

Article

European Dairy Farmers' Perceptions and Responses towards Development Strategies in Years of Turbulent Market and Policy Changes

Abele Kuipers ¹, Agata Malak-Rawlikowska ^{2,*}, Aldona Stalgienė ³, Anita Ule ⁴ and Marija Klopčič ⁴

¹ Expertise Centre for Farm Management and Knowledge Transfer, Wageningen University & Research, 6708 Wageningen, The Netherlands; abele.kuipers@wur.nl

² Institute of Economics and Finance, Warsaw University of Life Sciences, 02-787 Warsaw, Poland

³ Institute of Economics and Rural Development of the Lithuanian Centre for Social Sciences, A. Vivulskio g. 4A-13, 03220 Vilnius, Lithuania; aldona.stalgienė@laei.lt

⁴ Department of Animal Science, Biotechnical Faculty, University of Ljubljana, SI-1230 Domžale, Slovenia; Anita.Ule@bf.uni-lj.si (A.U.); Marija.Klopčič@bf.uni-lj.si (M.K.)

* Correspondence: agata_malak_rawlikowska@sggw.edu.pl; Tel.: +48-225-934-220

Abstract: Farmers operate in a changing market, policy and social environment so questions arise as to how they experience these changes and react in their business orientation. This topic was examined in the period 2011 to 2016 in a strongly fluctuating product market and food policy environment, e.g., abolition of milk quotas in Europe. The study was based on unique panel data for 290 dairy farms in Poland, Slovenia, Lithuania and The Netherlands, questioned up to three times in 2011, 2013 and 2016. The conceptual framework was composed of Farmer goals, Resources, Opportunities and Threats (O&T), and Future expectations (performance) as continuous variables, and countries and strategy farmer groups as categorical variables. Data were analysed applying PCA, ANOVA, cluster and regression analyses. Dairy farmers seemed not to be motivated or educated to take strategic decisions that made the best use of their resources and to take opportunities and mitigate threats to achieve their personal goals. Farmer perceptions were strongly affected by country of origin, local environment and milk price, and less by the strategy group. The market situation is one of the dominant factors affecting the mind-set of farmers in Europe. Future expectations were evaluated highest in 2013 (period with 'high' prices), lowest in 2016 (price crisis) and intermediate in 2011 (moderate price period). The large dependence of farmers on the price of their product could be a sensitive issue for politicians, but also food chain members and farmers' syndicates. They may anticipate a fluctuating attitude of farmers with respect to organisational and institutional plans and implemented measures, depending on the market situation and related policy context.

Keywords: policy changes; abolition of the milk quota; farmers' perceptions; farming goals; resources; opportunities & threats; market situation; strategies; Europe



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1. Introduction

Farmers operate in a changing market, agri-food policy and social environment. More market oriented policies tend to increase price volatility affecting farm development and profitability. This is illustrated in Figure 1 for milk price and number of dairy cows over time in various dairy producing regions of the world. An example of a agri-food policy change with big impact on the market and management environment of farms was the abolition of the milk quota regime in the European Union (EU). The milk quota system was introduced in the EU in 1984 (2004 for the New Member states, when they entered the EU) and continued until its abolition in 2015. The largest quota holders in the 28 EU countries in 2014/2015 were Germany (19.6% of total), France (17.1%), United Kingdom (10.3%), The Netherlands (7.8%), Italy (7.3%) and Poland (6.5%), and relatively small quota were owned by Lithuania (1.2%) and Slovenia (0.4%) (EU total quota was 154.6 million tons; European

Commission, DG Agriculture and Rural Development). Freeing up the production of milk in the European community caused an increase of 5.1% in milk deliveries to dairies in 2017 compared to 2014 [1]. However, production volume developed differently for EU member countries before and after abolition of quotas (Figure 2). A shift in dairy farm growth in some countries could be expected [2–4]. Also, societal debate about animal husbandry, sustainability and welfare is ever increasing [5–7]. Therefore, the question arose as to how farmers experience these changes. In other words how are farmers' mind-sets affected by these changing circumstances and how do they react in their future operation and management of their businesses in the rural area? This question is meaningful since Methorst et al. [8] concluded that 'personal views and preference' is the most significant explanatory driver for farmers' strategies. Moreover, farm strategies, besides operational business, do affect the livelihood of the rural areas, since the cattle sector utilizes most of the grasslands in Europe, covering more than a third of the agricultural area.

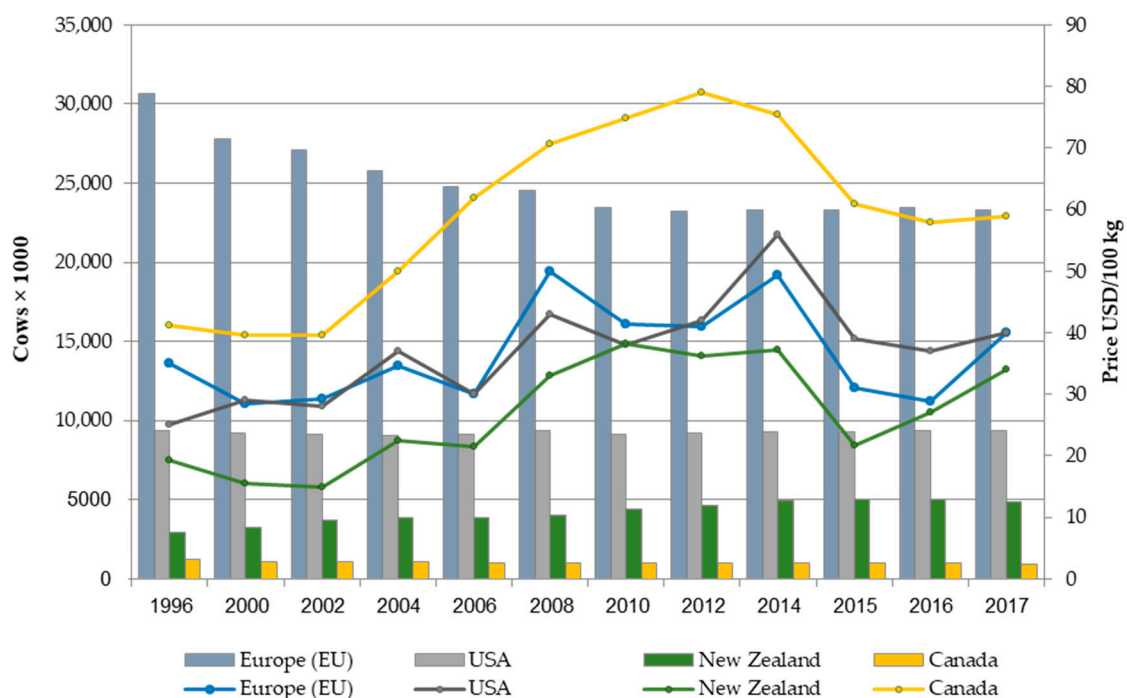


Figure 1. Development of price (right axis, USD/100 kg) and number of cows (left axis, ×1000) in major dairy regions in the world in period 1996 to 2017. Source: IFCN Dairy Research Network [9].

Technical and productive potential and structural outlook on the dairy sector have been widely discussed and described [10–14]. Also farmers' attitudes or opinions toward policies have been analysed in Western Europe [15–20]. For example, Ragkos et al. [21] studied Greek dairy farmers' strategies during crisis, and Creemers et al. [22] studied future farming strategies versus perception of sustainability in some, mainly Western EU countries. Thorsoe et al. [23], based on a study in Denmark, Greece, France, Latvia, and the United Kingdom, concluded that the market situation, affected by price volatility, results in poor adaptive capacity of dairy farms and also that farmers in different countries, despite comparable regulatory framework, apply different strategies. However, studies based on Eastern European countries are scarce (although Kuipers et al. [11] and Gorton et al. [24] included new EU member states in studies during the period of EU expansion). It confirmed the need for more updated studies in this region of the EU.

In North America attitudes and preferences on farmer responses towards market policies were studied by Kastens and Goodwin [25] and entrepreneurship by Knudson et al. [26]. In Australia and New-Zealand interactive stakeholder studies were being performed presenting various scenarios for strategic development of the dairy communities [27].

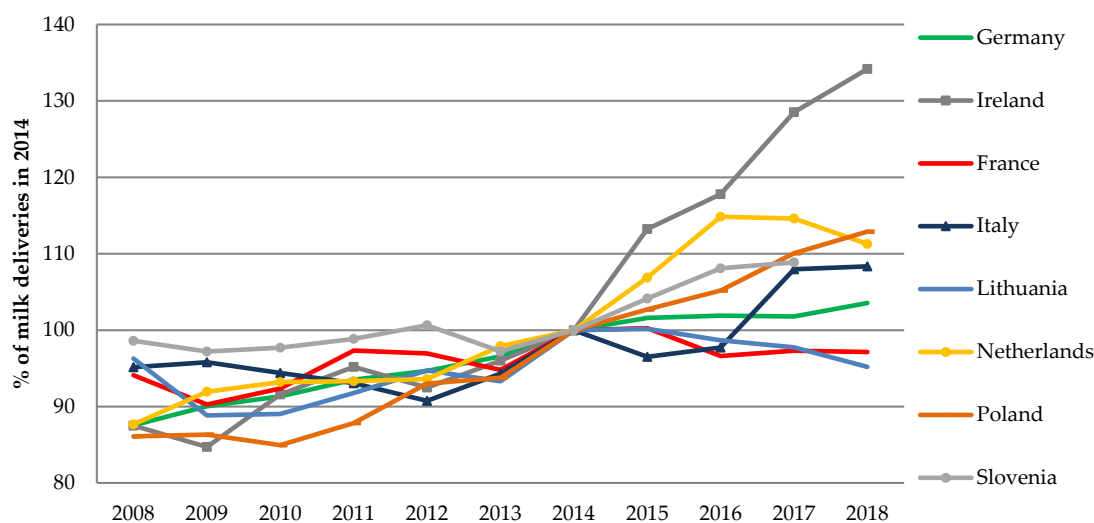


Figure 2. Dynamics of raw cows' milk delivered to dairies in selected EU countries in 2004 to 2018; deliveries in 2014 are set at 100%. Source: EUROSTAT Database [1].

