

Is Cheese Sustainable? *A Multi-scale Exploration of Botton Gouda*

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Food is the foundation stone of human longevity, yet the current ‘food crisis’ shows that the majority of global food production is unsustainable for humans and the biosphere (Shiva, 2008:2, Orr, 2004). Sustainability is “the capacity to create, test, and maintain adaptive capability” which can be achieved through development, “the process of creating, testing and maintaining opportunity” (Holling, 2001:390). Holling (2001) proposes that multi-scale understandings can reveal the dynamics of complex systems. This holistic view could contribute to strong sustainability thinking whereby natural capital is non-substitutable (Neumayer, 2003:24). While there is a global-scale food crisis, looking at the local level (and individual products) can reveal how adaptive capabilities and sustainable opportunities of food systems develop (Shiva, 2008:77; Norberg-Hodge, *et al.* 2002; Granstedt, 2012; Pretty, 2002). In this case, global increases in cheese and dairy consumption are a threat to both human and animal health, food security and the environment (Gerosa and Skoet, 2012:1), while the example of Botton Gouda cheese demonstrates the opportunity for a local organic integrated food system.

This paper will examine Botton Gouda cheese as a product in a largely sustainable local food system and discuss it in connection with wider global challenges to illustrate dissonances and complexity, thereby, revealing the tensions that exist between global and local-scale production and consumption of cheese. Botton Gouda could also be discussed in relation to many different aspects of food production and consumption, as illustrated in Fig. 1. This discussion will highlight some of these aspects: the historical development of cheese-making; global issues of livestock agriculture and dairy; integrated organic closed system agriculture; life cycle assessments of cheese; and finally, the socioeconomics of local food and consumption patterns of cheese. These lenses reveal various different dynamics of scale, as summarised in Table 1.

