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Future images of meat consumption in 2030

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ABSTRACT

The issue of meat consumption has been a subject of interest that has been looked at from environmental, animal and human perspectives. This paper contributes to the discussion by clarifying the diversity of views with regard to the future of meat consumption. Two round Delphi expert interviews and a consumer survey were conducted in order to collect information. Five coherent future images were constructed: Traditional Approach, Business as Usual, Humans First, Wellness and Vegetarian Society. The discussion part of the paper presents possible ways of influencing meat consumption according to the holders of these different images of the future.

1. Introduction

Food production has undergone a great transition during recent decades. The worldwide transformation of agriculture from using traditional, low-tech methods to its current intensive use of energy, fertilizers, machinery, biocides and irrigation has led to significant increases in agricultural production. The transformation has resulted from factors such as programmes of agricultural research, technological innovation, the development of new infrastructures and the expansion of the volume and logistical ability of the world economy. Agricultural transformation, which was driven by the green revolution, made the majority of foodstuffs available, and at lower prices, to almost all consumers in the Western world in the sixties and seventies [1,2]. Since then consumers have had a virtual freedom of choice regarding food, within certain limits of course, and the markets have made sure that a diversity of products has been available.

However, there is no sign that this ongoing transition will come to an end anytime soon. The efficiency of logistics, the variety of products and the apparent ease of buying food products in many countries does not mean that food consumption choices are unproblematic. Western societies have moved from a situation where the "producing enough" approach has resulted in problems of overproduction. Moreover, the green revolution has also had major social and ecological impacts. One effect of the green revolution has been the growth in meat consumption in the developed world in recent decades (see Fig. 1). Furthermore, most estimates expect the growth rate to continue [3,4]. It would therefore be reasonable to assume that further transition might emerge from the pressure created by the demand for meat. However, in some countries, such as Finland, the growth of meat consumption has somewhat levelled off since 1988.

The green revolution combined with population growth and very low food prices has come to be regarded as problematic. More specifically, an increasing amount of literature has identified problems with the current energy intensive system of food production and consumption. Additionally, meat consumption has been identified as problematic from at least three perspectives: an environmental perspective, an animal perspective and a human perspective [5–7].

The environmental consequences of meat consumption have received considerable publicity during the last 10 years. It has been stated that the environment is being degraded or rendered unproductive in some regions, because of the

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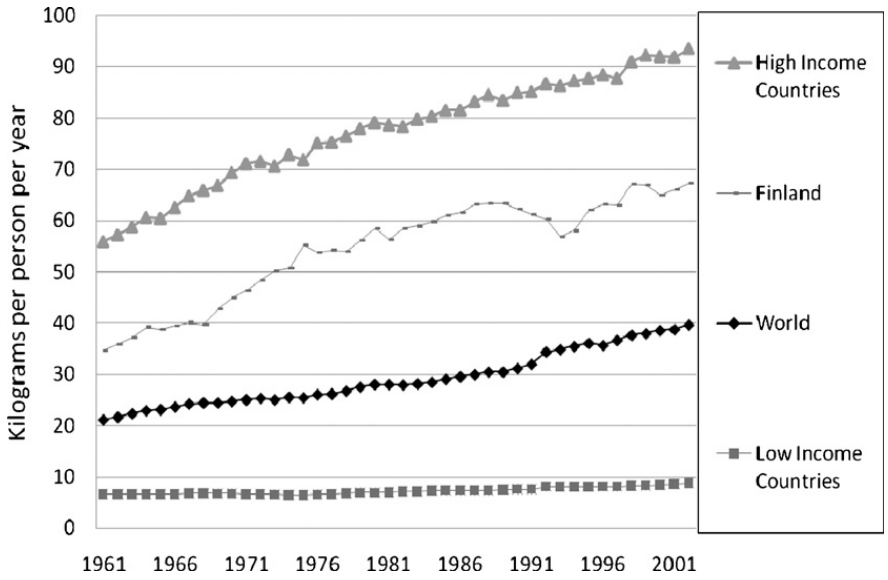

Fig. 1. The development of meat consumption on a global scale and in Finland from 1961 to 2002 [42].

environmental impact of meat consumption and production on land [8,9], energy [10] and water [11,12]. Globally, agriculture accounts for approximately a fifth of the total green house gas emissions, and of that amount approximately 35% comes from livestock production [13]. Beef production results in large amounts of methane, which is a significant contributor to green house gas emissions [14]. According to the life cycle approach, a kilogram of beef is equivalent to the amount of CO_2 emitted by the average European car every 250 km [15]. In addition, when differences between omnivorous, vegetarian and vegan dietary patterns were evaluated the green house gas emissions resulting from meat consumption were evident [16].