Performance at farm level is usually measured by production criteria such as milk yield per cow or grain yield per ha, or by financial results such as labour income or milk returns over feed costs. Self-perceived success and satisfaction is a less straightforward concept. Bergevoet [28] and Morris et al. [29] found that maximising income is not the highest goal of farmers in The Netherlands and Wales, respectively, while Gorton et al. [24] noticed a production-oriented mind-set in Europe. Social and work circumstances, among others, also play a role in the performance of farmers [30–34].

A shortcoming of almost all such studies is that they are usually based on farm data and farmer or stakeholder perceptions at one particular point in time. Trends in perceptions, attitudes and farm strategies are rarely examined, which creates an important knowledge gap that our study attempts to address. Therefore, the aim of this study was to gain insight into the perceptions and expectations of dairy farmers in a period of rapidly changing market and food policy circumstances. The following research questions were addressed:

- (1) How do dairy farmer perceptions of farming goals, available resources, opportunities & threats and future expectations change over time?
- (2) Do country and region of origin affect the farmers' perceptions?
- (3) To what degree do farmer expectations over time depend on their perceptions of the farming goals, available resources, and opportunities & threats?

These issues were studied in a period of price and agri-food policy changes, e.g., the abolition of the milk quota system in Europe, and consequent strongly fluctuating market circumstances. Our study, based on 6 years' observation of farmer behavior, allowed for capturing self-reported farmer attitudes and perceptions during 'prosperity' and 'crisis' periods in the market. Our results can be useful to help shaping policies for the dairy sector in individual countries and to strengthen specific tools targeted at selected groups of farmers.

2. Materials and Methods

2.1. Sample

The study was based on questionnaires from farmers in four European countries, Lithuania, Poland, Slovenia and The Netherlands. We purposely selected European countries with different background and characteristics of agricultural sectors with varying climatic, natural and landscape conditions. The idea was to study the diversity between European regions, having Western (NL), Central (PL), North-Eastern (LT) and Southern (SI) EU countries involved, but all represented by family farming.

The sample consisted of 290 replies to a questionnaire—60 from Poland, 64 from Lithuania and 94 from Slovenia completed by the same group of dairy farmers in 2011, 2013 and 2016, and 72 farmers from the Netherlands who filled in the questionnaire in 2013 and 2016. The farmers in Poland, Lithuania, and Slovenia were a sub-sample from a study on dairy farmers' business strategies in these three CEE countries in 2011 [35]. That sample was selected on a stratified random procedure, in order to reflect the dairy farm structure in each country, according to the herd size. The entire sample in 2011 consisted of 1028 farms. These farmers were requested to fill in questionnaire again in 2013 and a more condensed questionnaire was used in 2016. Almost one-quarter (218) of the original group of farmers completed the questionnaire all three times. In the Netherlands two-thirds of farmers who completed the questionnaire on the first occasion (102) also did so the second time (72). The original sample of farms was representative in Lithuania, Poland and Slovenia for the number of farmers with 10–49 cows, but the number of farms with 5–9 cows was underrepresented and the number of farms with 50 or more cows was overrepresented (Agricultural Information and Rural Business Development Centre, Lithuania, 2011, 2013 and 2016; Agricultural Market Agency, Poland, 2011, 2013, 2016; Quota Agency, Slovenia, 2011, 2013, 2016). The Netherlands' original sample quite accurately reflected the situation in that country (Central Statistics Agency—CBS). The values for herd size, land owned and land rented for the original and current samples did not significantly differ (*t*-test; $p > 0.05$) for the Netherlands, Poland and Slovenia, but the Lithuanian farms in the current sample were significantly larger than in the original sample (see Table 1). The Lithuanian sample appeared to be the most biased towards larger farms. In Poland, the farmers were sampled from the Mazowieckie region, where the farm structure reflects the structure in the whole country, while in Slovenia, Lithuania and the Netherlands, they were widely distributed geographically. In Poland, Lithuania and Slovenia the questionnaires were distributed and collected by extension service in group meetings or during individual farm visits for extension activities. In the Netherlands a random sample of all dairy farms was used and the questionnaires were collected by post. In all countries, farms were selected where more than half of the family's income came from dairy farming and farmers sold their milk or dairy products to the processing company or directly to the local consumer.

Table 1. Characteristics of the samples of dairy farms in four European countries studied over the period 2011 to 2016—mean value and standard deviation (SD).

Country	Year	Cows		Land Owned		Land Rented	
		Number	SD	Hectares	SD	Hectares	SD
Lithuania	2011	57.48	45.50	70.73	68.95	80.98	82.98
	2013	59.77	45.27	87.44	79.48	87.23	82.88
	2016	62.80	46.98	98.81	82.80	80.48	74.52
Poland	2011	26.18	21.05	29.38	15.87	8.29	12.21
	2013	28.53	21.80	31.27	18.34	10.47	14.84
	2016	30.03	24.37	31.57	19.74	10.46	17.34
Slovenia	2011	31.11	18.70	13.74	7.46	16.51	13.60
	2013	31.66	19.32	14.39	8.06	17.31	14.10
	2016	34.53	22.43	16.02	10.01	16.63	13.24
The Netherlands	2013	91.39	48.88	36.44	25.09	16.68	19.39
	2016	100.85	56.57	40.44	25.31	16.01	16.27

2.2. Framework to Predict Future Expectations

The conceptual framework (Figure 3) was based on work of Ondersteijn et al. [36], describing a model relating the producers' environment goals to the performance of dairy farms, and a similarly structured model applied by Hansson [37], describing dairy farm economic performance. In the conceptual framework, opportunities and threats—O&T (external environment), farmers' resources (internal environment), and farming goals

(mission), and the perceived strategic development path (strategy) chosen by the producer influence the perceived performance of the farm (see Figure 3). This conceptual framework had also been applied in the farmers' business strategies study of Verhees et al. [35] and the stakeholders' study of Kuipers et al. [38], using data from the same countries for one particular year. In the present study, the various elements in the framework were followed for a period of 5 years, enabling to study the trend in those elements over time.



Figure 3. Framework describing the relationships of internal and external factors with strategy and farm performance, i.e., future expectations of farmers—this study.

Perceived 'performance' was translated into future expectations or success. Future expectations were measured by questioning the farmer about the expected success and economic prospects of his/her farm and positive versus negative feelings about the future of farm business in the particular region. The conceptual framework assumes that farmers (indeed entrepreneurs) set strategic goals to improve their future prospects. Thus, taking strategic decisions improves future prospects by aligning the internal and external environment, respectively expressed by resources and O&T. Because the particular region or country can also affect available resources, O&T, farming goals, strategic direction and future expectations, country was included in the conceptual framework (Figure 3).

2.3. Analyses

To study the three research questions posed, data were collected to operationalize the elements of the framework described in Figure 3. The study was split into the period 2011 to 2013 containing farm data from the three CEE countries and period 2013 to 2016 containing data from the same CEE countries and the Netherlands. The two periods were characterised in the analysis by the average level of scores of components C in year i and j ($(C_{year_i} + C_{year_j})/2$) and the change in scores between years ($C_{year_j} - C_{year_i}$).

To measure 'Strategic direction', farmers were asked to specify in a catalogue of 10 strategies what their first (score 3), second (score 2) and third (score 1) choices were for the development of their farms over the following five years. A Principal Component Analysis (PCA) was performed to summarize the data and identify certain strategic directions, i.e., development paths. Next, farmer groups were distinguished based on the strategies, using both the complete set of 290 producers and the two subsets of respondents in 2011 to 2013 (CEE-countries) and 2013 to 2016 (CEE countries plus the Netherlands). These producer groups are called strategic groups. Then, a hierarchical cluster analysis (i.e., Ward's method) was applied. Basing on the agglomeration coefficient and expert knowledge of the sector, 6 clusters (strategic groups) were distinguished as a possible solution. Later a non-hierarchical cluster analysis was implemented (i.e., K-means in SPSS) with the cluster centroids (PCA factors) of the hierarchical cluster analysis as initial cluster centres to assign farmers to the strategic groups.

To measure 'Farmer goals', a list of 25 potential farming goals was presented. Respondents were asked to evaluate how important each of the farming goals was to them, in a 7-point Likert scale where 1 meant 'not important' and 7 'very important'.

To evaluate 'Resources', a catalogue of 13 resources which are available on a farm was composed. Producers were asked to evaluate the degree of difficulty in obtaining them, using a 7-point Likert like scale where 1 meant 'very difficult to obtain' and 7 'very easy to obtain'. Two resources were removed from the list for all years: 'buy additional milk quota' and 'rent additional milk quota', because quota was not any longer an available resource in 2016.

