Institutional consumers' views of GHG emission reduction by optional milk systems within sustainability frame

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Abstract: *An on-going study examines how Green House Gas (GHG) emission information could be used to support consumption driven changes in production, leading to reduction of GHG emissions in agriculture. This paper presents a pre-study, looking for discursive grounds by which institutional consumers make choices when confronted with the knowledge of GHG emission characteristics of five optional milk systems. The milk systems to be compared in terms of agricultural GHG emissions were (Option I) conventional milk system based on imported soy protein feed, (Option II) conventional milk system using domestic protein source and (Option III) organic milk system, as well as vegetable milk systems based on (Option IV) imported soy and (Option V) domestic oat. The discursive turn to these optional milk systems was taken by five catering information professionals, who tried to respond to the idea of catering for sustainability. The results revealed four different discourses, with variable ability to make use of emission information when systemic change is to be approached in everyday productive activities. Regarding emission information, the least sensitive discourse was the one of modernization, emphasising the use of conventional, cheap products. Sustainability and ecological modernization discourses exhibited most imaginative and novel solutions in productive activities. Bioregionalism discourse joined other discourses connecting them with the idea of domestic production. The discourses identified in this pre-study were, however, very fine-grained and intermingled, offering rather lean support for novel choices. Additionally the market position of organic milk suffered due to emission information, stressing heavily the reliability of environmental information as a 'change agent' on the market.*

Keywords: *optional milk systems, GHG emissions, climate change, discursive grounds*

Introduction

Finnish and Swedish programs for sustainable consumption and production aim at change towards more environmentally friendly and sustainable buying behaviour in terms of economic and socio-cultural conditions, according to the lines of action articulated at World Summit on Sustainable Development 2002 (Getting more from less, 2005, Think twice!, 2005). These programmes also concern food systems, as for instance the proposals for Finland's national programme to promote sustainable consumption and production (Getting more from less, 2005) recommends that the consumption of organic and local food by catering organisations should expand 10-15 % yearly, corresponding to EU wide efforts for sustainable agriculture and increased agro-environmental measures (EC 1999, 2005). In catering, the communication of environmentally friendly food is signalled in the Nordic countries by labelling schemes (Swan labelling of restaurants, 2006). Additionally, initiatives for catering for sustainability emerge e.g. in Italy, UK, Denmark, Sweden and Finland, featuring the use of local and organic food (Morgan and Sonnino, 2005, Mikkelsen et al., 2007, Mikkola, 2008). Furthermore, American Dietetic Association takes the position to promote ecological sustainability by food choices (ADA, 2007). Some studies aim at decreasing Green House Gas (GHG) emissions by detecting significant differences between GHG emissions of various foods and based on this information, the reconstitution of both nutritionally and environmentally balanced diets is considered (Wallén et al., 2004, Foster et al., 2006).

However, sustainability considerations bear on a wider sphere of issues than the environmental ones or particularly GHG emissions only, suggesting that economic and socio-cultural aspects make the changes in consumption patterns less unambiguous. The vested ecological, economic and socio-cultural interests become well exemplified by dairy and vegetable milk systems in Finland. Although milk production, whether conventional or organic, is an important source for agro-environmental impacts like eutrophication and GHG emissions, it also supports biodiversity of the agro-ecosystems. The consumption of milk products makes milk production an economically important sector in Finland,

where the annual consumption equals about 2100 million litres of raw milk; the value of milk products on the market is about 2000 million euros yearly. The share of organic raw milk is only about 1% of the total raw milk, and the higher price of organic milk is seen as obstacle in its marketing. Presently, only part of organic milk is marketed as organic; the situation is similar in the UK (Franks, 2003). Organic fresh milk would be a relevant product in sustainable catering, since it is identified as a strong organic product line and is readily available on the market in several countries, for instance in the US and UK (Du Puis, 2000, Hill and Lynchehaun, 2002) as well as in Finland. Fresh milk and milk products comprise about 30% of the total intake of the kilojoules in the average Finnish diet. Including beef, major part of which comes from the dairy cattle, the share of total intake is about 34 %. In general, milk has been an important source of calcium for consumers of all ages (National Nutrition Council, 1999). Fresh milk and milk products have also a prominent position as ingredients in meal preparation according to traditional recipes. Milk in all its different forms as part of meals is a heavily constructed part of Finnish and more generally Northern European and American food culture (Du Puis, 2000, Buttel, 2000), creating and strengthening social order (Douglas, 1975, Murcott, 1982) as well as structuring economy and environment. So far, the share of vegetable milks like soy or oat milks is marginal on the market, although this consumption is rising partly due to particular health problems and environmental as well as ethical convictions.