From animal welfare and animal rights perspectives the argument for a reduction in meat consumption and an increase in vegetable consumption started to gain more credence, in the 1970s, as concerns about the environment rose. In his classic book Singer [17] presented animal welfare arguments based on the concept of least harm, which emphasised that ethical action is action that provides the most good or does the least harm. According to Singer's argument harm to animals should also be considered and evaluated and this would lead to a vegetarian diet. Reagan [18] argued that animals are valuable as such and further strengthened the animal rights arguments. From the animal rights perspective the basic interests of non-human animals should be afforded the same consideration as the basic interests of human beings. Many more arguments have since followed and most claim that, from the ethical and animal point of view our usage of animals and meat eating is contestable [19].

From the human perspective interest in meat consumption practices has two strands; its effects on physical health and on mental well-being. With regard to physical health, research supports the idea that there is neither much harm nor many benefits from a vegetarian diet. This is, of course, very difficult to prove, but current data seems to support the view that there are no major differences in health or life expectancy between omnivores and vegetarians [20]. Some researchers have, however, argued strongly in favour of a vegetarian diet [6]. With regard to mental well-being sociological research has identified possible linkages between meat consumption and chauvinism [21] and meat consumption has also been identified as possibly endorsing racism [22] by endorsing 'specism'. Specism is the act of placing higher moral or ethical value on one species over others.

Calls to lower meat consumption levels globally have been presented from an environmental perspective and methods for achieving that goal have been developed. Goodland [23] proposed that foodstuffs higher in the food chain (like meat and milk) should be taxed more heavily than products lower in the chain (like vegetables and berries). This may be inadequate action since food accounts only about one-tenth of the consumer-price index in developed countries (13% in Finland in 2002) [24]. Because of the low proportion of food in the total consumption any additional taxes would have to be quite high in order to be effective and that may be politically unacceptable. A team of international health experts led by McMichael [25] proposed an international contraction and convergence strategy as a way of limiting global meat consumption. Although promising, such a strategy would be quite hard to implement as such. It might be that better results could be achieved with more subtle measures aimed at specific groups, which is a theme elaborated on in the text below. In order to plan and implement procedures that can influence meat consumption, a better and broader understanding of the factors influencing meat consumption is required. Furthermore, the consumer perspectives of these factors should be analysed in order to understand the level of influence needed for the changes to be brought about.

The purpose of this paper is to examine images of the future in the context of both probable and preferred meat consumption up to the year 2030, in order to identify what types of images exist and to determine which factors are seen as relevant. Images of the future have been described by as "development constructs" that society creates to characterize its

expectations about the future [26]. From this perspective, images of the future can be seen as expressing the end points in a continuum of social change [27]. If images of the future are then seen as a tools for making such images become part of reality they can then be used to direct actions and decision-making [28]. If the factors behind these images can be identified and the relationships that these factors have within certain groups can also be recognised there should be improved opportunities for influencing those factors and ultimately realising the desired image of the future.

The rest of the paper proceeds as follows: first the Delphi method for investigating expert views is described. That is then followed by a description of the consumer survey and the cluster analysis method that was used in that analysis. The third section compares the expert views with the results of the survey on consumer views. Then the factors affecting expert and consumer views on meat consumption are laid out in a table. Based on the comparison, future images are formed and enriched with citations from the expert interviews and the answers to the open questions written by the consumers. The final part of the results' chapter uses visualization to outline the differences between the views. Finally, the results and the formation of the future images are discussed and recommendations for future research are made.

2. Materials and methods

Expert views on the development of the factors affecting meat consumption were asked for as part of a wider two round Delphi study on the future of food consumption. The Delphi method is an expert view based method of envisioning the future of a complex issue. The key characteristics of the Delphi method are: at least two rounds of inquiry, feedback from previous rounds and anonymity of statements [29–32].