To measure 'O&T', a list of 26 social and economic issues in a farm's external environment was compiled. Farmers were requested to indicate whether they considered it an opportunity or a threat. A 7-point Likert like scale anchored by -3 'big threat' and $+3$ 'a big opportunity' was used. For presentation purposes, this scale was transformed to 1 to 7, equal to the scale used for the other elements in the model.

To evaluate 'Future expectations', five measures for success and expectation were listed as statements. Respondents were asked whether they agreed with the statements. A 7-point Likert like scale anchored by 1 'fully disagree' to 7 'fully agree' was used.

In 2011 some questions had from 10 to 30 missing values, such as questions 'Reduce debts' and 'Improve maize production' (Farming goals); 'Commercial credit', 'Qualified labour', 'Seasonal workers' and 'Advice of private consultants' (Resources), and 'Certifying organisations' and 'New EU Agricultural policies' (O&T). Obviously these questions were more difficult or sensitive to answer. In the following year a successful effort was made to help farmers deal with these questions. The missing values in year 2011 were replaced per country by the average score of all farmers in that country who completed the particular question in 2011.

Next, in order to see if questions could be summarized, PCAs with the Varimax rotation were conducted. Additional PCAs were performed for the questions related to Farming goals, Resources, O&T, and Expectations. A scree plot, Eigenvalue (should be above 1), and total variance accounted for (above 55%) were used as criteria [39]. Moreover, the reliability of the measure should be higher than 0.60, as indicated by Cronbach's Alpha.

The principal components established for 'Farmer goals', 'Resources', 'O&T' and 'Expectations' were considered as continuous variables based on the 7-point Likert like scale values. The components were checked for normality looking at the mean, standard deviation, skewness and kurtosis statistics. Average scores across the variables (questions) composing each component were used in the subsequent analyses.

Country and strategy group were treated as categorical (nominal) variables. Analyses of variance (ANOVA) were used to test whether countries and strategy groups had an effect on each of the components Farming' goals, Resources, O&T and Expectations. Statistical differences between regions (countries) and between strategy groups were assessed using the Least Significant Differences (LSD) and Student-Newman-Keuls (SNK) tests.

Finally, 'Farmer goals', 'Resources', and 'O&T' were regressed on 'Future expectations'. This analysis was performed to test the relations in the conceptual framework. F-tests were used to determine whether these elements of the framework influenced future expectations. Subsequently, strategy groups were included in the regression analyses to see whether 'Strategic direction' alters the effect of 'Farming goals', 'Resources', and 'O&T' on 'Future expectations' [40]. Countries were included as dummy variables to reduce the error term variance. The effects of country and strategy group as categorical variables were obtained by comparing each to one of the existing countries or strategy groups. The proportion of the variation explained by the regression procedure is expressed by the coefficient of determination (R^2). Calculations were performed with the IBM-SPSS statistics 21 package (IBM, Armonk, NY, USA). Statistical significance was set at 1% and 5% probability levels.

3. Results

3.1. Farm Characteristics

Table 1 presents the main characteristics of the sample for the four countries in period 2011 to 2016. It can be observed that small scale farms predominate in all four countries. However in Lithuania a group of larger farms, mostly former state farms with more than 100 cows (15% in 2011 to 22% in 2016) were part of the sample, and in the Netherlands sample, 31% of farms in 2013 to 39% in 2016 had more than 100 cows. In both Slovenia and Poland, only one farm in the sample exceeded 100 cows. Average farm size (owned + rented) in Lithuania varied from 120 ha in 2011 to 135 ha in 2016 for less than 100 cow herds and 322 to 336 ha for more than 100 cow herds. In The Netherlands, farm size ranged from 41 ha in 2013 to 44 ha in 2016 for less than 100 cow herds, and from 81 to 76 ha for

herds of more than 100 cows. The average farm sizes for Poland and Slovenia were about 40 and 32 ha, respectively. About half of the land on the Lithuanian and Slovenian farms was rented, compared to about one third in The Netherlands and Poland. Farms in the three CEE countries were very fragmented. The land area at the beginning of the study period was split up, on average, for Lithuania, Poland, and Slovenia in 14.4 (for farms with less than 150 cows), 15.4 and 30.7 parcels per farm, respectively. The increase in farm size was modest in the period studied (2 to 4 ha), except in Lithuania where it averaged 28 ha (rented land became owned). Herd size increase in the study period averaged from 3 cows in Slovenia (5 year period) to 9 cows in The Netherlands (3 year period). No increase in intensification of dairy farming took place, except in farms with more than 100 cows in The Netherlands.

3.2. Strategic Groups across Countries

A PCA was conducted to condense the list of 10 strategies into a small group of components indicative of farm development. The relationships between the derived components and the 11 original questions based on the total dataset are given in Table 2.

Table 2. Correlations between development paths (i.e., components) and original questions about strategic direction ($n = 798$); highest correlations within components are underlined.

Questions	Components (Main Factors)				
	1 Wait & See	2 Diversify	3 Move	4 Cooperation	5 Chain Integration
Relocate my entire or part of farm	0.059	−0.116	<u>0.791</u>	−0.094	−0.030
Expand dairy production	<u>−0.592</u>	−0.220	0.020	−0.485	−0.164
Start a new farm	−0.010	0.150	<u>0.728</u>	0.088	0.012
Wait and see	<u>0.803</u>	−0.135	−0.123	0.010	−0.219
Downscaling	<u>0.671</u>	0.120	0.131	−0.108	0.019
Diversify into other agricultural activities	0.219	<u>0.678</u>	−0.141	−0.231	−0.001
Chain integration: co-operate with other partners in chain	−0.052	−0.057	−0.022	0.005	<u>0.981</u>
Diversify into other non-agricultural activities	−0.138	<u>0.727</u>	0.133	0.178	−0.114
Co-operate with other dairy farmers in machinery	−0.057	−0.067	−0.003	<u>0.895</u>	−0.028
Further specialization in dairy farming	−0.485	<u>−0.504</u>	−0.094	0.022	−0.154

The five components listed in Table 2 were the base for the cluster analysis which indicated six farmer groups or clusters. The PCA and cluster analysis were also carried out for the periods 2011 to 2013 and 2013 to 2016 separately. Similar farmer clusters could be defined from that analysis. One farmer cluster defined as ‘Movers’ was very small containing only 2% of the farmers. This group of farmers was associated with the ‘Growers & Specialisers’ group so both groups were combined. The defined farmer groups are presented in Table 3.

The ‘Growers & Specialisers’ were the largest group (initially 48% of all farmers), but decreased over time (Table 3). In contrast, the ‘Wait & See’ group increased over time, especially in the Netherlands (42% of farmers in 2016). The proportion of ‘Co-operators’ grew in times of low prices (2011 and 2016), while the Chain integrators were popular in 2013 when prices were good. The cluster group of ‘Diversifiers’ increased slightly. This was mainly due to an increase in popularity in Slovenia, in which country diversification (agro-tourism, marketing for local products) is a viable alternative to specialised dairy farming.

Table 3. Strategic groups of farmers in CEE countries and the Netherlands over the period 2011 to 2016—number and % of farmers (in brackets).

Year	Farmers' Strategic Groups										Total N	
	Growers & Specialisers (+Movers)		Diversifiers		Wait & See		Co-Operators		Chain Integrators		CEE	NL
	CEE	NL	CEE	NL	CEE	NL	CEE	NL	CEE	NL	CEE	NL
2011	105 (48.2)		36 (16.5)		24 (11.0)		24 (11.0)		29 (13.3)		218	
2013	94 (43.1)	23 (31.9)	39 (17.9)	9 (12.5)	23 (10.6)	21 (29.2)	19 (8.7)	15 (20.8)	43 (19.7)	4 (5.6)	218	72
2016	70 (32.1)	19 (26.4)	41 (18.8)	6 (8.3)	37 (17.0)	30 (41.7)	31 (14.2)	14 (19.4)	39 (17.9)	3 (4.2)	218	72
N	311		131		135		103		118		798	

3.3. Farmer Perceptions across Strategic Groups and Countries

3.3.1. Labelling of Components

The PCA method performed for the 26 farmer goals resulted in six components covering both study periods, named as 'maximize profit', 'sustainable farming', 'outside work environment', 'dairy tradition', 'social life' and 'low cost management' (Table 4). For the period 2011 to 2013, a seventh component emerged, labelled 'improve management', and for the period 2013 to 2016 this was labelled secure income. The PCA result for the 11 resources used resulted in four components were labelled as 'land', 'labour', 'capital', and 'know-how'. The PCA analysis for the 25 opportunities and threats (O&T) distinguished seven components, i.e., 'EU', 'market', 'regulations', 'local rural situation', 'schemes', 'services', and 'new technologies & consumers'. The PCA result for the five statements related to success and expectations resulted in one component called 'future expectations' (combination of technical plus economic performance). A list of the components and the number of questions (variables) included is presented in Table 4 and the questions are detailed in Appendix A. The scores of measures on % of variance explained, Eigen value and Cronbach's Alfa are also listed in Table 4. The components approached normality when looking at the mean, SD, skewness and kurtosis statistics. Only the farming goal 'secure income' showed a peak in score values. The component 'low cost management' failed in meeting the Cronbach's Alfa criterion and was deleted from the subsequent analyses. Average scores across the variables in each component were used in these analyses.