In this paper, the assumption of ambiguous food choice on environmental grounds in terms of sustainability is examined by informing representatives of institutional consumers about agricultural GHG emissions of different milks and analysing the consumers' discourses about their choices of milk products within sustainability frame. Would GHG considerations introduce potential for changes in milk consumption? What kind of new, more sustainable consumption orientations would the institutional consumers adopt on the basis of GHG information? The milk systems to be compared in terms of agricultural GHG emissions are (Option I) conventional milk system based on imported soy protein feed, (Option II) conventional milk system using domestic protein source and (Option III) organic milk system, as well as vegetable milk systems based on (Option IV) imported soy and (Option V) domestic oat. The discursive turn to these optional milk systems is taken by five catering information professionals, who try to respond to the idea of catering for sustainability. The results of this pre-study suggest, that choices are characterised by considerations of hegemonic discourses of modernization and bioregionalism, but some room for manoeuvre and change of product choice can be expected by discourses emphasising sustainability and ecological modernization. The analysis of discourses seems to offer useful insights when studying how to make progress towards sustainable consumption and production.

Research methods and data

Estimation method for agricultural GHG emissions of optional milk systems

The agricultural GHG emissions of milk production comprise the methane (CH_4) from enteric fermentation, CH_4 from dung, carbon dioxide (CO_2) and nitrogen oxidule (N_2O) from soil as well as the CO_2 associated with the manufacture of fertilizers. The indirect emissions due to ammonium from dung were not considered here. The emissions of the optional milk systems have been estimated on the basis of the yearly average consumption of milk in Finland calculated from the per capita consumption (MMM, 2006) as if all the milk consumed would originate from one of the optional milk systems. The 2100 million kg include the liquid milk and the milk used for processed dairy products. The number of cows to produce this amount of milk was calculated from the average yearly milk production per cow. In the dairy milk Options I, II and III the feeding requirements were kept the same, and the amount of imported soy fodder in Option I was equal to the combined amount of the rape seed and pulses in Options II and III. Therefore also the cows' output of milk was assumed to be the same - 7200 l cow $^{-1}$year^{-1} - in all three options. The differences between conventional and organic milk production arise from the fact that, compared with conventional crop production, the yields per hectare are up to 30% lower for organic production (Lötjönen et al., 2004).

The emissions were quantified on the basis of the number of cows and their fodder requirement to satisfy the yearly demand of 2100 million kg milk. The field area needed to produce the fodder was calculated from the long term average yields per hectare of the various fodder plants (MMM annual issues). The data on fodder requirements (Tuori et al., 2002), yield per hectare, the percentage of food obtained from the yield and fertilization levels (MMM, 2006) are given in Table 1. The 7% soy beans in

soy milk and 10% oat in oat milk were obtained from the ingredient declarations of commercial products.

Table 1. The feed requirements, fertilization levels, yield ha^{-1} and the factor to convert the harvested yield to the product.

	Fodder requirement kg cow^{-1} year^{-1}	Yield kg ha^{-1} conv.	kg ha^{-1} org.	To food from yield %	Fertilization N kg ha^{-1}	N kg ha^{-1}
silage	10731	20000	15000		180	20
hay	397	3500	2200		180	20
pasture	5496	17000	12000		150	10
barley, feed	634	3000	1800		90	18
oat, feed	703	3000	2000		90	10
crushed rape	630	900	600		110	15
pulses	204	2000	1300		40	15
soya cake	834	1600		80	110	15
oat, food*		3000	2000	60	90	10
soybeans**		2000				

* 10 % oat in oat milk

** 7% soya in soy milk

Option I – conventionally produced milk, protein feed based on imported soy
Option II - conventionally produced milk relying on domestic feedstuffs
Option III – organically produced milk relying on domestic feedstuffs
Option IV – soy milk based on imported soy
Option V – oat milk based on domestic oat

