Material change for a better environment

**Final Report**

# Beverages: Self-Dispensing


This report describes a project to investigate and scope the wider use and potential for implementing the self-dispensing of beverages (alcoholic and soft drinks) in-store in UK retail outlets. The concept is that with a self-dispensing system that enables reuse of containers, it would be possible to reduce the consumption of beverage packaging, which currently amounts to approximately 1.3 million tonnes per annum in the UK household waste stream. The aim of this research is to identify the feasibility of undertaking, and the outline framework for, trials to test the concept.

**Project code:** RP0022
**Research date:** January to March 2009 **Date:** June 2009

WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.

**Written by:** Peter Anderson, Nigel Wilmshurst and Dr. Derek Wright

Ceres Logistics

**Front cover photography:** Drinking fountain, the first one installed by the Metropolitan Drinking Fountain and Cattle Trough Association, St Sepulchres Church, Snow Hill, London

# Executive Summary

**Self-dispensing is widely used in beverages and many other products. This project investigates the feasibility of self-dispensing of beverages in retail stores and analyses the opportunities for WRAP (Waste & Resources Action Programme) to support market tests. The aim of implementing such systems would be to encourage waste reduction through packaging reuse.**

The research involved two distinct phases; firstly a desktop study was conducted investigating beverage markets, existing dispensing technologies and previous consumer research. Secondly, key stakeholders from the supply chain were consulted through a workshop and structured interviews.

**Desktop Investigation**

While the total volume of bottled water, soft drinks, milk and alcohol is very large, the markets for beverages are fragmented by beverage types, brand owners, brands and points of sale. Such fragmentation has important implications for the potential of self-dispensing systems to alter consumption patterns in the off-trade beverage sector. With the exception of Coca-Cola, no single brand sells significant enough volumes that major tonnages of packaging could be saved from it switching to self-dispensing. Penetration of markets on a significant scale will require comprehensive consumer uptake across a range of beverage types and brands. Any single beverage type chosen for possible trials should therefore demonstrate the potential for the generalisation of the results and outcomes to a range of other beverages.

There are relatively few beverage self-dispensing examples where consumers reuse their containers. Only one example has been found where bottles were washed within the machine and this company no longer operates. Therefore, there is little existing evidence to help support the development of a business case for self-dispensing systems in retail stores. Whilst this suggests that up until now, there has been little commercial willingness to expand this concept, this does not necessarily mean that such systems are not commercially viable, as legislative changes, consumer preferences and technological developments can all affect feasibility and the financial case.

Dispensing technologies such as those developed by Vivreau and Waterwerkz are on the specific boundaries of this project. Such developments do demonstrate that environmental benefits can be made not only through reduced packaging but also by producing drinks in situ, dramatically reducing transport requirements in the process. Development and the expansion of such technologies should be considered in conjunction with the concept of reusable bottle systems.

**Analysis**

The project has uncovered a complex range of interrelated issues. It is difficult to definitively assess the feasibility of the original concept of a self-dispensing machine that also cleans and sterilises reusable bottles, due to the lack of examples on the market.

Clearly environmental benefits may be achievable through implementation of self-dispensing systems, not only through reduced packaging consumption, but also through reduced transport from post-mix production. However, without analysing the full impacts associated with the manufacture and operation of dispensing machines, particularly if bottle washing is undertaken, it is not possible to make rigorous conclusions on comparative impacts.

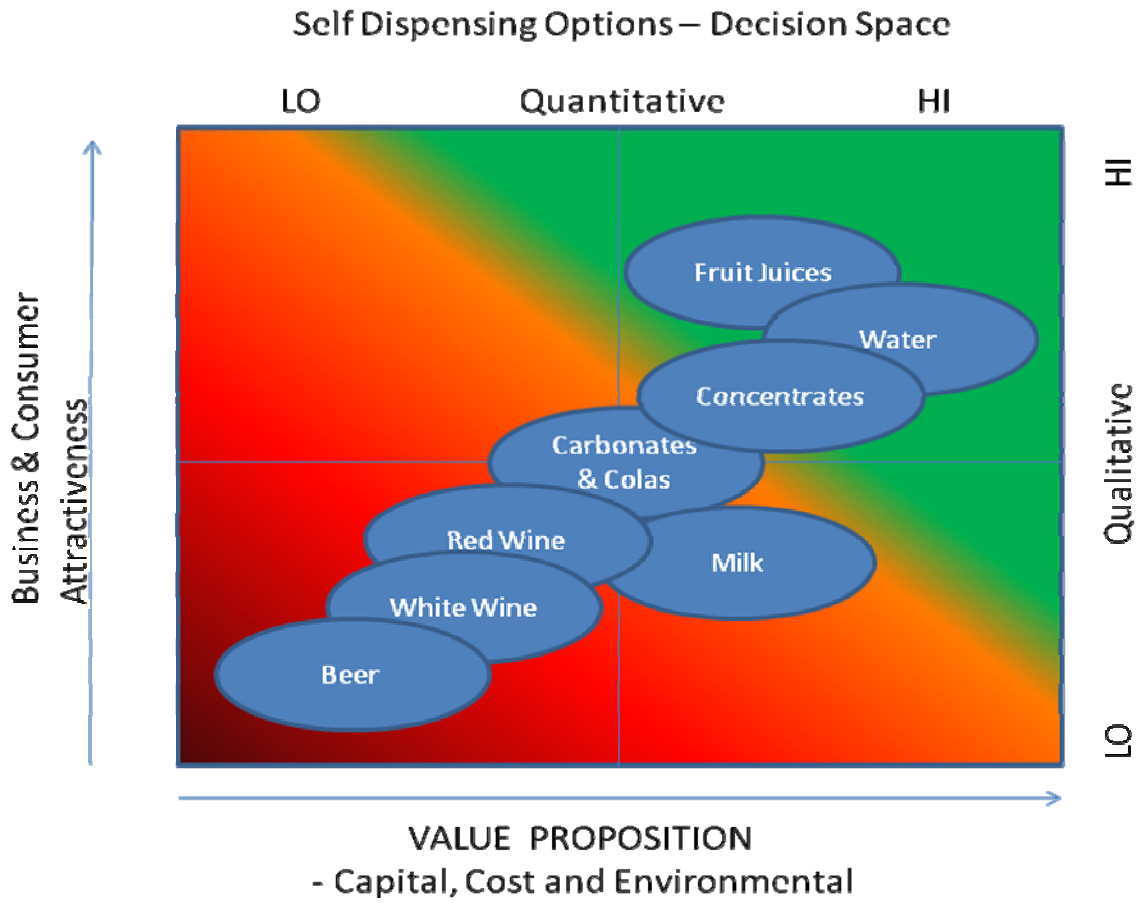
As there are no vending machines that wash bottles currently on the market, we report only outline costs. It is clear that development costs from scratch for such a machine could be significant. Alternative options could be trialed at much lower costs, for example, where consumers wash their own bottles at home, or flexible packaging beverage machines. The costs of each option need to be considered in conjunction with the potential environmental benefits on offer.

Stakeholders attending the workshop were keen on the concept, although major brand owners have concerns over brand integrity. Machine manufacturers are concerned over the risk of market failure for an R&D project of such high potential costs. The retailers interviewed revealed an interest in the idea, however they require more evidence of the business viability.

**Beverage Choice**

The general consensus of the stakeholders was that the potential regulatory and practical obstacles surrounding self-dispensing of alcoholic drinks meant that the concept was more appropriate for soft drinks. Milk was also considered as it retails in a few categories (full fat, semi-skimmed and skimmed) and high volumes, but hygiene issues present major challenges.

Within soft drinks, carbonates were seen as the least attractive option by many because of difficulties in retaining levels of carbonation, and brand owners concerns of quality control. Fruit based drinks made from concentrate (juices or squashes) are considered to be the most appropriate beverages for initial trials, and offer the potential environmental and logistical benefits to be gained from post-mix production.




**Trial Programme**

A 3-stage trial programme is proposed to help evaluate the potential for self-dispensing beverage systems:

- Stage 1 – Establish Trial Management – How is it going to be done?
- Stage 2 – Trial Implementation – What is happening or happened?
- Stage 3 – Trial Evaluation and Recommendations for any further Trials – What does it tell us?

The aim of the trial would be to evaluate consumer response, the business case and environmental costs and benefits.

**Conclusions**

Key conclusions emanating from the project are:

- The drinks market is big, but it is fragmented across a multitude of flavours, brands, supply networks and containers styles and sizes. Consequently to achieve environmental benefits from reduced packaging requires the self-dispensing concept to be widely adopted.

- Machine technology is not a barrier but the cost of developing a device that will not only dispense liquids in a hygienic, controlled and consumer effective manner but also allow brand quality to be maintained is a challenge.
- Alcoholic drinks are probably not suitable for social reasons, and they are technically more challenging.
- Carbonated drinks are likely to loose 'gas' quickly degrading the quality so this sector is also less suitable for self-dispensing.
- Regional water taste is important in assuring brand quality.
- Milk is sold in considerable volumes, there are few players in the supply chain and it is a relatively homogeneous product. Hygiene control is perceived as a major challenge.
- Post mix fruit juices and squashes have supply chain advantages from reducing the transport of water. The volume of sales and the relatively few equipment suppliers indicate these beverage types as potential candidates for pilot trials.
- Potential trial stakeholders are unlikely to provide trial funding without a comprehensive cost-benefit case being made. This suggests any pilot project should be conducted in Phases so that any investment can be validated in a progressive and risk contained approach.
- The 'prototype' machine would represent a significant cost if it includes bottle cleaning. Stakeholders will need to decide on the number of machines needed for the trial and whether a single site, single machine would provide sufficiently robust data for generalisation of the market penetration of the concept to be assessed.
- More refined research and discussions between potential trial stakeholders will undoubtedly be required before a trial programme is agreed.

The initiation of a trial should consider how the environmental impacts will be measured. In this instance the change to self-dispensing has the potential to affect the upstream supply chain from drinks manufacture through to the consumer. Whilst there are apparent benefits in terms of reduced packaging and transport, additional environmental impacts will result from activities such as machine manufacture and operation. Bottle washing, whether undertaken by consumers or the machine, will have impacts in terms of water and energy that need to be clearly understood.

The 'pilot' panel of stakeholders would be advised to use computer simulation to map these processes and assess the anticipated magnitude of change in carbon, cost, energy and water before finalising the trial schedule.

# Contents

# 1.0 Introduction

## 1.1 Project Outline and Aims

Conceptually, the idea that individual consumers could be encouraged to use self-dispensing machines to buy a product and pay for it on site, within a highly regulated process, is not new. Every day people purchase food, and hot and cold drinks from machines. We also allow consumers to buy highly flammable petrol on a self-dispensing basis. The extension of this 'self-service' concept to other potential retail areas such as beverage products and its evaluation is the essence of this scoping project.

This project was undertaken during the first quarter of 2009; it investigates the feasibility of self-dispensing of beverages and analyses the opportunities for WRAP to support market tests. An outline specification of the information these trials will seek to accomplish is also described.

Customers of French vineyards and tourists visiting cider makers in the South West of England have been able to use their own bottles and containers to buy their drinks for decades. In many respects, the technology and equipment for self-dispensing exists and is already established. However there are many challenges to be overcome before retailers would be able to offer a variety of product types and options of presentation for the consumer. In addition to the consumer, the capability, design and cost of equipment that is capable of dispensing different products and forms is clearly a fundamental consideration.

Extending the self-dispensing concept into other retail spaces is clearly different, both economically and environmentally. Each stakeholder both commercial (supplier and retailer) and individual consumers will clearly take different views; their view depending upon where the costs and benefits might eventually lie within the end to end supply chain.

Environmentally, reducing packaging materials is potentially beneficial. In addition to the potential for reducing packaging, self-dispensing could also enable consumers to minimise product waste because they can buy what they want rather than simply buying the quantity of the pre-packaged product. WRAP's recent study 'The Food We Waste' demonstrated the scale of consumer waste and this could be an important additional benefit. Further environmental and economic benefits may also be gained in the supply chain's logistics activities by the possibility of 'bulk' shipping of product and use of post-mix production in dispensing machines.

It is logical to suppose that normal business developments will have led major suppliers of beverages to have already explored the potential economic benefit of self-dispensing options in their own established markets. However, given the aims and thrust of the Courtauld Commitment, and the range of major drinks manufacturers and retailers involved, it is an opportune time to objectively re-examine the feasibility for self-dispensing options. Innovative or niche markets may especially gain from the concept of self-dispensing. Such activity may both encourage major retailers to consider applications and follow suit as well as drive changes in consumer behaviour. The growth of so-called 'convenience' stores at fuel stations is an example of consumer driven diversification by oil companies and major supermarkets.

This study includes a review of international markets in self-dispensing products to help demonstrate the potential barriers and opportunities for implementation in UK markets.