3.3.2. Perceptions across Strategic Groups and Countries

In Table 4 the various components are ranked according to average scores for the three years of measurement. Sustainability, i.e., breeding more durable cows and improving welfare friendly housing, and maximize profit, i.e., running the farm efficiently and breeding for high milk production, are considered as main farming goals throughout the study period. Land and labour were the scarcest resources, and new technologies & consumers, i.e., utilizing technical developments and focusing on consumers and the market were considered the biggest opportunities.

Next, the study period was split into the period 2011 to 2013 containing data from the CEE countries only, and the period 2013 to 2016 containing data from the CEE countries and The Netherlands. These periods were each characterised in the analysis by the average level of scores of components, i.e., perceptions, and the change (difference) in scores between years.

When analysing the 'change in opinion' scores over time, 'future expectations' scored slightly higher in 2013 than in 2011 for all three CEE countries (on average +0.23; Table 5).

In general, perceptions of farmers did not change much from 2011 to 2013. However, the farmers in the CEE countries reacted differently to 'dairy tradition', 'capital' and 'market' in 2013 versus 2011. In respect to these components the confidence of Lithuanian farmers dropped in contrast to the farmers from the other countries. From 2013 to 2016, 'future expectations' dropped on average by a score of 0.7, the drop being least in The Netherlands and most in Lithuania (Table 5). Also, substantial drops in scores were seen for Farming goals, Resources and O&T (highest for 'dairy tradition' and 'regulations', -0.43 , and for 'local environment' and EU -0.35). The Polish farmers deviated in 2016 significantly more negatively from their opinions in 2013 on Farming goals, Resources and O&T than their colleagues from the other three countries. Overall, the five strategy groups did not affect the change in opinions significantly.

Table 4. Measurement properties of the elements in our model for year 2011 (CEE-countries; $n = 218$) and year 2013 and 2016 (all 4 countries; $n = 290$).

Elements of Model and Underlying Components	Variables	2011							2013					2016					
		Variance Explained %	Cronbachs Alpha	Mean	SD	Skewness	Kurtosis	Variance Explained %	Cronbachs Alpha	Mean	SD	Skewness	Kurtosis	Variance Explained %	Cronbachs Alpha	Mean	SD	Skewness	Kurtosis
Farming goals:																			
dairy tradition	3	73.84	0.822	5.58	1.28	−1.14	1.23	69.35	0.779	5.44	1.23	−0.61	−0.09	73.56	0.819	5.02	1.45	−0.72	0.01
outside work environment	3	59.43	0.657	5.73	0.95	−0.85	1.69	58.42	0.643	5.45	1.09	−0.81	0.74	58.54	0.646	5.33	1.10	−0.58	0.09
low cost management	2	59.30	0.303	5.40	1.31	−0.697	0.048	58.74	0.285	5.60	1.17	−0.72	0.22	58.90	0.288	5.46	1.23	−0.72	0.55
social life	4	52.26	0.689	5.75	0.95	−1.11	2.48	51.32	0.678	5.77	0.94	−0.83	0.93	51.11	0.668	5.66	0.939	−0.58	0.02
sustainable	6	58.64	0.848	6.29	0.77	−2.30	10.2	52.61	0.813	6.27	0.68	−0.98	0.50	57.33	0.848	6.06	0.844	−1.29	2.29
maximize profit	3	59.25	0.636	6.36	0.74	−2.47	12.2	61.43	0.665	6.20	0.84	−1.14	0.92	64.70	0.688	6.09	0.94	−1.19	1.26
improve management	3	55.90	0.603	5.68	0.98	−0.98	2.13	54.90	0.564	5.73	0.94	−0.50	−0.36						
secure income	2							66.29	0.482	6.43	0.70	−1.48	2.70	71.08	0.579	6.40	0.78	−1.60	3.19
Resources																			
land	2	75.42	0.671	2.77	1.36	0.76	0.27	74.45	0.655	2.45	1.21	0.91	0.66	77.24	0.705	2.48	1.28	0.84	0.24
labor	2	76.71	0.695	2.84	1.24	0.61	0.35	75.63	0.677	3.10	1.26	0.11	−0.56	85.45	0.827	3.09	1.33	0.10	−0.69
capital	4	55.79	0.727	4.48	1.14	−0.12	0.00	46.05	0.590	4.38	1.01	−0.28	0.11	50.17	0.666	4.29	1.06	−0.32	−0.18
know-how	3	64.30	0.718	5.21	1.09	−0.30	−0.06	61.80	0.678	5.26	1.11	−0.44	0.18	60.34	0.665	5.25	1.02	−0.32	−0.31
Opportunities and Threats																			
market	4	43.02	0.485	3.45	1.02	0.24	0.22	49.14	0.628	3.67	1.11	−0.05	−0.17	55.55	0.732	2.64	1.25	0.45	−0.44
regulations	4	65.95	0.827	4.11	1.26	0.10	−0.39	62.69	0.794	4.03	1.14	−0.11	−0.19	56.63	0.732	3.59	1.16	0.37	0.13
schemes	2	65.25	0.465	4.34	1.08	0.31	0.48	67.66	0.513	4.12	1.06	−0.03	0.61	65.52	0.468	3.88	1.02	−0.22	1.45
local environment	3	50.94	0.506	4.33	1.06	0.06	−0.22	46.52	0.424	4.43	0.99	−0.34	0.05	47.65	0.438	4.09	0.97	0.11	0.53
EU	3	57.23	0.616	4.65	1.14	−0.53	0.32	53.40	0.560	4.66	1.07	−0.48	0.71	58.91	0.649	4.29	1.19	−0.35	0.25
service	1	50.01	0.747	5.14	0.89	−0.24	0.48	47.81	0.719	5.06	0.88	−0.23	1.20	43.92	0.675	4.90	1.86	0.34	−0.08
new technologies & consumer	4	51.91	0.676	5.60	0.81	−0.12	−0.65	60.33	0.778	5.46	0.90	−0.59	1.74	52.91	0.693	5.24	1.82	0.13	−0.07
Future expectations																			
future expectations	5	44.23	0.660	4.73	0.93	0.21	−0.36	53.00	0.776	5.00	1.05	−0.13	−0.44	53.56	0.778	4.31	1.22	0.03	−0.15

Table 5. Effect of country and strategic group on year differences in scores in Farming goals, Resources, Opportunities and Threats and Future prospects in periods 2011 to 2013 and 2013 to 2016, analysed by ANOVA.

Elements of Model and Underlying Components		Mean (2013–2011) ¹	Country Effect ² (C)	Strategic Group Effect (SG) ³		Mean (2016–2013) ¹	Country Effect ² (C)	Strategic Group Effect (SG) ³	
				2011	2013			2013	2016
Farming goals									
dairy tradition	3	0.058	* LT, SI < PL			−0.426	** PL < SI		
outside work	3	−0.018				−0.128	** PL < NL, SI, LT		
social life	4	0.052				−0.111	** PL < NL, SI, LT	** 3 < 1	
maximize profit	3	0.002				−0.114			* 2 < 5, 1, 4
sustainable	6	0.043			* 3 < 5	−0.209	* PL < NL, SI, LT		
improve management	3	0.097				/	/	/	/
secure income	2	/	/	/	/	−0.035	* NL < SI		
Resources									
land	2	−0.338				0.028	** PL < NL		
labor	2	−0.037				−0.010			
capital	4	−0.029	* LT, PL < SI			−0.086	* PL < NL		
know-how	3	−0.056				−0.013	* PL < LT, SI		* 3 < 4
Opportunities and Threats									
regulations	4	0.059				−0.439			
market	4	−0.057	* LT < SI, PL			−0.039			
local environment	3	0.217				−0.348	** PL < SI, NL		
schemes	2	−0.065				−0.240			
new technologies & consumer	4	−0.007				−0.222	* PL < NL		
EU	3	0.159				−0.365			
services	5	−0.051				−0.162	** PL < SI, NL, LT		
Future Expectations									
	5	0.232				−0.691	** LT < SI, NL PL < NL		

¹ Concerns LT, PL, SI farmers in period 2011–2013 and LT, PL, SI, NL farmers in period 2013–2016. ² Significant at * $p < 0.05$ or ** $p < 0.01$. ³ Strategic group SG1 (1) = Growers and specialisers; SG2 (2) = Diversifiers; SG3 (3) = Farmers who wait & see; SG4 (4) = Co-operators; SG5 (5) = Chain integrators.

When analysing the average score of opinions within the two periods studied, many significant differences between countries, and to a lesser degree, between strategy groups were observed (Table 6). In the period 2011 to 2013, the Slovenian farmers scored lower on most of the components than their colleagues from Poland and Lithuania while in the period 2013 to 2016, the Netherlands' and Slovenian farmers scored lower on several components than the farmers from Poland and Lithuania. Exceptions were future expectations, market and availability of labour on which Netherlands' farmers were most positive, and sustainability on which Slovenian farmers were most positive. Lithuanian and Slovenian farmers scored highest on dairy tradition and secure income, Polish farmers on local rural environment and Lithuanian farmers on technologies & consumers, EU and services. The Wait & See farmers' strategy group scored in all years significantly lower on most components than the other four groups. In 2016 the Chain integrators strategy group scored lower on availability of labour and know-how.