The emission factors expressed as kg cow^{-1} year^{-1} were: 117,06 CH_4 for enteric fermentation (Statistics Finland, 2007) as well as 8.53 CH_4 and 2 N_2O for dung (Pipatti, 2001). For the emissions from the soil the average Finnish annual value of 4.395 tons CO_2 ha^{-1} (Statistics Finland, 2007) was used. The emissions from fertilizer manufacture were calculated using the value 6.67 kg CO_2 kg^{-1} fertilizer (Kramer et al., 1999) and assuming application of fertilizers according to the terms of environmental subsidy. The GHG emissions were expressed as CO_2 equivalents, for which the conversion factors 21 for CH_4 and 310 for N_2O were used (IPPC, 2005). Only the primary production was considered here, and thus the CO_2 emissions of country specific transport and processing were not accounted for. However, the emissions for the imported soy, both fodder and soy used for soy milk, were calculated using a single emission factor that comprises the emissions from soil, from fertilizer manufacture as well as the ship transport to Finland. The factor was derived from the data of Nielsen et al. (2003).

Analysis of optional milk system discourses

For considerations about the use of optional milk products in terms of agricultural GHG emissions in catering organisations, the interviewees were sent an email offering relevant information about agricultural GHG emissions of optional milk systems (Table 2 and Figure 1), with reminders about environmental issues of eutrophication, ozone depletion, biodiversity and hazardous chemicals. Furthermore, when the interviewees were asked about the optional milk products of their choice, reference was made to issues like food culture, food safety and security, product prices and climate change. The telephone interviews were done two days after sending the email, and the interviews were written in shorthand by the researcher. Here the building up of discursive ground took place in a non-directive dialogue between the interviewees and the researcher. The five telephone interviews

worked as a pre-study for a focus group to be organised in the next stage of the study. The pre-study was designed to inform about the ways the interviewees related to the graphs, and whether societally important discourses could be identified. The emission results presented in the graphs (Figure 1) were derived from milk system specific production estimates (Tables 1 and 2) and the interviewees were informed about the calculatory character of the results.

This form of interviewing made use of informational stimuli (Törrönen, 2001) by focussing on environmental threats and sustainability issues, which were relevant for interviewed persons in their professional positions (Pedersen and Viken, 2003). The given information confronted the professionals with their ordinary choices of products, meant to suit to their contextual uses. The professional knowledge was understood to be formed and expressed within "the professional knowledge landscape" (Connelly and Clandinin, 1999), which catches the integration of 'in-catering' context with the 'out-of-catering' contexts, often carrying along societal and organisational views, rules and regulations known to professionals. When making choices about the use of optional products, professionals are both enabled as well as constrained within their organisations; their professional identities, including the environmental or sustainability "project" identity (Castells, 1997), develop in negotiations between organisational actors and practices (Forward and Scheerhorn, 1996). Discourses were used in this paper to approach "the professional knowledge landscape", which was a difficult terrain especially when the alignment with information was complicated by strong practical, cultural, economic and environmental concerns.

Several different sustainability issues were inherently referred to the interviewees, and the interview talk was analytically distinguished as discourses of optional milk systems (Parker, 1992, Burr, 1998). These discourses are suggested to reflect social reality not chaotically, but by making sense by limited number of different constellations available to the interviewees (Burr, 1998). The identified discourses were understood to inform about the discursive grounds of the uses of optional products, as ways to relate to conflicting information and to decide how 'in-catering' context mingles with 'out-of-catering' contexts; the analyses of discourses made these 'undercurrents' visible.

The interview stimulus contained politically sensitive material by presenting optional milk products in particular environmental light. In order to avoid ethical ambiguity possibly harming operational food businesses, the interviewees were judgementally chosen from among information professionals who were prominent teachers on hotel, restaurant and catering sector and experienced professional business developers on the food sector.

Results

Estimated agricultural GHG emissions of optional milk systems

The amounts of total GHG emissions for the yearly production of 2100 million kg milk for the five options are given in Table 2. To provide a better basis for eventual comparisons the results in Figure 1 are given per capita per year.

Table 2. Total GHG emissions from the production of the milk for the yearly average consumption in Finland, Mg CO_2 equivalents a year.

