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2022-01


http://hdl.handle.net/10138/337426
https://doi.org/10.1016/j.futures.2021.102870

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Coping with uncertainty: Exploring the foresight actions’ role in supporting growth-orientation among Finnish dairy farmers

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ABSTRACT

The two objectives of this study are to investigate how Finnish dairy farmers cope with uncertainties of their external business environment and how they apply foresight methods in their strategic management, e.g., in planning for expansion. The research data consist of 135 survey responses from larger than average dairy farmers across Finland. To reveal the role of future thinking and long-term management in farmers’ goal setting, we first carried out an explorative factor analysis (EFA) for the management related claims. The identified latent factors were managerial, planning, and cautious approach. Significant differences in managerial approach were found with respect to turnover and age of farmers. Planning approach correlated with farmer’s time horizon. In the binary logistic regression for predicting the growth orientation farmer’s planning approach, age and length of time horizon were the only significant predictors. Many farmers are particularly cautious when it comes to planning the future of milk production. Strengthening farmers’ foresight skills with training may help farmers to cope with volatile business environments.

1. Introduction

Following certain megatrends, there have been major changes in the food and agribusiness sectors. One has been the development of global markets (Boehlje, Roucan-Kane, & Broring, 2011), while the other has been the expectation that climate change will affect food production (Niles et al., 2015). Together with fluctuations in local markets, these global changes have had an impact on the business environment for dairy farmers in Finland as the country’s milk market is, in spite of its remote location, now very closely integrated with the global agricultural market. Consequently, there has been a rapid structural change at the local level and global drivers have sped this process up. As of 2019, the average number of milking cows per farm was 41 and there were 5720 dairy farms (LUKE, 2021). It has been predicted that, by 2025, there will be fewer than 4200 dairy farms left in Finland (LUKE, 2019a), and yet in spite of this decrease, overall milk production will barely decrease. Since 1995, the milk production has remained in 2.4 million tonnes in Finland (LUKE, 2019b). After 2010, the most significant decrease has been in the number of dairy farms with herds of less than 50 cows; while the number of farms with more than 50 cows has increased (LUKE, 2019c).

Similar structural changes have been observed globally (Britt et al., 2018). To stay economically competitive over the next few decades, growing farms will need to cope with an increasing complex business environment. Expanding milk production means dairy farmers in Finland must develop their operational and strategic management skills in order to make long-term strategic commitments.
e.g., investing in cow barns. However, profitability of these long-term investments is often uncertain, as it is hard to know precisely how the business environment will change. Long-term strategic planning is thus essential; according to (Ebener & Smith, 2015), such ‘strategic planning’ will not only clarify the goal of a business but will also guarantee its success. One way to support this is to use foresight methods; Horton (1999) defines foresight as a way for businesses to explore possible future developments that will help them make decisions and improve their competitiveness, while Rohrbeck and Schwarz (2013) see foresight as a way to gain a better understanding of changes in the business environment.

Meanwhile, Vecchiato (2012) emphasises how foresight provides the tools for management to reframe strategic planning in an uncertain situation. The core of foresight lies in evaluating trends and changes in the business environment. Various corporations use it to develop their business, as it allows them to make long-term plans (Daheim & Uerz, 2008) and spot uncertainties in their business environment. Likewise, foresight methods can help farm entrepreneurs achieve success by improving their understanding of uncertainties in their business sector and the consequences of any potential changes they might be planning (Tilley & Fuller, 2000).

Heinonen, Karjalainen, Ruotsalainen, and Steinmüller (2017) emphasise how foresight actions are also important in the energy business sector because, rather than a direct development curve, there are various change processes going on at different paces and understanding these requires continuous work (Heinonen et al., 2017). Integrating foresight methods into farm management could clearly improve agility and help maintain the profitability and competitiveness of dairy farms. The aim of this study is to increase the education and advisory sectors’ understanding of dairy farmers’ foresight actions. The research targeted to larger dairy farms, which are expected to be the most potential survivors of the structural change. As Lehtonen and Niemi (2018) stress, because Finnish agriculture is presently based on small-scale farming which has high costs and low productivity, there is a need for structural change in Finland. More attention should be paid to those farmers seeking for growth for their business, as by aiming to expand milk production they are supporting the regional food supply and are thus an important group in terms of food security.

This study aims to fill the knowledge gap in foresight research by focusing on how foresight methods are implemented in the farming context. The purpose here is to explore how growth-oriented dairy farmers in Finland see their future and to reveal the kind of foresight actions they use to facilitate strategic planning in farm management. Researching this question is particularly pertinent when it comes to designing and delivering additional training for dairy farmers, as it will not only show which current foresight methods are being used, but also provide benchmarks and deliver practical know-how – these are the concerns which frame the context of this study.

The second section of this article explores the business environment of dairy farmers, its sources of uncertainty, foresight in greater detail, and how foresight is implemented in dairy farm management. The third section presents the data and methods used, while the fourth focuses on the results and discussion, followed by a conclusion.