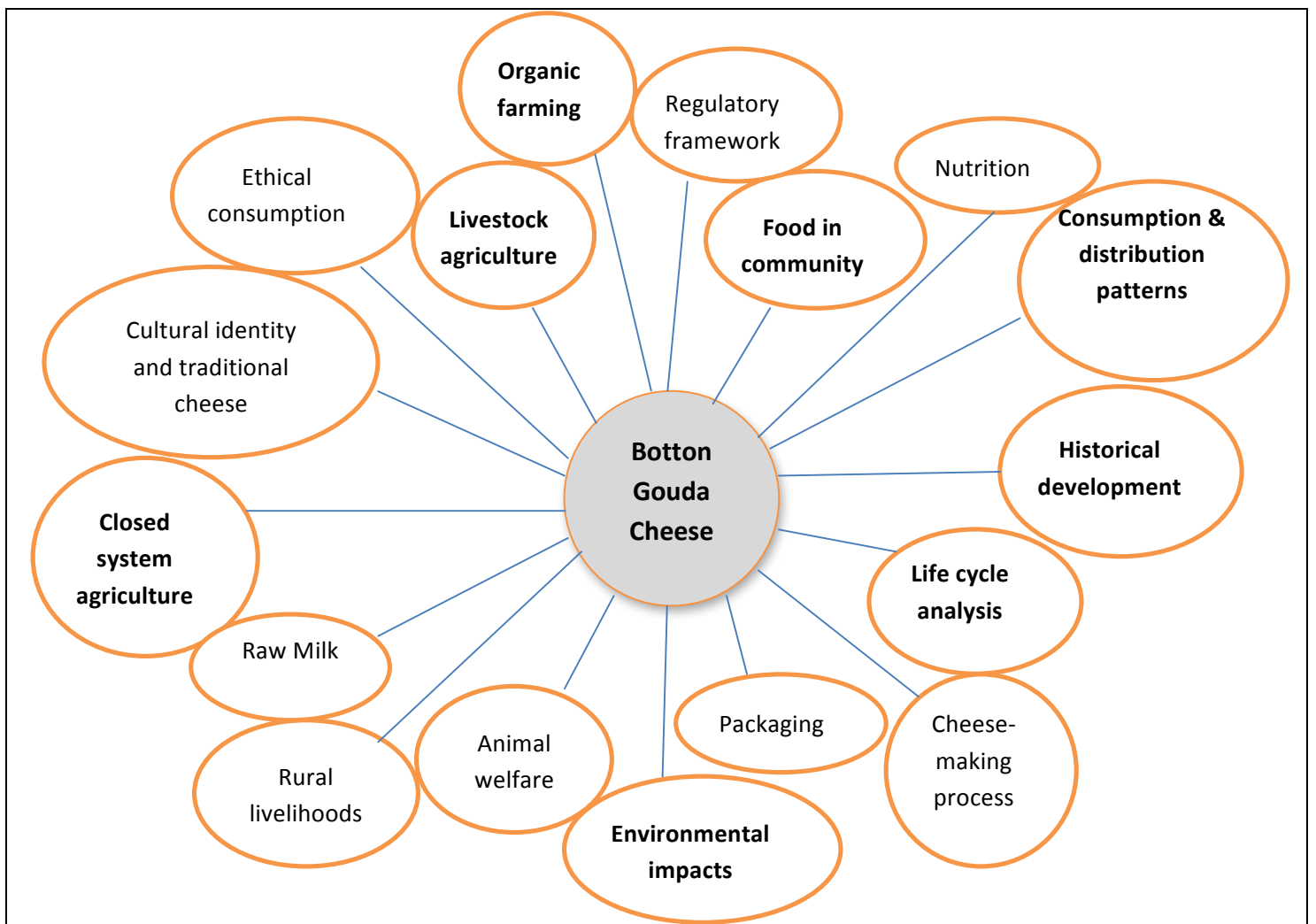


Figure 1. Mind map diagram illustrates how Botton Gouda cheese is at the centre of many possible debates on sustainable food production and consumption. Some of the many interconnected sustainability topics related to Botton Gouda cheese are shown here. Those marked in bold font are discussed to varying degrees of depth in this essay.

Table 1. This table shows the different aspects of cheese explored in this paper and the dynamics of scale which were revealed.

<i>Aspects of cheese explored</i>	<i>Dynamics of scale</i>
<i>Historical development</i>	From local-scale common-sense to industrial-scale economic efficiency.
<i>Livestock agriculture</i>	Global problems need local, regional, national and global scales of thinking.
<i>Closed system farming</i>	Sustainable practices including organic, integrated closed systems on the local-scale must be met by global/national-scale consumption reductions.
<i>Environmental impact</i>	Difficult to measure and compare efficiency of local and industrial scales due to lack of evidence.
<i>Socio-economic context</i>	Both local and global-scale networks of trade need to be considered.
<i>Consumption and distribution</i>	Labelling is necessary for wide-scale distribution, while community relationships are more important for local-scale consumers.

Botton Context

Botton Gouda is produced in Botton Creamery, an enterprise in Botton Village, a Camphill community. Camphill Initiatives work to improve the lives of those with learning disabilities and mental health problems through by creating a supportive community, which integrates work, education, and services into daily life. In line with the Camphill initiative, half of the village population have learning disabilities and are cared for by voluntary co-workers, who work and live alongside each other in shared households in a village setting.

Box 1. Botton Village – A Camphill Community

Since 1955 Botton has developed into a village which combines caring for learning disabled adults with a community working lifestyle. It has grown to approximately 270 residents living in 30 houses. All residents work voluntarily in the various workshops, farms, gardens and households which contribute to the upkeep, self-sufficiency and income of the whole community. Botton is inspired by anthroposophy, a philosophy founded by Rudolf Steiner which informs the ethos of the village, the cultural life and the biodynamic agriculture practices. Consequently, Botton is considered a sustainable community in terms of its high quality food produce, environmentally conscious land management, high degree of self-sufficiency, diverse and rich cultural life.

Workshops and farms provide meaningful work and help to sustain the community. Food is a significant aspect of community life, connecting residents on many levels. See Box 1 for further details of Botton Village. Botton Creamery is considered an essential component of the village food system and compliments the agricultural practices, as Fig. 2 illustrates. Biodynamic agriculture is based on the view of a farm as a living organism, which in practice is an ecological closed energy farm system, with integral nutrient and resource recycling processes (Haden & Helmfrid, 2004:14). Small dairy herds are essential in this system as manure is used to fertilise the fields.