	I	II	III	IV	V
CH_4, manure	52,075	52,075	52,075		
CH_4, enteric fermentation	714,647	714,647	714,647		
N_2O, manure	180,242	180,242	180,242		
CO_2 and N_2O, soil	1812,856	2837,626	4170,919		511,107
CO_2 fertil-manufacture	509,479	555,487			69,761
CO_2 imported soy*	2292,520			1009,190	
total	5561,819	4340,076	5117,882	1009,190	580,868

*transport, soil and feritlizer manucacture included

Option I – conventionally produced milk, protein feed based on imported soy
Option II - conventionally produced milk relying on domestic feedstuffs
Option III – organically produced milk relying on domestic feedstuffs
Option IV – soy milk based on imported soy,
Option V – oat milk based on domestic oat

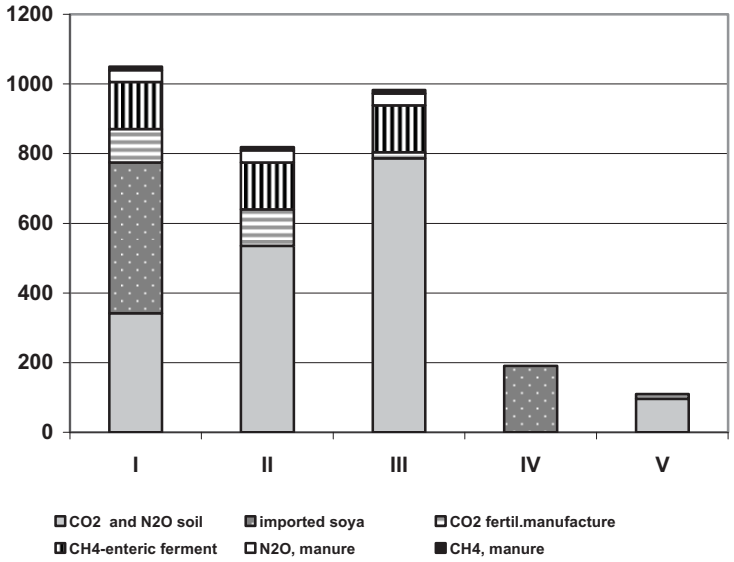

Figure 1. The GHG emissions from of the five different options of milk, kg CO_2 equivalents per capita per year.

Option I – conventionally produced milk, protein feed based on imported soy
Option II - conventionally produced milk relying on domestic feedstuffs
Option III – organically produced milk relying on domestic feedstuffs
Option IV – soy milk based on imported soy
Option V – oat milk based on domestic oat

The results show rather convincingly that regarding the GHG emissions the conventional milk production with domestic feed (Option II) is less of an environmental impact than the organic milk production (Option III). The major source of the GHG emissions is the soil, and because of the more extensive land use the environmental performance in regard to the GHG emissions of organic agriculture is poor. Similar results have been lately reported also from elsewhere (e.g. Foster et al., 2006, Thomassen et al., 2006, Risku-Norja & Mäenpää, 2007), although also the opposite has been reported (e.g. Cederberg & Mattson, 2000). The conventionally produced milk relying on imported soy as the source of protein is even slightly more burdening than the organic production. On the other hand, the calculations have the greatest uncertainties as to the emission factors of imported fodder.

As to the GHG emissions, the soy milk and the oat milk appear to be superior to the dairy milk options. However, in the dairy options, the processing plant is the cow, whereas in the vegetable options production of only one of the necessary raw materials has been accounted for. In addition to soy or oat these milks contain sugar and various other components. Compared to raw milk from cow, these require much more processing, peeling, grinding, filtering, and the products are more akin to that of fruit juice (Foster et al., 2006). Dairy and vegetable milk options are not directly comparable without LCA data from the whole life cycle for both types of products. Besides the dairy cows are an important source of beef, because the major part of the domestic beef is side product of milk production; this should be also taken into account in eventual LCA approach.

Interviewees' reported storytelling

The analyses of discourses focussed first on the discursive paths built by the five interviewees; they positioned themselves both as individual and institutional consumers, 'visiting' sites and actors of production and consumption by their talk. For the sake of clarity, the storytelling of the interviewees is reported here as indirect and 'condensed' (Tracy, 2002). This allows the tracking of the topical order used by the interviewees, making visible the constraints stemming from food culture and meal preparation, food security and quality, as well as price and environmental considerations, and eventually evidencing how the interviewees clarified themselves the grounds and relative freedom of their choice of products.