2. Uncertainties in the dairy farming business environment

As Groenewald (1987) points out, farming entrepreneurs face a great deal of risk and uncertainty. This article follows the interpretation of risk as ‘uncertain consequences’, whereas uncertainty itself is ‘imperfect knowledge’ (Hardaker, Anderson, Huirne, & Lien, 2015), and these twin aspects of farming guide this article throughout. Guesmi and Serra (2015) state that uncertainty is ‘more the norm than the exception’ in agriculture, as farmers face challenges in many forms, as ‘changes in natural, technological, economic, political, and social environments’ (Malcolm, 2011). As such, agricultural business environments can be approached from different perspectives: for instance, in terms of micro-social, internal, and external farm environments (Hansson, 2007). But irrespective of where this analysis begins, one must accept that a typical feature of external environments is that farmers can only adapt to them (ibid); macro-level uncertainties arise from global changes in supply and demand, for instance, which often lead to increasing fluctuation in milk prices – forcing dairy farmers to adapt (Britt et al., 2018).

As European agriculture is subject to strong political regulation in the form of the EU’s Common Agricultural Policy (CAP) – some of this uncertainty in farming takes a political form (Ondersteijn, Giesen, & Huirne, 2006; Schaper, Lassen, & Theuvsen, 2010). European dairy farmers faced major changes when milk quotas were abolished: because it enabled milk production to be increased without penalties, there was overproduction and milk prices became more volatile (Methorst, Roep, Verhees, & Verstegen, 2017). While some farming businesses expanded milk production, many refrained from making investment decisions that would overcome the volatilities of the business environment (Klopic et al., 2019). As well as policy regulations, there are civic pressures concerning environmental and animal welfare issues, and markets (Ambrosius, Hofstede, Bock, Bokkers, & Beulens, 2015). Novel forces that challenge traditional food production arise as the agricultural sector confronts certain expectations of providing other social benefits in the form of public goods and services (Boehlje et al., 2011; Gomez-Limón, Gomez-Ramos, & Fernandez, 2009; Guesmi & Serra, 2015; Norton, 2016).

Only a few studies have focused on how farmers anticipate future changes in their external business environments (e.g., Ondersteijn et al., 2006) even though these changes may be essential in strategic planning – a far more widely studied subject with several frames of reference (e.g., McDonald, Shalloo, Pierce, & Horan, 2013; Niles, Brown, & Dynes, 2013; Methorst, Roep, Verhees, & Verstegen, 2016; Veerhees, Malak-Rawlikowska, Stalgiene, Kuipers, & Klopic, 2018). Several such studies on decision-making in agriculture and dairy farming (Ferguson & Hansson, 2013; Hansson & Ferguson, 2011) have focused on how decisions are processed and implemented. Lunneryd and Öhlmér (2009), for instance, investigated strategic decision-making in Swedish dairy farms, while in Finland there has also been some foresight literature concerning the ways in which farmers collect and process information about the future (Rikkonen, Mäkijarvi, & Ylitalo, 2013). Nevertheless, studies on the use of foresight information in farming remain relatively scarce, and a greater understanding of the subject would improve farmers’ agility in strategic planning and management.

Farmers face a difficult position in the market as they are usually caught between stronger players (Michels & Gow, 2012). As a consequence they have little control over producer prices, but dairy farmers can command other parts of the production process.
In dairy farm management, foresight is essential in tackling the driving forces of the business environment to render it less complex (Leppilä, Mustonen, & Kauranen, 2012). This complexity is, along with uncertainty, a perpetual feature of the agricultural sector (Huan-Niemi, Niemi, Rikkonen, Wuori, & Niemi, 2017). Foresight can be carried out at the individual level (Huan-Niemi et al., 2017; Tapinos & Pyper, 2018) and so be incorporated into a farm’s management routines (Appiah & Sarpong, 2015). For foresight to work most beneficially, changes in the business environment are not simply observed, but also analysed and acted upon (Daheim & Uerz, 2008). When the business environment is regularly checked and analysed, the changes needed can be spotted at an early enough stage – allowing dairy farmers to maintain agile and competitive.

Tilley and Fuller (2000) make the point that having a strategic awareness capability helps small businesses – as many Finnish dairy farms are – to improve their competitiveness and chances of survival. Foresight enables the entrepreneur to internalise information and data about both the internal and external environments and use the knowledge accumulated in their business management (Hannon & Atherton, 1998; Tilley & Fuller, 2000). Foresight thus plays an important role in the development of an organisation’s macro-level understanding (Cunha, Palma, & Costa, 2006), precisely because it synthesises information from a range of sources and so grounds any conclusions made about the expected impacts (Daheim & Uerz, 2008).

Although foresight predictions can in no way guarantee 100 per cent accuracy (Tilley & Fuller, 2000), the process encourages proactive business management that will be more flexible and agile. Duguay, Landry, and Pasin (1997) define flexibility as a company’s capacity to deploy and redeploy its resources, and the key to agile management is the ability to adapt to changes in the external environment (Duguay et al., 1997).