Fundamentally, the Delphi method is not a survey aimed at finding average opinions or differences in opinion between statistically representative groups. Rather, it is an expert based method which aims to make sense of alternative scenarios for the future [30–32]. Thus, the choice of respondents is crucial to the understanding of results [31,33]. In this study, special attention was given to ensuring a wide range of expertise was represented, which was contemplated by several meetings within the research group and the project board. An expertise matrix was formed, in which the nature of a person's expertise was cross-matrixed with the background organisation of the panellists. The panellists' expertise included political, economic, socio-cultural, technical and environmental and ethical approaches to food consumption. The organisations they came from included research, administration, enterprise and non-governmental organisations (Table 1). There were 22 women in the 39 participants (56%) in the first round panel. Age ranged from under 30 years old to over 60 years old. The experts varied from professors to students, directors to lower-post research experts.

The first round of the Delphi was conducted as semi-structured face to face interviews regarding the future of food consumption. The interviews lasted from 1 to 2 h. The interviews were then transcribed and factors affecting meat consumption were identified by reading through the text many times. The transcribed texts amounted to more than 450 pages. Expert views on both probable and preferred amounts of meat consumption in the future were asked for and reported separately [7]. The interviews were conducted in Finnish. The second round was carried out with the Webropol-Internet service [34]. The second round included questions that hoped to elaborate upon answers, given to first round questions regarding the factors seen as affecting food consumption. Three factors from the categories of economic, social, technical and environmental and ethical were presented in the first round and were chosen for the second round questionnaire. The experts expressed their views on both the probable and preferred future of meat consumption up to 2030. In the first round, 39 experts were interviewed and only two people refused of the 41 asked to participate. Out of these 39 experts interviewed, 21 responded via the Internet survey.

In addition, the research utilized a survey on Finnish consumers. The National Consumer Research Centre has compiled a register called the ''Consumer Panel'' for the gathering of research data. Altogether the panel has about one thousand members over the age of 18 years. Based on the availability of the people in the panel, 271 consumers were asked to answer the second round questions and 177 (65%) answers were received. From those who answered the survey 173 stated their gender, of which 104 were women. Also, 172 stated their age, of those 27 were between 21 and 30, 45 between 31 and 40, 37 between 41 and 50, 34 between 51 and 60 and 29 over sixty.

Both the experts and consumers were asked to assess possible changing factors identified in the first Delphi round by using a scale of 0–10 (presented as 'radio buttons'). Zero meant either very unlikely or not at all preferable and ten was defined as either very likely or very preferable. Respondents were also given the possibility to answer the 'cannot say' option for each statement. Each prompt was expressed as a statement of a direction, or trend in the future development of meat consumption. The stronger the respondent saw the trend as being in the future, the higher the value (see the complete list of

Table 1
The expertise matrix—number of experts interviewed in the project in the first round and the second round (second round in parentheses).

Background organisation	Area of expertise				
	Political	Economic	Social and cultural	Technical	Environmental and ethical
Research	1 (0)	2 (1)	3 (2)	2 (2)	1 (1)
Non-governmental organisations	2 (0)	2 (1)	2 (1)	3 (3)	2 (1)
Civil servants and politicians	3 (0)	2 (1)	1 (1)	1 (1)	1 (0)
Corporations	1 (1)	3 (3)	2 (2)	4 (1)	1 (1)

meat consumption related variables in Section 3). The cases were then grouped by hierarchical cluster analysis. Cluster analysis [34] does not require random sampling unless it is used to verify a theory [36] and thus fits well with Delphi studies [37,32].

The first round interviews were carried out in 2006 and the second round survey in 2007. Incomplete answers in the second round were excluded from the cluster analysis. Views on probable and preferred development were treated as two separate cases, thus 17 experts had 17 views on probable development and 17 views on preferable development, totalling 34 views of the future. With regard to consumers, there were 102 complete answers for preferable future development and 113 for probable future development, totalling 215 complete responses for the consumers. No weighting of variables was considered necessary since all variables were on the same scale.