Within our methodology the research for this project is based upon a core structure that seeks to understand both the nature of consumer demand and holistically analyse the challenge in supplying a value proposition within a tightly regulated food and drink business sector. The analysis covers the issues of quality, quantity, logistics, legislation and customer application.

## 1.2 Project Scope

Previous research for WRAP has investigated the potential for greater use of self-dispensing[1]; it encompassed a wide variety of food and non-food, liquid and solid products.

This project investigates the feasibility of beverage self-dispensing in retail outlets, where the product is consumed off-site. Therefore, self-dispensing in cafes, restaurants, bars, etc. is excluded. Self-dispensing systems that result in a reduction of waste through packaging reuse and/or reduction are the focus of this study.

[1] *WRAP (2007) Self-Dispensing Systems – Commercial Feasibility Study, WRAP.*

Beverages, for the purpose of this study are split into three groups:

- Alcoholic drinks
- Soft Drinks (incl. water)
- Milk and dairy drinks

## 1.3 Project Approach

**Desktop Study**
'Desktop' research covered the following issues:

- Beverage Markets
  - Research the markets for alcoholic and non-alcoholic beverages to determine the relative importance of sub-sectors and brands in terms of volume.
- Distribution
  - Review sales outlets in the beverages markets.
- International Review
  - An investigation of international examples of self-dispensing of beverages in retail outlets.
- Vending Machine Technologies
  - Understand current and emerging vending machine technologies and their relevance to self-dispensing in retail.
- Consumer Research
  - Review previous consumer research on self-dispensing and beverage shopping habits.

**Analysis**
A workshop was conducted with a group of drinks manufacturers and equipment suppliers to gain their insight into the key issues that had emerged from the background research. Further interviews were conducted with major retailers to elicit the views of these key stakeholders.

These stakeholder consultations helped identify the most appropriate types of beverage for further investigation and the key opportunities and constraints faced in bringing the concept to market.

Analysis was undertaken concerning:

- Environmental Costs and Benefits
- Regulatory Issues
- Consumer Issues
- Technical and Operational Factors
- Economic Viability

**Develop Trial Specification**
A specification was developed that outlines the aims, approach and proposed outcomes of any future trials undertaken.

# 2.0 Market Assessment

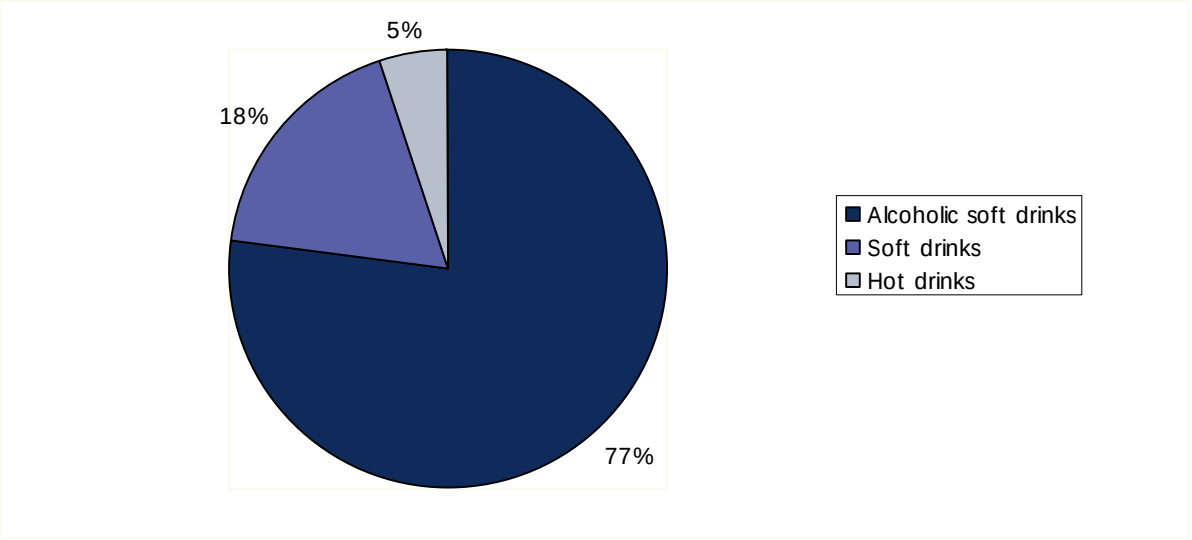
## 2.1 UK Beverage Market

### *2.1.1 Market Coverage and Segmentation*

Within the UK, drinks accounted for an estimated 6.5% of all consumer expenditure in 2007, but this is slightly less than 5 years before when it was 7%. Prices are extremely competitive in the drinks sector, therefore even if sales grow, the total revenue may not. The total UK market was worth an estimated £54.13bn in 2007[2].

'Beverages' are segmented in a number of ways. Commonly, the primary distinction used is between alcoholic, soft drinks and hot drinks. These sectors are quite separate in their characteristics and in terms of the companies operating within them.

**Figure 1** The share in value of the UK beverages market 2007[3]




A further distinction that can be made is between on-trade and off-trade sales. On-trade refers to drinks that are purchased and consumed at the same location e.g. pubs, restaurants and cafes, whereas off-trade is drink bought and consumed 'off' site, e.g. drinks bought for home consumption. This project is concerned with off-trade beverages only.

Hot drinks are not considered further in this report as this is, substantially an on-trade market. Ready to drink (RTD) teas and coffees are considered within the soft drink sector.

Although rarely considered part of the beverages market in research reports, milk has been included within this study as a potential product for self-dispensing.

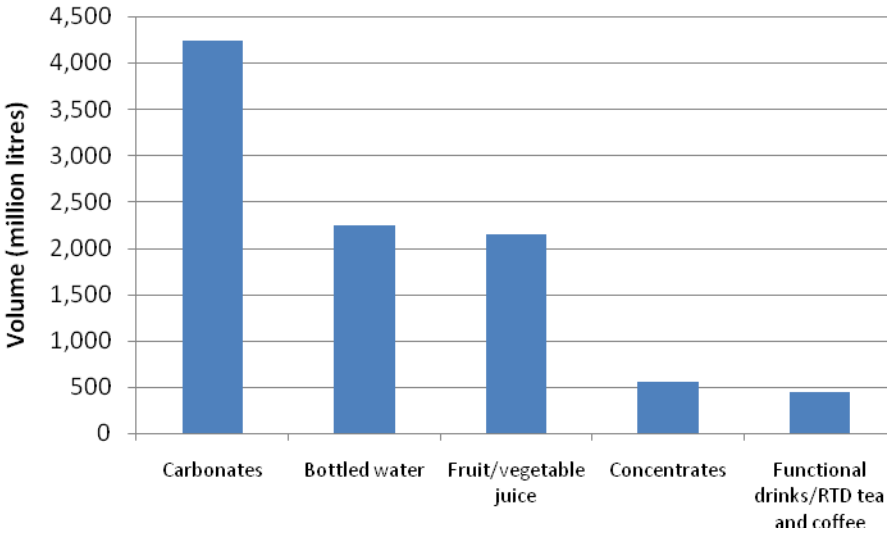
## 2.2 Soft Drinks

### *2.2.1 Background*

In 2007, the quantity of off-trade soft drinks sold in the UK was 9.6 billion litres, 85% of the total soft drinks market. Carbonated drinks account for 44% in terms of volume followed by bottled water (23%) and fruit/vegetable juice (22%).

[2] *Keynote (2008) Market Review 2008 – Drinks Market.*
[3] *Keynote (2008) Market Review 2008 – Drinks Market.*

**Figure 2** Off-trade Sales of Soft Drinks (as sold) by Sector: Volume 2007[4]




The table below shows the top six companies share over 50% of the off-trade volume market, with Coca-Cola Enterprises the market leader by some distance with 21.5% of the market, followed by Britvic Soft Drinks Ltd with 9.6%.

So-called 'own' brands of the major retailers have made some penetration into this market with Tesco, J Sainsbury and Asda sharing a combined 13% of the off-trade market.

**Table 1** Company Shares of Off-trade Soft Drinks (as sold) by Volume 2007[5]

| Company | % of Market Share by Volume |
|---|---|
| Coca-Cola Enterprises Ltd | 22 |
| Britvic Soft Drinks Ltd | 10 |
| Danone Waters (UK & Ireland) Ltd | 6 |
| Tesco Plc | 6 |
| J Sainsbury Plc | 5 |
| GlaxoSmithKline Plc | 5 |
| Asda Group Ltd | 2 |
| Barr (AG) Plc | 2 |
| Tropicana UK Ltd | 2 |
| Nestlé Waters UK Ltd | 2 |
| Highland Spring Ltd | 2 |
| Princes Soft Drinks Ltd | 2 |
| Gerber Foods Soft Drinks Ltd | 1 |
| Silver Spring Mineral Water Co Ltd | 1 |
| Nichols Plc | 1 |
| Others (<1% share each) | 33 |

As the table below shows, the volume share of the soft drinks market by brand is more evenly distributed. Tesco's 'own brand' leads the market share with 6%, however this covers the company's whole range of soft drinks including waters, juices, concentrates, etc. Coca-Cola and Diet Coke are the two largest selling single drink brands both with 5.6% by volume.

[4] *Euromonitor (2008) Soft Drinks – United Kingdom.*
[5] *Euromonitor (2008) Soft Drinks – United Kingdom.*

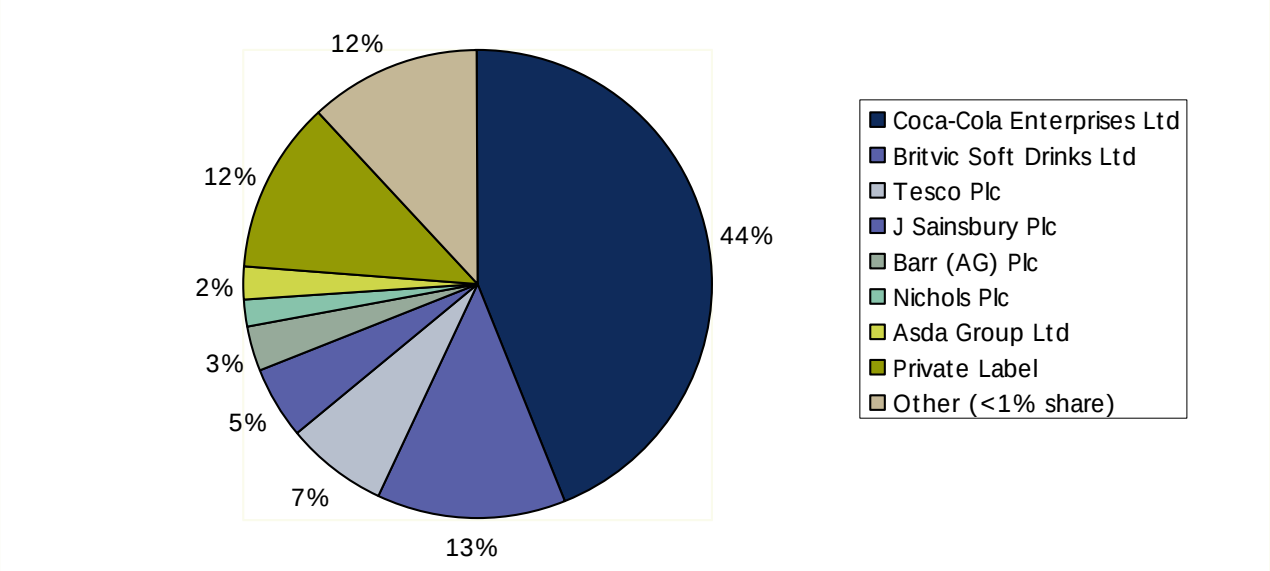
**Table 2** Brand Shares of Off-trade Soft Drinks (as sold) by Volume 2007[6]

| Brand | Company | % of Market Share by Volume |
|---|---|---|
| Tesco | Tesco Plc | 6.0 |
| Coca-Cola | Coca-Cola Enterprises Ltd | 5.6 |
| Diet Coke | Coca-Cola Enterprises Ltd | 5.6 |
| Sainsbury | J Sainsbury Plc | 5.0 |
| Robinsons | Britvic Soft Drinks Ltd | 3.4 |
| Volvic | Danone Waters (UK & Ireland) Ltd | 3.4 |
| Lucozade | GlaxoSmithKline Plc | 3.2 |
| Evian | Danone Waters (UK & Ireland) Ltd | 2.7 |
| Asda | Asda Group Ltd | 2.3 |
| Fanta | Coca-Cola Enterprises Ltd | 2.2 |
| Pepsi | Britvic Soft Drinks Ltd | 2.0 |
| Pepsi Max | Britvic Soft Drinks Ltd | 1.7 |
| Ribena | GlaxoSmithKline Plc | 1.7 |
| Highland Spring | Highland Spring Ltd | 1.6 |
| Tropicana | Tropicana UK Ltd | 1.5 |
| Diet Pepsi | Britvic Soft Drinks Ltd | 1.2 |
| Irn-Bru | Barr (AG) Plc | 1.1 |
| Perfectly Clear | Silver Spring Mineral Water Co Ltd | 1.0 |
| Others (<1% share each) | | 49 |

### *2.2.2 Carbonates*

Coca-Cola Enterprises Ltd leads the carbonates sector, with 44% of the total volume market. Britvic Soft Drinks Ltd which includes the Pepsi brands is second with 13%, followed by Tesco Plc at 7%.