Consequently, milk and beef production are by-products, which add economic value and diversity to the system. Botton Creamery processes 76, 000 litres of milk, which is 75% of the total milk yield from the 48 milking cows in Botton Village. The whey from cheese-making returns to the farms as pig feed. This cyclical food system is unfortunately rare in the context of global agriculture. Despite this, small artisanal dairies producing high quality local cheeses do still persist in many parts of Europe (de Roest, 2000:4).

Botton Gouda Food System

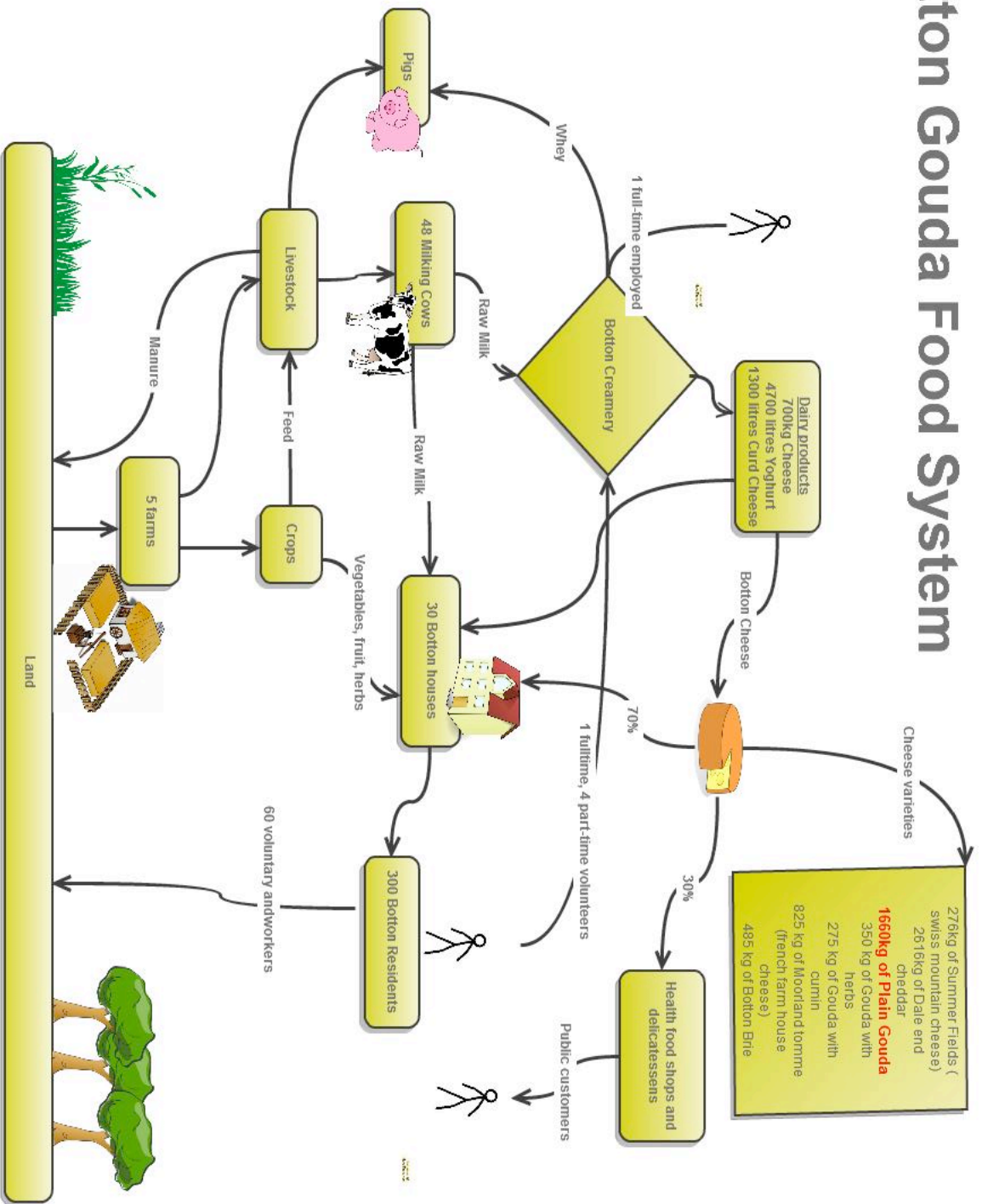


Figure 2. Source: Author's own research

Figure 2. This diagram shows how the main components of the food system in Botton Village link to Botton Gouda. The arrows represent the flow and direction of resources. The quantities are approximations, because these aspects are not measured frequently or to high degrees of accuracy. This diagram illustrates how interlinked the production of Botton Gouda is with both the agricultural system and the Botton Village community. Economic aspects are not shown, however the main flows of money are between:

- £. Creamery and farm
- £. Creamery and Botton Houses
- £. Creamery and shops

Historical Development

The historical development of cheese-making demonstrates the local level logic behind this process, which contrasts with industrial scale cheese production. Cheese-making is an old tradition that developed at the farmhouse scale to make use of excess milk (Blundel, 2002:1). This was driven both “by needs of self-sufficiency and preservation of nutrition from locally available raw materials” (Tragear, 2003:94), and as an economic activity which converted highly perishable milk into a product that is more easily transported and stored (Blundel and Tragear, 2006:706). Botton Creamery developed out of a similar need to utilise the milk