THE FUTURE OF MILK IN THE LIGHT OF THE AGRICULTURAL POLICY CHANGES TOWARDS 2025 – A DELPHI STUDY ON FUTURE CHALLENGES OF THE FINNISH MILK SECTOR

Pasi Rikkonen, Jyrki Aakkula and Mari Rajaniemi

MTT Agrifood Research Finland, Economic Research, Luutnantintie 13, 00410 Helsinki, Finland

Contact: pasi.rikkonen@mtt.fi

European Association of Agricultural Economists

Università degli Studi della Tuscia

Istituto nazionale di Economia Agraria

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Abstract

The production of milk is facing major challenges in the coming reforms of Common Agricultural policy (CAP). At the same time the global market demand for refined milk products is changing mostly because of increasing welfare in Asian market (China, India). These EU and global level changes affect Finnish agriculture in many ways. In this paper the focus is on the future of milk production in Northern perspective studied with one of the futures studies method, the Delphi method. The Delphi method aims to identify and explore alternative future possibilities, their probabilities of occurrence, and their desirability by tapping into the expertise of respondents.

The studied themes in the Delphi questionnaires were defined according to their policy relevancy. The themes were 1) the structural change of milk production 2) the agricultural policy changes 3) the changes in milk market and national economy 4) the changes in technology, production processes and know-how and 5) the changes in consumption and in societal values. These themes interact closely with each other, and therefore they are interpreted as a whole to capture a holistic view on the future milk production in Finland. We produce alternative future images for the milk sector in Finland between 2007 and 2025 based on views and argumentation of the Delphi panel experts. The first round of the Delphi study was carried out by structured questionnaire (internet survey) including five face-to-face interviews and the second feedback round followed the same procedure. The panel consisted of 30 national experts familiar with the milk sector.

The future images of the milk sector are constructed and related policy choices are recognized by analysing major driving forces and directions of development in terms of their importance, likelihood and desirability. An analytical framework to assess strategic decision-making challenges is outlined and key issues to be taken into account in the future policy design are identified. The derived future images give a clear picture about policy challenges and alternative development paths that the milk sector as well as the CAP has to be prepared to cope with by the year 2025.

Keywords: Future of the CAP, Delphi Study, Milk

JEL Code: Q18

Introduction

The production of milk is facing major challenges in the coming reforms of Common Agricultural policy (CAP) such as the abolition of milk quotas and the diminshing role of the CAP. At the same time the global market demand for refined milk products is changing mostly because of increasing welfare in Asian market (China, India). Moreover, in the same period world population will also continue to increase. There are also several single factors affecting the milk sector such as the increasing prices of input for example energy price. Finland represents an agricultural area in where the production costs are by reason of natural conditions somewhat higher compared to the other EU member states. Therefore these EU and global level changes affect Finnish agriculture in many ways. In recent years the total volume of produced milk has decreased from 2,400 million litres (in 2004) to over 2,200 million litres (in 2007) and Finland fell 2.9% short of the national quota. Europe is the only area in the world in where the milk production has decreased during the two recent centuries. The reasons behind this development are especially the production quotas and decreasing number of farms in milk production. In other areas of the world such as Asia and North America, the milk production has increased. EU's share of the world's total production is slightly over one fifth (FAO 2003, 2005, 2006, Niemi et al. 2008).

Historically, EU member states have had guaranteed prices above market level through CAP. Price support, however, has created distortions to production as farmers were encouraged to expand supply and produce large surpluses of agricultural commodities. Through the recent and ongoing agricultural (CAP) and trade policy (WTO) reforms EU opens its' markets to global competition. Given these developments, Finland is facing many challenges in the coming years. (Eickhout et al. 2007, Bruinsma 2003). Milk production is the most important agricultural production sector in Finland. In recent years milk has accounted for about half of the return on agricultural production at market price (44% in 2007). Through the quotas it has been possible to ensure the production also in the less-favoured areas where the alternatives employment opportunities are scarce. Internal policy changes mean that Finnish milk sector must prepare for the abolition of the quota scheme and be capable of finding alternative ways to ensure the continuation of the domestic milk production. (Niemi et al. 2008).

In this paper the focus is on the future of milk production in Northern perspective studied with one of the futures studies method, the Delphi method. The Delphi method aims to identify and explore alternative future possibilities, their probabilities of occurrence, and their desirability by tapping into the expertise of respondents. The Delphi method consists of the judgement of experts by means of successive iterations of a given questionnaire, to show possible convergence of opinions and to identify dissent or non-convergence. The Delphi method is considered especially useful for long-range matters (20 to 30 years) as one of the most used scenario planning method in the field of foresight.