**Figure 3** Company Shares of Carbonates by Off-trade Volume 2007[7]



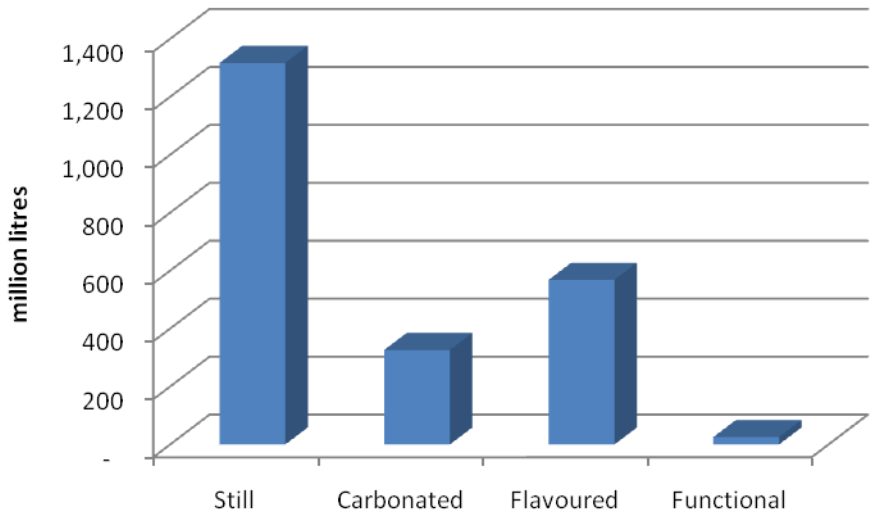

[6] *Euromonitor (2008) Soft Drinks – United Kingdom.*

[7] *Euromonitor (2008) Carbonates in the United Kingdom.*

### *2.2.3 Bottled Water*

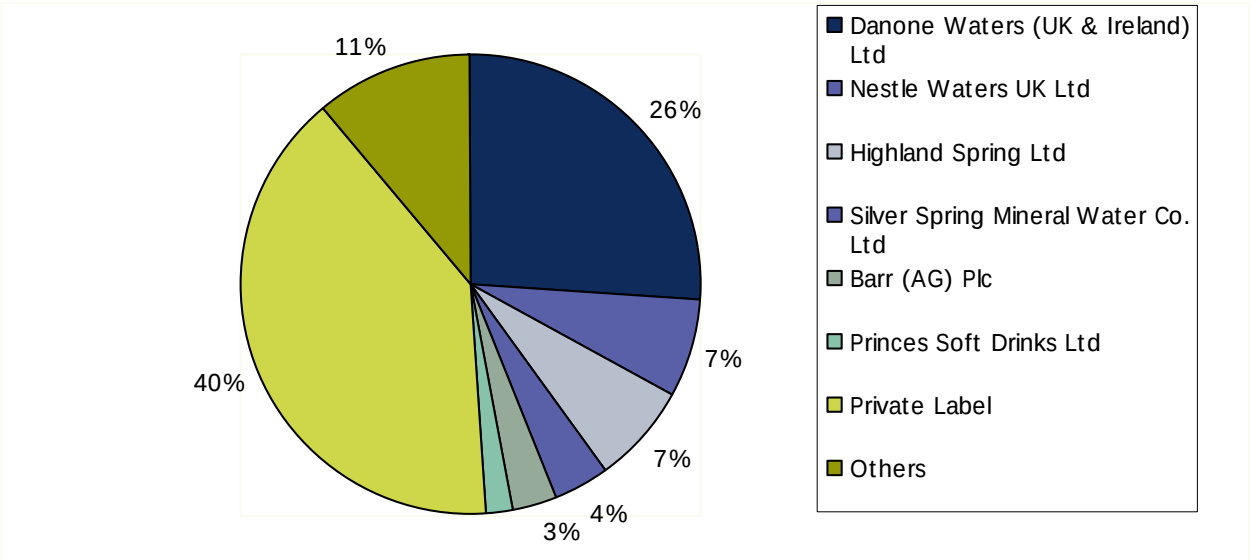
In 2007 the total 'off-trade' sales of bottled water was 2.2 billion litres. A breakdown of bottled water sales is shown in Figure 4 below. Still water accounted for 59% of total sales, with flavoured waters at 25% and carbonated water 15%.

**Figure 4** Off-trade Sales of Bottled Water: Volume 2007[8]




Danone Waters, at 26%, is the leading seller of bottled water, with its two key brands, Volvic and Evian.

**Figure 5** Company Shares of Bottled Water by Off-trade Volume 2007[9]




[8] *Euromonitor (2008), Bottled Water in the United Kingdom.*
[9] *Euromonitor (2008), Bottled Water in the United Kingdom.*

### 2.2.4 *Fruit and Vegetable Juices*

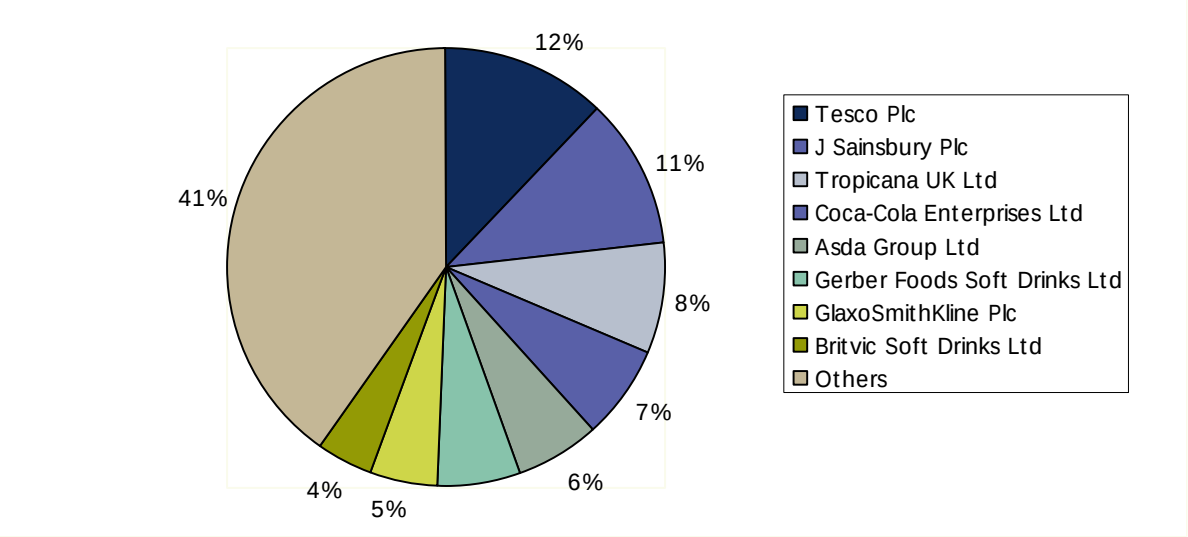
Orange dominates the fruit and vegetable drink sales, followed by mixed juices and apple juice.

**Table 3** UK Production of Fruit Juices 2007[10]

| Fruit Juice Type | Volume Sales (Million litres) |
|---|---|
| Orange juice | 568 |
| Mixtures of fruit and vegetable juices | 522 |
| Apple juice | 327 |
| Pineapple juice | 54 |
| Concentrated fruit and vegetable juices | 37 |
| Grapefruit juice | 21 |
| Tomato juice | 14 |
| Other single fruit juices | 3 |

Major retailers' own brands have gained significant market share in the fruit/vegetable juice market, with Tesco (12%) and Sainsbury (11%) having greater market share than any other brands.

**Figure 6** Company Shares of Fruit/Vegetable Juice by Off-trade Volume 2007[11]




### 2.2.5 *Concentrates*

Britvic Soft Drinks Ltd and its Robinsons brand has a significant share of the 'concentrates' market with 44% in terms of value. 'Ribena' owned by GlaxoSmithKline is worth 16% of the total market.

[10] *National Statistics (2008) Product Sales and Trade PRA 15320 – Fruit & Vegetable Juice 2007.*

[11] *Euromonitor (2008), Fruit/Vegetable Juice in the United Kingdom.*

**Table 4** Brand Shares of Concentrates by Off-trade Value 2007[12]

| Brand | Company | % Share |
|---|---|---|
| Robinsons | Britvic Soft Drinks Ltd | 44 |
| Ribena | GlaxoSmithKline Plc | 16 |
| Jucee | Princes Soft Drinks Ltd | 6 |
| Vimto | Nichols Plc | 4 |
| Bottlegreen | Bottlegreen | 4 |
| Ocean Spray | Princes Soft Drinks Ltd | 4 |
| Tesco | Tesco Plc | 3 |
| Kia-Ora | Coca-Cola Enterprises Ltd | 3 |
| Asda | Asda Group Ltd | 3 |
| Sainsbury | J Sainsbury Plc | 2 |
| Private Label | | 1 |
| Others | | 12 |

### *2.2.6 Distribution of Soft Drinks*

The movement of soft drinks from the point of manufacture to final retail destination are many and various through the multiplicity of supply channels involved.

Table 5 below indicates the predominance of supermarkets in comparison with other retail outlets in the sale of soft drinks overall, with the exception of functional drinks.

**Table 5** Off-Trade Sales of Soft Drinks by Sector and Distribution Format: % 2007[13]

| % Off Trade | Carbonates | Juices | Water | Functional Drinks | Concentrates | RTD Tea | RTD Coffee |
|---|---|---|---|---|---|---|---|
| Supermarkets | 74 | 83 | 70 | 44 | 93 | 58 | 74 |
| Discounters | 4 | 2 | 3 | <1 | <1 | 1 | 0 |
| Small grocery Retailers | 15 | 13 | 14 | 52 | 6 | 35 | 25 |
| Others | 6 | 3 | 13 | 2 | <1 | 5 | <1 |
| Vending | 2 | <1 | <1 | <1 | 0 | <1 | 0 |

## 2.3 Alcoholic Beverages

### *2.3.1 Background*

In 2007, the quantity of off-trade alcoholic beverages sold in the UK was just over 4 billion litres, which is just below 50% of the total market. The volumes of off-trade alcoholic beverages sold in the UK are shown in the table below. Beer represented 57% of volume sold, followed by wine (27%) and cider (10%). Spirits, which contribute 5% of total volume, are not considered in further detail in this market assessment. Early discussions with stakeholders revealed that due to the high value of the products and potential for spillages, spirits would not be a good option for self-dispensing.

[12] *Euromonitor (2008) Concentrates in the United Kingdom.*
[13] *Euromonitor (2008) Soft Drinks – United Kingdom.*

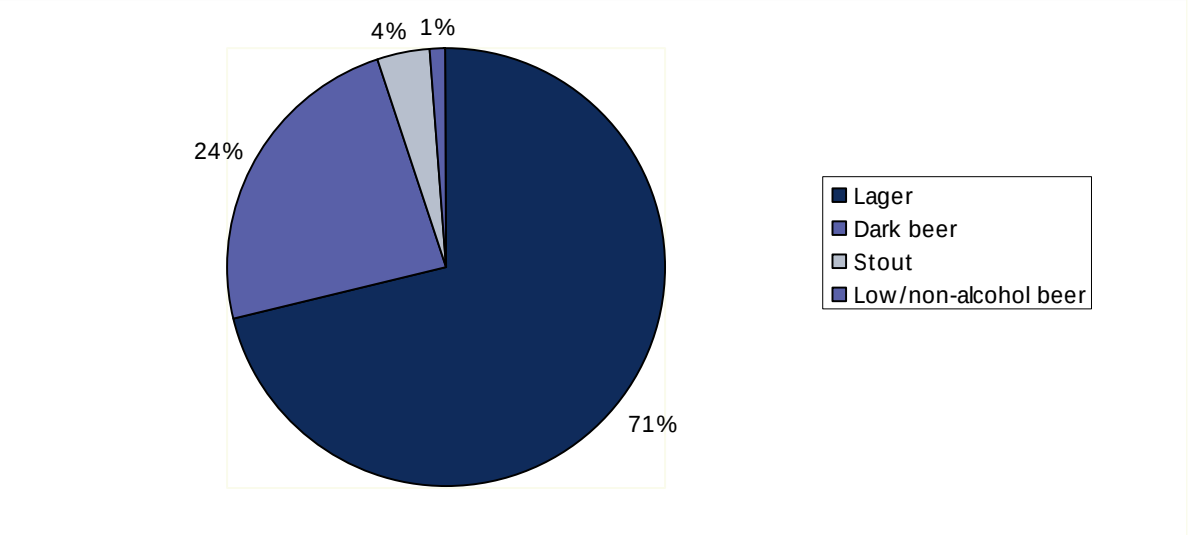
**Table 6** Off-trade Volume Sales of Alcoholic Drinks 2007 (million litres)[14]

| | Off-trade volume (million litres) | % of Total volume |
|---|---|---|
| Beer | 2,292 | 57% |
| Wine | 1,073 | 27% |
| Cider/perry | 387 | 10% |
| Spirits | 207 | 5% |
| RTDs/High-strength premixes | 73 | 2% |
| Total | 4,031 | |

**Beer**

Figure 7 below shows that total volume sales of lager accounted for 71.2% of total beer sales (on and off-trade) by volume in the UK in 2007. Dark beers, such as real ales make up the majority of the remaining consumption (24% of total sales).