The Furthest Neighbor method was used for the grouping and the normal Euclidean distance was used as the measure of dissimilarity [38]. In addition, the Ward method was used to make sensitivity tests in order to see whether the groupings were static or dependent on the clustering method. A few cases changed places in the grouping but we found no need to reconsider the future images. Furthest Neighbor was thus chosen to express the results since it uses a simple Euclidean distance measure whereas the Ward method uses squared Euclidean distance. Consumers and experts were grouped separately for comparison. The decision outline, regarding the number of different future images outlined, was mainly based on the tradition of futures studies, which most often uses three to six [39] or three to five scenarios [40]. Furthermore, since the limit of illustrative scenarios is often considered to be seven and three might give an apparent option of two extremes and a midway alternative [41,32] four to six future images were considered relevant. Four expert clusters and five consumer clusters were chosen based on the hierarchical tree output of the SPSS14.0 software.

3. Results

3.1. Average views of the preferred and probable future of meat consumption

Average and median values for the preferable and probable future images of both experts and consumers were calculated in order to identify differences and large dispersions from the average (Table 2). Statistical tests of significance in differences between the two groups were not calculated since the expert panel was not a random sample.

Large differences in the probable and preferable images of the future could be identified with respect to issues such as, "cheap foreign meat will have entered the market", "rising income levels will have increased meat consumption" and "increasing amounts of animal diseases will decrease meat consumption". In contrast, probable and preferred future images were closest to each other when considering whether support of health values would lead to "increasing vegetarianism", "increasing meat prices will have led to a decrease in meat consumption" and "vegetarian meat substitutes will have taken the place of meat in the market". Surprisingly, increasing attention being given to animal rights and resulting in less meat being consumed also gained close estimates in the preferred and probable futures.

Both consumers and experts saw laboratory grown meat as the least preferable factor that would influence future meat consumption of the factors presented to them. Neither consumers nor experts desired human remoteness from livestock and the prospect of cheap foreign meat entering Finnish markets and consequently resulting in an increase in Finnish meat consumption. However, this development was considered to be very likely, which makes it a clear threat in the respondents' minds. It was especially a threat in the opinion of the experts. However, even consumers stated that would be a negative reason for increasing meat consumption.

Both consumers and experts thought that it would be very likely that the number of vegetarians would increase in the future and regarded health factors as a probable and, in particular, preferable reason for this increase. Vegetarianism was also thought preferable when considering average responses. However, it was not entirely clear whether the respondents actually meant an increase the amount of strict vegetarians or an increase in the share of vegetables in people's diets.

3.2. Future images

The answers given by the participants were clustered into different consumer and expert view groups. After that the answers were then placed into a futures table (Table 3). In order to make the table more readable, the answers were visualized using arrows. Cluster centres (i.e. the average responses of the variables in a cluster) 0 to 2 were marked as ↓↓, 2 to 4 as ↓, 4 to 6 as ↔, 6 to 8 as ↑ and 8 to 10 as ↑↑. The futures images were then combined by using the quantitative results gained from the cluster analysis and the qualitative answers received from the expert interviews and consumer surveys.

3.2.1. A Traditional Approach Society

A distinctive feature of the first cluster (see Table 3) was that the views presented were very negative towards the development of meat substitutes. The increase of animal rights issues in society was also seen as being very negative. However, animal diseases as a factor that would decrease meat consumption were not considered as being relevant. In the expert group, human remoteness from animal production, which would lead to increasing meat consumption and cheap foreign meat entering the Finnish market, was also considered to be very negative. In contrast, factors that would increase traditional meat consumption were considered relevant.

Two comments characteristic of this view are presented below:

Table 2
Differences in consumer and expert views on potentially changing factors in meat consumption by year 2030 in Finland on a scale of 1–10[a].