The purpose of this paper is to detect, based on views of agricultural and food-chain experts, what type of policy challenges key driving forces and other indicators of change pose to the Finnish milk sector and its further development. The first objective is to assess which driving forces the experts consider to be the most important and influential. The second objective is to develop an analytical framework which would make it possible to detect the type of policy challenge that a certain driving force represents. The third objective is to classify driving forces according to the developed policy challenge typology and, based on this classification, to identify likely pitfalls and drawbacks that the milk sector is going to face in the future.

Material, methods and the Delphi process

The Delphi method concentrates on assessing the future development. The users of the Delphi technique aim to explore alternative future images, possibilities, their probabilities of occurrence, and their desirability by tapping the expertise of respondents. Linstone and Turoff (1975, p.3) characterize Delphi as a method for structuring a group communication process in such a way that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem (see also Sackman 1975, Kuusi 1999, Rowe and Wright 2001, Tapio 2003). The Delphi method consists of experts' judgement by means of successive iterations of a given questionnaire, to show convergence of opinions and to identify dissent or non-convergence. Anonymity and feedback can be considered as two irreducible elements of a Delphi technique. Traditionally, a third feature, a consensus seeking, has been one element.

In this study, the empirical data was gathered following the principles of a Policy Delphi method and its latter variant Argument Delphi (Turoff 1975, p. 80, Kuusi 1999). The Policy Delphi represented a significant departure from the understanding and application of the Delphi technique as practiced in 1950–70 (Turoff 1975, p. 80). Delphi as it originally was introduced and practiced tended to deal with technical topics and seek a consensus among homogeneous groups of experts. The Policy Delphi, on the other hand, seeks to generate the strongest possible opposing views on the potential resolutions of a major policy issue. A Policy Delphi should be able to serve any one or any combination of the following three objectives: (1) to ensure that all possible options have been put on the table for consideration, (2) to estimate the impact and consequences of any particular option and (3) to examine and estimate the acceptability of any particular option.

The studied themes in the Delphi questionnaires were defined according to their policy relevancy. The themes were 1) the structural change of milk production 2) the agricultural policy changes 3) the changes in milk market and national economy 4) the changes in technology, production processes and know-how and 5) the changes in consumption and in societal values. These themes interact closely with each other, and therefore they are interpreted as a whole to capture a holistic view on the future milk production in Finland. The

time frame of producing alternative future images for the milk sector in Finland was defined between 2007 and 2025.

A first round questionnaire was developed and pre-tested by the research group that implemented the study and also with couple of outside experts in the agricultural field. The first round of the Delphi study was carried out by structured questionnaire (internet survey) including five face-to-face interviews and the second feedback round followed the same procedure. The panel consisted of 30 (83%) national experts (of the total 36) familiar with the milk sector (Table 1). Before the second round, a feed-back report that included the first round results was send to the respondents. The second round response rate remained somewhat lower, 63% of the total 36 addressees.