produced by the village’s dairy herds. Over the last two centuries, small-scale cheese-making has declined due to small-scale farms being displaced by large-scale, mechanised production systems (Blundel, 2002:1; de Roest, 2000:7, Pretty, 2002:105). In the mid-20th century this decline was caused by government support of industrial production, control of supply chains and the growth of supermarkets (Blundel and Tragear, 2006:719; Tragear, 2003:97). For example, the Milk Marketing Board centralised the milk trade as a statutory buyer and seller of milk in the UK which “effectively rendered small-scale, on farm processing of milk into cheese for commercial purposes completely uneconomic, if not illegal” (Tragear, 2003:97).

However, alongside industrial practices of cheese-making, a small number of traditional product ‘re-inventions’ have been increasing since the 1960s (Tragear, 2003:100). To put the Botton Gouda in context of the current UK cheese landscape, the UK consumes approximately 415,843 tonnes of cheese annually (DairyCo, 2012), 57% of which is produced in the UK (Hawkins, 2011:3). The UK is dominated by 98% industrial-scale cheese production, while Botton Gouda is part of the mere 2% small-scale artisanal cheese-makers (Blundel and Tragear, 2006:706). Due to globalised industrial dominance, the potential for local cheese-making lies in the exploitation of niche markets and alternative supply chains such as farmers’ markets (Tragear, 2003:93, de Roest, 2000:7). The logical sense of making cheese to maximise the resource of milk has therefore become marginalised by cost-effective industrial-scale cheese-making, at the cost of a huge amount of resources such as land and energy. There is clearly a dissonance between local and industrial-scale cheese production, because the original sustainability of resource flow does not occur at the larger scale.