3. Data and methods

3.1. Data collection and survey design

A survey of 135 Finnish dairy farmers was used in the empirical analysis for this study. The data was collected between February and March of 2019 from Finnish dairy farmers found within the intranet pages of Valio. Valio collects 80 per cent of the raw milk produced in Finnish dairy farms and operates in nearly every part of the country (Valio, 2020). The survey was voluntary, and those who responded received information about their anonymity in the study, the purpose and background of the research, and how the data obtained would be used. The survey was advertised in the intranet’s news column, and a link to it was also posted on Valio’s private social media accounts. The survey was accessed a total of 421 times and overall, 216 respondents began to answer the questionnaire also enquired about a range of foresight actions that participants might be implementing in their dairy farm management. Interestingly, the respondents to our survey were somewhat younger than Finnish dairy farmers on average, and women were more active in responding than men even though, according to Finland’s national statistics (LUKE, 2019d), men are reported to be the primary farmer in 85.3 per cent of the farms in Finland and women in only 14.7 per cent Table 1. Despite these statistics, farming couples may, in practice, have equal roles in the strategic management of a farm-unit. The turnover distribution among our respondents showed that larger than average dairy farmers were clearly more motivated to respond.

As the present study needed to be somewhat explorative in nature, due to the lack of directly relevant previous research, the survey questionnaire also enquired about a range of foresight actions that participants might be implementing in their dairy farm management. Interestingly, the respondents to our survey were somewhat younger than Finnish dairy farmers on average, and women were more active in responding than men even though, according to Finland’s national statistics (LUKE, 2019d), men are reported to be the primary farmer in 85.3 per cent of the farms in Finland and women in only 14.7 per centTable 1. Despite these statistics, farming couples may, in practice, have equal roles in the strategic management of a farm-unit. The turnover distribution among our respondents showed that larger than average dairy farmers were clearly more motivated to respond.

3.2. Statistical analysis

The statistical analysis was conducted in three phases. The first was to explore the latent factors behind the variables associated with futures thinking and long-term management by carrying out an explorative factor analysis (EFA) with Varimax-rotation on them. These EFA variables are presented in Table 3. Factor scores were calculated for each individual respondent and variable. The second stage was to divide the participants into groups and use Kruskall-Wallis tests to examine the differences in factor scores between each group. The final stage in the analysis was to build a binary logistic regression model to explore whether the variables and factors correlated with the probability of belonging to the group of farmers that were growth oriented.

EFA determines the correlation between variables in linear terms (Field, 2018) by grouping them according to a smaller number of latent factors $\gamma_i$. Each resulting variable group $x_{in}$ correlates significantly with one or more latent factors representing constructs underneath (Field, 2018). In our particular context, EFA was used to reduce the original variables elicited from the survey, which had asked dairy farmers to evaluate the importance of foresight actions and thinking futures in managing their business (Table 3). Eq. 1
presents the linear model used for the EFA (Field, 2018).

\[ y_i = \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots + \beta_n x_{ni} \]  

(1)

Rotation in EFA makes interpreting the results simpler by allowing the factor loadings of each group of variables to be more clearly differentiated (Field, 2018), as only strong loadings are counted (Jolliffe, 2002). The reliability and internal consistency of each factor can then be evaluated with a Cronbach’s alpha. There has been much debate about what makes an acceptable cut-off point for reliability with Cronbach’s alpha, but generally values of between 0.50 and 0.80 have been used (Field, 2018). One aspect to consider when calculating this value is the number of variables in each factor (Field, 2018; Hair, F.; Black, B.; Babin, & Anderson, 2010) and the precise context of the research in question (Field, 2018).

Because the dependent variable is binary (Table 2), factor scores were incorporated into the logistic regression as explanatory variables and the dependent is coded a dummy variable. Being binary also means the logistic regression variant of an OLS regression analysis needed be used (Hair et al., 2010), as unlike a straightforward OLS, it can handle a categorical dependent variable (Field, 2018; Hair et al., 2010) and so predict the membership of a binary category (Field, 2018). By then using a logarithmic transformation for odds ratio, a non-linear relationship could thus be presented in a linear form (Field, 2018). The equation of logistic regression (Eq. 2) used in this process can be expressed as follows:

\[ \ln \left( \frac{\lambda_i}{1-\lambda_i} \right) = b_0 + b_1 x_1 + \ldots + b_n x_n \]  

(2)

where \( \lambda_i \) is the probability of an event occurring, \( 1 - \lambda_i \) is the probability of it not occurring, \( \frac{\lambda_i}{1-\lambda_i} \) is the odds ratio, \( b_0 \) is a constant, \( b_i \) is a parameter, and \( x_i \) is a predictor (Field, 2018; Hair et al., 2010). The coefficients in this logistic regression represent the nonlinear relationship between the dependent (log of odds ratio) and independent variables (Hair et al., 2010). Calculating the odds ratio is an important part of interpreting the logistic regression; as the probability cannot have values outside a scale of 0–1, a logistic (or logit) model needs to be used to translate probability into an odds ratio. The odds ratio presented in equation 3 is thus an exponential function of the logit model (Hair et al., 2010):

\[ \text{Odds} = \left( \frac{\lambda_i}{1-\lambda_i} \right) = e^{b_0 + b_1 x_1 + \ldots + b_n x_n} = e^{\text{logit}} \]  