Table 1 - The respondent panel

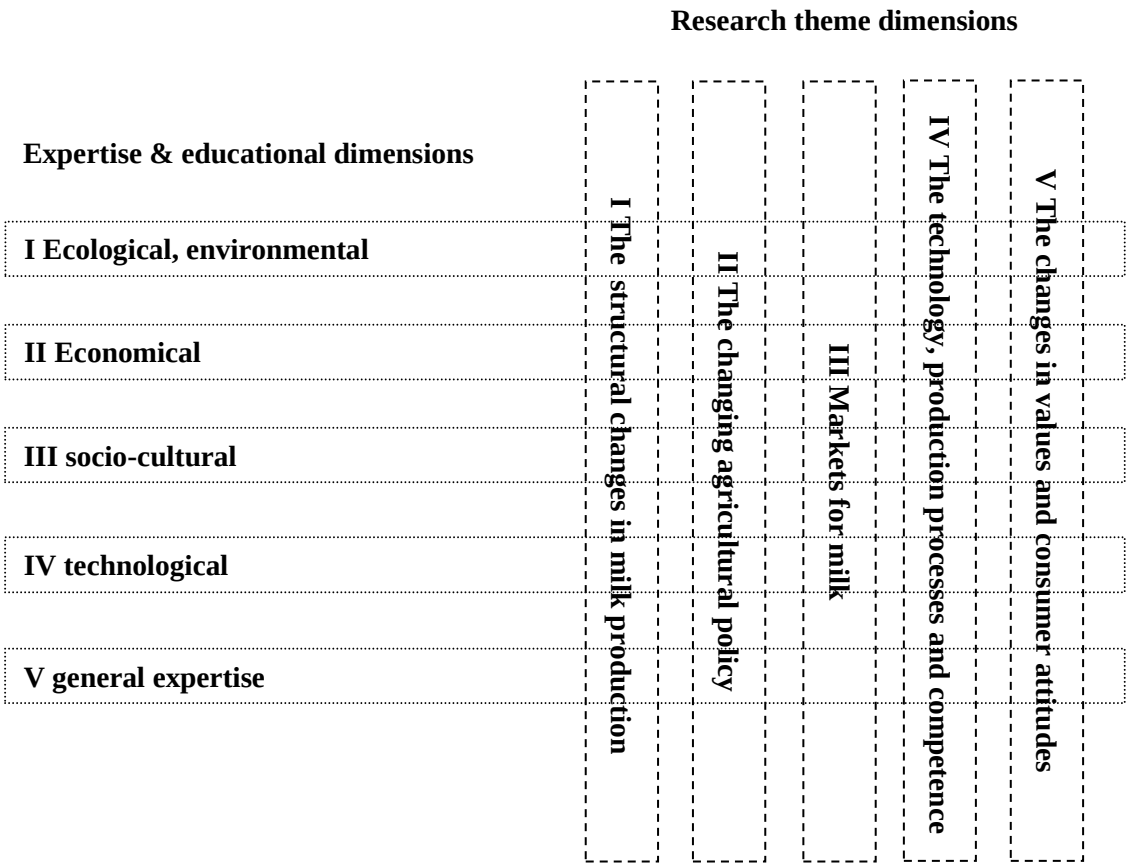
Research	10
NGO's and agricultural unions	6
Administration	5
Industry	4
Other stakeholders	3
Consultation	3
Primary production	2
Education	2

The themes themselves can be seen as a framework to assess strategic decision-making challenges to be taken into account in the future policy design of agricultural policy agenda. The derived future images will give a clear picture about policy choices and alternative development paths that the milk sector as well as the CAP has to be prepared to cope with by the year 2025. In futures studies, a broadly used approach to produce a holistic view on the future is to study topics connected to the changes in a Social, Technological, Economic, Ecological, Political and in Value environment (STEEPV). It is possible to gain a deeper insight into the studied factors with the STEEPV set, as the dimensions in a policy point of view are particularly influential and relevant (see Van der Heijden et al. 2002, Rikkonen 2005). The STEEPV set up was utilised here in the preparation of the questionnaire and also in categorising the results of the Delphi process.

The selection of the panel is a critical phase in using methods like Delphi technique. In this study the selection process proceeded as follows. First, the criteria and classification for choosing expert were prepared according to the studied themes (substance), the needed expertise to cover the studied substance and the actor listing of milk sector. Also at this phase, the preliminary panellists were listed. After circulating the list of preliminary panellists the coordinator of the Delphi process personally called to the chosen experts that were selected to be interviewed. The interviewed experts were selected in such a way that they represented the expertise coverage of the criteria dimensions. The panellists list was complemented until there

was a sufficient amount of expertise in the light of criteria dimensions. The criteria for selecting the panel in this study is presented in Figure 1. The boundaries between groups are indicative.

Figure 1 - The criteria for selecting expert panel

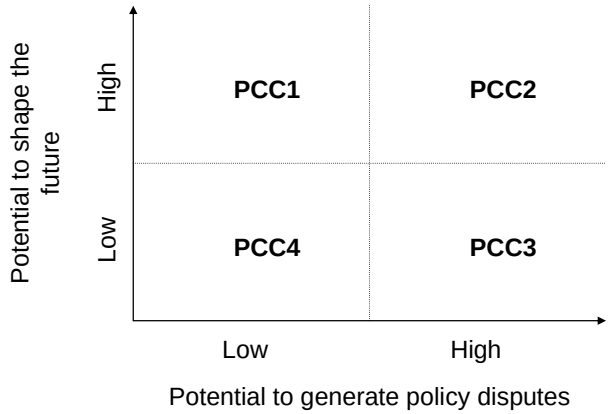


Analytical framework

Although it is crucial to detect key future-influencing factors like driving forces, megatrends and weak signals which are likely to shape the future, from the policy-making point of view it is even more important to identify the type of a challenge that they pose to a political decision-making process. In Rikkonen et al (2006), a multi-dimensional framework for analysing strategic policy challenges was outlined. Expert views on developments in certain key variables shaping the future of agriculture were translated into different kind of policy challenges based on their importance rating, certainty of occurrence, degree of probability and degree of desirability. As a result, a typology with eight different policy challenge categories was defined. With help of the policy challenge typology, possible future developments in certain key factors were classified in respect to their policy relevance and significance. The typology made it possible to identify possible future developments that may be potential sources of policy conflicts or possess characteristics of wild cards or weak signals.