Livestock Agriculture

Cheese-making is shaped by and developed from its agricultural practices. This is significant because 90% of environmental impacts of cheese are in the on-farm stage of milk production (Aguirre-Villegas, 2011; Foster *et al.*, 2006:74). The impacts of global-scale cheese consumption in relation to agricultural contexts are now considered. Livestock agriculture is a major contributor to many of the most serious environmental problems such as land degradation, water pollution and climate change; it accounts for 18% of global greenhouse gas (hereafter 'GHG') emissions (Steinfeld *et al.*, 2006:4). This is exacerbated by livestock intensification due to increasing human population and increasing consumer demands for meat and dairy (Walther, *et al.*, 2008:391; Steinfeld *et al.*, 2006:10; Gerosa and Skoet, 2012). It is estimated that at current rates, the global production of milk will increase from 580 to 1043 million tonnes by 2050, mostly in developing countries (Steinfeld *et al.*, 2006:275). Yet, in developed countries such as the UK with already high dairy consumption, current diets, policies and agricultural practices relating to dairy need major adjustments to be sustainable (Garnett, 2007). There are differing perspectives on the changes needed: for example, Visak (2007) argues that vegan agriculture is the most sustainable option because two-thirds of global arable land is currently used for animal husbandry which is not energy-efficient enough to provide for the growing population on soils which are fast degrading. In contrast, Garnett (2007) considers GHG emissions and suggests there is more complexity than simply reducing livestock, because alternative non-animal substitute foods also produce considerable GHGs. While it is clear that the UK needs to reduce overall consumption of meat and dairy products, agricultural practices also need to complement this change in diet by shifting to sustainable systems. On the national level, Butler and Turner (2007) attempt to show how integrated models of dairy farming in the UK meet both economic and environmental pressures, but have yet to reveal how this would manifest itself in reality. In the context of a local-scale example, BERAS Implementation (Baltic Ecological Recycling Agriculture and Society) in Järna, Sweden demonstrates what 'sustainable food societies' can be in practice and promote this holistic model of integrated agriculture that considers environmental impacts, livelihoods, businesses and social interactions and the processes which connect these (Granstedt, 2006:7). Both global and local-scale thinking are therefore demanded to address these issues.

Closed System Farming

As discussed, cheese-making, in the context of global agriculture, can have detrimental impacts on both the environment and society, however Botton Gouda demonstrates an opportunity for cheese-making in a sustainable agricultural manner on a local-scale. Biodynamic agriculture is practiced in Botton Village, an anthroposophical approach to agriculture that developed out of the teachings of Rudolf Steiner (1924) (Haden & Helmsfrid, 2004:14). Biodynamic farming is considered an example of a mixed organic, closed farm system based on ecological cycles. Table 2 illustrates attributes of these practices. DEFRA (2012) defines organic agriculture as a similarly holistic approach that aims, “to achieve a closed system, keeping external inputs and waste outputs to a minimum, recycling where possible and using manure from livestock as a resource.” This definition of organic farming is most achievable with mixed livestock and crop, or by developing close ties between complementary farms (Granstedt, 2012:94). Indeed, it is only since the introduction of NPK (Nitrogen, Phosphorus, and Potassium) fertilisers that livestock and crops were separated as synthetic fertilisers began to replace manure in the 1950s (Granstedt, 2012:45).

Table 2. This table shows attributes of organic and biodynamic agricultural practices. Biodynamic practices include all of the organic attributes, therefore only the <i>additional</i> practices on biodynamic farms are shown here.	
Summary of Organic Agricultural Practices as defined by Pretty, (2005:114) and DEFRA, (2012)	Summary of Biodynamic Agricultural Practices as defined by Haden and Helmsfrid (2004:14)
Closed system farms	“the integration of animals and crop production on mixed farms”
Avoidance of artificial fertilisers and pesticides	“the use of special preparations to maintain and enhance the flow of cosmic and life energies within the farm organism”
crop rotation and other forms of husbandry to maintain soil fertility	“the timing of planting, harvesting and cultivation activities in accordance with the phases of the celestial bodies (including the sun, moon and outer planets)”
Weeds, pests and diseases controlled “using appropriate husbandry techniques and where necessary approved materials to control pests and disease” (DEFRA, 2012)	“complete avoidance of all chemical fertilizers and synthetic biocides in the farm system”
Maximum reliance on local farm-derived renewable resources	
Minimised external inputs	

To achieve a closed farm system, farmers must grow enough feed for the livestock, whereas large-scale intensive dairy farming breaks the nutrient cycle when the number of livestock exceeds the amount of feed grown (Granstedt, 2012:45). Furthermore, organic dairy farming decreases environmental impacts in comparison to conventional practices (Rosari and Aumaritre, 2004), by addressing the key problems of land degradation and pollution. Organic

dairy farming however, does not necessarily describe such holistic farming practices, as organic dairy standards only require organic feeds and greater animal welfare such as larger pasture area and restricted antibiotic and hormone usage (Oroganti, 2011:12, Rosari and Aumaritre, 2004). Organic agriculture has also been mechanised and commercialised to some degree, which has begun to undermine the sustainability of the organic label (Campbell *et al.*, 2011).