(3)

Once the odds ratio is calculated, the probability \( \lambda_i \) can be expressed as the following logit model:

\[ \lambda_i = \frac{e^{\text{logit}}}{1 + e^{\text{logit}}} \]  

(4)

When the probability is 0.50, the odds ratio is 1.0; when it drops below 0.50, the logit becomes negative with an odds ratio under 1.0;

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Descriptive of sample</th>
<th>Descriptive of all Finnish dairy farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer’s age</td>
<td>Mean 44 years</td>
<td>Mean 49 years**</td>
</tr>
<tr>
<td>Farmers’ age groups</td>
<td>Percent of observations in the sample</td>
<td>Not available</td>
</tr>
<tr>
<td>Less than 35</td>
<td>20</td>
<td>Not available</td>
</tr>
<tr>
<td>35–44</td>
<td>35.6</td>
<td>Not available</td>
</tr>
<tr>
<td>45–54</td>
<td>44224</td>
<td>Not available</td>
</tr>
<tr>
<td>55–64</td>
<td>44271</td>
<td>Not available</td>
</tr>
<tr>
<td>65 or more</td>
<td>0</td>
<td>Not available</td>
</tr>
<tr>
<td>Number of dairy farms</td>
<td>135</td>
<td>5720 farms***</td>
</tr>
<tr>
<td>Farmer’s gender</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>42.3%</td>
<td>85.3%*</td>
</tr>
<tr>
<td>Female</td>
<td>57.0%</td>
<td>14.7%*</td>
</tr>
<tr>
<td>Did not specify</td>
<td>0.7%</td>
<td>Not available</td>
</tr>
<tr>
<td>Annual turnover of the farm</td>
<td>% (n of farms) of the sample</td>
<td>% (n of farms) of all Finnish dairy farms</td>
</tr>
<tr>
<td>Less than 50,000€</td>
<td>0.7% (1)</td>
<td>2.6% (150)</td>
</tr>
<tr>
<td>50,000–100,000€</td>
<td>7.4% (10)</td>
<td>27.1% (1550)</td>
</tr>
<tr>
<td>100,000–250,000€</td>
<td>25.2% (34)</td>
<td>46.2% (2640)</td>
</tr>
<tr>
<td>250,000–500,000€</td>
<td>45.9% (62)</td>
<td>18.7% (1070)</td>
</tr>
<tr>
<td>500,000–750,000€</td>
<td>12.6% (17)</td>
<td>4.2% (240)</td>
</tr>
<tr>
<td>750,000–1,000,000€</td>
<td>6.7% (9)</td>
<td>0.1% (60)</td>
</tr>
<tr>
<td>1,000,000€ or more</td>
<td>1.5% (2)</td>
<td>Not available</td>
</tr>
</tbody>
</table>

*Gender share of milk farm managers in official Finnish agricultural statistics in 2016 (LUKE Natural Resources Institute Finland).
**Mean age of Finnish dairy farmers in 2019 (LUKE Natural Resources Institute Finland).
***Number of Finnish dairy farms in 2019 (LUKE Natural Resources Institute Finland).
and when the probability is above 0.50, the logit has positive value (Hair et al., 2010). This means there is lower probability when more negativities exist in the logit value and increasing probability with an odds ratio above 1.0 (Field, 2018).

4. Results and discussion

Because there is currently no clear understanding of how foresight is implemented on dairy farms, nor how it supports strategic planning and activities, this study investigated a range of different foresight actions by asking dairy farmers about their strategic goals and management or leadership actions. The results were then coded as dummy variables for the purposes of the analysis (Table 2).