In this paper, a modified typology based on Rikkonen et al's (2006) work is introduced. The number of different kind policy challenges is reduced from eight to four by using only two dimensions in the analysis. Possible developments of future-influencing factors (PDFIF) in relation to the milk sector are sorted based on their potential to shape the future and their potential to generate disputes in the policy-making process. The typology of four policy challenge categories (PCC) is presented in Figure 2.

Figure 2. The typology of four policy challenge categories.



PCC1 is for PDFIFs which are of self-fulfilling nature and which have a significant impact on the formation of the future development. However, because of their self-fulfilling nature, the PDFIFs belonging to this category do not represent a crucial challenge from the policy-making point of view. The self-fulfilling nature of the PDFIFs indicates that a desirable future state of affairs will be achieved by business-as-usual policy actions. When experts state their views on PDFIFs of this category, they consider them as important future-shaping phenomena and expect that both desirable and probable developments of these factors will go to the same direction.

The PDFIFs in the PCC2 represent, in turn, lines of development which highly affect the future and which cannot be controlled by current policies and their direct continuums. Thus, the PDFIFs which are situated in the PCC2 pose a significant policy challenge and have to be paid particular attention when future policies are designed. The have a clear potential to instigate policy disagreements and cause political conflicts. In this case, it is typical for expert views that a PDFIF is considered an important future defining issue although its desirable and probable developments are expected to diverge.

The PDFIFs in the PCC3 and PCC4 represent developments which are not likely to have a significant impact on the state of the future. Their difference is that the PDFIFs in the PCC3 may appear in the future as a notable policy challenge, although a great amount of uncertainty will be related to the realisation of these policy challenges, where as the PDFIFs in the PCC4 are not considered to pose any significant policy challenges. In terms of expert

views, the PCC3 type PDFIFs have a low importance from the future formation point of view but certain policy challenges may become realised because desirable and probable developments go to opposite directions. In this respect, the PCC3 type PDFIFs may even possess characteristics of wild cards or weak signals. When the PCC4 type PDFIFs are in question, experts agree on their lacking ability to shape the future and believe that desirable and probable lines of development will be parallel.

Classification of the PDFIFs

Next, a set of criteria is developed to assign the PDFIFs into the policy challenge categories. The assignment process has two phases. First, all the 90 future issues listed in the Delphi questionnaire are identified as certain type of PDFIFs based on the views of the experts on their importance, desirability and probability. In this first phase the PDFIFs are assigned to 16 subcategories following classification criteria derived from the analytical framework. The classification criteria which are applied to assign a PDFIF to a certain policy challenge subcategory are found in Table 2.

Table 2 - The classification criteria used to assign PDFIFs to a certain PCSC.

CLASSIFICATION CRITERIA				Policy challenge subcategory (PCSC) / number of PDFIFs
Mean of importance[A]	**Standard deviation of importance[B]**	**Sign of desirable and probable developments[C]**	**Sum of desirable and probable developments[D]**	
low	low	different	low	1 / 4
			high	2 / 0
		same	low	3 / 5
			high	4 / 1
	high	different	low	5 / 8
			high	6 / 1
		same	low	7 / 12
			high	8 / 10
high	low	different	low	9 / 5
			high	10 / 12
		same	low	11 / 6
			high	12 / 12
	high	different	low	13 / 0
			high	14 / 3
		same	low	15 / 4
			high	16 / 5

[A] The mean of the importance of a PDFIF. Considered high if it is greater than the median of all PDFIF importance means.
[B] The standard deviation of the importance of a PDFIF. Considered high if it is greater than the median of all PDFIF importance standard deviations.
[C] The similarity of signs of the means of desirable and probable developments of a PDFIF. Are of the same sign if both desirable and probable developments go the same direction, i.e. either decrease or increase.
[D] The sum of the absolute values of the means of desirable and probable developments of a PDFIF. Considered high if it is greater than the median of all PDFIF sums of absolute values of means of desirable and probable developments. The median is calculated separately for those PDFIFs which are of the same sign and which are of the different sign.