**Figure 7** Sales of Beer by Subsector: Total Volume 2007[15]




The major companies and their brands are shown in the table below.

[14] *Euromonitor (2008), Alcoholic Drinks - United Kingdom.*

[15] *Euromonitor (2008), Beer in the United Kingdom.*

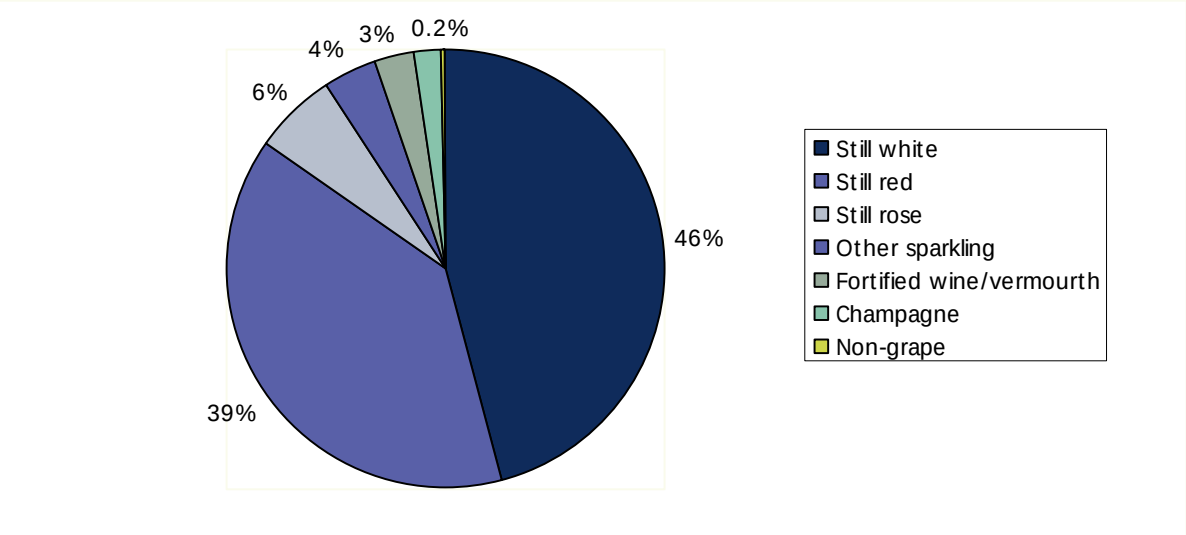
**Table 7** Key Companies and Brands in the Beer Market[16]

| Company | Brands |
|---|---|
| Carlsberg UK Ltd | ■ Carlsberg<br>■ Tetley's<br>■ Holsten Pils<br>■ Tuborg<br>■ Skol |
| Molson Coors UK Ltd | ■ Carling<br>■ Worthington's<br>■ Grolsh<br>■ Coors |
| InBev UK Ltd | ■ Stella Artois<br>■ Beck's<br>■ Castlemaine XXXX<br>■ Boddingtons<br>■ Tennent's |
| Scottish & Newcastle PLC | ■ Kronenbourg 1664<br>■ Foster's<br>■ John Smith's<br>■ Strongbow |

**Wine**

Figure 8 below shows that consumption of wine is dominated by still red and white wines accounting for nearly 85% of total wine sales and amounting to over 1.1 billion litres (on and off-trade).

**Figure 8** Sales of Wine by Subsector: Total Volume 2007[17]




Nearly all wine consumed in the UK is imported. The wine market is very fragmented although a number of large companies do produce some of the leading brands. All major wine producing countries compete in the lucrative UK market. In terms of self-dispensing, however, wine is a complex drink with many sub-divisions: each wine is identifiable by age, country, colour, style, type of grape, vineyard etc. Wine is increasingly available in a range of containers and quantities adding to the complexity of the product mix and stock keeping units (SKUs).

[16] *Keynote (2008) Market Review 2008 – Drinks Market.*

[17] *Euromonitor (2008), Wine in the United Kingdom.*

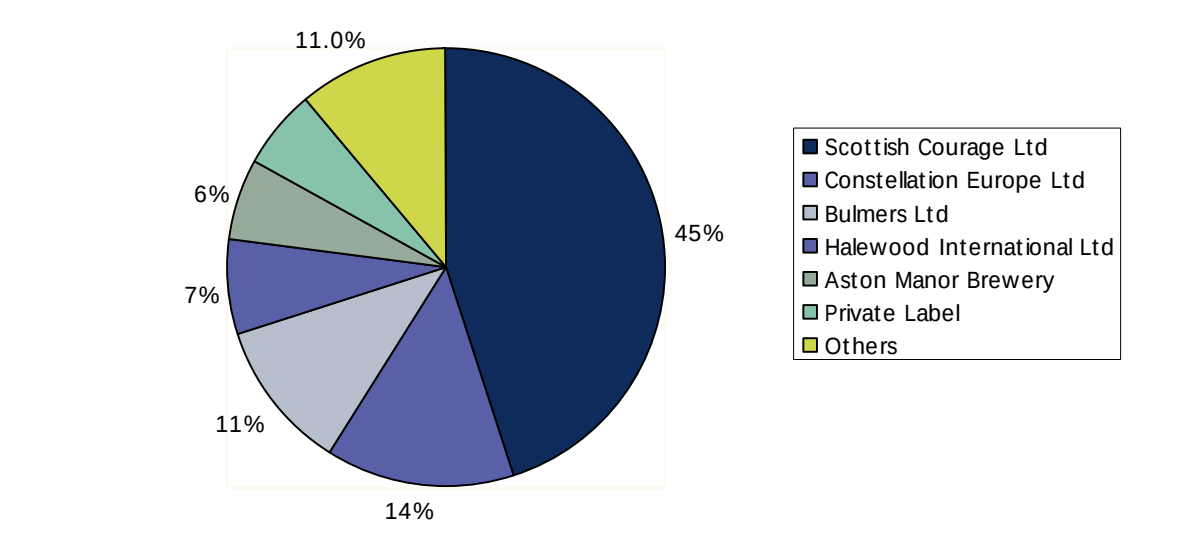
**Table 8** Key Companies and Brands in the Wine Market[18]

| Company | Brands |
|---|---|
| Constellation Europe Ltd | ■ Hardys<br>■ Stowells<br>■ Echo Falls<br>■ Kumala |
| Diageo PLC | ■ Blossom Hill<br>■ Piat D'Or |
| Fosters EMEA Ltd | ■ Penfolds<br>■ Wolf Blass<br>■ Rosemount Estate<br>■ Lindemans |
| Pernod Ricard UK Ltd | ■ Jacobs Creek<br>■ Campo Viejo<br>■ Wyndham Esate |

**Cider/Perry**

Off-trade sales of cider and perry in the UK amounted to 387 million litres in 2007, or 10% of the total alcoholic drinks market in terms of volume. Three companies have control of over 70% of the cider market (on and off-trade). Scottish Courage is the market leader (45% of market volume), followed by Constellation Europe (14%) and Bulmers (11%).

**Figure 9** Cider/Perry Company Shares by National Brand Owners (% of total volume – on and off-trade)[19]




### *2.3.2 Distribution of Alcoholic Drinks*

Overall the predominance of supermarkets in the sale of alcoholic drinks appears less pronounced than for soft drinks as show in Table 9 below, where off-licence and convenience store sales are important.

[18] *Keynote (2008) Market Review 2008 – Drinks Market.*

[19] *Euromonitor (2008), Cider/Perry in the United Kingdom.*

**Table 9** Off-Trade Sales of Alcoholic Drinks by Distribution Format: % Value 2007[20]

| | % Off Trade |
|---|---|
| Supermarkets | 44 |
| Independent Food Stores | 10 |
| Convenience Stores | 4 |
| Discounters | 2 |
| Specialists | 37 |
| Direct Sales | 2 |
| Others | 1 |

However, when segmented by supplier type and considered by volume rather than value, as shown in Table 10 below, the importance of supermarkets sales readily becomes apparent.

**Table 10** Off-Trade Sales of Alcoholic Drinks by Distribution Format: % Volume 2007[21]

| % Off Trade | Beer | Cider/Perry | Flavoured Beverages | Wine | Spirits |
|---|---|---|---|---|---|
| Supermarkets | 61 | 50 | 64 | 70 | 60 |
| Independent Food Stores | 18 | 14 | 14 | 3 | 11 |
| Convenience Stores | 12 | 14 | 8 | 5 | 2 |
| Discounters | 3 | 6 | 1 | 1 | 3 |
| Specialists | 6 | 15 | 12 | 14 | 20 |
| Direct Sales | <1 | <1 | 0 | 7 | 2 |
| Others | <1 | 1 | <1 | <1 | 3 |

## 2.4 Milk

### *2.4.1 The Market*

Over 4.9 billion litres of milk was sold in the UK in 2008[22]. Major grocery retailers are now market leaders and have gained significant share in this market with Tesco, Sainsbury and Asda having a combined share of 42% of the market. The two major non-retailers in the market are Arla Foods (16%) and Dairy Crest (8%).

**Table 11** Drinking Milk Products Company Shares 2006[23]

| | Company Shares % of retail value |
|---|---|
| Tesco Plc | 16 |
| Arla Foods UK Plc | 16 |
| J Sainsbury Plc | 12 |
| Asda Group Ltd | 11 |
| Dairy Crest Plc | 8 |
| Wiseman Dairies Plc | 3 |
| Vandermoortele (UK) Ltd | 2 |
| Premier Foods Plc | 2 |
| GlaxoSmithKline Plc | 1 |
| Campina UK Ltd | 1 |
| Twining & Co Ltd | 1 |
| Private Label | 20 |
| Other (< 1% share) | 8 |

[20] *Euromonitor (2008), Alcoholic Drinks - United Kingdom.*
[21] *Euromonitor (2008), Alcoholic Drinks - United Kingdom.*
[22] *http://www.mdcdatum.org.uk/RetailerDataPrices/tnsliquidmilk.html*
[23] *Euromonitor (2007) Dairy Products in the United Kingdom.*

### 2.4.2 Distribution of Milk

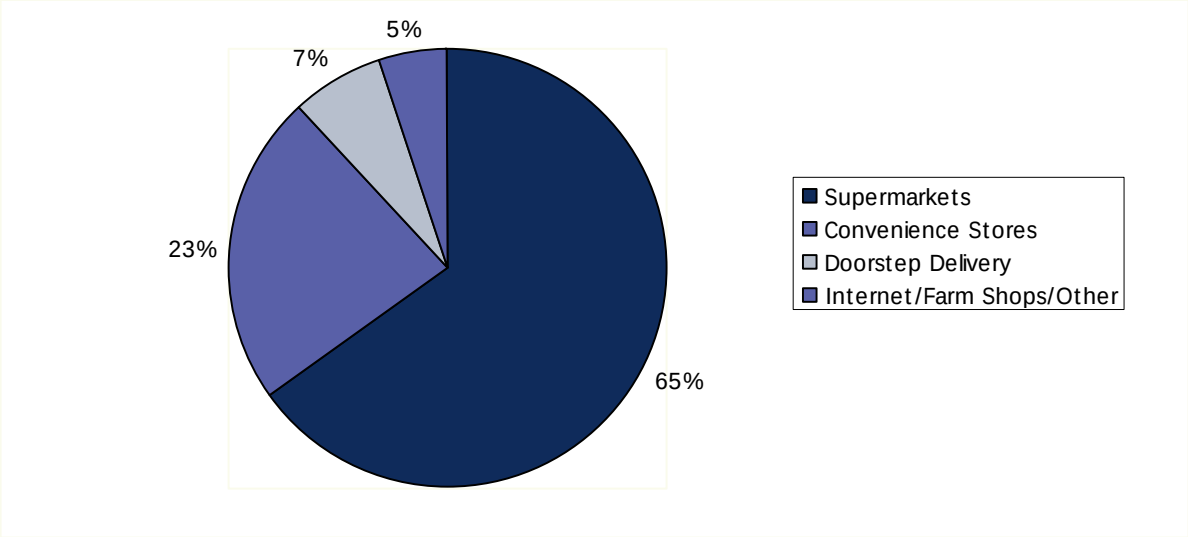
The milk retail distribution chain was investigated by DEFRA in a review of life cycle impacts[24]. Milk is normally transported from the farm to the dairy or via a 'transhipment depot' by the milk purchaser. Organic milk produced in the UK is transported separately. Milk destined for major retailers is kept separate for dedicated processing and packaging. Some farms have diversified and process dairy products on the farm; these, however, are a minority.