4.1. Strategic goals and managerial actions

As can be seen in Table 2, the respondents seemed to be more focused on production-related goals than the economic goals of their business. This may be due to the close relationship between milk yield and the total turnover of dairy farms. If the focus on farms is more on measuring production than setting economic goals, this would translate into results showing a lack of focus in business management. If production management is placed above business management, dairy farmers are unlikely to use foresight methods to manage their farms, which may cause problems as the volatility of milk prices has increased over time (Niskanen & Myyrä, 2015).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Summary of dairy farmers’ goals and plans (n = 133).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Yes (%)</td>
</tr>
<tr>
<td>Existing, regularly updated business plan</td>
<td>31 (23.0)</td>
</tr>
<tr>
<td>Vision for dairy farm</td>
<td>75 (55.6)</td>
</tr>
<tr>
<td>Goal for production</td>
<td>99 (74.4)</td>
</tr>
<tr>
<td>Goal for economics</td>
<td>54 (40.0)</td>
</tr>
<tr>
<td>Plan to exit dairy farming</td>
<td>12 (8.9)</td>
</tr>
<tr>
<td>Plan to reduce production</td>
<td>3 (2.2)</td>
</tr>
<tr>
<td>Plan to keep current production level</td>
<td>46 (34.1)</td>
</tr>
<tr>
<td>Plan to increase dairy production</td>
<td>79 (58.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Results of EFA. Varimax-rotated loadings present variable loadings for the main factors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Variable</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Managerial approach</td>
<td>Has knowledge about agriculture’s future scenarios</td>
</tr>
<tr>
<td></td>
<td>Finds ways to adjust dairy farm production</td>
</tr>
<tr>
<td></td>
<td>Has evaluated the dairy farm’s situation regularly</td>
</tr>
<tr>
<td></td>
<td>Evaluation of business environment is part of risk management</td>
</tr>
<tr>
<td></td>
<td>Has developed a variety of possible future paths for the dairy farm</td>
</tr>
<tr>
<td></td>
<td>Discussions with colleagues about dairy farming</td>
</tr>
<tr>
<td>Planning approach</td>
<td>Has thought about what the business environment will be like in 10 years</td>
</tr>
<tr>
<td></td>
<td>Is interest in the future</td>
</tr>
<tr>
<td></td>
<td>Has attended future-related occasions</td>
</tr>
<tr>
<td></td>
<td>Note: Cronbach’s alpha = .558, Eigenvalue = 1.559</td>
</tr>
<tr>
<td>Cautious approach</td>
<td>Has based major decisions on knowledge</td>
</tr>
<tr>
<td></td>
<td>Bases opinion on the information of experts</td>
</tr>
<tr>
<td></td>
<td>Bases decisions on personal opinions</td>
</tr>
<tr>
<td></td>
<td>Note: Cronbach’s alpha = .425, Eigenvalue = 1.414</td>
</tr>
<tr>
<td>Removed variables</td>
<td>Has discussed dairy farming options with advisors</td>
</tr>
<tr>
<td></td>
<td>Is not afraid of the future</td>
</tr>
<tr>
<td></td>
<td>Has a positive orientation towards the future</td>
</tr>
</tbody>
</table>
These fluctuations may cause severe economic difficulties for those dairy farmers, who have no financial buffer for periods of adverse price relations. By implementing foresight actions – such as evaluating the business environment, following through on an updated scenario, and gathering information about price volatility – dairy farmers can mitigate the consequences of market risks and be more alert to changes in the business environment.

For all continuing farmers, volatile market prices and other sources of uncertainty are the norm, and they need to learn to cope with them. As mentioned earlier, however, the sample in the present study was not representative of Finnish dairy farmers as a whole, but of production-oriented younger farmers and larger dairy farms. The majority (n = 79) of respondents were aiming to increase milk production, indicating not only positive future orientation but also long-term planning horizons. Future orientation is understood here to be the motivation for individuals to make decisions and actions focusing on an anticipated future (Ahvenharju, Minkkinen, & Lalot, 2018). It is fortunate that future-oriented farmers are well represented here, as the demand for dairy products is expected to increase globally (Britt et al., 2018). Competitive farms are the ones that are growing larger (e.g., in terms of milk production) yet their overall number is decreasing, as growth brings with it increasing business risks. Foresight actions can lead to a strategic agility (Sarpong, Maclean, & Alexander, 2013) which would allow competitive farms to tackle growing uncertainty by being more economically oriented. The purpose of foresight is to help managers make decisions (Calof, Miller, & Jackson, 2012) and make it easier for them to stay abreast of events in turbulent environments. As Hannon and Atherton (1998) state in their review of previous studies, firms that have business plans – whether written or unwritten – are more flexible and competitive in a complex business environment insofar as they outline an understanding of the external environment. However, they also add that strategic awareness is more important than a written business plan for small business operators. Meanwhile, Mäkinen (2013) has observed that one of the most commonly recognised elements of successful strategic management is to have a vision. Interestingly, only 31 farmers in our survey reported regularly updating their business plan and yet 75 of them had a vision of what their business would be like in the future. The average time horizon in long-term planning or futures thinking was 11.8 years, ranging from 2 to 70 years and with a standard deviation of 8.5 years.

4.2. Implementing foresight in dairy farms

Explorative factor analysis was used to combine the 15 original Likert-scale variables on foresight from the survey to produce three feasible factors for further investigation (Table 3). There was a fourth factor, but it had a low Cronbach’s alpha value and included only two variables, which measured more or less the same thing, so it was removed from further analysis. As foresight among dairy farmers is not understood in any detail, combining different foresight actions provides valuable information of foresight factors and these factors can then be employed in later analyses.

KMO value is 0.748 and mean values and standard deviations are the responses of growth-oriented dairy farmers among the whole respondent group (answers on a 5-point Likert scale). Variables removed were connected to factors 4 and 5, which had a low Cronbach’s alpha.

Table 4 presents the results of the Kruskall-Wallis test for difference in each of the three foresight factors between farmers grouped according to turnover, age, and future thinking time horizons.