Following the analytical framework, a PDFIF is likely to have considerable potential to shape the future if experts regard it as an important future issue. And vice versa, if a PDFIF

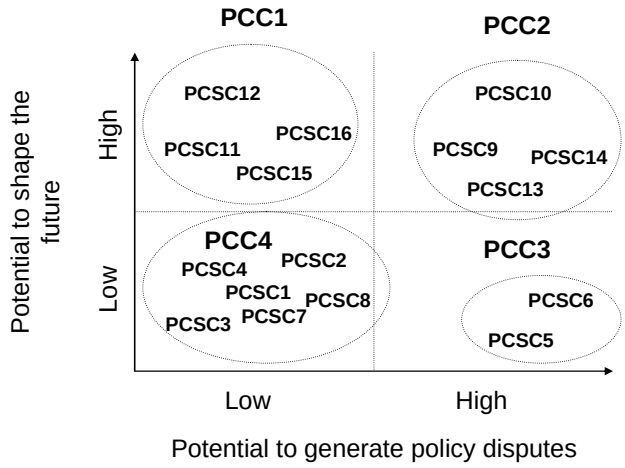
is considered of minor importance, its potential to affect the formation of the future is insignificant. Thus, the first classification criterion, the magnitude of the mean of the importance of a PFD signals its potential to influence the future development. The second classification criterion, the standard deviation of the importance of a PDFIF, in turn, tells about how much variability is attached to expert views related to the importance of a PDFIF. The interpretation in this context is that high standard deviation of importance of a PDFIF indicates future policy uncertainties. Low standard deviation of importance combined with the high mean of importance of a PDFIF strengthens a PDFIF's potential to be an influential change factor in the future.

In case of the third classification criterion, if desirable and probable developments of a PDFIF go to opposite directions (i.e. are of the opposite sign), there is an obvious need for remedial policy actions which may be sources of political disagreements. On the other hand, if desirable and probable developments of a PDFIF go to the same direction (i.e. are of the same sign), it is less likely that major policy conflicts will appear. What comes to the fourth classification criterion, the sum of absolute values of the means of desirable and probable developments of a PDFIF, it describes the intensity of desirable and probable developments. The interpretation of the fourth classification criterion is closely connected to the third classification criterion. If the signs of desirable and probable developments of a PDFIF are the same, a high sum of the absolute values of the means of desirable and probable developments signals that the PDFIF has potential to shape the future and that there is not much uncertainty related to the projected development. Consequently, if the signs of desirable and probable developments of a PDFIF are not the same, a high sum of the absolute values of the means of desirable and probable developments indicates that certain controversial policy issues will be encountered in the future, but their exact nature depends on which development dimension is more dominant, desirable or probable. If the probable development dimension is more dominant, the occurring controversial policy issues are likely to be less fundamental and severe, because the desirable development does not so sharply differ from the probable development.

In the second phase, the sixteen PCSCs were assigned to the four major PCCs. The placement of the subcategories in relation to the four major categories is depicted in Figure 3. The principles applied in the placement reflect the classification criteria. If PDFIFs in a PCSC have a high mean of importance and different signs of desirable and probable developments, then they have simultaneously high potential to shape the future and high potential to generate policy disputes, i.e. they belong to the PCC2. Consequently, if PDFIFs in a PCSC have a high mean of importance and the same sign of desirable and probable developments, then they have high potential to shape the future but low potential to generate policy disputes, i.e. they belong to the PCC1. Furthermore, if PDFIFs in a PCSC have a low mean of importance, a high standard deviation of importance and different signs of desirable and probable developments, then they have low potential to shape the future but high potential to generate policy disputes, i.e. they belong to the PCC3. Finally, if PDFIFs in a PCSC have a low mean

of importance and a low standard deviation of importance or a low mean of importance and a high standard deviation of importance but the same sign of desirable and probable developments, then they have low potential to shape the future and low potential to generate policy disputes, i.e. they belong to the PCC4. As a result, 27 PDFIFs were assingned to the PCC1, 20 to the PCC2, 9 to the PCC3, and 34 to the PCC4.

Figure 3 - The placement of the PCSCs in relation to the PCCs.



The list of the PDFIFs assigned to the policy challenge categories and key statistical values related to PDFIFs are found in Appendix 1.

Conclusions and discussion

What comes to future directions of the Finnish milk sector, the expert views clearly indicate that the structural change in milk production will follow the current lines of development. There will be less but larger dairy farms in terms of both field area and number of cows, and they invest heavily on cowhouses and automation of milk production. Despite investments in technology, also more employees will be needed at dairy farms. Dairy farmers will specialize in milk production and outsource field cultivation operations. Farmers will pay more attention to the development of their management skills. Technological progress and better management skills will lead to enhanced productivity of dairy farming and lower production cost per unit of output. Agri-environmental and animal welfare considerations will play an increasing role in agricultural policy-making. Consequently, nutrient emissions from dairy farms will start to diminish. The de-coupling of agricultural support goes further, the share of dairy cattle related subsidies of the farm income will decrease. Also the amount of agricultural support as a whole will decrease, when the EU's agricultural budget will diminish. Domestic consumption of dairy products is not expected to rise but appreciation of domestic dairy products as well as their quality will get higher. The export of dairy products will grow, the greatest export potential being in Russia.