The first interviewee adopted the position of a "common catering manager and milk user", and suggested immediately the first option with the domestic protein source, (actually the second option, MM), because vegetable milks seemed to be weird. Particularly the behaviour of vegetable milks in meal preparation raised uncertainty, and the taste of oat milk was deemed cereal-like. Organic milk was seen expensive, and not satisfying the national demand. The interviewee felt the 'pressure' for "idealism", but turned to "realism", due to perceived constraints by everyday life. Of the two vegetable milks, the oat variety was domestic and better approved than soy, which does not grow in Finland. Basically, it was suggested, the catering managers had enough to do when addressing various dietetic needs. Nutrition has been "pumped in" for years, and due to the "moving parts" and excessive information something needs to "thrown away", in practice carbon dioxide. However, the interviewee admitted that "changes were under way", and was inherently prepared for the moving parts to settle in novel constellations.

The second interviewee was amazed due to the graphs, "telling so much", and focussed on her own milk consumption of only conventional milk, produced with imported or domestic protein. She did not use organic milk and was surprised about its emissions. The reason for this was explained, and understood by the interviewee as an argument not to use organic milk, the use of which was anyway perceived as a "sultry" issue. Oat milk was considered to be an interesting domestic milk product option, not to be discriminated in food preparation; it can be used for pancakes and in baking and the taste of it is deemed good by some consumers. The interviewee saw it as a product suitable for environmentally aware young people, to be used in attitude building by public institutions. The interviewee thought about her home surrounded by dairy farms and concluded that it would be difficult to introduce the idea of oat milk there. This practice would lead the local economy to plummet, and the idea seemed even worse when thinking about how the local farmers have been able to create the local co-operative dairy within the "EU squeeze". On the other hand, one part of the home region grows grain, and the better price for a special oat could make the grain profitable. The biggest farms in the region cover 300-500 hectares, and population is little less than 100 000. In the interviewee's eyes, the second milk option seemed to be practically feasible, and was to be preferred due to the lesser emissions than by other "real milks". However, oat milk cannot be used for celiac disease patients, so soy is better for them. Oat milk, although more expensive, would be a good option for environmentally profiled day-care centres and primary education schools, and the modest emissions would be a good argument in brand building.

The third interviewee had never thought about the product choice from the emission point of view. For her, food culture and preparation called for the first three milk options, of which the domestic option was preferable. Organic milk did not seem to be favourable in climatic respect; it may have some sort of market and ethical value, but no further advantage as a product. The consumer cannot perceive the difference between imported and domestic protein feed in the milk. Concerning food security and quality, in case of "crisis" quality food is needed. Soy and oat milk preserve well, and availability will be better (than of cow's milk, MM). So far it was not clear for her whether the quality of soy or oat milk is better and in which ways their sensory and microbiological properties differ. Concerning price, the first two options were similar and cheapest. This is important when thinking about the paying consumer; it is well advised to "favour Finnish". Regarding the GHG emissions, soy and oat are in a class of their own, and choosing only one product would lead to oat milk. From her point of view, the use of oat milk would be agreeable, but for budget reasons the choice was milk option two.

The fourth interviewee considered the emission calculations to be probably correct. She told about her commitment to domestic food and organic farming, as an approach for securing the cleanliness of the domestic food system, in case the "population would become dependent on it". On the other hand, biotechnology is attractive if you control the risks, and they both have a role to play in livelihood promotion, and for allowing consumers to have a choice. The milk product two would be the choice here, since the basis for its production is safe. The interviewee also was a celiac disease patient, having used oat milk and other products suitable for persons over 60 years old with heart and artery diseases, and was looking for functional food. In general, oat has very good pro-biotic properties, and it was a very positive perception that the CO_2 was as low as it was. Soy is the cheapest protein at the moment but environmentally more damaging with transport and possible genetic engineering; on the other hand, it may be positive due to avoidance of herbicides. All options like soy are needed, but one needs to think about the vast majority of consumers and in Finland the industry is still competitive; this bends to conventional milk and oat milk. Organic milk is expensive and the farming techniques need development. Anyway, a growing share of population needs special products, with low and soft fat, and vegetable milks could have 20 - 30% of the market, maybe even more. Vegetarian and vegan food is increasingly available, and if animal welfare proves too difficult to be solved, oat milk could be

a solution. Possibly “economic crises” could support the use of oat milk. In the long run, soy is cheaper and the vast majority buys the cheapest option. “Domesticity is approved by a little less than half of Finns, and more than half are less committed”.