At the dairy, cream is separated from the milk and the three variants are produced – whole milk, semi-skimmed milk and skimmed milk. Subsequent heat treatment is applied to produce pasteurised, UHT and sterilised milk.

Milk is packaged in a variety of materials (see 3.2.2 below) and pack sizes, and stored for a short time before despatch to retailers. Pasteurised milk is delivered directly to retailers, whilst UHT and sterilised milk is commonly distributed via regional distribution centres (RDCs).

Two thirds of milk is purchased from large supermarkets, followed by 23% being purchased in convenience stores.

**Figure 10** Milk Purchases by Outlet in 2007[25]




## *Summary of Beverage Markets*

The markets for beverages are fragmented in terms of beverage types, brand owners, brands and points of sale. This has important implications for the potential of self-dispensing systems to alter consumption patterns in the off-trade beverage sector. With the exception of Coca-Cola, no single brand sells in such significant volumes that major tonnages of packaging could be saved from switching to self-dispensing. Penetration of markets on a significant scale will require comprehensive consumer uptake across a range of beverage types and brands. Any beverage type chosen for possible trials should therefore demonstrate the potential for the generalisation of the results and outcomes to a range of other beverages.

[24] *DEFRA (2007) The Environmental, Social and Economic Impacts Associated with Liquid Milk Consumption in the UK and its Production – A Review of Literature and Evidence, DEFRA, London.*

[25] *Source: WRAP (2008) Refillable Glass Beverage Container Systems in the UK, WRAP, Banbury.*

## 2.5 Automatic Vending Industry

### *2.5.1 Background*

The concept of self-dispensing of 'beverages' is perhaps older than might first be thought. It is claimed that in the year 215 BC Greek mathematician Hero of Alexandria produced a vending machine. In this "machine" a coin's weight opened a valve which released water. The 'holy' water flowed until the coin eventually fell from its tray and closed the valve. However it took some 2000 years before in 1888, a UK entrepreneur invented a 'self-dispensing' machine, capable of selling books.

It is also probably worth recording that a "beverage" is a liquid which is produced entirely for human consumption. This fact means that unlike Greece in 215BC, today in the UK hygiene and health risks must be managed carefully to avoid infecting consumers. However, internationally there are examples where, in some countries, there is less concern over hygiene and potential contamination as Figure 11a below demonstrates. This piece of equipment dispenses water from a spring source. Some machines are capable of complex processes such as the Australian "Hot chip" machine shown below in Figure 11b.

**Figures 11a&b** Examples of Self-dispensing: Water dispensing to users' container; Hot Chip Vending Machine in Australia


Japan reportedly has over 5.5million machines selling a wide and vast range of produce.

**Figures 12a&b** Rice dispenser in Japan; Drinks Dispensing in Japan


Drinks dispensing machines exist and these range from simple 'water' dispensers found in many offices to fruit juicers at hotels and other premises where the hospitality to the consumer means they are not 'buying' the particular individual drink(s) as part of the contract with the hotel, garage, sports facility, etc.


**Figure 13** Drinking fountain - the first one installed by the Metropolitan Drinking Fountain and Cattle Trough Association, St Sepulchres Church, Snow Hill, London

In recent years there has been a wide variety of products available through vending machines. Machines of today are capable of accurately distinguishing between a range of coinage. In this particular study we are concerned with the concept of self-dispensing beverages. This has slightly different nuances in that, because the machine would be located at a retailer's premises, payment may not necessarily be prepaid at the machine. However because of trading standards and consumer laws the quantity of liquid dispensed would need to be regulated or measured to ensure the consumer was charged correctly.

### *2.5.2 Industry Structure*

Key Note's[26] report provides analysis of the vending industry. Some key facts are extracted and presented below:

- Sales through automatic vending machines are estimated to have increased by 11.9% between 2003 and 2007, reaching £3.58bn.
- There are approximately 1.3 million vending machines in use in the UK, nearly half of which are classed as 'refreshment machines'.
- The main categories of refreshment machines are free-standing traditional beverage machines (accounting for around 40% of the total) and cold-beverage machines (representing 15% of the total).
- Approximately 40% to 50% of the refreshment machines in operation are thought to be refrigerated vending machines.
- The main business groups in the UK automatic vending market are: manufacturers of vending machines and components; machine operators that sell, distribute and maintain the machines; and the suppliers of products and merchandise for machines.
- The machine distributor and operator group comprises the largest sector in terms of numbers of companies, although it is highly fragmented and highly competitive.

[26] *Keynote (2008) Market Report 2008: Automatic Vending. Keynote Ltd, Hampton, Middlesex.*

## 2.6 International Examples of Self-dispensing

### *2.6.1 Background*

Contact was made with a number of international organisations with interests in beverages and automatic vending. They were asked for examples of where self-dispensing of beverages was in use in retail stores. Many knew of the USA example of Fountain Fresh International, which is discussed below (section 2.6.2), but they were unable to identify any further examples. Organisations contacted included:

- European Fruit Juice Association
- European Beverage Association
- European Federation of Bottled Waters
- American Beverage Association
- Refreshments Canada
- The New Zealand Juice and Beverage Association
- Australian Food and Grocery Council
- Australian Beverages Council
- International Society of Beverage Technologists
- International Bottled Water Association
- European Vending Association
- Canadian Automatic Merchandising Association
- National Automatic Merchandising Association
- Australian Vending Association
- The International Beverage Dispensing Equipment Association

### *2.6.2 Fountain Fresh International*

There are very few examples of self-dispensing of beverages in retail stores from which to draw experience. At a micro-level, there are vineyards and cider producers where consumers can bring containers to refill with wine and cider.

One of the few known examples of self-dispensing in actual retail stores is a USA company called Fountain Fresh International which developed a system for self-dispensing of soft drinks and water in the 1990s. Whilst the idea appeared to have some initial success, by the late 1990s, the company had ceased trading. This team's research could not establish whether the company had insufficient capital to exploit the opportunity or whether its demise resulted from a lack of consumer demand.

Consumers were able to purchase low-priced beverages by washing and refilling reusable soft drink bottles in the 'Fountain Fresh Beverage Center' dispensers. Machines were self-operated and offered drinks in one and two litre sizes at a significant discount compared with ready bottled drinks. Two versions of the dispensers were marketed, offering either 12 or 24 flavours of cold carbonated soft drinks. Water taken directly from the local supply, and filtered, was also available for dispensing in gallon jugs which could be reused, again at a lower price than other bottled water.

Fountain Fresh initially contracted other companies to blend and package the syrups, but in 1995 started its own blending and packaging plant to supply retail stores that had installed their dispensers.

The system was rolled out across various US retailers including Wal-Mart. It was also operated overseas, including Canada, Australia and The Philippines'.

There is little factual and conclusive evidence publicly available as to why exactly the Fountain Fresh concept failed, however a number of websites refer to design problems with the dispensing machines that were 'messy, confusing and difficult to operate'.

Fountain Fresh appears to have generated initial interest in the concept, probably primarily due to the cost savings for consumers and the potential economic benefits for retailers. In some stores, Fountain Fresh products were reported to have captured 30 to 60 per cent of bottled soft drinks sales, in some cases topping all of the Coca Cola and Pepsi brands combined. However, ultimately the initial interest appears to have declined due to technical issues surrounding the machines.

There were clearly environmental benefits of the Fountain Fresh system in terms of reduced packaging use through customer's use of reusable bottles. However, significant benefits were also gained through the use of

post-mix syrups. The dispensers mixed syrups delivered to the retailer with water from the local supply, thus reducing the quantity of overall beverages transported to the retailer.

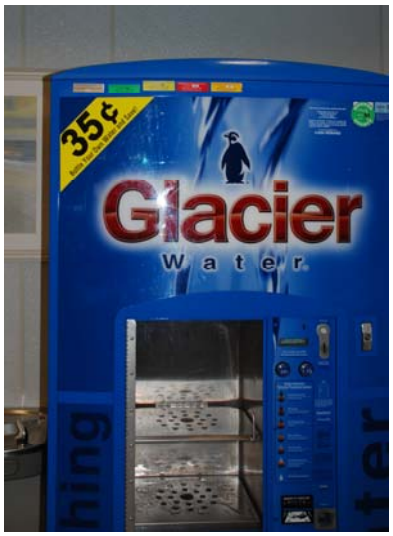
### *2.6.3 Glacier Water*

Glacier Water is a US-based company that manufacture machines that dispense fresh filtered water. The company claim to have 17,000 machines in the US and Canada, located in and outside retail stores and at other locations.

The system requires that customers bring their own reusable bottles for refilling, and they are offered a price reduction compared with ready bottled water. The key difference between this system and that used by Fountain Fresh is that the machine does not wash bottles; instead the customer is required to wash their bottles at home.

The Glacier Water concept offers environmental benefits when compared to pre-bottled water sold in shops. Clearly, reuse of bottles helps reduce the quantity of packaging waste. Also, because the water is sourced directly from the local water supply, there are no impacts from a transport based distribution network.

**Figure 14** Glacier Water Dispenser




### *2.6.4 Beer Self-Dispensing*

The Novosibirskprodmash Company is the leading manufacturer of beverage bottling equipment in Russia. One of its products is the Pegas Dispenser which enables dispensing of carbonated beverages (e.g. beer) from pressurised vessels (kegs) into PET bottles.

The system is used primarily for self-dispensing beer in retail stores, a concept which is apparently quite popular in Russia. The company also has distributors in Latin America and Asia. However, the system does not encourage reuse of bottles.

## 2.7 UK Examples of Self-Dispensing

### *2.7.1 Waterwerkz*

Waterwerkz is a UK-based company that has developed a vending machine technology that enables water-based beverages to be produced within the machine and served into re-sealable flexible packaging. The machine filters mains water and makes flavoured drinks using bag-in-box syrups.

The Waterwerkz system provides environmental and logistical advantages compared with conventional beverage vending machines dispensing cans and bottles. The vending machines are capable of holding up to 2000 pouches, with capacities ranging from 200ml to 500ml, reducing storage, transport and stocking of machines with cans and bottles. The high storage capacity of the machines significantly reduces the number of required restocking visits.

The drinks are produced post-mix using syrups and local water, thus reducing transport compared with ready made drinks. The manufacturers claim that the flexible pouches used are recyclable, and are 75% lighter than

PET bottles and 90% less bulky, thus reducing packaging waste. Additionally, by using just-in-time flash chilling, energy consumption is reported to be reduced by up to 80%.

Although this system does not involve reuse of beverage packaging, it does demonstrate that beverage dispensing can offer environmental benefits in other ways.

### *2.7.2 Vivreau*

Vivreau offer filtered water systems as an alternative to bottled water for offices. Many large corporate organisations now use Vivreau to reduce their environmental impacts (and presumably costs). There are various types of dispensing machines offered, where the consumer can either self-serve from a dispenser or tap, or reusable bottles are filled, for example for meeting rooms.

The environmental benefits of this system include the reduction in impacts associated with sourcing, packaging and transport of bottled water.

### *2.7.3 Unpackaged*

"Unpackaged" is an independent organic grocery store located in Islington, London. The shop sells a variety of produce (foods and non-foods) and they encourage shoppers to reuse containers by offering a 50p discount.

As well as oils, shampoo, washing liquid and dry foods, "Unpackaged" sells organic apple juice which can be self-dispensed from bag-in-box containers.

## Summary of Self-Dispensing Technologies

There are relatively few beverage self-dispensing examples where consumers reuse their containers. Only one example has been found where bottles were washed in the machine and this company no longer operates. Therefore, there is little existing evidence to help support the development of a business case for self-dispensing of beverages in retail stores. Whilst this suggests that up until now, there has been little commercial willingness to expand this concept, this does not necessarily mean that such systems are not commercially viable, as legislative changes, consumer preferences and technological developments can all affect feasibility and the financial case.

Further dispensing technologies such as those developed by Vivreau and Waterwerkz are on the specific boundaries of this project, but do demonstrate that environmental benefits can be made not only through reduced packaging but by producing drinks in situ, therefore dramatically reducing transport requirements. Development of such technologies should be considered in conjunction with concept of reusable bottle systems.

