but much less than in Cases 2 and 4. The yield is also at a significantly higher level. The farmers in Case 4 also experienced huge problems with calf mortality. From the year before change to the second year after change they lost on average 18% of their calves, while the other three farms lost only 6% during the same period. Further, the farmers in Cases 1 and 3 lost fewer cows during transition. They were also much better at planning for herd expansion and rearing of heifers to increase the herd. Thus they only had to buy 23% and 16% of the cows and heifers they needed, respectively, while the similar figures for the farmers in Cases 2 and 4 were 45% and 46%, respectively. Taken together the differences reported here indicate that the farmers in Case 1 and Case 3 had a significantly better production economy during change than Cases 2 and 4.

In Table 1 we compare our cases according to a change management perspective. We notice that the two cases with the most transformational changes (Cases 2 and 4) also have less relevant change experience than the two others. They experience more capacity strain due to the large transformation. The combination of strained capacity and lack of experience makes the change process vulnerable to unforeseen events and problems. In change terms Case 4 is like a Big Bang change. A lot of changes took place simultaneously; from single to collaborative farming with new partners, from three tie-up barns to one big free shed, and new systems for milking, feeding and manure handling. In addition, the farmers in Case 4 did not know each other in advance and were at very different life stages. Their experience with change

Table 1. Change management: comparing the cases.

	Case 1	Case 2	Case 3	Case 4
Change type	Gradual herd expansion, technology modification	Transformational; herd expansion, new technology, new organization	Gradual herd expansion, technology modification	Transformational; herd expansion, new technology, new organization
Change experience	Building investments, expansion and change of system	Diversification to other fields	Building, expansion and change of system and cooperation	Limited change experience
Capacity	Strained but sufficient	Strained, prolonged transition	Strained but sufficient	Strained, prolonged transition
Change management (transition phase)	Increasing yields and production	Problems with technology Yield drop High culling rate Partnership strained	Some expected problems, recovered quickly	Problems with technology Yield drop High culling rate
Motivation	Inner	External	Inner	External
Use of consultants	Deliberate before change	Limited	Deliberate before and after	Limited
Planning of joint operation	Limited	Limited	Careful	Limited
Performance(post-change)	Better than expected	Financial strain, does not meet expectations	Exceeding goals earlier than expected	Does not meet expectations

was also limited. A dairy advisor commented on the importance of experience with change processes:

> 'Those who are experienced with changes have a great advantage. They know what change is all about, and they need less help from consultants.'

Similarly, the farmers in Cases 1 and 3 had both been involved in a major building process that included change from tie-up barns to loose housing and herd expansion. Their former experience made them mentally prepared for possible transitional problems, and how these could be handled. For them, continuous strategic change had become a kind of lifestyle. They had acquired a high change capacity.

The lack of change experience in Cases 2 and 4 could perhaps have been compensated through mobilizing support from advisors. Several of the farmers we interviewed underlined how much interaction with consultants or agricultural advisors meant to them. A male farmer in his thirties who was very satisfied with the transition to an AMS put it this way:

> 'The distance between me and the advisors has always been short. I've always known who to ask for advice… and discussing with them has been valuable to me.'

An experienced advisor also stressed the importance of using consultants during and after change:

> 'With respect to guidance there are two major challenges; feeding and milk quality. Fat dry cows and thin lactating cows are common. Therefore the farmers need to get in contact with feeding specialists immediately. They also need help from consultants to sort out cows with high cell counts.'

The farmers in Case 1 and 3 also used consultants in planning and implementing the changes. The principal farmer in Case 3 explains how a dairy consultant helped them to make budgets for the transition period and suggested how profits could be shared between the three partners:

> 'It is important to have a budget, at least in the beginning, with a new production system and expansion… You feel more confident about what you are doing.'

The farmer in Case 1 also used consultants in areas where he had limited competence himself, such as economic long-term planning. However, for the building process he himself had the relevant knowledge and experience. Contrary, the farmers in Cases 2 and 4 did not interact much with consultants before, during and after the change.