Variables	Consumers		Experts	
	Average	Standard deviation	Average	Standard deviation
Economic				
Increased income levels will have increased meat consumption				
Prob.[b]	6.5	2.0	6.1	2.3
Pref.	3.9	2.5	4.0	2.9
The global increase in meat prices will have decreased meat consumption				
Prob.	5.3	2.3	5.1	2.4
Pref.	5.6	2.6	5.3	3.0
Cheap foreign meats will have entered the market				
Prob.	7.8	1.7	7.3	2.3
Pref.	3.0	2.5	2.9	2.4
Social				
The number of vegetarians will have increased				
Prob.	7.2	1.9	7.6	1.5
Pref.	7.1	2.4	5.8	2.8
Human remoteness from food production will have increased meat consumption				
Prob.	4.7	2.4	4.0	1.6
Pref.	3.3	2.3	2.5	2.4
Interest in health factors will have increased vegetarianism				
Prob.	7.5	1.8	7.4	1.7
Pref.	8.4	2.1	7.6	3.1
Technical				
An increase in the number and diversity of meat substitutes (such as soy and wheat protein products) will have decreased meat consumption				
Prob.	6.1	2.2	5.5	2.6
Pref.	6.0	2.8	5.3	3.1
Laboratory grown artificial meat will have taken the place of conventional meats				
Prob.	3.6	2.7	2.4	2.7
Pref.	1.6	2.0	2.6	3.0
Development of less fatty meat products will have increased meat consumption				
Prob.	6.4	2.0	6.2	2.4
Pref.	5.7	2.7	5.7	3.1
Environmental and ethical				
Global increases in the price of raw materials and scarce resources (water, energy and land) will have decreased meat consumption				
Prob.	5.5	2.2	5.7	2.4
Pref.	5.8	2.6	4.8	3.1
Increases in animal diseases will have decreased meat consumption				
Prob.	5.8	2.4	5.0	2.4
Pref.	3.7	3.0	2.5	2.1
An increase in animal rights issues within society will have decreased meat consumption				
Prob.	5.3	2.4	4.9	2.3
Pref.	6.1	2.9	4.7	3.1

[a] The respondents were asked to imagine what will have occurred by the year 2030.
[b] Prob. = probable future, Pref. = preferred future.

"*We can keep meat consumption growing if we can develop healthier meat products. It is important from the perspective of employment.*" (Expert interview)
"*Nothing but domestically produced meat for our tables*". (Written consumer comment.)

Based on such characteristics this cluster was separated from the others and was named the Traditional Approach Society as it relied on past experience and a rather closed domestic food market. Sixteen out of the 215 views given by the consumers belonged in this cluster as did two of the preferred views out of the 34 views given by the experts.

3.2.2. The Business as Usual Society

The second cluster was the only one in which both consumers and experts did not view any radical changes as preferable nor probable. A slight decrease in meat prices and an increase in income levels seemed to account for the slight increase in the number of vegetarians. Less fatty meat products were seen as increasing slightly, whereas laboratory meat was considered to be marginal.

Table 3
The futures table of both the consumer and expert future images of the factors affecting meat consumption in Finland in 2030.

Variables			Consumers					Experts			
			Traditional Approach	Business as Usual	Humans First	Wellness	Vegetarian	Traditional Approach	Business as Usual	Humans First	Vegetarian
Economic	Increased income levels will have increased meat consumption		↑	↑	↔	↔	↓↓	↓	↔	↔	↓↓
	The global increase in meat prices will have decreased meat consumption		↓	↔	↔	↑↑	↑	↑	↑	↓	↑↑
	Cheap foreign meats will have entered the market		↑	↑	↓	↑↑	↓	↓↓	↑	↔	↓↓
Social	The number of vegetarians will have increased		↔	↑	↑	↑	↑↑	↓	↑	↑	↑↑
	Human remoteness from food production will have increased meat consumption		↓	↔	↓	↑↑	↓	↓↓	↔	↓	↓
	Interest in health factors will have increased the number of vegetarians		↔	↑	↑↑	↑↑	↑↑	↓	↑	↑	↑↑
Technical	An increase in the number and diversity of meat substitutes (such as soy and wheat protein products) will have decreased meat consumption		↓↓	↔	↔	↑↑	↑↑	↓↓	↑	↔	↑↑
	Laboratory grown artificial meat will have replaced conventional meats		↓↓	↓	↓↓	↑	↓	↓↓	↓	↓↓	↔
	Development of less fatty meat products will have increased meat consumption		↔	↑	↑	↑↑	↔	↔	↑	↔	↓↓
Environmental and Ethical	Global increases in the price of raw materials and scarce resources (water, energy and land) will have decreased meat consumption		↓	↔	↔	↑	↑	↑	↑	↓	↑↑
	Increases in animal diseases will have decreased meat consumption		↓↓	↔	↔	↑↑	↓	↓↓	↔	↓↓	↔
	An increase in animal rights issues in society will have decreased meat consumption		↓↓	↔	↔	↑	↑↑	↓↓	↔	↓	↑↑
	Number of cases in the cluster	Preferable	9	15	0	50	28	2	4	8	3
		Probable	7	94	4	7	1	0	12	5	0
		Total	16	109	4	57	29	2	16	13	3

■ = very undesirable or very improbable. ■ = very preferable or very probable.