While there are significant differences in managerial approach to implementing foresight between farmers grouped according to turnover ($\chi^2 (2) = 11.344, p = 0.003$), there is no strong variation among the turnover groups in either planning or cautious approaches. The biggest farms (with a turnover of 500,000€ or more) are clearly keener on managerial actions than smaller farms. This result would imply path dependency: these farmers probably invested in their business only recently and are, therefore, now more focused on managing the farm for profitability, rather than planning new investments and actively practising foresight.

There are also significant differences in managerial approach to implementing foresight between farmers grouped according to age.
It seems that younger farmers are keener than others to implement foresight actions in managing their farms. This may be because farmers under the age of 35 are in the early stages of their entrepreneurial lifecycle, while older farmers have probably already invested in their business earlier and their long-term planning horizon has shortened as retirement approaches. Foresight may also seem completely unnecessary to those who plan on winding down the business at that point.

For the last grouping – according to future thinking time horizons – the Kruskall-Wallis tests found significant differences only in planning approach ($\chi^2(2) = 10.959$, $p = 0.001$). Farmers with a long-term planning horizon seem to benefit from continuous foresight as it allows them to be better prepared for changes in the business environment (Peter & Jarrat, 2015). The results of these Kruskall-Wallis tests beg the question as to whether dairy farmers are only interested in implementing foresight in the investment phase of their business lifecycle.

### 4.3. Foresight implementation in predicting growth-orientation

Analysis continued with building a logit model to test whether foresight approaches could predict the growth-orientation claimed by dairy farmers in the population sampled. Several candidates for explanatory variables have previously been suggested to represent foresight approaches as EFA factors in logistic regression analysis. In farm management studies, for instance, age, farm size, and level of education are commonly used (i.e., (Ondersteijn et al., 2006); Hansson & Ferguson, 2011; Daxini et al., 2018), so these variables were added to the logit model, along with respondents’ EFA scores and future-thinking variables. Independent variables included in the first phase of building the model were the scores of the three factors EFA factors; the number of milking cows; the average annual milk yield in (kilos); the time horizon for long-term planning (in years ranging from 2 to 70, mean = 11.8, standard deviation = 8.5); as well as the respondent’s current age and education (categorical variable: 0 = no higher education, 1 = higher education).

This model was able to predict the correct class in 75.9 per cent of cases with respect to growth-orientation. To confirm the model structure and to reveal possible collinearities, the logit model was estimated again using the stepwise method. These estimations suggested that the time horizon in futures thinking, as well as the planning approach and age of farmers were variables that were all associated with growth-orientation, whereas the size of farm and education of the farmer were not.

However, as the stepwise method did not improve prediction power, an enter method logistic regression was run with the variables from Table 5 and non-significant variables removed. The education variable was one such variable removed, as it did not seem to have any statistical significance, which at first seemed odd as this would conflict with results from previous studies that find higher education to be significant. In this particular sample, however, the respondents had a fairly homogenous level of education, which would explain its lack of prediction power in the model. Once removed, the model gained its current prediction power of 75.9 per cent. Later, the variables of average annual milk yield and managerial approach were also removed from the model, although this did not change the model’s prediction power. The result was a model where both the $R^2$ values are fairly low, and with only three statistically significant variables; two of which had a risk level of under 5 per cent and one under 10 per cent. This is probably due to the small size of the sample, which only consisted of 135 observations in the end, so these results should be considered with caution.

The only foresight factor from the EFA with statistical significance for predicting growth orientation after logistic regression was planning approach. This was surprising, as issues of foresight in farm management were expected to have a stronger impact on bigger farms, producing a result in which managerial approach would also be a significant predictor of growth orientation. This may be because larger farms might have only recently invested in expanding their operations, so it would make sense to manage the farm for profitability rather than planning any further new investments.

Original variables for the planning approach include positive interest in the future, thinking about the business environment in the coming 10 years, and attending to events related to anticipated futures (Table 3). The variables of planning approach and time horizon have an odds ratio of above 1.000 – increasing their probability of being important to growth-oriented dairy farmers. Age, on the other hand, has an odds ratio of below 1.000, indicating that being growth-oriented is less likely among older dairy farmers. This finding is similar to previous studies in which young farmers were found to be more eager to implement new farming solutions or expand their farms. Knight, Cable, Patrick, and Baguet (2003), for instance, found that the younger the farmer, the greater their interest in learning to use new tools and effort put into futures and choosing financial management options. Meanwhile in the UK, Rose et al. (2016) found that the higher the farmer’s age, the less likely they were to use decision support tools in their farming.

