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Waste of organic and conventional meat and dairy products—A case study from Swedish retail

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ABSTRACT

Many retailers take initiatives to reduce food waste, which can lead to enhanced sustainability, including reduced environmental impacts and cost savings. Another common environmental strategy in retail management is to increase the range of organic products. This study examined if organic food products have a higher level of waste, which thereby risk to counteract the environmental ambitions behind offering these products. The study also examined to what degree differences in waste level could be explained by turnover, shelf-life and wholesale pack size. In the study, six Swedish supermarkets provided data on all articles sold or wasted in the deli, meat, dairy and cheese departments during 2010 and 2011. 24 organic products were compared to their conventional counterparts; 22 of these had higher waste levels (from 1.5 to 29 times higher). Differences in wastage were also compared across departments; in all four departments, organic products as a group had higher waste percentage at all four departments. There was a negative correlation between the total mass sold of a product and the percentage waste. Also, longer shelf-life was associated with decreased waste, but only for products with low turnover. The systematic problem of retail food waste – particularly of organic products and other products with a low turnover – may be mitigated by increasing turnover, by stocking products with longer shelf-life or by decreasing the ordered volume (e.g. through decreased wholesale pack sizes).

1. Introduction

The Food and Agricultural Organisation of the United Nations (FAO) has estimated that about one-third of the food produced world-wide is wasted along the supply chain (Gustavsson et al., 2011). This causes significant global problems in three major areas. Firstly, wasting food while millions of people are suffering from hunger raises moral questions (Stuart, 2009), and could contribute to a future food crisis (Nellemann et al., 2009). Secondly, food production consumes finite natural resources, such as freshwater, fossil energy, land, and mineral fertilizers; contributes to environmental degradation; induce antibiotic resistant pathogens; contributes to animal suffering and occupational hazards, all of which result in vain if food is wasted. Thirdly, wasting food has a large economic impact for all stages of the food supply chain (FSC), and especially final consumers, who spend significant amounts of money on food, wasted in the households (Ventour, 2008). For these reasons, initiatives need to be taken to reduce waste in all stages and by all actors in the FSC.

One of these actors is the retail sector, where waste reduction measures for environmental reasons constitute a rather new area of work. Waste management and waste reduction in the FSC are addressed in several recent studies, which focus on money, hunger, environment or combinations of these (Alexander and Smaje, 2008; Buzby et al., 2009, 2011; Lee and Willis, 2010; Gustavsson and Stage, 2011; Hanssen and Schakenda, 2011; Mena et al., 2011; Stenmarck et al., 2011). Supermarkets are not the largest contributor to food waste in the food supply chain, with estimates of 3% of the waste in the German FSC (Göbel et al., 2012) and 3.8% in the Swedish supply chain (Jensen et al., 2011). While percentage waste in supermarkets is lower than in other sectors of the FSC, the amounts are still high, with 39 000 wasted tonnes per annum in Sweden (Jensen et al., 2011) and 4,433,000 tonnes per annum in the whole European Union (EC, 2010). Active work to reduce waste is a potential way of working with sustainability for retailers. Another way of addressing the corporate responsibility connected to environmental issues is to obtain environmental certification for retail outlets (Axfood, 2011). To keep these certifications the supermarkets have to fulfil several criteria regarding waste management and what to sell, which is all audit by an external organisation. The three main supermarket certification systems currently used in Sweden do not yet address the problem of food wasted within supermarkets (Sjöberg, 2012), but all require supermarkets to carry a basic selection of organic products (SSCN, 2009; Nordic Ecolabeling, 2010; KRAV, 2012). Since the food waste problem is not taken into consideration in the certification process, it is likely that the effects

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on waste of increasing the range of organic products offered have not been evaluated. As long as organic products have a low turnover, the risk of excess waste can counteract the intended positive effect aimed for by carrying a broader range of organic products. If considered by the customers, this rebound effect could potentially harm the confidence in organic products, since the environment is an important attribute in customer preferences for organic food (Wier et al., 2008). Therefore, addressing the problem with food waste of organic products may be of higher importance than only the footprint of the wasted kilos.

One basic reason for retail food waste is that supermarkets order more products than their customers buy. Therefore customer preferences are an important determinant of waste for all products, but may have an even greater effect on organic products since they often sell at a higher price than their conventional counterparts, and therefore require stronger demand. A lack of demand can cause a low sell rate, or turnover (here defined as sold mass over time), which may result in higher percentage waste (Hanssen and Schakenda, 2011). Only a small share of products sold are organic (Axfood, 2011), and therefore these products risk to have lower turnover and therefore higher percentage waste.