3.4. Trend in Farmer Perceptions and Expectations

Figure 4 illustrates the trend in perceptions of the farmers towards 'future expectations', 'market', 'EU', 'local rural environment', 'availability of labour' and 'dairy tradition', respectively. 'Future expectations' and 'market' scored highest in 2013, lowest in 2016 and intermediate in 2011, although for the CEE countries the market situation scored almost the same in 2011 as in 2013. The Netherlands' and Polish farmers reacted similarly towards changes in the market place. A similar pattern in perception from year to year can be seen for the EU. Slovenian farmers were the most indifferent to changing their perception towards the EU, although in 2016 all countries dropped in appreciation score for the EU. The 'local rural environment' and 'availability of labour' were not sensitive towards time in most countries, with the exception of Poland where a negative trend in the score for 'labour' in combination with availability of 'land' and 'capital' was visible from 2011 to 2016.

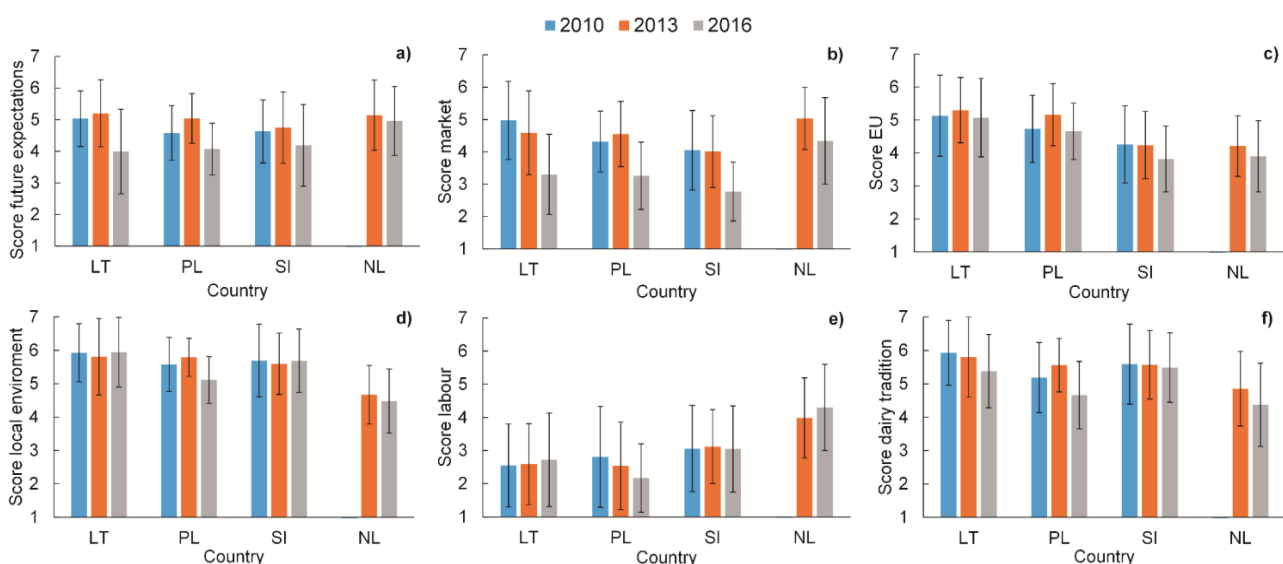


Figure 4. Trend in (a) future expectations, (b) market, (c) EU, (d) local rural environment, (e) labour and (f) tradition for farmers' groups in four countries in period 2011 to 2016 (1 = pessimistic/negative to 7 = optimistic/positive).

Table 6. Effect of country and strategic group on mean scores in Farming goals, Resources, Opportunities and Threats and Future prospects in periods 2011 to 2013 and 2013 to 2016, analysed by ANOVA.

Elements of Model and Underlying Components		Mean (2013 + 2011) ¹	Country Effect (C) ²	Strategic Group Effect (SG) ³		Mean (2016 + 2013) ¹	Country Effect (C) ²	Strategic Group Effect (SG) ³	
				2011	2013			2013	2016
Farming goals									
dairy tradition	3	5.607	* PL < LT		** 3 < 5, 2, 4, 1	5.229	** NL < PL < SI, LT	** 3 < 2, 5, 4, 1	** 3 < 5, 2, 4, 1
outside work	3	5.722				5.390	** NL < PL, SI ** PL < LT		
social life	4	5.779	** SI < LT, P			5.718	** SI, NL < LT		
maximize profit	3	6.357		* 3 < 2, 5, 1, 4	** 3 < 5, 2, 4, 1	6.143	** NL < SI, PL, LT	** 3 < 2, 4, 5, 1	** 3 < 5, 1
sustainable	6	6.311		* 3 < 4, 1	** 3 < 5, 1, 4	6.165	** NL, PL < SI	** 3 < 2, 1, 4, 5	* 3 < 4
improve management	3	5.726	** SI < PL, LT			/	/	/	/
secure income	2	/	/	/	/	6.417	** NL, PL < LT, SI		
Resources									
land	2	2.598	* SI, LT < PL			2.464			
labor	2	2.824	** LT, PL < SI			3.093	** PL < LT < SI < NL		* 5 < 4
capital	4	4.466	** SI < LT < PL			4.334	** SI < NL < LT < PL		
know-how	3	5.178	** SI < LT, PL			5.256	** SI < LT, NL, PL		** 5 < 2, 4, 3, 1
Opportunities and Threats									
regulations	4	4.136				3.809	** NL < PL, SI < LT		
market	4	3.421	* SI < LT, PL			3.156	** SL, LT < PL < NL		
local environment	3	4.442	** SI < LT < PL			4.259	** NL, SI, LT < PL		
schemes	2	4.312		* 3 < 5		4.004	** NL < LT, SI, PL	** 3.4 < 5, 2	
new technologies & consumer	4	5.600			* 3 < 5, 4, 2, 1	5.351	** NL < SI, PL < LT	** 3 < 4, 1, 2, 5	
EU	3	4.725	** SI < LT, PL	* 4 < 5		4.474	** SI, NL < PL < LT	** 3 < 2, 5, 1	** 4, 3 < 1, 2
services	5	5.116	** SI < LT, PL			4.979	** SI, NL, PL < LT		
Future expectations									
	5	4.843	* SI, PL < LT	** 3 < 4, 5, 2, 1	** 3 < 2, 5, 1, 4	4.655	** SI, PL, LT < NL	** 3 < 2, 1, 5, 4	** 3, 5 < 4, 1, 2

¹ LT, PL, SI in period 2011–2013 and LT, PL, SI, NL in period 2013–2016. ² Significant at * $p < 0.05$ or ** $p < 0.01$. ³ Strategic group SG1 (1) = Growers and specialisers; SG2 (2) = Diversifiers; SG3 (3) = Farmers who wait & see; SG4 (4) = Co-operators; SG5 (5) = Chain integrators.

3.5. Framework Explaining Future Expectations

The results of regressing 'Farming goals', 'Resources' and 'O&T' on 'Future expectations' are shown in Tables 7 and 8. The components as explanatory variables (listed in the far left column) did not show clear signs of co-linearity, although correlations above 0.30 were found between the components land and local rural situation, EU and capital, EU, services, regulations and technology, and between sustainable, dairy tradition and social life.

Table 7. Regression analyses of Farming goals, Resources, and Opportunities and Threats on Future prospects for mean 2013 minus 2011 and mean 2016 minus 2013; regression coefficients (b) are listed as the change in performance per unit change in the particular component; strategic direction and countries were inserted as dummy variables.

Elements with Components	Expectations 2013 Minus 2011 ¹		Expectations 2016 Minus 2013 ¹	
	Without Strategies ²	With Strategies ²	With Strategies ²	Without Strategies ²
Countries (versus Lithuania)	F = 2.736 (<i>p</i> = 0.067)	F = 2.736 (<i>p</i> = 0.067)	F = 9.288 (<i>p</i> = 0.000)	F = 9.288 (<i>p</i> = 0.000)
Poland	0.189	0.192	0.377	0.397
Slovenia	−0.125	−0.125	0.577 **	0.633 **
Netherlands	/	/	1.004 **	0.976 **
Strategic direction (versus Wait & See) ³		F = 1.159 (<i>p</i> = 0.330)	F = 2.385 (<i>p</i> = 0.056)	
Growers & Specialisers		0.325	−0.381	
Diversifiers		0.109	−0.333	
Cooperators		0.561 *	−0.708 *	
Chain integrators		0.085	0.171	
Farming goals	F = 0.965 (<i>p</i> = 0.458)	F = 0.966 (<i>p</i> = 0.457)	F = 0.870 (<i>p</i> = 0.531)	F = 0.946 (<i>p</i> = 0.472)
sustainable	0.019	0.001	−0.123	−0.099
outside work environment	0.069	0.050	0.045	0.043
maximize profit	0.082	0.074	0.036	−0.008
social life	0.021	0.065	0.028	−0.069
dairy tradition	−0.080	−0.074	−0.036	0.055
improve management	−0.213	−0.234	/	/
secure income	/	/	0.006	0.000
Resources	F = 4.553 (<i>p</i> = 0.002)	F = 4.920 (<i>p</i> = 0.001)	F = 2.744 (<i>p</i> = 0.029)	F = 2.083 (<i>p</i> = 0.083)
land	−0.021	−0.013	0.039	0.037
labor	−0.077	−0.081	0.031	0.041
capital	0.192 **	0.206 **	0.008	−0.013
know-how	0.022	0.011	0.151 *	0.125
Opportunities and Threats	F = 2.902 (<i>p</i> = 0.007)	F = 3.012 (<i>p</i> = 0.005)	F = 3.361 (<i>p</i> = 0.002)	F = 3.018 (<i>p</i> = 0.005)
regulations	−0.040	−0.039	0.021	0.000
market	0.042	0.054	0.181 **	0.176 **
local rural environment	0.115	0.110 *	0.107	0.094
schemes	0.098	−0.103 *	−0.060	−0.036
new technologies & Consumers	0.048	0.026	−0.070	−0.027
EU	0.134 *	0.121 *	0.007	0.014
service	0.049	0.096	0.185 *	0.184 *
R²	0.21	0.24	0.24	0.20

¹ Expectations 2011–2013 relates to SI, LT and PL, and Expectations 2013–2016 to SI, LT, PL and NL. ² * *p* < 0.05; ** *p* < 0.01. ³ Calculations are based on farmers' cluster 2013.