Cheese-making needs to be considered in the context of sustainable farming practices. For example, integrated closed systems, reduction of chemicals and less intensive use of land are solutions to the combination of demands on dairy producers, which includes “producing a high quality product within the constraints of quota, price, increasing environmental awareness and animal welfare concerns” (Butler and Turner, 2007). This must be simultaneously addressed by reducing global and especially national levels of demand for dairy. This is necessary to minimise pressure on conventional intensive dairy because more land is required for both organic and mixed closed system dairy farming methods (Sumberg, 2009:10). The dynamic between local/regional and national/global scales shows that such local-scale production solutions are needed in combination with global and national scale consumption reduction.

Environmental Impact

When measuring the environmental impacts of cheese-making, low food miles are a key feature and are, “one of the strongest arguments in favour of a shift toward local foods” (Norberg-Hodge *et al.* 2002:17). As Edwards-Jones *et al.* (2008) postulate, ‘food miles’ have developed into a more comprehensive measurement of ‘Life Cycle Analysis’ (Hereafter ‘LCA’), which considers “both the direct emissions from activities like transport, alongside those generated during the manufacture of the relevant inputs, e.g. fertiliser, pesticides, electricity and machinery” (Edwards-Jones *et al.*, 2008). LCAs of cheese have shown that it produces even more emissions (13.5 kg CO₂ e) than some kinds of meat, for example pork and chicken, and rates third highest in a study of common food types (Hamerschlag, 2011:6). The largest impacts of cheese (90%) are in the on-farm stage of milk production (Aguirre-Villegas, 2011; Foster *et al.*, 2006:74). The total impacts of Botton Gouda are uncertain in terms of energy and emissions because there is no LCA data. Also, general on-farm GHG emissions are difficult to calculate due to the diversity of contributing factors, which makes it difficult to compare the impacts of different types of cheese (Edwards-Jones *et al.*, 2008).

This initial milk production stage is minimised on Botton farms due to a focus on labour intensive, rather than machinery intensive practices, and energy-saving efforts such as one of the farms milking cows by hand. Transport of Botton Gouda is minimal as approximately 70% is consumed within Botton Village, travelling under one mile between farms, creamery and consumers. In addition, the consumption patterns of the residents save energy by eating communally in households of around six to twelve. In this respect, the system is energy efficient, however the energy costs, carbon emissions and water used for cheese-making in ratio to the small amount of production may show less efficiency in comparison to exporting the milk and processing elsewhere in a large-scale dairy. In terms of LCAs it is difficult to determine whether local-scale cheese-making is more GHG emission efficient than industrial-scale.

Socio-economic Context

While it is important to consider cheese production in terms of environmental impacts, the socioeconomic contexts are also essential to assess the sustainability of food because they are at the roots of the problems in food systems (Orr, 2006:183). Localised, biodiverse, organic agriculture can reduce impacts on the environment and improve farmer's livelihoods (Shiva, 2008:97, Norberg-Hodge, *et al.* 2002). It is imperative therefore that re-adjustments and conversions to more sustainable practices include economic viability and social support (Butler and Turner, 2007). Botton Creamery serves the local community of Botton Village and sells to the public through the Botton Store, local health food shops and delicatessens. With both guaranteed local customers in Botton Village and additional niche markets in the area, Botton Creamery is economically viable, as long as the production costs continue to remain low. In this case, one member of staff is full time employed and the other staff members are residential volunteers in Botton Village, thus the community context is crucial. The local food movement promotes similar small-scale businesses, reduced transportation and reinvigoration of rural communities, (Norberg-Hodge *et al.*, 2002:3) and often refers to local food as a term synonymous with sustainable food systems. Others argue that a distinction made must be made between local and sustainable systems because local food is the not the most sustainable option per se, as the impacts of existing international markets, such as fair trade, need to be considered (Sumberg, 2009:10; Edwards-Jones, *et al.*, 2008). The local food message can be a powerful catalyst to support local food networks, however both international trade and local farming practices need to be considered to enable economically viable and socially just sustainable food systems (Sumberg, 2009). Local cheese-making must

therefore not be isolated from national and global considerations, as sustainability includes more than just local contexts.