## 2.8 Consumer Research on Self-dispensing

As part of previous research for WRAP on self-dispensing across a wide range of food and non-food products, a consumer awareness survey was conducted[27]. The aim of the survey was to 'assess consumer's views and perceptions of self-dispensing'. Certain findings from the survey are of particular note for this project.

A number of key drivers were identified for purchasing 'loose' products (food and non-food):

- Less packaging;
- You can buy as much as you want;
- It is cheaper;
- You can see what you are getting; and
- It's an easy way to try new products, as you need only buy a small quantity.

The main barriers identified were:

- Unhygienic;

[27] *WRAP (2007) Self-Dispensing Systems – Commercial Feasibility Study, WRAP.*

- No information about the product (brand, nutritional content, etc);
- No 'sell by' date;
- The quality may not be good; and
- Freshness.

Respondents were asked for their views on self-dispensing of particular products. The idea of self-dispensing of beverages was not particularly popular as illustrated in the quotes from the report below:

- '*There is clearly most concern about soft and liquid foods; only 37% of people said that they felt very comfortable or comfortable buying drinks (e.g. juices, milk) from a self-dispensing system'.*
- *'Hygiene issues emerge specifically with liquid food. In effect, people feel more comfortable buying dry food or liquid non-food items since they do not have to worry about hygiene'.*
- *'The items that have the highest number of people who feel uncomfortable or very uncomfortable are drinks (e.g. juices, milk) and soft and liquid foods (e.g. jam, soup)'.*
- *'Liquid products: people believe self-dispensing these would be too messy. There is not much concern about hygiene with these types of products – except in the case of liquid food, where people are concerned about hygiene'.*

The survey revealed some further interesting views on self-dispensing:

- Dispensing machines would be fine for dispensing dry-food or non-food items: bath salts, DIY products, vegetables and fruits;
- Self-dispensing machines need to be appealing in terms of hygiene and appearance;
- Information about the product needs to be clear (nutritional information, brand of the product, 'best before' or 'sell by' date);
- Self-dispensing systems have to be easy to use; and
- Supermarkets are the main driver in the market.

Two key motivators were identified that could persuade consumers to adopt new technologies. Firstly, environmentally conscious purchasers may be attracted to spend more time, make more effort and potentially spend more money to purchase something with good 'green' credentials. Secondly, financial incentives in terms of low-cost goods or the opportunity to buy premium goods at a lower price is likely to be an important driver.

# 3.0 Analysis of Opportunities and Barriers to Self-dispensing Beverages

## 3.1 Introduction

A workshop was undertaken in Banbury on the 5th March with a group including dispensing machine manufacturers and suppliers, and beverage brand owners and manufacturers. Further structured interviews were conducted with a number of major retailers to gauge their views on the project.

The output from the workshop (summarised in Appendix 1) and interviews have been considered in conjunction with the results of the desktop study to form an analysis of following areas:

- Environmental Costs and Benefits
- Regulatory Issues
- Consumer Issues
- Technical and Operational Factors
- Economic Viability

Further to this, the key viewpoints of each stakeholder group are summarised, as ultimately, the feasibility of this project depends on the future commitment of these organisations.

The ‘mind map’ overleaf illustrates the broad range of issues raised during the research and stakeholder discussions.

**Figure 15** 'Mind Map' of Self-Dispensing Issues

## 3.2 Environmental Costs and Benefits

### *3.2.1 Background*

A primary focus for undertaking this project was the potential to reduce consumption of beverage packaging by encouraging greater use of reusable containers. This not only has benefits in terms of reduced waste, but also from wider resource use in raw material extraction and manufacture of that packaging. Further investigation into the potential for developing systems where drinks are manufactured post-mix in dispensing machines using syrups or concentrates and a local water supply has indicated that there may be significant additional benefit in terms of reduced distribution requirements.

However, the environmental arguments are of a wide scope and complex, potential benefits must be contrasted with the impacts from manufacture and operation of dispensing machines. In a machine with a washing facility, water and energy consumption, and waste disposal may be further significant issues.

A full supply chain environmental cost-benefit has not been possible within the timescale of this study but would be prudent for it to form a key part of the trial(s). Instead the primary issues are analysed, and illustrated with data where it has been possible.

### *3.2.2 Beverage Packaging*

The table below shows data compiled by WRAP on estimated tonnages of beverage packaging consumed in the UK. The data excludes milk packaging which is discussed below. Total beverage packaging consumption for on and off-trade is estimated at 2.3m tonnes per annum, with off-trade packaging accounting for just over half of the tonnage, 1.2m tonnes. Within the off-trade, wine packaging amounts to over 495,000 tonnes or 41% of total off-trade packaging.

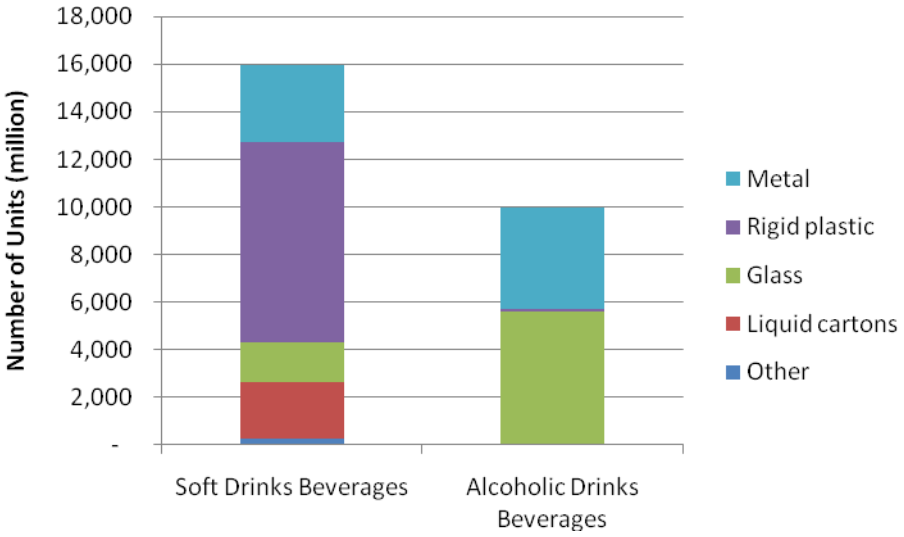
**Table 12** Estimated Consumption of UK Beverage Packaging[28]

| Sub-category | Off-trade tonnage | % of Off-trade | On-trade tonnage | % of On-trade | Total | % of Total Packaging |
|---|---|---|---|---|---|---|
| Wine | 495,499 | 41% | 630,635 | 58% | 1,126,134 | 49% |
| Beer & cider | 273,202 | 23% | 247,183 | 23% | 520,385 | 23% |
| Spirits & liqueurs | 124,361 | 10% | 77,852 | 7% | 202,213 | 9% |
| Soft drinks | 304,315 | 25% | 124,298 | 12% | 428,613 | 19% |
| | 1,197,377 | | 1,079,968 | | 2,277,345 | |

Total alcoholic drinks packaging (where glass is used more widely than in soft-drinks) represents 75% of off-trade packaging, and 81% of total beverage packaging. Figure 16 illustrates that although the number of alcoholic beverage units sold is less than for soft drinks, a significant proportion of this is glass (56% of units). In comparison, glass only accounts for 11% of soft drinks units sold.

[28] *Data compiled by WRAP Beverages Team, sourced from DHL, BSDA, Mintel, Gin & Vodka Assoc, Scottish Whisky Association & British Beer & Pub Association*

**Figure 16** Primary Beverage Packaging 2007 (on and off-trade)[29]




The tables below show the top 3 sub-categories for the major beverage types in terms of tonnage of packaging.

**Table 13** Major Sub-Categories of Packaging for Wine, Beer and Soft Drinks[30]

| Wine Sub-category | Sub-category tonnage | % of product group tonnage total |
|---|---|---|
| Red wines | 187,086 | 38% |
| White wines | 169,973 | 34% |
| Other wines | 75,936 | 15% |
| Total tonnage | 495,499 | |

| Beer Sub-category | Sub-category tonnage | % of product group tonnage total |
|---|---|---|
| Lager | 220,722 | 76% |
| Ales & stout | 41,336 | 14% |
| Cider & perry | 29,270 | 10% |
| Total tonnage | 273,202 | |

| Soft Drink Sub-category | Sub-category tonnage | % of product group tonnage total |
|---|---|---|
| Small carbonates & RTD's | 57,033 | 16% |
| Large carbonates | 39,953 | 11% |
| Longlife juice | 47,171 | 13% |
| Total tonnage | 304,315 | |

Further analysis of packaging tonnages is presented at 4.1.2 below for the beverage types chosen as having greatest potential for self-dispensing.

**Milk**

Mintel[31] report that plastic bottles are used to pack 78% of all milk sold through shops and traditional doorstep deliveries. HDPE is the most important material although some PET is also used. Glass bottles are used for 11% of milk sold, the vast majority of which will be in doorstep deliveries. The remaining 11% is packaged in cartons, 90% of which is UHT.

Over 3 billion HDPE milk bottles are manufactured in the UK each year using 120,000 tonnes of plastic[32].

[29] *Euromonitor (2008), Beverage Packaging in the United Kingdom.*
[30] *DHL Exel Supply Chain (2008) Waste & Resource Action Programme Baseline Data Report 2007. WRAP, Banbury*
[31] *Mintel International Group Ltd (2006) Milk and Cream - UK, London: Mintel*
[32] *Dairy Supply Chain Forum (2008) The Milk Roadmap, DEFRA, London*

### 3.2.3 Secondary and Tertiary Packaging

Together with potential savings in primary packaging, moving to self-dispensing systems can also result in savings of secondary packaging (e.g. cardboard) and tertiary packaging (e.g. pallets). An example of possible savings in secondary and tertiary packaging for fruit concentrates is presented below at 4.1.2.

It is not possible to make direct assumptions for secondary and tertiary packaging for all types of beverages based on the example of fruit squashes, as different systems may be used, e.g. shrink wrap, dollies, etc. However, for drinks produced using post-mix syrups, the reduced quantity of water requiring movement will invariably lead to savings in transit packaging and also has the potential to lower the impact and cost of transportation and warehousing.

### 3.2.4 Distribution

The Department for Transport (DfT) estimates the annual transport for different commodity groups[33]. Approximately 57 million tonnes of beverage products were transported in 2007, accounting for 3% of total goods lifted. The beverage commodity group excludes milk, tea and coffee.

A better measure of transport intensity is tonne-km which takes account of weight and distance travelled. Beverages accounted for 4.2% of total goods moved in 2007, amounting to 6.8 billion tonne-km. Using an average greenhouse gas conversion factor for HGVs[34], this volume of transport results in just under 900,000 tonnes of $CO_2$ emissions.

Off-trade drinks, the focus of this study, account for 70% of total beverages sold. If it is assumed that this is representative of goods moved, then approximately 4.8 billion tonne-km of off-trade drinks were moved in 2007, resulting in 630,000 tonnes of $CO_2$ emissions.

### 3.2.5 Other Environmental Issues

As noted above, at this stage it has not been possible to consider the full environmental cost-benefits of self-dispensing against current practices within the resources of this project. A full environmental supply-chain assessment should include the following stages.

**Table 14** Supply Chain Environmental Impacts

| Packaged Beverages | Self-Dispensing Beverages |
|---|---|
| Packaging (Primary, Secondary and Tertiary)<br>▪ Raw Material Extraction and Processing<br>▪ Distribution to Packaging Manufacturer<br>▪ Packaging Manufacture<br>▪ Distribution to Beverage Manufacturer<br>▪ End of Life (Recycling/Landfill)<br>Beverages<br>▪ Raw Material Extraction and Processing<br>▪ Distribution to Packaging Manufacturer<br>▪ Beverage Manufacture<br>▪ Distribution to Retailer | Packaging (Primary, Secondary and Tertiary)<br>▪ Raw Material Extraction and Processing<br>▪ Distribution to Packaging Manufacturer<br>▪ Packaging Manufacture<br>▪ Distribution to Packaging Manufacturers/ Retailers<br>▪ % Reuse<br>▪ End of Life (Recycling/Landfill)<br>Beverages<br>▪ Raw Material Extraction and Processing<br>▪ Distribution to Packaging Manufacturer<br>▪ Manufacture of Drinks/Concentrates<br>▪ Distribution to Retailer<br>Dispensing Machines<br>▪ Raw Material Extraction and Processing<br>▪ Manufacture<br>▪ Operation (incl. bottle washing)<br>▪ Maintenance |

However an LCA assessing a full range of environmental impacts of this type of system would be extremely costly and is unlikely to represent value for money. The proposed trial could provide insight into the key areas. Thus, it

[33] *DfT (2008) Road Freight Statistics 2007, DfT, London*
[34] *DEFRA (2008) Guidelines to Defra's GHG Conversion Factors*

may be more appropriate to consider major environmental impacts (e.g. carbon and water) within any further investigations.