The regression coefficients $-b$ —for the period 2011 to 2013 and for 2013 to 2016 with and without strategies were quite similar in direction and size, with one exception, namely the b -coefficients for strategic groups in the period 2013 to 2016 (Table 7) were negative in contrast to the other b -coefficients. This was due to an unusually large drop in future expectation by the 'Wait & See' group from 2013 to 2016.

Table 8. Regression analyses of Farming goals, Resources, and Opportunities and Treats on Future prospects for mean 2011 plus 2013 and for mean 2013 plus 2016; regression coefficients (b) are listed as the change in performance per unit change in the particular component; strategic direction and countries were inserted as dummy variables.

Elements with Components	Expectations 2011 + 2013 ¹		Expectations 2013 + 2016 ¹	
	Without Strategies ²	With Strategies ²	With Strategies ²	Without Strategies ²
Countries (versus Lithuania)	F = 4.687 (<i>p</i> = 0.010)	F = 4.687 (<i>p</i> = 0.010)	F = 5.721 (<i>p</i> = 0.001)	F = 5.721 (<i>p</i> = 0.001)
Poland	−0.290 *	−0.268	−0.137	−0.128
Slovenia	0.097	0.112	0.375 *	0.385 *
Netherlands	/	/	0.736 **	0.678 **
Strategic direction (versus Wait & See) ³		F = 3.729 (<i>p</i> = 0.006)	F = 6.980 (<i>p</i> = 0.000)	
Growers & Specialisers		0.248	0.422 **	
Diversifiers		0.346	0.340 *	
Cooperators		0.407	0.411 *	
Chain integrators		0.198	0.500 **	
Farming goals	F = 8.744 (<i>p</i> = 0.000)	F = 6.763 (<i>p</i> = 0.000)	F = 3.985 (<i>p</i> = 0.000)	F = 6.303 (<i>p</i> = 0.000)
sustainable	0.327 *	0.302 *	0.058	0.104
outside work environment	−0.298 **	−0.283 **	−0.088	−0.122
maximize profit	−0.004	−0.036	−0.040	−0.004
social life	0.076	0.080	0.060	0.055
dairy tradition	0.261 **	0.243 **	0.172 **	0.204 **
improve management	0.058	0.053	/	/
secure income	/	/	−0.086	−0.086
Resources	F = 4.702 (<i>p</i> = 0.001)	F = 4.295 (<i>p</i> = 0.002)	F = 4.833 (<i>p</i> = 0.001)	F = 4.875 (<i>p</i> = 0.001)
land	−0.071	−0.025	0.001	−0.008
labor	−0.078	−0.139 *	−0.045	−0.040
capital	0.253 *	0.187 *	0.202 **	0.187 **
know-how	0.009	0.018	0.065	0.068
Opportunities and Threats	F = 2.739 (<i>p</i> = 0.010)	F = 2.806 (<i>p</i> = 0.008)	F = 7.684 (<i>p</i> = 0.000)	F = 7.320 (<i>p</i> = 0.000)
regulations	−0.041	−0.074	−0.007	−0.035
market	0.035	0.065	0.198 **	0.201 **
local rural environment	0.186 *	0.175 *	0.190 **	0.199 **
schemes	−0.070	−0.070	−0.141 *	−0.127
new technologies	0.068	0.097	0.242 **	0.251 **
& Consumers				
EU	0.215 **	0.264 **	0.183 *	0.210 **
service	−0.094	−0.076	−0.057	−0.063
R²	0.32	0.39	0.40	0.38

¹ Expectations 2011–2013 relates to SI, LT and PL, and Expectations 2013–2016 to SI, LT, PL and NL. ² * *p* < 0.05; ** *p* < 0.01. ³ Calculations are based on farmers' cluster 2013.

The F-statistics in Tables 7 and 8 indicate that all elements in the model influenced 'Future expectations' (performance), although 'Strategic directions' (*F* = 1.159 and 2.385) and 'Farming goals' (*F* = 0.966 and 0.870) did not significantly contribute to explaining the changes in 'Future expectations' over time (Table 7). For the CEE countries sample (2013 minus 2011; Table 7), farmers who were more satisfied with availability of 'capital', their 'local rural situation' and the EU were more positive about the future of their farm business; a 1 unit positive change in perceived availability of capital or appreciation of the local rural situation or the EU resulted in a +0.11 to +0.21 improvement in expectations, while a 1 unit negative change in appreciation of certification schemes resulted in a +0.10 improvement in expectations. For the four country sample (2016 minus 2013), a 1 unit increase in the components 'know-how', 'market' and 'service' contributed significantly to positive changes of +0.15 to +0.19 in expectations.

For the CEE countries sample (2011 plus 2013; Table 8), farmers who are more sustainable oriented, and who better appreciate the 'dairy tradition', availability of 'capital',

'local rural environment' and the EU, tended to be more positive about the 'future of their farm business' (+0.18 to +0.30). Conversely, a positive appreciation for 'outside work' and 'availability of labour' were associated with a negative expectation level (−0.14 to −0.28). For the four country sample (2013 plus 2016), a 1 unit increase in the components 'dairy tradition', 'available capital', 'market', 'local rural environment', 'new technologies & consumers' and the 'EU' contributed significantly to a higher expectation level (+0.17 to +0.24). A positive appreciation of certification schemes was linked to a lower expectation level (−0.14).

All strategy groups had significantly higher future expectations than the Wait & See group. The differences in 'future expectations' scores between, on one hand, the Growers & Specialisers, Diversifiers, Co-operators and Chain integrators, and on the other, the Wait & See farmers ranged from 0.34 to 0.50 (Table 8).

Strategic direction did not reduce the influence of 'Farming goals', 'Resources', and 'O&T' on 'Future expectations' (Tables 7 and 8; compare outside columns to centred columns in 2 periods studied), indicating that strategy is not a mediating variable. In other words, including 'Strategic directions' in the model did not increase prediction of 'Future expectations' (R^2) substantially and did not exclude other elements from the model. Thus, dairy farmers seem not informed or not interested to make strategic decisions that make the best use of their resources, mitigate threats and take opportunities to achieve their personal goals. Instead, Strategic directions, Farming goals, Resources, and O&T influence farmers' Future expectations (prospects) directly.

4. Discussion

4.1. Farm Characteristics and Farm Size

The signalled overrepresentation of larger farms raises the question if the results may have been affected by farm and herd size, although an initial beginning assumption was that farm size would be confounded with country, because Lithuania and especially The Netherlands have the larger farms. When perceptions were sorted into two herd sizes (≤ 100 cows and >100 cows), several of the components showed considerably higher scores with the larger herd size across all years: 'future expectations' 0.4 to 0.7; 'EU and market' 0.2 to 1.0; 'new technologies' & 'consumers and services' 0.4 to 0.2. However, other components like 'labour', 'capital' and 'local rural environment' differed only slightly between larger and smaller herds. When entering herd size as a dummy variable in the regression equation for predicting level of 'expectation', it came together with country into the solution for the period 2013 to 2016 (four countries' sample) and R^2 increased by 0.08 for the period 2011 to 2013 (CEE-countries' only sample). This shows that inclusion of herd or farm size in the framework can contribute to a minor improvement in the model as used in this study. Herd size was also useful in explaining farmer opinions regarding technology adaptation in Kentucky [41] and Australia [42], and was successfully included in the decision framework as applied by Kastens and Goodwin [25], Castro et al. [19] and Morris et al. [29].

4.2. Farmer Strategy Groups

Strategy formulation requires long term planning and peace of mind. Interactive strategic management trainings with dairy farmers, as described by Malak-Rawlikowska et al. [43], established that farmers tend to focus on day-by-day management and the majority prefers to discuss cow related topics, such as aspects of cow housing, feeding and health. It takes effort and trainer skills to follow the process of future thinking.

In this study, five groups of farmers were identified with similar strategic directions. This was based on their perceptions in 2011, 2013 and 2016 separately expressed by answering the questions listed in Table 2. The Growers & Specialisers group was largest although diminishing in size over the course of the study period. A production oriented mind-set was also reported by Alford (2003) and Gorton [24]. Other perceptions did not differ much between the strategic farmer groups. Only Wait & See farmers scored significantly lower

on several components than the other groups, similar to observations in the studies of Barbieri and Mahoney [32] and Verhees et al. [44].