In total, 84 dairy farmers in this study were predicted by logistic regression analysis to belong to the group of growth-oriented farmers. Their membership was not related to either location or gender – the number of men (40) and women (44) were roughly

### Table 5
Logit model to predict dairy farmers’ growth-orientation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\beta$</th>
<th>Wald</th>
<th>Sig.</th>
<th>Odds</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.033</td>
<td>2.821</td>
<td>.093</td>
<td>56.431</td>
<td>.994</td>
<td>1.022</td>
</tr>
<tr>
<td>Number of milking cows</td>
<td>.008</td>
<td>1.306</td>
<td>.253</td>
<td>1.008</td>
<td>.999</td>
<td>1.000</td>
</tr>
<tr>
<td>Annual milk yield</td>
<td>.000</td>
<td>.229</td>
<td>.632</td>
<td>1.000</td>
<td>.999</td>
<td>1.000</td>
</tr>
<tr>
<td>Future years timespans</td>
<td>.555</td>
<td>3.018</td>
<td>.082</td>
<td>1.743</td>
<td>.931</td>
<td>3.261</td>
</tr>
<tr>
<td>Current age</td>
<td>-.094</td>
<td>13.873</td>
<td>.000</td>
<td>.910</td>
<td>.866</td>
<td>.956</td>
</tr>
<tr>
<td>Managerial approach</td>
<td>-.012</td>
<td>.002</td>
<td>.965</td>
<td>.988</td>
<td>.580</td>
<td>1.684</td>
</tr>
<tr>
<td>Planning approach</td>
<td>.779</td>
<td>5.802</td>
<td>.016</td>
<td>2.160</td>
<td>1.154</td>
<td>4.041</td>
</tr>
<tr>
<td>Cautious approach</td>
<td>.306</td>
<td>.272</td>
<td>.261</td>
<td>1.358</td>
<td>.797</td>
<td>2.316</td>
</tr>
</tbody>
</table>

Cox & Snell $R^2$: 0.305; Nagelkerke $R^2$: 0.411.
equal, and they were scattered all over Finland. The group was well-educated – 58 out of the 84 had a higher education, which might also partly explain their interest in tracking changes in the business environment. Among the growth-oriented group, the average herd size of milking cows was 69, the average annual milk yield per cow 9963 kg, the average area of (owned and rented) arable land 114.3 ha, and the average time horizon for long-term planning was 14.2 years (with a standard deviation of 8.5 years). Pouru, Dufva, and Niinisalo (2019) collected a sample of 101 Finnish SMEs (small and medium-sized enterprises) to reveal that most entrepreneurs had a relatively short time horizon of only 2–5 years for futures thinking. Ruff (2015) rightly points out, however, that time horizons depend on the nature of the business in question – different products have different life cycles, and this will affect foresight activities.

It was predicted that the average age of farmers in the growth-oriented group would be 39 years old, and that they would have an average of 12.2 years farming experience (with a standard deviation of 7.8 years). Because this is notably younger than the average age of Finnish dairy farmers, one can expect that not only will their futures thinking be longer term, but also that they will make Finnish milk production more profitable.

While futures thinking is clearly a personal issue, foresight can be learned (Ahvenharju et al., 2018). Learning to develop foresight methods could improve managerial flexibility so the farmer would be better prepared for any possible shocks (Robert, Thomas, & Bergez, 2016). The motivation for farming families to invest time and effort into foresight clearly depends on understanding the benefits of anticipating various changes in the business environment: it encourages long-term economic viability and deters farmers from making unprofitable investments. The time horizons for investing in dairy farming are, as this study has shown, typically quite long. The business environment may change significantly over the expected lifetime of the investment, so one of the first steps towards successful strategic planning is to analyse the futures anticipated.

This data set shows that dairy farmers under 35 years of age focus on foresight and are future- and growth-oriented. As the youngest group of farmers, they very likely put the most effort into increasing the size of their farms. Foresight makes it easier to cope with uncertainties and a high level of education would improve their ability to collect and evaluate information and then make conscious decisions based on that evaluation. Ahvenharju et al. (2018) note that, apart from understanding time, futures thinking also means understanding the value of each individual’s input in shaping the future. By understanding that this will help them achieve the outcome they desire, dairy farmers may become more flexible managers of businesses that are economically profitable and carefully monitored in a complex and changing business environment.

In this study, dairy farmers reported carrying out foresight at several levels of farm management. Dairy farmers of the future could also benefit from foresight training. As the complexity of the dairy business increases year by year, those dairy farmers who have the ability to ‘interpret’ the business environment may be better placed to make decisions about developing their farm. While the present study merely scratches at the surface of improving farmers knowledge and skills in farm management, it gives us a much better idea of futures thinking in dairy farming.

5. Conclusion

This study was inspired by several discussions with Finnish dairy farmers about the future of milk production in Finland. The study’s particular focus was on how such farmers orient themselves to different futures by examining the foresight actions they use to cope with uncertainties in the business environment. The literature review showed how such foresight could help overcome the challenges of increasing uncertainties associated with increasing milk production, and how farmers might implement foresight actions in their strategic planning and management practices.