## 3.3 Regulatory Issues

### *3.3.1 Alcohol Licenses*

If alcoholic drinks were to be dispensed from a machine in a shop, then the retailer would require a different type of license than they need currently. This relates to the fact that a seal would be broken (on the bulk packaging) to dispense the drink into containers.

### *3.3.2 Mineral Water*

Water branded as spring or mineral water must by law be bottled at source, therefore these types of drinks could not be transported in bulk to retailers for self-dispensing into containers.

### *3.3.3 Labelling*

There are certain legal requirements as to what must be included on the label of food and drink products sold in the UK. This may add complexity to the machine requirements, particularly if it dispensed different products, requiring different ingredient lists, use by dates, etc.

One workshop attendee did raise the point that certain information that would normally be needed on packaging could be displayed on the dispensing machine, thereby simplifying the potential information requirements.

### *3.3.4 Weights and Measures*

The Weights and Measures Act 1985 is the main piece of legislation covering weights and measures controls in the UK. The Act covers a numbers of different aspects of this area including the units of measurement used, controls of transactions and control over equipment.

Any equipment used to dispense liquids would need to meet the requirements of weights and measures standards and be regularly subjected to test and certification.

The involvement of consumers dispensing their own quantities and paying for the quantity issued will involve the equipment working continuously and certified to the satisfaction of Trading Standards Weights and Measures Inspectorate.

Consequently either a machine would dispense fixed and pre-defined measures or the quantity dispensed would need to be dynamically measured so that a ‘bar code’ or similar means of identifying the quantity and price to be charged at the retailer’s point of sale is ‘built in’.

The normal requirements of the H&SE regulations at work clearly need to be accommodated.

### *3.3.5 Reuse of Bottles*

The Food Standards Agency (FSA) was contacted regarding the potential use of reusable bottles in a dispensing system, where the bottle was washed either in the machine or by the consumer. Their response was as follows:

> *Food contact articles such as plastic water bottles and plastic containers are generally designed and migration tests carried out to demonstrate that they can be safely used for the purpose intended by the manufacturer. Migration tests are carried out by manufacturers as part of their work to ensure compliance with legislative controls that ensure that any chemical migration is within safety limits. In relation to the continuous re-use of these bottles and containers, generally it is assumed that once the contents of the water bottle/container are removed they should be discarded. However, providing the condition of the bottle/container has not deteriorated, and it can be effectively cleaned it would be safe to use. If there are any doubts, do not continue their use. The best advice that you can follow is to use the products for the purpose the manufacturer declares they are intended. If there is no such declaration, check with supplier or manufacturer direct. The important thing to bear in mind is that if such products are being re-used, the contents should be replaced with like for like; if the original contents of the bottle is water, then it should be replaced with water. This advice is also available on the Agency's 'eatwell' website below:*
>
> *http://www.eatwell.gov.uk/asksam/keepingfoodsafe/asksamstoringpreparing/*

*Whilst consumers can reuse these bottles it is important to observe good hygiene and make sure they are kept clean. It would be difficult to give a set number of times that bottles can be re-used, but consumers should use their judgement as to whether the bottles are showing signs of wear and/or are difficult to clean. Drinks bottles/sports bottles are best washed out with soapy hot water and rinsed thoroughly before they are re-used. Manufacturers of bottled water normally provide usage and storage instructions on their product (usually refrigerate after opening and consume within 3 days) and these should be adhered to. If a bottle is filled with tap water it would be appropriate to treat it in the same way as an open bottle of commercially bottled water and apply the same type of storage and usage instructions to it.*

*There is nothing specific in food hygiene legislation prohibiting such practice. However, there is a requirement in the law that all articles, fittings and equipment (includes containers) with which food comes into contact are to be effectively cleaned and be kept in such good order, repair and condition as to minimise any risk of contamination.*

*The decision to allow customers to bring in their own or re-used containers is one for each individual business. It would certainly be sensible for a business to ensure that the containers provided by customers are clean with no foreign body or other obvious contamination. Food businesses would also need to cover such activities in its food safety management system / procedural instructions for its staff.*

*In relation to contamination leading to food poisoning - if such an event were to lead to legal action it would ultimately be up to the courts to decide the outcome.*

So although there is no identified legal reason preventing consumers washing their own bottles for reuse, retailers' and/or their insurers may be liable should a case of consumer food poisoning occur.

## 3.4 Consumer Issues

### *3.4.1 Cost*

The prime motive for customers to choose a new product or change the way they purchase a product e.g. through self-dispensing will be cost, particularly given the current economic climate. Whilst environmental benefits may encourage the most ethically conscious of consumers, to gain any significant market share would require a cost differential between self-dispensing and ready-packaged products.

The economic situation is a major factor affecting all sectors including soft drinks and alcoholic beverages. The latest market research reports used in the analysis of markets above (e.g. Euromonitor) highlighted changes to consumer demand in the very early stages of the economic downturn.

In soft drinks, a shift in demand to cheaper alternatives such as concentrates was evident, where sales increased by 3% in terms of volume and value in 2007, where sales had previously been stagnant. Ambient juices, cheaper than the fresh chilled juices were also reported to be performing well.

In alcoholic beverages, the clearest indication of changes to consumer demand is a shift to off-trade sales. In 2007, off-trade sales increased by 3%, whilst on-trade sales fell by 6%[35]. Commentators have suggested this could be partly driven by the recent smoking ban and the low price of off trade alcohol, particularly in supermarkets, leading people to stay at home rather than drink in pubs.

### *3.4.2 Environment*

The environment is an increasing driver in consumer behaviour in the food and drink sector. WRAP's own campaign on food waste, 'Love Food Hate Waste', the perceived over-packaging of food and the retailer's and food manufacturers own efforts through the Courtauld Commitment are all factors that are affecting consumer decisions on food and drink purchases.

In the beverages sector, one particular area that has been affected is bottled water which has come under pressure from environmental campaigners for the potential negative environmental impacts from packaging and shipping compared with using tap water.

[35] *Source: Euromonitor (2008) Alcoholic Drinks - United Kingdom.*

### 3.4.3 Health

There is increasing pressure from Government and Health Authorities to address the growing problem of obesity, with two-thirds of the UK's adult population being overweight (DoH). Healthy eating awareness campaigns such as 'five-a-day', and legislative restrictions on advertising of junk food to children, are changing consumer preferences in food and drink purchases.

In soft drink retailing, demand has shifted from carbonates to perceived healthier options such as fruit smoothies, fruit juice and bottled water. Within the carbonates sector, there is greater demand for low-calorie drinks.

### 3.4.4 Hygiene

The issue of hygiene was raised as a clear concern with customers in previous WRAP research on self-dispensing (see section 2.8), particularly for liquids. It was also one of the key factors in the demise of Fountain Fresh.

Concerns over hygiene may be real or perceived. For example, consumers may have concerns over hygiene in using reusable bottles, even though in reality, if cleaned thoroughly there may be no greater risk than using new bottles.

Hygiene is not just the concern of consumers; both retailers interviewed highlighted hygiene as a particularly sensitive issue. Spillages could lead to negative perceptions for customers and deter them from using the machines.

The reality is that if the washing, filling and closure activities were all undertaken within the closed environment of the machine, then spillages may not be a significant issue. A number of stakeholders also suggested that the enclosure of containers within the machine would give consumers greater certainty over the hygiene of the system rather than having to replace a cap themselves.

### 3.4.5 Ease of Use

For a self-dispensing system to work, stakeholders agreed that the machines must be carefully designed to ensure that they were simple to use. The length of time that a customer might have to wait for their bottle to be washed and refilled might be a constraint. In modern life, people must juggle shopping with work, childcare, leisure time, etc. so there is a question as to how long the average shopper will be willing to wait for the product to be dispensed. One way around this might be for a machine that washes bottles to have a number of bottles or a carousel within the washing & filling loop at any one time, so that consumers do not actually need to wait for their own bottle to be washed but take the next available bottle that has been refilled, in effect they are exchanging bottles rather than reusing their own, however the environmental benefits of reuse would be retained. However this would require standardised containers.

Stakeholders questioned whether consumers would remember to bring their bottles back to the shop. Many pointed to the reusable bag example, where many people do purchase these types of bags, but then forget to take them shopping.

There would need to be a stock of new bottles available to purchase for first time buyers and those who had forgotten their own bottles.

### 3.4.6 Education and Marketing

One of the retailers interviewed was concerned that consumers might not understand the benefits of using a dispensing machine. Assuming cost benefits were available to the consumer, this would clearly be a key marketing message. However, the key environmental benefits would also need to be explained e.g. waste reduction and carbon footprint.

Information would need to be provided on the system for bottle reuse i.e. there is a price differential when consumers bring their own bottle. If consumers are expected to wash their own bottles, then clear information would need to be provided on the machine, on the bottle and/or on a leaflet explaining how to ensure the bottles are cleaned properly.

One marketing idea raised at the workshop was to build a machine that was transparent so that people could see the washing, filling and closure activities. This was deemed to be an excellent way of encouraging people, particularly children, and parents with children to engage with the machine.

## 3.5 Technical and Operational Factors

### *3.5.1 Bottle Washing*

The representatives from the dispensing machine sector agreed at the workshop that most of the technologies being discussed were already in the market either in 'on' or 'off'-trade premises. Producing post-mix drinks, carbonation and refrigeration were all technical issues that could be overcome, albeit at a cost. The one aspect of this concept that is different from anything else on the market is the bottle washing facility. Although it had been achieved in the Fountain Fresh machines, there is nothing currently on the market that does this, and therefore there are great uncertainties as to the technical difficulties that might be faced in developing a machine from scratch, and indeed the cost of doing this. As one stakeholder stated, "*the 'container wash' aspect of the machine would need significant investigation because it would need to wash to almost sterile conditions in a matter of seconds (very difficult) as a consumer may bring in a container containing residues of harmful material (e.g. petrol) or bacteria (3 week old milk container), etc.*"

### *3.5.2 Refill Time*

Because of the uncertainties surrounding the bottle washing, the time taken between a customer placing their bottle into the machine and receiving it after washing, filling and closure is unclear. How long might a customer be willing to wait, and will people be dissuaded if they need to queue? As mentioned previously, waiting time could be reduced if an exchange system could be created where a number of containers were being processed in the machine at any one time.

### *3.5.3 Quality Control*

One of the major concerns of the brand owners present at the workshop was the difficulty in ensuring quality of product compared to producing drinks within their own factories. This is a particular issue with carbonates, where creating drinks using post-mix will never create a product of the same quality neither in terms of taste or level of carbonation. The point was also raised that water tastes different in different areas of the country, therefore it will be difficult to retain consistency of taste if drinks are created from post-mix.

### *3.5.4 Staff Training*

Major retail stores have large workforces, and it would be necessary to train a significant number of people in operating and replenishing machines to ensure cover at all times of opening. Depending on the complexity it is possible this could be "on-the-job".

### *3.5.5 Shutdown*

In the event of a machine breakdown, it is likely that an engineer from the machine supplier will be needed. Reliability of machines will be very important if consumers (and retailers) are not to be dissuaded from using them. However, machine suppliers are well used to providing rapid 24 hour customer service support through leasing and maintenance agreements.

### *3.5.6 In-store Logistics*

The frequency and ease with which a machine needs to be replenished is an important factor for retailers. If post-mix syrups or concentrates are used, then frequency of replenishment can obviously be reduced significantly compared with ready-made drinks. The size and number of bulk containers will obviously have a bearing and are clearly influenced by the Health, Safety and Environment (HSE's) Manual Handling regulations. It may be possible to have two bulk containers so that when one is empty, it automatically switches to the second, and whilst that is being used, the empty container can be replaced. This would ensure that the machine is never out of stock. However, if a machine is to have a number of different beverage flavours, then the machine will need to encompass more bulk containers. Health and safety standards with regard to lifting that need to be considered are discussed below.

Storage space at the back of store will be needed for full and empty bulk containers of drinks, and for empty drinks containers for filling.

### *3.5.7 Labelling*

Another challenge faced in developing a machine is labelling. Labels will need to provide not only product information e.g. ingredients, but also barcode so that the product can be scanned at the checkout. This should not be a major technical hurdle since these types of labels are already produced in many shops at meat, fish and delicatessen counters. However, it will add complexity and cost to the development of the machine. If sticky

labels are applied to containers, it will be necessary for the machine to be capable of removing old labels in the washing phase.

Alternative methods of labelling and barcoding may be available, and could be investigated in any further project development.