All these changes and developments the experts regard as salient issues shaping the future of milk production in Finland. They are also considered of being of self-fulfilling nature, the experts do not see any major conflicting policy issues arising in these respects and foresee that desirable and probable developments will be parallel.

There are also a few worrying prospects. Although productivity of dairy farming will increase and cost savings will take place, the profitability of dairy farming is not expected to perk up, because prices of agricultural inputs rise, the debt load of dairy farms gets heavier, national as well EU financed agricultural subsidies are reduced and continuous ambivalence of agricultural policy is a source of additional costs. There are also external factors like more frequent animal diseases which will weaken profitability. Consequently, dairy farmers will encounter in the future a heavier work load and a more demanding operating environment, which endanger their work coping. As well as exports, also import of dairy products will grow. Consumers appreciate domestic origin of dairy products, but this will not be transmitted into producer prices, because other actors of the milk chain will be able to pocket the added value. The competition at the dairy product markets will become more intense and the Finnish milk sector will not be able to enhance its competitiveness as rapidly as some of the competitors.

It seems clear that the most severe problems in dairy farming will be related to farm income and its development. Although the experts do not favour in general much higher agricultural subsidies, they nevertheless consider it problematic that especially in Southern Finland the expected reduction of nationally financed agricultural subsidies combined with other factors lessening national room for manoeuvre in agricultural policy will jeopardize the future of dairy farming. An attempt to safeguard operational preconditions of dairy farming in Southern Finland would most likely lead to policy disputes in both EU and national context. From the European Commission point of view, it would be a political risk to allow Finland national “envelopes” or any other financial exceptions from the mainstream CAP. In Finland, in turn, tensions between farmers in north and south would mount if dairy farmers in Southern Finland received additional compensations entitled only to them.

They are also a few surprising future considerations. The experts do not see bioenergy or organic production as issues, which would play an important role in the future of the milk sector. The use of bioenergy, especially the use of biogas, is expected to increase at dairy farms, but its significance as a change factor shaping the future of dairy farming is not pivotal. This most likely reflects a general attitude among the experts towards bioenergy and its production and utilisation potentials in agriculture. The consumption of organic milk products is expected to rise, but not considerably. The experts believe that functional and light-content dairy products will play a bigger role at the consumer side than organic dairy products. However, it seems that in general changes at the consumer side are considered of being minor importance as future-shaping forces or politically sensitive questions. Only the use of GM

fodder and consumers' attitudes towards GMOs are seen as potentially contradictory future policy issues at the consumer side.

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Appendix 1

PDFIFs sorted out by the policy challenge category and subcategory and key statistical values of the PDFIFs used in the classification process.