Opinions change and therefore individual farmers sometimes changed from year to year between strategic groups. This crossover was studied by M. Klopčič (University of Ljubljana, Slovenia, personal communication). It appeared that 30% to 50% of farmers restated their strategic direction such that they were assigned to a different strategic group within the period studied. This shift in perceived strategy emphasises the fluency in opinions in a period of dramatic changes in external circumstances.

Strategies of farmers may or may not align with the strategic directions of the other main partners in the food chain, like dairy and feed companies, farmers' syndicates, agricultural ministries, and nongovernmental organisations (NGOs). A strong food chain can be envisioned having partners with similar goals, all pushing together in the same (or a few well defined) direction(s) (see scenario studies of [27,45]). The strategies of stakeholders in the dairy chain in the same countries as in this study were examined in 2015 [38], asking the same questions as in the present study. A further step in the analysis will be to mirror the opinions of farmers and stakeholders and report it.

4.3. Farmer Perceptions over Time

Farmer perceptions are presented based on components, i.e., composites of questions combined by PCA and then expressed in average scores for these questions. The presentation of component scores is by year, country and strategy group. This makes it possible to integrate a large set of data and present it in an understandable way. However, going back to the original questions may add additional insight. The O&T environment with respect to the market, EU, new technologies & consumer and the local rural situation are examples of factors that especially impact the expectations of farmers. Various questions relating to these components are depicted in Figure 5 for the different countries for the period 2013 to 2016.

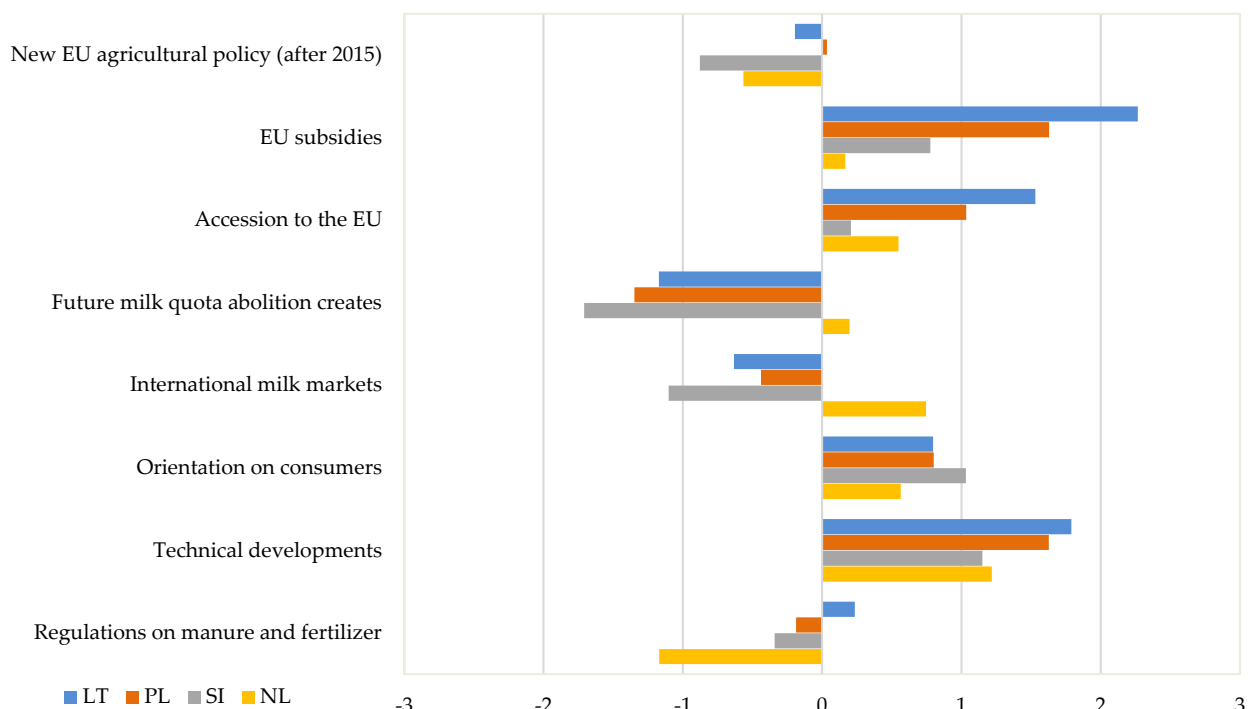


Figure 5. Perceptions averaged over years 2013 and 2016 based on original questions composing the Opportunities and Threats component (scale transformed to -3 big threat to $+3$ big opportunity for illustrative purpose).

This detailing of the analysis indicates underlying questions dominating the outcome. Netherlands' farmers were distinctly more positive about the abolition of the quota system and own market situation than the farmers in the other countries, indicated by a substantially higher score for the component 'market'. EU subsidies were perceived as a bigger asset by CEE farmers than Netherlands' farmers which contributed to a relatively higher score of CEE farmers for the component *EU*. Obviously, the market attitude of Netherlands' farmers lowered somewhat the appreciation score for the subsidy policies of the EU. Rules on manure management and other environmental issues are a hot topic in the Netherlands [46], resulting in a negative score for the component 'regulations'. Farmers in Slovenia scored highest on the question on consumer orientation but lower on new technologies, which resulted in a less distinct outcome for the component 'new technologies & consumers'. In contrast, Lithuanian farmers were very positive towards new technology, as expressed by the relative high score for the component new 'technologies & consumers'. Thus, additional information from the individual questions deepens the insight into the more global component results presented in this study.

4.4. Framework Predicting Future Expectations

A limited set of farmers' perceptions measured by the specified components were interrelated with their future expectations. Perceptions towards the components 'market', 'EU', 'local rural environment', 'capital', 'new technologies & consumers and services' especially emerged as indicators of the current mind-set of the farmer. Higher appreciation for these components resulted in a more positive outlook on the farm business. The mind-set of the farmer, especially towards the market, EU and local rural environment seemed to follow the fluctuation in milk price. The year 2011, and even more so 2016, coincided with (very) low milk prices, while in 2013 the milk price was relatively better (see Figure 6). The importance of milk price for the viability of dairy sector was also described by Walsh et al. [47]. The three components mentioned had lower scores by (on average) -0.11 in 2011 and -0.58 in 2016 compared to 2013. For the other mentioned components the differences in score were mainly noted for the period 2013 to 2016, where 2016 had the lower value.

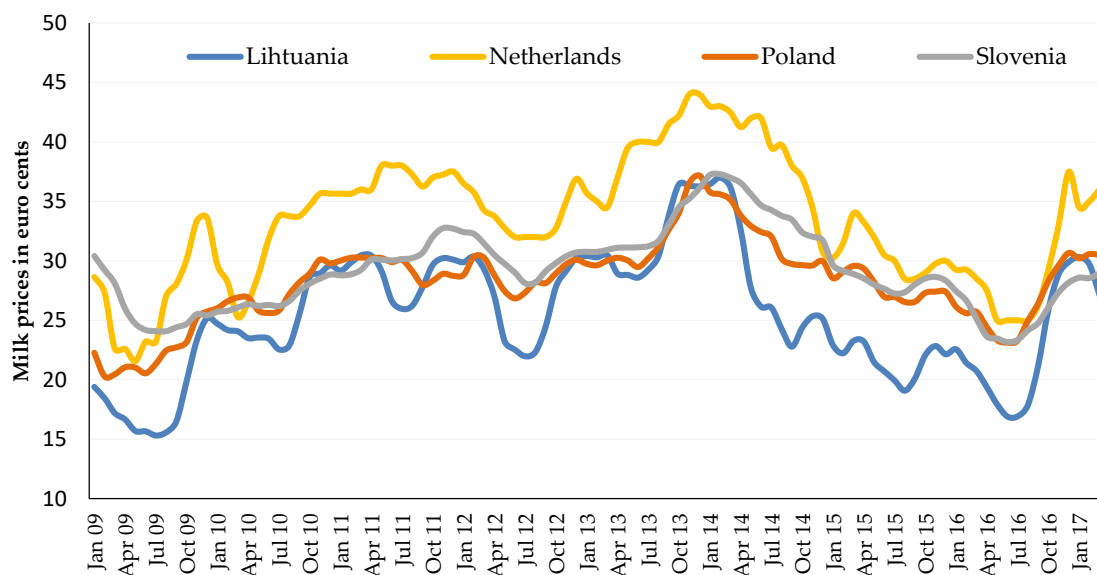


Figure 6. Trend in milk prices in four countries in study. Source: EUROSTAT.

The framework as applied assumed an intermediate role of 'Strategic direction'. This was not the case. All elements in the framework, i.e., Resources, O&T, Farming goals and Strategic direction affected Future expectations (performance) in a direct way. This was not completely unexpected. Decision making is a complex process, which does not

follow a strict step by step approach as depicted in the findings and models of many workers [48–51]. Also considerable differences in perceptions existed among countries, i.e., regions. Obviously, history and local circumstances play a role in the mind-set of the farmer. The framework could be further detailed by adding farm size as an element to the conceptual framework, although part of the variation in farm size is already captured by country. But also within countries large differences in farm size are possible as illustrated by the situation in Lithuania.