> "*We do not have any reason to raise meat consumption in Finland, nor do we have any reason to try to lower it radically. There are no environmental reasons in Finland nor are there any health reasons*". (Expert interview).
> "*I do not know if human remoteness from food production will result in lower meat consumption, but at least consumers will want their meat cut into smaller chunks and packed in a nicer way*". (Written consumer comment).

The majority of consumer views belonged in this group (109 out of 215 answers) as well as almost half of the expert views (16 out of 34). As no great changes were expected and slight changes pointed in the same direction as current trends the future image of this group was called Business as Usual.

3.2.3. The Humans First Society

The third cluster differs from the second cluster by having a more negative perspective on laboratory grown meat and also by being more negative towards cheap foreign meats entering the market and consequently resulting in increased meat consumption. A 'no regrets' approach to environmental factors was adopted as animal diseases, an increase in resource prices and animal ethics were not considered very relevant. On the other hand, health factors resulting in increasing vegetarianism were high on the agenda.

> "*Our primary goal is to bring benefits to consumers, and yet not harm their purchasing power*" (Expert interview.)
> "*People will value the role of agriculture as the maintainer of the countryside*". (Expert interview.)

This was the smallest consumer cluster (only 4 out of 215 views) but among experts it was the second most popular group (13 out of 34 views). This future image was called the Humans First Society.

3.2.4. The Wellness Society

The fourth cluster was quantitatively only identified among consumers but there were some compatible aspects in the qualitative material in the expert interviews. This cluster was characterized by having a positive perspective on all factors that could have positive effects on humans. Views in this cluster saw it as beneficial that cheap foreign meats would enter the Finnish market and they saw no problems in human remoteness from food production. For this cluster increased meat consumption as a result of healthier meat products becoming available was also seen as a positive thing. Both increasing and decreasing factors affecting meat consumption are seen as growing simultaneously. The image formed here seems not to form an entirely coherent unity as, for example, meat prices seem to go up (due to scarce resources) as well as down (due to international trade).

> "*In the future I believe that more emphasis will be placed on health aspects. It is very difficult to forecast what the effects (on food production) brought about by climate change, water adequacy and logistics will be*". (Written consumer comment.)
> "*This wellness, meaning the well-being of humans. This will be a growing issue*". (Expert interview)

This cluster was termed the Wellness Society and 57 out of 215 consumers views belonged in this group. What was notable was that out of those 57 views 50 belonged to the preferable category.

3.2.5. The Vegetarian Society

The last cluster was characterized by having very positive views towards an increase in vegetarianism in general. It was also the only group which did not assume that income increases would result in increasing meat consumption. In this cluster experts were very negative and consumers negative on the issue of cheap foreign meat entering the market and resulting in increased meat consumption. Several citations clearly show the thinking behind this image:

> "*. . .at the same time as we get more (meat) substitutes, these (substitutes) will develop a better image and they will become more available*" (Expert interview.)
> "*We are raising a generation which believes in veganism and does not believe in red meat*". (Expert interview.)
> "*If we would have a more vegetarian based diet in the rich countries we would save natural resources and we could carry forward our globe*". (Written consumer comment.)

This future image was called the Vegetarian Society. There were 29 consumer and 3 expert views in the cluster. This group was characterized by a large share of preferable views (28 out of 29 consumers and all three experts).

3.3. A comparison of the future images of meat consumption

The five future images of meat consumption are compared in Figs. 2 and 3 in relation to the economic, social, technical as well as environmental and ethical perspectives in order to visualize the differences between the groups. The combined values of the expert and consumer clusters were used as the basis for the visualization. From the economic perspective there are large differences between the Business as Usual image and the Vegetarian image. The vegetarian group saw the issue of cheap foreign meats entering the markets or an increase in income levels resulting in a growth in meat consumption as being very negative.

In the social category the Humans First image is the only one that has any positive ideas stemming from human remoteness from food production. The Traditional Approach image is the only one that does not see increase of vegetarianism as a positive factor even if it would increase human health.