Policy challenge category (PCC1..PCC4) Policy challenge subcategory (1..16) Possible developments of future-influencing factors (PDFIF) (I-1..V-13)*	Mean of importance [0..5] (median=3.69)	Standard deviation of importance [0..2] (median=0.84)	Mean of desirability [-2..2] (median=0.60)	Mean of probability [-2..2] (median=0.47)	Sum of absolute values of the means of desirability and probability [0..4]**
POLICY CHALLENGE CATEGORY PCC1					
I-1. Number of dairy farms in Finland (12)	3.90	0.76	-0.97	-1.62	2.59
I-2. Number of milking cows per dairy farm (12)	4.10	0.79	1.24	1.50	2.74
II-10. Significance of agri-environmental issues in agricultural policy-making (12)	3.90	0.76	0.79	1.27	2.06
II-11. Animal welfare measures at dairy farms (12)	3.83	0.75	0.90	0.97	1.86
II-12. Agri-environmental measures at dairy farms (12)	3.76	0.82	0.71	1.03	1.74
III-3. Production cost of milk per kg (12)	4.52	0.50	-1.21	-0.43	1.64
III-17. Productivity of dairy farming (12)	4.31	0.83	1.31	0.66	1.97
IV-1. Outsourcing of field cultivation operations at dairy farms (12)	3.75	0.63	0.96	1.07	2.03
IV-2. Contracting at dairy farms (12)	3.69	0.75	1.17	1.20	2.37
IV-4. Automation of milk production at dairy farms (12)	3.86	0.82	1.14	1.33	2.47
IV-17. Management know-how at dairy farms (12)	4.34	0.76	1.66	1.03	2.69
V-1. Appreciation of domestic milk products (12)	4.28	0.64	1.38	0.37	1.75
II-13. Share of dairy cattle related subsidies of the farm income (11)	3.86	0.82	-1.41	-1.24	0.90
II-18. Agricultural budget of EU in the programme period 2021-2027 (11)	3.75	0.74	-0,04	-1.07	1.11
III-4. Export of dairy products from Finland (11)	3.93	0.83	0.45	0.24	0.69
IV-13. Investments into new cowhouses (11)	3.90	0.66	0.90	0.57	1.47
IV-14. Investments into extensions of existing cowhouses (11)	3.83	0.79	0.72	0.52	1.24
V-4. Consumption of dairy products (11)	4.21	0.61	0.79	0.00	0.79
I-16. Need for labour at dairy farms (15)	3.69	1.02	0.59	0.87	1.46
III-15. Export of dairy products from Finland to Russia (15)	3.83	0.91	0.93	0.48	1.41
IV-21. Nutrient emissions from dairy farms (15)	3.69	0.91	-0.90	-0.07	0.97
V-13. Safety of domestic dairy products (15)	4.14	0.90	0.76	0.30	1.06
I-7. Cultivated area at dairy farms (16)	3.76	1.01	1.17	1.07	2.24
I-14. Number of employees not belonging to the farmer family at dairy farms (16)	3.86	1.04	1.07	1.17	2.24
I-15. Specialization in milk production (outsourcing of other farming activities) (16)	3.83	0.99	1.21	1.13	2.34
II-9. Animal welfare considerations in agricultural policy-making (16)	3.72	0.87	0.79	1.27	2.06
II-14. Price of milk quotas (16)	3.69	1.21	-1.41	-1.24	2.65

POLICY CHALLENGE CATEGORY PCC2					
I-6. Animal diseases in Finland (10)	4.10	0.75	-0.66	0.47	1.13
II-2. Agricultural subsidies financed by the EU (10)	4.17	0.59	0.28	-0.97	1.25
II-4. Ambivalence of agricultural policy (10)	4.32	0.60	-1.24	0.52	1.74
II-5. National room for manoeuvre in respect to the CAP (10)	4.14	0.57	0.97	-0.45	1.42
II-7. National aid for milk production in Southern Finland (10)	4.14	0.73	0.38	-0.97	1.35
III-5. Import of dairy products to Finland (10)	3.93	0.78	-0.34	1.07	1.41
III-8. Competitiveness of the Finnish milk sector (10)	4.48	0.62	1.21	-0.17	1.38
III-9. External competition in the Finnish dairy products market (10)	4.07	0.64	-0.21	1.17	1.38
III-14. Prices of agricultural inputs (10)	4.14	0.68	-0.62	0.86	1.48
III-21. Profitability of milk production (10)	4.61	0.49	1.21	-0.10	1.31
V-3. Work coping at dairy farms (10)	4.41	0.72	1.00	-0.53	1.53
V-11. Consumers' willingness to pay for domestic dairy products (10)	3.90	0.80	1.07	-0.07	1.14
III-1. Retailer's share of the added value of the milk chain (14)	3.69	0.91	-0.93	0.24	1.17
III-18. Debt load of dairy farms (14)	3.97	0.85	-0.52	1.00	1.52
IV-16. Domestic content of dairy materials used by the food processing industry (14)	3.79	0.89	0.76	-0.59	1.35
II-1. National agricultural subsidies (9)	4.21	0.71	0.24	-0.55	0.79
II-8. National aid for milk production in Northern Finland (9)	4.07	0.74	0.07	-0.59	0.66
II-16. Agricultural budget of EU in the programme period 2007-2013 (9)	3.79	0.62	0.00	-0.64	0.64
II-17. Agricultural budget of EU in the programme period 2014-2020 (9)	3.89	0.72	0.00	-1.18	1.18
V-2. Workload at dairy farms (9)	4.17	0.75	-0.45	0.64	1.09
POLICY CHALLENGE CATEGORY PCC3					
III-7. Agglomeration of milk processing industry (6)	3.62	0.89	-0.10	1.17	1.27
II-3. Regulative measures in dairy production (5)	3.55	0.85	-0.37	0.43	0.80
II-6. Underproduction in relation to the country-specific milk quota (5)	3.32	0.93	-0.26	0.21	0.47
III-12. Overproduction of milk in the EU (production exceeding EU consumption) (5)	3.66	0.84	-0.24	0.55	0.79
III-20. Import of dairy products to Finland from Baltic countries and Poland (5)	3.36	0.97	-0.25	0.82	1.07
IV-18. Farm level processing of milk (5)	2.52	0.97	0.21	-0.24	0.45
IV-19. Industrial fodders in the feeding of milking cows (5)	3.45	0.85	-0.21	0.50	0.71
IV-20. GM fodder in the feeding of milking cows (5)	3.24	0.97	-0.07	0.79	0.86
V-9. Consumers' critical attitudes towards GMOs (5)	3.34	0.92	0.17	-0.24	0.41
POLICY CHALLENGE CATEGORY PCC4					
I-13. Importance of crop production to the Finnish agriculture (3)	3.14	0.68	0.38	0.00	0.38
I-17. Pluri-activity at dairy farms (3)	2.93	0.83	-0.21	-0.27	0.48
IV-3. Machinery investments at dairy farms	3.66	0.76	0.66	0.86	1.52