An exploratory factor analysis of our data sample revealed an interesting range of ways that respondents implemented foresight in their business. The original variables extracted from the data were reduced to a few latent factors representing three foresight approaches: managerial, planning, and cautious. The managerial approach described those farmers who had outlined possible future paths for their dairy farm and had envisioned future agricultural scenarios. In the form of certain daily management practices, these foresight actions can support short-term planning by helping farmers regularly evaluate current changes (e.g., in agricultural policy). The planning approach described the foresight actions of those farmers who focused on long-term planning. This group were found to be mainly younger farmers and farmers with larger-than-average dairy farms. These results emphasise the need for there to be more foresight training for farmers of the future – the ability to think up and choose from a range of possible actions elicited through effective foresight actions could greatly benefit all farmers. By thinking in the long term and improving their foresight skills in business management, future farmers would build more flexible strategies and maintain business agility. Stakeholders should emphasise the value of foresight actions in the farming sector overall by supporting development of these skills at the farm level.

While many of the expected associations were weak, three variables did have statistical significance in predicting growth-orientation in a dairy farm business: planning horizons in farm management (in years), the planning approach factor, and farmers’ time horizons in futures thinking. Futures thinking is highly personal, depending on the person’s attitude and stage of life, for instance. In the case of growth-oriented farms, path dependency might guide a dairy farmer’s thinking and make it harder to make heavy capital investments in developing their farm. Curiously, the number of milking cows in a dairy farm was not a significant predictor of growth orientation in this data sample. Although the farms sampled here were bigger than average dairy farms in Finland, structural changes may also be forcing larger farms to quit rather than expand.

Due to the explorative nature of this research, and because of certain data limitations, it would be beneficial to find out more why farmers with a so-called managerial approach do not actually focus on long-term planning and only rarely use foresight. This study also highlights the need for foresight actions to be introduced more comprehensively both to farmers in the field and those in training so that nobody needs to unlearn any bad habits. As seen in previous studies and from the business world, foresight is important when revising business strategies and for maintaining a certain agility and business competence. Farmers must adapt to changes in the
business environment and be better able to incorporate foresight in strategic decision-making at the level of the individual farm.

Declaration of Competing Interest

This research has received funding from Oiva Kuusisto foundation and the former employee of the author, JAMK University of Applied Sciences, has supported the author to work with this research. The survey was delivered to the respondents by major Finnish dairy co-operative Valio without financial contribution.

Acknowledgement

I confirm, this manuscript has not been published elsewhere and is not under consideration by another journal. As the author, I agree with its submission to Futures.

Appendix A

Questionnaire form

Q1. In which region your dairy farm is located?

"03"AB

"03"C

Q2. Year you are born?

Q3. Your gender?

"05"Female

"05"Male

"05"Not specified

Q4. What is your education?

"07"Primary education

"07"Secondary professional education

"07"Agriculture college

"07"Bachelor diploma

"07"Master diploma

"07"PhD

Q5. At which year did you begin dairy farming?

Q6. What is the business form of your dairy farm?

"09"Family farming

"09"Agricultural tax partnership

"09"General partnership

"09"Limited partnership

"09"Limited company
Q7. How many people does your dairy farm employ?
   Full-time ________
   Part-time ________

Q8. What were your dairy farm’s key production indicators at the end of 2018?
   Number of milking cows ________
   Average milk yield pro cow ________
   Average number of calving’s ________

Q9. How much do you have arable area, hectares?
   Own field ________
   Rented fields ________
   Contract fields ________

Q10. What is your turnover pro year?

"011"
50,000 € or less

"011"
50,000€ – 100,000€

"011"
100,000€ – 250,000€

"011"
250,000€ – 500,000€

"011"
500,000€ – 750,000€

"011"
750,000€ – 1,000,000€

"011"
1,000,000€ or more

Q11. Please, select all following options that fit to your dairy farming operations. Our dairy farm business has…

"013"
… on regular basis updated business plan

"013"
… vision for the farm business entity

"013"
… goal for the milk yield

"013"
… goal for the work performance productivity

"013"
… goal for economic result

"013"
… key performance indicators at use

"013"
… organic milk production contract

"013"
… aim to exit of milk farming
... aim to decrease the milk production

... aim to maintain the existing level of the milk production

... aim to expand the milk production

Q12. How many years ahead do you think of your dairy farm planning?

Q13. Evaluate for well the following claims fit to your idea of future and to your relationship towards future. 1 = completely disagree, 2 = partly disagree, 3 = I don’t agree nor disagree, 4 = partly agree, 5 = fully agree.

I discuss with colleagues about the future’s dairy farming

I have knowledge of agriculture’s future scenarios

I have attended to future-related occasions

I have positive orientation toward future

I have thought about business environment in 10 years

I am not interest of future

I feel afraid when thinking of future

I ground my opinion of changes in the business environment on the information of experts

I ground my opinion of changes in the business environment to my personal opinion

I evaluate the farm business on regular basis and near future’s activities

Evaluation of business environment is part of risk management

I look for ways to adjust dairy farm production

I have developed a variety of possible future paths for the dairy farm

I ground the major decisions of the farm development to the vast amount of information

I discuss of the dairy farming options with advisors


Rohrbeck, Rene, & Schwarz, Jan, O. (2013). The value contribution of strategic foresight: Insights from an empirical study of large European companies. Technological Forecasting & Social Change, 80(8), 1593–1606.