Fig. 3 highlights the fact that all groups saw it as negative that laboratory grown meat would replace traditional meat. On the other hand there was a large variation in the images on the issue of meat substitutes, ranging from the very negative perspectives of the Traditional Approach group to the very positive views held by the Vegetarian group.

None of the groups disagreed strongly with the statement that a scarcity of raw materials and resources will have limited the consumption of meat in the year 2030. The Vegetarian image thought that this was very likely and agreed with the statement very strongly. Overall, the Humans First image was rather similar to the Business as Usual image. The Vegetarian Society and the Traditional Approach images often directly oppose each other in most cases.

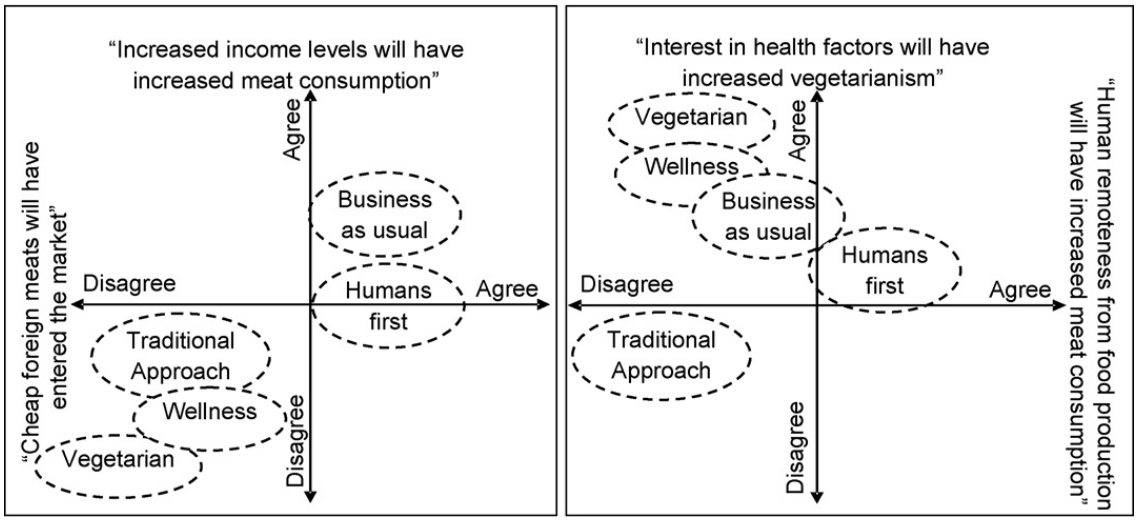

Fig. 2. Five future images in relation to economic and social factors.