The farmers in Cases 1 and 3 had an inner motivation to grow and to develop the business. The changes were outcome of seeking opportunities proactively. Several of our farmers showed a strong inner motivation to develop the farm continuously. A very motivated male farmer in his forties had moved from a tie-up barn to loose housing with robotic milking and was satisfied with the change. He put it this way when we asked him what he enjoyed in dairy farming:

> 'I'm not that experienced so I haven't had time to be bored… Everything is new, you learn something every day. To maintain the interest in farming you have to develop the farm. I appreciate the freedom in my work, to be my own boss and the versatility my job offers… And it's really rewarding to work with animals.'

Compared to Cases 1 and 3, the change in Case 2 was more motivated by outside forces. Partially as a result of quota regulations, the farm family had diverted resources to the development of new ventures on the farm, but milk production was still economically important. In Case 4 the farmer had been motivated for change over a longer period, but inhibited by regulations. His motivation in joint farming came more or less spontaneously after a meeting arranged by the dairy company, where he saw the opportunity to increase the milk quota and acreage. Thus joint farming was not his primary wish. One of the dairy advisors underlined the importance of inner motivation when we asked him about the most important success criteria:

> 'They farmers need great commitment. They have to spend the time it takes to get the job done and do it 105%. It's not enough to see what other farmers have accomplished… You can see them at meetings, the ones who do not listen… they need to accept what it is all about before they start.'

In Case 3 the farmers spent a lot of time discussing and planning their joint operation. The discussions were open and they managed to build trust, gain a common understanding of the change, and harmonize their expectations. Through thorough planning and a lot of communication and interaction during the whole transition process, the partners managed to developed a common understanding of the future aims and recreate their former ways of working, their daily routines and practices. The principal farmer was also very satisfied with how the joint operation worked. In Case 1 the farmer did not spend much time on planning the joint operation because in practice it simply involved rent of extra land and milk quota. The other farmer was passive and just received a rent. In Cases 2 and 4 the farmers spent very little time on planning and discussing, and this can explain why the results did not meet their expectations. In Case 4 the farmers did not know each other well before entering the joint operation. In Case 2 the interviewee claimed to know her partner well ahead of the partnership. However, as the transition evolved, she discovered that they had quite different practices and routines. They had not managed to develop a common understanding of the future aims and recreate their ways of working, their daily routines and practices.

In Figure 2 we sum up our main findings. Former experience with change increases the farmers' change capacity, which in turn improves the change management. Inner motivation improves both change management and farm performance during and after change. Deliberate use of consultants and careful planning of joint operations also contributes positively to change management and thus to farming performance during and after change.

Analysis of the cases could indicate that age is a factor, and that transformational change is more easily handled by younger farmers (Cases 1 and 3). After many years of dairy farming, routines become automated, often with success (Case 2). In such cases external pressure to change may both disturb established routines and decrease motivation. This could be especially difficult when the routines of different farmers and herds are mixed as in joint farming with several active partners. In Case 2 the original plan was turned around as the joint farming was dissolved and an AMS installed in place of the new milking parlour. Cases 1 and 3 both have young farmers, but also farms where the principal farmer is in charge (Case 1), or has active support from parents and supplemental competence from partners (Case 3). The

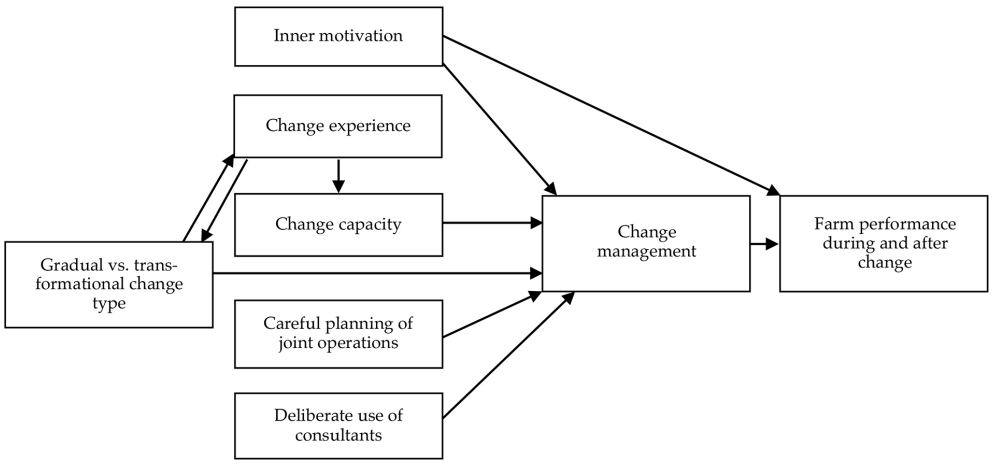

Figure 2. Conceptual change model based on our hypotheses.
Note: By change type we mean gradual change versus transformational change, and by change management we mean how well the change is managed.

relative success of the younger farmers may therefore have more to do with motivation and social capital than age in itself.