The fifth interviewee experienced the choice of product difficult, but eliminated soy and oat milk due to their weirdness. Because of their limited applicability, they can not be compared with milks used as drink or ingredient for meals; they do not fit into Finnish food culture. If there is great pressure and the choice needs to be made, from today’s perspective vegetable milks are “rather remote options”. If you run down the industry, that is costly too, and vegetable milks will not pay back economically. Milk options one or two would be the choice because of the same price, but domestic milk has lower emissions of these two. Also meal preparation and food culture dictates conventional domestic milk, but food security and quality would emphasise organic milk. Only in a really “compelling situation” oat milk would be the choice.

Discourses of optional milk systems

Modernization discourse

The essence of modernization discourse was identified as emphasis for the use of developed technology, industrial efficiency, possibly imported raw materials as well as high productivity enabling cheap food to be offered for mass markets. Environmental impacts as external phenomena were difficult to discuss (Dryzek, 1997, Spaargaren, 1997, Arce and Long, 2000) within the context of conventional milk system. This discourse leaned on the cheap milk, used by cost-aware catering organisations, willing to align with ‘orthodox’ and ‘modern’ nutrition for customers. The modern catering units also committed to the economic importance of conventional milk system, and from this stance it seemed difficult to change ingredients for meal preparation. The modernization discourse offered no heavy weight for environmental concerns, which were mostly bypassed. Confronted with GHG emissions, the conclusion was that the most suitable product would be the conventional milk, produced with either imported or domestic feed. The ‘unfavourable’ GHG emissions of organic milk were rather pleasing when supporting choice for conventional milk.

Sustainability discourse

The sustainability discourse represented the positive and mutually strengthening economic, environmental and socio-cultural aspects, implemented in imaginative and reformist ways, including both local and global actors (Dryzek, 1997, Spaargaren, 1997). The sustainability orientation was identified in ability to think about optional milk systems in terms of all three dimensions. Changes in meal preparation were suggested and efforts to produce novel kinds of pleasurable tastes were approved. The consumers were seen to operate with different economic resources and nutritional needs, directing their demand for different milk products; the rural livelihood aspects were also kept in mind. The GHG emissions were included in the examination of milk systems, and translated to local livelihoods by organic to biotechnological processes. Here the discursive choices were oat or soy milk, both of which had their customers in individual consumers with nutritional disorders or vegan orientation and institutional consumers emphasising environmental adaptation. Surprisingly, the conventional milk options were perceived to produce less emissions than organic milk, which normally would have been the assumed sustainable choice. Interestingly, four of the five interviewees expressed concerns about “crisis”, “economic crises”, “compelling situation” or “changes under way”. This could be seen to result from confrontation with emission information and issues of food safety and security mentioned in the basic interview information, stressing the need for changes and maybe supporting the use of vegetable milks. Normally food security is a distant topic, as referrals are made to historic or developing countries’ problems. This sustainability discourse concerned the sustainability of the national population, in relation with optional milk systems and particularly vegetable milks.

Ecological modernization discourse

Ecological modernization discourse paid particular attention to co-operation of industry, state and scientific-technical expertise in reforming industry towards environmental friendliness by advanced technology, and boosting economy by communication of environmentally competitive products (Dryzek, 1997, Spaargaren, 1997). This discourse can be seen as a variant of sustainability discourse, being effective especially in the industrial welfare states of Northern Europe (Dryzek, 1997). Here the reaction to the GHG emissions was positive in case of oat and soy, and organic milk production was seen to need development of farming techniques; the option as such was not rejected. The industrial

organic and biotechnological base was seen as securing economic basis and consumer choices by product development. Oat and soy milk were seen as environmentally competitive as they would offer chances for brand building and environmental visibility. Whereas oat and soy milk could be seen as relevant options for a rather large share of consumers changing their consumption for environmental and functional aims, the organic milk could be available and developed more environmentally friendly.