Consumption and Distribution

Literature and media promote mixed messages to consumers about which cheeses are most sustainable, with different perspectives prioritising contrary aspects of sustainability. Green consumption has been described as “a slippery, multifaceted and often contradictory subject” (Littler, 2008:92) and cheese is no exception. The local food movement promotes buying cheese locally (Norberg-Hodge, *et al.* 2002), the organic movement advocates buying chemical free cheese (Grandstedt, 2012), while LCAs encourage thinking in terms of emissions and environmental impact (Edwards-Jones *et al.*, 2008, Hamerschlag, 2011). Additionally, traditional perspectives promote the cultural heritage of artisanal speciality cheese (de Roest, 2000; Blundel and Tegear, 2006), animal welfare proponents discourage cheese consumption for both cruelty and sustainability reasons (Visak, 2007) and nutrition experts advise on both healthy and unhealthy aspects of cheese (Walther *et al.*, 2008). Sustainable cheese choices are therefore ambiguous. Almost unintentionally, Botton Gouda complies to many of these sustainability attributes, in that it is local, organic, biodynamic, ethical, artisanal, low-impact, full-fat and additive-free. In contrast to Littler’s notion of ‘radical consumption’ in which consumers are “encouraged to shop for change” (Littler, 2008:4), 70% of Botton cheese is not sold according to the ‘local label’ attribute. These consumers are Botton residents who do not necessarily buy Botton Gouda for the aforementioned sustainable consumption attributes, but rather because it is an integral and convenient product of the community. In contrast, Botton Gouda sold in local niche markets is likely to attract consumers specifically for its sustainable attributes. This demonstrates that local food labels are not always the main reason why people purchase certain goods, rather it is linked to relationships between people within the community and their connections to the place. To counter the separated nature of current food systems, there is a need for more of such relationships which “build a tangible culture of connections to the land” (Pretty, 2002:109).

Conclusion

Assessing the interrelated global and local aspects of cheese in food systems provides new perspectives on localism in relation to global issues. Botton Gouda is produced within an

unusual environmental, social and economic context and provides new angles for debate on various food sustainability issues. Exploring the history of cheese revealed the development from local-scale common-sense cheese-making to economically efficient linear industrial-scale cheese production. A look at livestock agriculture highlighted many current global problems which need to be addressed at multiple scales. Organic, closed system farming methods are sustainable contexts for cheese-making in many respects on a local-scale, but need to be complimented by national and global-scale thinking to reduce cheese consumption. Measurements of environmental impacts, such as LCAs proved to be limited for assessing the local-scale cheese production in comparison to industrial-scale because data is limited, and they do not include livelihoods, health and other socioeconomic factors. In terms of economic viability, regional artisanal cheeses are still important in terms of consumer preference for high quality, tasty authentic cheese, however they are economically threatened by efficient globalised trade, and therefore are limited to niche markets (de Roest, 2000:7).

Sustainable cheese consumption is complicated by various sustainability attributes and labels which gives consumers mixed messages. In contradiction to notions of ‘radical consumption’ in widely-distributed cheese, the Botton Village context revealed a higher importance of relationships in community and social connections. This demonstrates that real life connections to people and land are clearly significant for consumption on the local-scale, in contrast to reliance on labels in larger-scale product distributions. This exploration of Botton Gouda has revealed various dynamics between scales of production and consumption. While no clear next steps for sustainable cheese-making are deciphered here, it is recommended that all these facets and interrelated issues of sustainability are kept in the picture. Clarity can be gained from investigation of local-scale examples such as Botton Gouda, which show the reality of opportunities. This holistic, yet grounded understanding is necessary for moving towards sustainability: “the goal of fostering adaptive capabilities and creating opportunities” (Holling, 2001:390).

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