Discussion

This study is among the first to address the introduction of AMSs and cooperative farming on dairy farms from a change management perspective. Our study demonstrates that when farmers carry out large changes, such as combinations of herd expansion and change of technology and organization, the transitional period can be aggravated in some cases and last for several years. The case-study method highlights the complexity of change management and how earlier change experience influences the transition process. Earlier change experience eases transitions on three theoretically different grounds. First, earlier changes mean that new changes become more gradual. Second, earlier change gives experience that creates familiarity with change processes, more realistic expectations and greater ability to handle challenges, also by mobilizing extra resources such as family members and consultants. Third, previous change experience in a small-firm context may indicate that the farmer tolerates uncertainty and is proactively seeking opportunities for development.

The farmers in Cases 1 and 3 made what may be seen as unprofitable investments during the 1990s, building new loose housing cowsheds for a relatively small herd. However, these seemingly unprofitable investments may have paid off in terms of increasing management capabilities and capacity for change. During their history of change they have acquired valuable experience and capabilities that enable them to handle new changes and transitions. When problems arise, their previous experience gives them the self-confidence they need to solve them. Adopting an AMS, these farmers did not face all the challenges of new housing, feeding and manure handling systems at the same time. The change process was much less demanding. Our findings are in line with scholars who argue that change needs to be made

regularly and rhythmically through so-called time pacing (Brown and Eisenhardt, 1997; Eisenhardt and Brown, 1999). This creates a regular, rhythmic, and proactive approach to change that can increase the capacity for change by creating a sense of urgency; hence, it increases the intensity of the effort in terms of information search and learning and increases the absorptive capacity (Linsu, 1998). At the same time, however, it gives people a sense of control because change becomes predictable, focused, and efficient.

Changes that involve expansion, growth, technology and organization simultaneously are challenging. Entering cooperative farming is a fundamental organizational change, as it increases the complexity of the organization and the potential for conflicts in decision-making as well as in day-to-day work. However, our findings show that even such a radical change in farm management can be handled successfully, given that the participants spent enough time on planning. Our findings support the findings of Schei et al. (2012). Collaboration with a passive partner is another way to reduce the complexity of joint operations.

Our findings support the importance of inner motivation. Here our findings are in line with Zimmermann and Campillo (2003). Farmers who go through transformational changes need a strong intrinsic interest and a high level of motivation to succeed. Encouragement from e.g. the government or dairy consultants is of course helpful, but it is not enough to accomplish the large changes we describe in our study. Intrinsic interest and motivation is necessary to be persistent enough to solve all the demanding tasks involved in transformational changes. Policymakers should take this into account when they change regulations or set up investment schemes to support large investments.

What are the implications of our study for dairy farmers, or other small businesses facing large changes? Our study shows that similar technologies can be introduced on comparable farms with very different results. Farmers should be aware that managing change while maintaining day-to-day production will strain their capacity. Therefore they should be prepared for a possible drop in performance. Previous experience, the capability to manage change and sufficient capacity is important to cope with transition problems. Dairy farmers need time to adjust to growth, often several years, particularly if the relevant management capacities are not in place ahead of the investments.

Our study has some limitations. It is based on retrospective interviews and participants may have had selective memory in describing and interpreting previous behaviour, in hindsight. Future research could therefore attempt to follow change processes as they unfold over time. Future studies could also try to verify our model of change by the use of quantitative analysis. The objective performance measures based on several indicators of productivity over a four-year period do, however, serve to confirm findings from the interviews about the challenges of managing change.

Conclusion

Continuous gradual changes, former change experience, inner motivation, deliberate use of consultants and careful planning of joint farming operations have a positive impact on performance during and after change. Farmers with experience from continuous change processes develop managerial capabilities and a change capacity that may be important to meet future changes successfully. Transformational chang-

es, such as those facing dairy farmers introducing AMSs, or large changes in the regulatory environment, should be recognized as a managerial challenge, and not only as a question of production scale or implementation of new technology.

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