(3)					
IV-15. Investments of the Finnish dairy industry to Baltic countries (3)	3.14	0.82	0.31	0.62	0.93
V-10. Number of people employed (directly or indirectly) by the milk sector (3)	3.38	0.76	-0.31	-0.90	1.21
V-8. Consumers' ethical considerations (4)	3.54	0.78	0.93	0.79	1.72
I-4. Production of organic milk (7)	2.53	0.96	0.72	0.27	0.99
I-8. Breeding of beef cattle at dairy farms (7)	2.63	0.98	-0.66	-0.80	1.46
I-11. Importance of dairy farms to the Finnish agriculture (7)	3.62	1.00	0.62	0.23	0.85
III-6. Export of organic dairy products from Finland (7)	2.34	1.12	0.48	0.17	0.65
III-11. Overproduction of milk in Finland (exceeding domestic consumption) (7)	3.34	0.84	-0.14	-0.07	0.21
III-16. Export of dairy products from Finland to Asian countries (7)	3.00	1.05	0.83	0.59	1.42
III-19. Milk production in Baltic countries and Poland (7)	3.61	0.86	0.04	1.32	1.36
IV-7. Biomass production at dairy farms for outside processors (7)	2.64	0.93	0.18	0.21	0.39
IV-10. Energy self-sufficiency of dairy farms (7)	3.36	0.85	0.96	0.41	1.37
IV-12. Genetic modification of the heredity of production animals (7)	3.38	1.03	0.21	0.69	0.90
V-5. Consumption of organic dairy products (7)	2.83	1.05	0.59	0.43	1.02
V-12. Consumers' willingness to pay for domestic organic dairy products (7)	3.04	0.98	0.86	0.27	1.13
I-10. Relative share of family-farm type dairy farms of all dairy farms (1)	3.24	0.82	0.03	-0.62	0.65
I-12. Importance of beef production to the Finnish agriculture (1)	3.38	0.81	0.69	-0.13	0.82
III-2. Processing industry's share of the added value of the milk chain (1)	3.59	0.77	-0.28	0.03	0.31
III-13. EU's influence at the global dairy product market (1)	3.52	0.81	0.62	-0.31	0.93
I-3. Average milk output per milking cow (8)	3.67	1.04	1.07	1.10	2.17
I-5. Number of dairy farms having milking robots (8)	3.40	0.88	1.03	1.40	2.43
I-9. Calves delivery to breeding farms at the age of two weeks (8)	2.86	0.91	0.66	0.90	1.56
II-15. Price of milk quotas in voluntary trading (8)	3.57	1.24	-1.36	-1.25	2.61
III-10. Processing of functional dairy products (8)	3.41	0.93	1.28	1.07	2.35
IV-5. Use of biofuels in working machines (8)	2.93	0.94	0.90	0.83	1.73
IV-6. Production of biofuels at dairy farms (8)	3.10	1.03	0.90	0.63	1.53
IV-8. Manure based biogas production at dairy farms (8)	3.38	0.96	1.24	0.93	2.17
IV-9. Energy efficiency of dairy farms (8)	3.55	0.93	1.34	0.62	1.96
IV-11. Biotechnology in processing of dairy products (8)	3.41	1.10	0.97	0.90	1.87
V-5. Consumption of organic dairy products (8)	2.83	1.05	0.59	0.43	1.02
V-6. Consumption of light-content dairy products (8)	3.45	0.97	1.00	1.07	2.07

* PDFIFs were pre-classified under five broad substance themes: I Changes in the structure of production, II Agricultural policy changes, III Changes at the market place and in the economy, IV Changes in technology, production process and know-how, V Changes in values and consumption

** When desirable and probable development are of the same sign, the median is 1.53; when they are of the different sign, the median is 1.12)