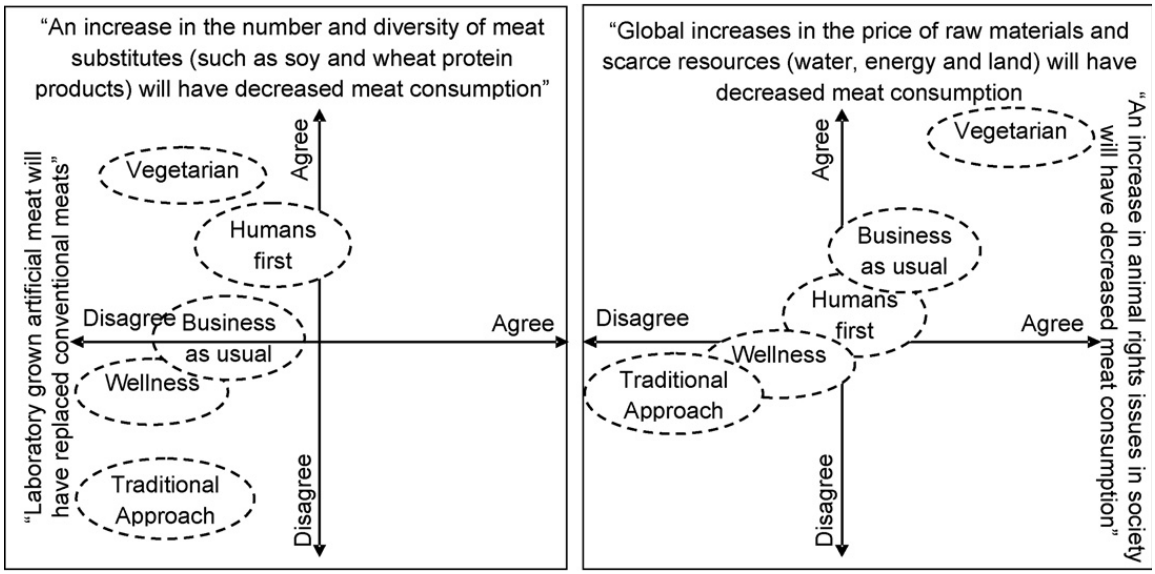

Fig. 3. Five future images in relation to technological, environmental and ethical factors.

4. Conclusions and discussion

In this paper we have analysed different types of future images of meat consumption for the year 2030, which were identified based on expert interviews and a consumer survey. The need for the analysis was based first of all on the fact that arguments about meat as a commodity have gained new perspectives and thus interest during recent decades. Firstly, the environmental burden from meat consumption has become a particularly important factor, especially if global warming is to be confronted. Secondly, the rise of animal welfare questions, due to industrial farming systems in Western countries, has raised interest in the issue. Thirdly, new knowledge about human physical and mental well-being related to meat consumption has, for its part, provoked interest in controlling consumption.

Current ideas regarding reducing meat consumption are, however, fairly robust. The idea of this paper has been to widen our understanding of the variety of the views on the issue and identify what type of interest groups can be observed. The reason for making this identification is that different kinds of groups may require different types of action and responses if they are to be encouraged and persuaded to alter their behaviour for economic, social, health or environmental reasons. The case data was from Finland, but the questions include aspects of the global food market applicable to many industrial countries confronted by the decreasing economic importance of their food production, as well as high-tech food productivity, environmental concerns and animal ethics.

This paper has developed a method for the systematic elaboration of future images by the using quantitative cluster method in combination with qualitative material in order to achieve enriched future images. The analysis revealed that both experts and consumers had a fairly negative view of laboratory grown meat. This indicates that technological development

may not be the most popular solution for coping with the growing meat consumption demand. Four out of five clusters produced an image which saw the number of vegetarians increasing, but only one saw it as very likely. When the answers were divided into different clusters the diversity of perspectives regarding the factors affecting meat consumption became evident. Five different types of images of the future were identified the: Traditional Approach, Business as Usual, Humans First, Wellness and Vegetarian societies.

There can be many reasons for the diversity of views related to meat consumption. Some humans value human life as the most valuable thing and others think that the environment is also valuable. It can also be that personal relationships with farmers or relationships to animals can influence people's perceptions in relation to the issue. Such different background variables can partly explain the variability of the answers. The most likely image of the future according to this research contained the emphasizing of small changes that would maintain the current, visible changes. The Business as Usual image of the future, which was the most popular image, was held by 109 out of the 215 responses given by the consumers and 16 out of the 34 views given by the consumers.

Based on the results of the paper a more practical, group by group, view towards changing people's meat consumption should be applied if, e.g. changes to bring about less green house gas emissions from agriculture are desired. For example the Traditional Approach Society group could be better informed about animal rights issues and more emphasis could be given regarding the possibilities of meat substitutes. This group could also be informed about the possibilities of vegetarianism in general. The Humans First group could be given more information about the capabilities of animals so that they would become more interested in them. For this group more and better products that could substitute for meat products would need to be available. The Business as Usual image seems to be rather strong and in order to alter its mindset economic incentives would probably be required. The Vegetarian Society image group might be encouraged to share their views with other consumers.

The key message of this research is that there are variations in people's perspectives regarding the need for change in meat consumption practices. Hence, it is obvious that a selection of methods would be required to help bring about any change in meat consumption. However, taxing products at a higher rate is not sufficient as different groups would need to be persuaded in different ways of the benefits of altering their diets and beliefs. More research is needed in order to develop efficient ways to influence meat consumption practices. As one of the consumers commented:

> "*First of all I believe that consumer groups will be divided into different segments: different kind of trends and/or ideas will become stronger and there will be more diversity*".

Understanding more about this diversity of consumer views in relation to the issue can help make the targeting of the methods more efficient and thus any transformation process more likely to succeed.

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