Bioregional discourse

The bioregional discourse emphasised connection between population, region, traditional tastes, domestic plants and animals as well as livelihoods (McGinnis, 1999). Here the Finnish farming system was seen to be presented in its most traditional form as today's organic milk system, representing highest level of independence, food security and safety, even product quality. The vegetable milks were not to be favoured because it would introduce weird tastes and loss of traditional ingredients in food culture. If conventional or organic milk systems could not sustain for some reason, the next solution would be domestic oat milk. It would originate in Finland and replace to some extent cow's milk systems. Bioregional discourse did not readily ground choices of products on the emission information. In its most restricted form it supported organic milk systems, but enabled expansion to conventional milk produced with domestic feed and after that to other products of domestic origin. The discourse favoured basically organic milk, conventional milk produced by domestic feed and oat milk.

Discussion

The results for farmland requirements were based on long-term average yields, and they can be seen as reliable also in absolute terms. The national averages of soil GHG emissions hide in reality a large variation due to differences in soil type, climate, local geomorphology, and production conditions. The results are, therefore, somewhat less accurate. There is also some variation as to the emissions from cows due to differences in eventual feeding. The most uncertainties were associated with the emission factors of fertilizer manufacture and of imported soy; however, the emissions due to fertilizer manufacture were fairly small when compared to the total; using some other published emission factor would not have markedly influenced the outcome. Instead, the more detailed data on GHG emissions from soy production could have had a visible influence on the results, to one direction or the other. Despite the uncertainties the figures refered to relative differences among the considered options, allowing the interviewees as representatives of institutional consumers to participate in the evaluation of the products stemming from optional milk systems. Only one interviewee referred to the reliability of results; most interviewees took the figures as given.

The identified discourses were rather different in their orientations and inclusiveness concerning emission information. The most 'ignorant' in this respect was the modernization discourse and to some extent the bioregionalism discourse. The modernization discourse could be seen as 'traditional', but it still seemed to represent the core features of most industrial production, aiming at competitiveness and expanding markets. The sustainability discourse was the most flexible in its orientation for change, regarding the emission information seriously, reorganising productive activities and creating new food culture, whereby nutrition, economy and environment were combined in socially acceptable ways. The 'Northern European' ecological modernization discourse was particularly looking for biotechnology and brand building by novel products, developing organic farming was also considered. Bioregionalism discourse took as the point of departure most preferably organic milk production. It offered the clearest independency of external resources, but adapted to modern milk production as well, as long it followed the bioregional boundaries and consequent food culture. It was flexible in joining other discourses, emphasising domesticity. The present discursive position of organic milk as sustainable option suffered due to negative GHG emission information; however, sustainability and ecological modernisation advocates could move on to the use of vegetable milks. The supporters of modernization discourse, having felt the 'moral' pressure for choosing organic milk, were able to use the emission information to support their existing choices. The modernization discourse seemed to be hegemonic, contested by 'minority' discourses of sustainability and ecological modernization. The discourse of bioregionalism was able to join modernization, sustainability and ecological modernization discourses by stressing domesticity of production. However, the use of discourses exhibited strong intermingling and produced multiple orientations for each of the interviewees; in this situation the hegemonic discourses may gain more support among consumers' everyday practices. Here the reliability of the GHG emission information is essential as it may cause change in buying

behaviour, particularly by those consumers who commit themselves to discourses of sustainability and ecological modernization.

Conclusions

This pre-study supported the assumption of extensive and viscous societal base of the discourses on the professional knowledge landscape. The initial discourses outlined here were abstracted from interviewees' talk and did not appear as clear and solid discursive formations. Rather, they were mixed with one another in a fine-grained way, making visible the discursive 'wrestling' taking place in the professional knowledge landscape. However, all the interviewees were using modernization, sustainability and bioregional discourses, as familiar discursive constellations. The decision making for the use of new products based on emission information was difficult in this kind of situation. However, the modernization discourse referred to the strong position of conventional milk on the market, bypassing emission information. Sustainability and ecological modernization discourses did not call for fast increase in consumption of vegetable milks, but offered possibilities for some part of consumers to consider emission information: the young and environmentally committed as well as persons with nutrition disorders and ethical convictions. Bioregional overtones were detectably joining all discourses, emphasising domesticity of production. The reliability of environmental information is crucial as it may change the environmental position of products on the market, exemplified by organic milk. However, although the 'modern' relation to milk system seemed to prevail, connected with the bioregional emphasis, there were perceptions of and ambiguous expectations towards changes for sustainability by all consumers. This signalled to some extent readiness for change for sustainability which may become increasingly approved also in practice.

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