4.5. Implications

This study shows that external factors are very important for the orientation of farmers towards their future position in the food chain and their negative or positive feelings. The market situation is one of the dominant factors affecting the mind-set of farmers in Europe. It indicates that the large dependence by farmers on the price of their product could be a sensitive issue for politicians, the population of consumers and farmers' syndicates. To examine this further, it would be interesting to repeat this study in different environments in countries such as USA or New-Zealand, that have a long market oriented tradition, and in Canada which has a milk quota system in place. Strongly fluctuating market and policy conditions disrupt the planning process and stability in the sector. Price fluctuations result theoretically in different reactions on investments for varying forms of behaviour towards risk [52]. Conforming to this principle, this study illustrates that the population of farmers divides into a risk seeking group looking for expansion and a wait and see group, a situation presently accentuated in the Netherlands by environmental restrictions [46]. Morris et al. [29] also signals a divergence of farmers in Wales in those who can be viewed as active or latent entrepreneurs and others who remain passive. This division tends to undermine common goals and cooperation in the rural domain and promotes individualism [17]. However, it may also contribute to rapid changes in the sector, which is sometimes desirable from a society viewpoint to improve overall food production efficiency. Nevertheless, also wait and see farmers may have their merit in the rural area. Barbieri and Mahoney [32] analysed producers who diversified their farms in Texas (USA). They observed that almost 50% of the diversifiers were retired from another profession and new entrants to agriculture. They also concluded that attracting new entrants to agriculture for non-economic reasons may bring societal benefits such as preserving heritage, maintaining rural landscapes and natural resources.

5. Conclusions

A dataset on the opinions held by dairy farmers was compiled and analysed to study farmer perceptions and expectations as concern Farming goals, Resources, O&T and Future expectations (performance) over time in three CEE countries—Poland, Lithuania and Slovenia—and one Western European country, The Netherlands. These countries cover a wide variety of circumstances in Europe, yet may be characterized from an international perspective as dominated by family farming and based on herds of a relatively small size. Farmer opinions were monitored over a 6-year period. The conclusions address the following three questions posed in the study.

5.1. How Do Dairy Farmer Perceptions of Farming Goals, Available Resources, Opportunities & Threats, and Future Expectations Change over Time?

The perceptions of Farming goals, Resources, O&T and Future expectations fluctuated during the study period. The O&T components are most susceptible to yearly effects caused, among others, by changing price and agri-food policy conditions. The availability of Resources and Farming goal components are less sensitive to the changing external circumstances. In general, the market situation is one of the dominant factors affecting the mind-set of the farmers in our sample. Future expectations were evaluated the highest in 2013 (a period with 'high' prices), the lowest in 2016 (a price crisis) and on an intermediate level in 2011 (a moderate price period).

This result implies that farmers' considerable dependence on the price of their product may be a sensitive issue for politicians, but also food chain members and farmers' syndicates. Policymakers and dairy chain stakeholders may anticipate farmers to have fluctuating attitudes to organisational and institutional plans and implemented measures, depending on the market situation and related policy context. When the market situation is favourable for farmers, they tend to show more of a positive attitude to specific measures perceived with a more optimistic view. Price fluctuations also lead to different reactions to investments and farmers' behaviour towards risk. This study illustrates that the farmer population may be divided into a risk-seeking group looking for expansion and 'a wait and see' group. This may allow policymakers and food chain stakeholders to adjust their strategies and measures with respect to these groups.

5.2. Does Country and Region of Origin Affect the Farmers' Perceptions?

Country of origin is a major element in the farmers' perception when expressed as the average level of scores of a component over several years. In the 2011 to 2013 period, Slovenian farmers scored lower for most components than their colleagues from Poland and Lithuania, while in the 2013 to 2016 period farmers from The Netherlands and Slovenia scored lower for several components than farmers from Poland and Lithuania. Exceptions were future expectations, market, and availability of labour regarding which The Netherlands' farmers were most positive, and sustainability as to which the Slovenian farmers were most positive.

Farmers in the Netherlands were distinctly more positive about the abolition of the quota system and their own market situation than farmers in the other countries. EU subsidies were seen as a bigger asset by CEE farmers than farmers in The Netherlands, which contributed to the CEE farmers' relatively higher score for the EU component.

Conversely, the country effect is less distinct while looking at the change in average score from one year to another. In other words, country and region of origin were strongly associated with the level of appreciation or disapproval of a component, but changes in this appreciation over time were relatively more similar among the countries involved in this study. Opinions did not really differ between the distinguished Farmer strategy groups, except for the Wait & See farmers who were the most pessimistic about all components.

This result indicates that significant country differences exist in the reactions of farmers to the changing circumstances in farming conditions. Overall, general policies do not easily deal with local perceptions and contexts. A more tailor-made approach to local circumstances may work better at motivating farmers to deal with changes. This also implies that in turbulent external circumstances dairy chain stakeholders can anticipate a client group of farmers that is firmly, sometimes aggressively, pushing forward, and another group that is hesitant about how to go on, or even considering stopping farming.

5.3. To What Degree Do Farmer Expectations over Time Depend on Their Perceptions of the Farming Goals, Available Resources, and Opportunities & Threats?

Future expectations are directly correlated with Farming goals, Resources, O&T and Strategic direction. Strategic direction did not play an intermediate role between, on one hand, Future expectations, and on the other, Farming goals, Resources and O&T, in contrast to the assumed framework.

Perceptions of the components "market", "EU", "local rural environment", "capital", "new technologies & consumers" and "services" especially emerged as indicators of the current mind-set of the farmer. Greater appreciation of these components led to a more positive outlook on the farm business. The mind-set of the farmer, particularly towards the market, the EU and local rural environment seemed to follow the milk price fluctuations.

Thus, the insight into the farmers' perceptions with respect to the market, local environment, technologies, consumers and services can help guide farmers while discussing their farm development strategy. The factor of farm size may be added to such a quick-scan approach.

The results, based on a longer observation of farmers' behaviour, capture the farmers' changing attitudes during 'prosperity' and 'crisis' periods in the market. These periods usually 'come and go away' in some cyclical order, depending on different impact factors. Yet, when interpreting our results, one should have in mind that the study was based on unique panel data for 290 dairy farms in Poland, Slovenia, Lithuania and The Netherlands, with the farmers being questioned up to three times in 2011, 2013 and 2016. Despite the sample being constructed so as to reflect the dairy farm structure in the selected countries, the data set is not fully representative. Still, the observations indicate interesting relationships that may be used to help shape policies for the dairy sector in individual countries and strengthen specific tools targeting selected farmer groups. Further, more attention in the analysis could be devoted to the changes in individual farmer attitudes over time. Individual perceptions are likely to be more diverse and changeable than group average perceptions.

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Appendix A

Components (main factors) based on questions 2011–2013 (LT, PL, SI) and 2013–2016 (LT, PL, SI, NL)

Appendix A.1 Farming Goals G

- (1) Dairy Tradition = G22_Provide my successor with opportunity for dairy + G23_Keep dairy tradition in family + G26_To have opportunity to work together with family
- (2) Outside work environment = G17_Maintain and develop nature and landscape + G25_Work with machines + G27_To work outside in the field
- (3) Low cost management = G4_Keep farm management simple + G5_Reduce debts
- (4) Social life = G9_Enjoy a rural lifestyle + G13_Have sufficient leisure (vacation) time + G14_be my own boss + G16_Be respected by community
- (5) Maximize profit = G1_Breed cows with high milk production + G2_Maximize profit + G3_Run the farm efficiently
- (6) Sustainable = G8_Breed 'sustainable' dairy cows + G12_Produce best quality product + G15_Produce a safe product for consumers + G18_Improve animal welfare (housing circumstances) + G19_Animal production with respect to animal welfare + G20_Work with animals
- (7A) Period 2011–2013: Improve management = G6_Improvement of grassland management + G7_Improvement of management of maize production + G10_Have a high tech farm

(7B) Period 2013–2016: Secure income = G21_Keep cost as low as possible + G24_Earn enough money to support my family

Appendix A.2 Resources R

- (1) Land = R1_Land to buy + R2_Land to rent
- (2) Labor = R9_Qualified labour + R10_Seasonal workers
- (3) Capital = R3_Commercial credit + R4_EU subsidies + R5_Direct payments + R8_Machinery
- (4) Know how = R11_Advise of extension services + R12_Advise of private consultants + R13_Access to new and useful knowledge

Appendix A.3 Opportunities and Threats OT

- (1) Market = OT4_Future milk quota abolition + OT7_Future reduction of direct payments (CAP) + OT17_The milk market situation in my country + OT18_International milk markets
- (2) Regulations = OT1_Regulations for animal welfare + OT2_Regulations for veterinary and sanitary standards + OT3_Regulations on manure and fertilizer + OT11_Inspection services
- (3) Schemes = OT9_Land property legislation + OT10_Certifying organizations
- (4) Local environment = OT24_The location of my farm + OT25_Consumer concerns + OT26_The availability of land
- (5) EU = OT5_Member of EU + OT6_EU subsidies + OT12_New EU agricultural policy (after 2015)
- (6) Services = OT19_Cooperatives + OT20_Colleague farmers + OT21_Advisory services + OT22_Veterinarians + OT23_Inputs suppliers
- (7) New technologies & Consumer = OT13_Technical developments + OT14_Orientation on consumers/the market + OT15_Internet + OT16_IC.

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