Turnover in combination with shelf-life (the time between packaging and the best-before or use by date) may influence percentage waste, since it sets the rate of sell and time available for supermarkets to sell the products. A possible cause of waste could be that too many items of each product are ordered, so that not all of them are sold before the best-before date. Therefore the minimum order may be important for the amount of waste. This minimum order is often set by the wholesale pack size, i.e. the size of the wholesale box in which products are packed for delivery to supermarkets. Aside from these more structural possible causes of waste, there are also accidental causes such as faults in refrigeration or mistakes with orders that may result in occasionally high percentage waste.

This study sought to investigate differences between the percentage waste of organic and conventional animal products, and whether these could be caused by lower turnover of organic products. The overall aims were to identify areas where waste reduction measures could best be targeted and to gain knowledge about causes of waste in order to eliminate these causes and decrease waste.

2. Materials and methods

Six supermarket branches located in the Stockholm-Uppsala region of Sweden provided data for the study. Data from their fresh meat, deli, dairy and cheese departments were used to compare organic products within these departments with their conventional counterparts. The supermarket branches belong to the Willy:s AB chain and were selected for participation by the company head office.

2.1. Descriptions of departments

The departments are defined by the supermarket chain, mostly for practical reasons. For example, the meat department sells fresh meat from terrestrial animals and the deli department processed meat products, such as sausages and smoked ham. Other than dairy products, the dairy department sells eggs and fruit juices, while the cheese department sells different cheeses and cheese-like products, e.g. tofu.

2.2. Ecolabelling of food products and supermarket certification

All six supermarket branches are enrolled in an environmental certification system known as *Bra Miljöval* (Good Environmental Choice, our translation), which obliges them to carry a basic selection of organic products within the four departments studied (SSCN, 2009). Certification is awarded and monitored by the Swedish Society for the Conservation of Nature, a non-government organisation, and the branches studied met the criteria by a good margin. This was due perhaps to a more ambitious sustainability programme within the corporate group, which includes the target to sell >3% organic products by 2012 and >6% by 2015 in the whole company (Axfood, 2011).

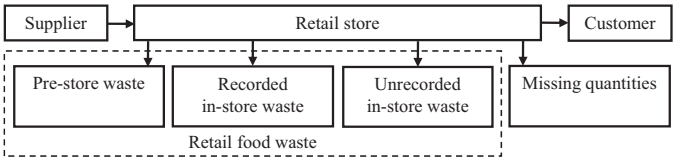

Fig. 1. Description of the physical flow of food and the different categories considered as food waste (Eriksson et al., 2012). Pre-store waste and recorded in-store waste was considered in this study.

2.3. Data collection

Data were collected for two years, 2010 and 2011, as part of the normal waste recording routine (Åhnberg and Strid, 2010; Eriksson et al., 2012), which was established several years before the study period. The daily routine started every morning with an inventory and a collection of all products that had passed or were close to their best-before or use-by date. Products assumed by the staff to be unsellable for other reasons, due e.g. to damaged packaging or colour changes, were also culled. The culled products were recorded with a scanner using the European Article Number (EAN) code and then discarded. This waste was defined in accordance with Eriksson et al. (2012) as recorded in-store waste. There is a possibility that products can be wasted without being recorded, i.e. unrecorded in-store waste or stolen products, which results in missing quantities (Fig. 1). Here, since everything was sold as packed items, both unrecorded in-store waste and missing goods were assumed to be sufficiently small so as to be negligible, in accordance with findings by Eriksson (2012).

Pre-store waste as described by Eriksson et al. (2012) was also recorded. At delivery, all products that did not fulfil the quality requirements were recorded as pre-store waste by scanning the EAN codes.

All recorded data were stored in databases at either the supplier (belonging to the same corporate group) or at the retail company head office. Data on total amount of pre-store waste, expressed as yearly sum of waste for each item delivered, were obtained from the supplier. Data on in-store waste, expressed as weekly total of each item, were obtained from the retail head office. The head office also supplied data on weekly totals of each item sold during this period. The information about sold products was recorded at the pay points in each branch.

2.4. Data analysis

The number of items sold was multiplied by the mass of each package and a material flow analysis was used to determine the wasted mass. Each waste flow was compared against the mass delivered, which was assumed to be equal to the sum of pre-store waste, in-store waste and sold products, since there was a lack of data on actual mass delivered. Therefore the equation $Q = W/(TW + S)$ used the recorded in-store waste, or wasted mass (W); combined pre-store and recorded in-store waste, or total wasted mass (TW); and mass of sold products (S) to calculate the waste quotient (Q). Unrecorded in-store waste and missing