### *3.5.8 Machine Size*

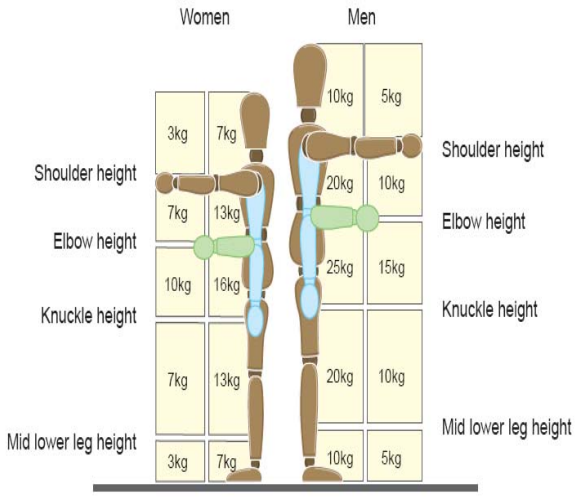
Evidently there is a trade-off between large dimensions for cabinets that both contain a wide enough range as well as the capacity for a significant volume of liquid. Unless the liquid is stored in remote containers the internal storage capacity is a non-trivial decision. Maximising the liquid storage capacity leads to reduced replenishment frequency. However if the feed relies upon gravity machine stability can be an issue. Many machines that dispense drinks use gravity to feed the products; as a result the equipment centre of gravity is relatively high. Some of the drinks machines currently on the market can weigh over 400kg when full. Dispensing equipment can be quite large and this impacts upon the ease of installation (access through standard doors, etc), may require high floor loading, specialised installation equipment (Manual Handling). Consequently a machine may need to be bolted to the floor.

Increased machine size also introduces a trade-off with the lost opportunity of sales from other retailed product displaced from the sacrificed 'lost' shelf space. Sales yield per metre of in-store shelf space is a key performance measure used by retailers.

### *3.5.9 Replenishment*

A clear design challenge is to give the system a 'volume' capability for maintaining throughput and service with the desire to maintain supply to consumers with minimum intervention. However restocking by store employees with individual 'packs' beyond 20kg approx without specialist handling equipment may risk breaching regulations. See below an illustration extracted from the UK's Manual Handling Operation Regulations 1992, HSE.

**Figure 17** Manual Handling Rules




### *3.5.10 Product Range*

Offering consumers a wide choice is, of course desirable but as the number of products rise then machine complexity and cost will also increase. The 'multi-variety' potential for tainting flavour will drive the need to purge nozzles, feed lines etc. This cleansing process will generate waste liquid requiring a collection tank or connection to drains, servicing and hygiene control.

Reducing the range potentially increases the 'yield' of the mainstream product but overall customer choice may reduce as could the revenue the retailer could have achieved from the shelf 'metres' lost by the machine's presence.

### *3.5.11 Container / Volume Options*

Dedicated re-usable 'brand' bottles can reduce nozzle/filler complexity but at a cost in the breadth of savings and consumer choice.

While limitations to' best' weight of product to be dispensed will be covered by the same regulatory limits as the replenishment activities it is unlikely that consumers would wish to purchase in quantities above 3 litres.

### *3.5.12 Payment Methods*

Most existing vending machines accept a variety of payment methods, coins, notes and credit cards. Some machines can communicate with mobile phones and debit the cost of the purchase from a pre-paid system. Other systems also offer the facility to change coinage and/or offer the correct change.

It is likely that any machine sites at a retail outlet would be required to comply with the retailer's existing Point of Sale (PoS) systems. Thus the machine would require some means of 'labelling' or bar-coding the consumers' container(s) with the quantity dispensed and product identification.

## 3.6 Economic Viability

### *3.6.1 Introduction*

As the preceding sections have shown there are many parameters to be considered in the design and operation of a self-dispensing machine.

It is therefore not possible within the resources and timescale of this project to provide a detailed breakdown of costs. Machines used to dispense fruit juices within hotels by residents commonly cost in the region of £3,000. A sophisticated can vending machine at the top end of the market may cost approximately £8,000 - £10,000. In this case the machine to dispense liquid into a consumer's container would probably be at the lower end of this spectrum. However if the machine needs to be capable of accepting and cleaning a variety of consumer presented containers the cost may rise considerably.

A number of dispensing machine suppliers were contacted for their views on the potential costs involved in developing, manufacturing and operating a machine that washed and filled bottles. Due to the fact that no machine on the market currently does this, a number of companies stated that it was impossible to determine without significant research. Some respondents did make estimates, although qualified that these were very much 'ball-park' due to the uncertainties involved.

Although it appears that there is no technological barrier to develop a machine that washes bottles, the cost of development must be considered in the context of the potential benefits (e.g. waste/carbon savings) and the risks of failure in the market.

However, there are varying types of dispensing technology options that might be considered for a trial:

- Machine for reusable bottles with container washing facility
- Machine for reusable bottles without container washing facility
- Machine dispensing drinks in flexible packaging

The last option listed above, although not meeting the specification outlined in the initial project document, does offer potential environmental benefits in terms of reduced packaging and reduced distribution through the use of post-mix. The costs of this option have been considered.

Below, we consider and compare the economic viability of each of these options.

### *3.6.2 Machine incorporating Bottle Washing*

**Development Costs**

One dispensing machine supplier remarked that the washing of reusable bottles element of the concept "*adds huge cost to the development because nothing like it exists today, therefore, it would be a virgin development starting from scratch, incorporating: dispense, chilling, packaging and sterilising all in one machine. No single manufacturer that I know of would have that capability*".

A number of suppliers estimated that development costs from scratch would be in the order of £500k-£1m. One suggested that development could take 18-24 months to bring to market.

**Capital Costs**
One supplier estimated that the cost per machine would be between £10-20k to the retailer. Another suggested production costs would be in the region of £7-11k. Typically, machines are leased to customers. An example was provided by one supplier where a machine is leased over 5 years at a rate of £65 per quarter per £1000 of capital. Therefore, a £10k machine could cost £650 per quarter to lease.

Installation including connection to water mains and drainage would be relatively low, approximately £200, although there may be additional costs to retailers in reorganising shelving, etc.

**Operating Costs**
One supplier provided estimates on the operating costs for a machine.

Electricity costs would be approximately £400 per year. Water costs in a machine that needed to wash each bottle individually could be high, although no estimates have been made, and it would depend on throughput.

The cost of producing the drink using concentrates can vary depending upon the percentage of juice content, and ratio of water to concentrate required. Concentrate syrups can range between 10p per litre to 50p per litre.

A standard vending machine costs in the region of £400 per year to maintain for parts and labour, although due to the complexity of the washing element of the proposed machine, it was estimated that maintenance costs would be higher, in the region of £800-1000 per year.

An additional cost would be water filter changes at £50 every 6 months.

### *3.6.3 Machine excluding Bottle Washing*

**Development Costs**
A beverage dispensing machine where the consumer washes their own bottle prior to returning to the shop for refilling already exists on the marketplace in the form of Glacier Water. Other on-trade machines serving a variety of beverage types essentially perform the same service i.e. in cafes and restaurants where customers self-serve juices and carbonated soft drinks. Therefore development costs for this type of technology would be small in comparison to a machine with a washing facility.

**Capital Costs**
Machines commonly found in hotels and similar establishments for use by residents for dispensing fruit juices typically cost approximately £3,000. A can vending machine may have a capital cost in the region of £7,000 depending on capacity and range. A dispensing machine with the full functionality to dispense product into a consumer presented container would cost more; circa £10,000. Installation costs are likely to be similar to the figure quoted above (£200).

**Operating Costs**
Operating costs would be lower than the bottle washing option, because of the reduced energy and water requirement from the washing phase.

Maintenance would also be lower, approximately £400 per year in comparison to £800-1000 per year for the machine with washing capability.

### *3.6.4 Machine Using Flexible Packaging*
Section 2.7.1 described the technology developed by a company called Waterwerkz, where drinks are dispensed into flexible pouches. There may be other existing or emerging technologies on the market that we have not found during our searches that could also offer environmental benefits.

The advantage of looking at these technologies compared with a bottle washing machine would be that the development cost would be vastly reduced.

The commercial viability of these systems that have already been developed and are on the market could be better understood.

### 3.6.5 *Illustrative Costs*

A machine may typically last 3 to 5 years. The table below is included purely for illustrative purposes. It assumes a high usage with consumers taking only 3 minutes to dispense their drink. At this rate of productivity the cost is between 3 and 4 pence per litre.

**Table 15** Illustrative Costs for Self-Dispensing Equipment

| | | | | | |
|---|---|---|---|---|---|
| Interest (Return on capital) | 6 | % pa | | Annual Equiv | |
| Machine: Installed Cost | 12000 | | | £ | 2,848.76 |
| Maintenance | 600 | 12 @ £50 | | £ | 600.00 |
| Replenishment | 2500 | £50/wk x 50 wks | | £ | 2,500.00 |
| Productive days | 360 | days | | | |
| Estimated Life | 5 | yrs | | | |
| | | | Total pa | £ | 5,948.76 |
| Cost per 'day' | | | | £ | 16.52 |
| hours per day | 12 | | | | |
| cycles per hour | 20 | | | | |
| Litres / cycle | 2 | | volume/day | £ | 480.00 |
| | | | cost per litre | £ | 0.034 |

## 3.7 Key Stakeholder Views

From discussions with stakeholders in the workshop and interviews, the key views on viability of in-store self-dispensing for each of the main groups are summarised below.

### 3.7.1 *Dispensing Machine Manufacturers*

The manufacturers of dispensing machines do believe that the technical issues posed could be overcome. However, since there is no vending machine on the market that currently washes, fills and seals beverage containers, the development costs are likely to be significant.

The resources required for R&D will be high, and they face the risk that those resources could be wasted if the product does not move beyond a trial phase to market. These companies may decide that their R&D resources are better spent on developments that hold less risk.

### 3.7.2 *Drinks Manufacturers*

A number of the major beverage brand owners were in attendance at the workshop. Brand integrity was a key concern for them, particularly for the major carbonate brands. It was concluded that these brands were unlikely to want their cola products sold through self-dispensing machines, because the quality would not be the same as ready bottled or canned products.

A number of attendees at the workshop agreed that this type of product would be more appropriate for own brand drinks or, a new or recent market entrant, for whom the risks associated with quality control were not so great.

### 3.7.3 *Retailers*

Meetings were held with two of the major food retailers to discuss the potential for in-store self-dispensing. Whilst both businesses were interested in the concept, they are a long way from committing to a trial. One suggested that a robust cost model would be needed to demonstrate the business case, before they would consider a trial. The other suggested that they would need to think long and hard about the type of machine and the type of beverage that would be appropriate.

# Summary of Analysis

The project has uncovered a complex range of issues. It is difficult to assess the feasibility of the original concept of a self-dispensing machine that washes reusable bottles, due to the lack of current examples on the market.

It is clear that environmental benefits may be achievable through implementation of self-dispensing systems, not only through reduced packaging consumption, but also through reduced transport from post-mix production. However, without understanding the full impacts associated with the manufacture and operation of dispensing machines, particularly if bottle washing is undertaken, it is not possible to make firm conclusions on comparative impacts.

As there are no vending machines that wash bottles currently on the market, we report only outline costs. It is clear that development costs from scratch for such a machine could be significant. Alternative options could be trialled at much lower costs, for example, where consumers wash their own bottles at home, or flexible packaging beverage machines. The costs of each option need to be considered in conjunction with the potential environmental benefits on offer.

Stakeholders are keen on the concept, although major brand owners have concerns over brand integrity. Machine manufacturers are concerned over the potential risks of market failure for an R&D project of such high potential costs. The retailers interviewed are interested in the potential of the idea but will need convincing of the business case.

## 4.0 Beverage Choice

### *4.1.1 Selection of Beverages*

The research undertaken and discussions with stakeholders has led us to a number of conclusions over the suitability of different beverages for self-dispensing.

The identification of the particular beverage for the first trial is problematic, in that there are many and various advantages and disadvantages in the particular choice of beverage and a consensus view on the most appropriate beverage for concept validation was varied.

It is clear that although alcoholic drinks offer great potential in terms of the quantity of packaging that is currently consumed, there are a number of considerable barriers faced in developing self-dispensing systems. Retailers pointed to the current sensitivity over alcohol and the current debate over setting minimum prices. In this context, developing a system that potentially offers cheaper alcohol compared to what is currently on the market poses difficulties for a number of stakeholder groups.

The general consensus of the workshop group, including the opinion of a representative from the alcoholic drinks sector was that the potential regulatory and practical obstacles surrounding alcoholic drinks meant that self-dispensing in-store was more appropriate for soft drinks.

The potential advantage in milk as a choice of liquid for self-dispensing is that compared to soft and alcoholic drinks, it is not a fragmented market. There are a small number of product types and brands, furthermore the own brands hold considerable market share. Therefore, the potential for market penetration is good even with just a few products across a small number of retailers.

However, the view of one representative from the milk industry was that the technical issues regarding milk and the concerns over hygiene meant that milk should be excluded from further consideration in terms of trials. This view concurred with that of the retailers, one of which also pointed out that because milk is such a big selling product, machines would need frequent replenishment, and the possibility of queues may dissuade customers from using the system.

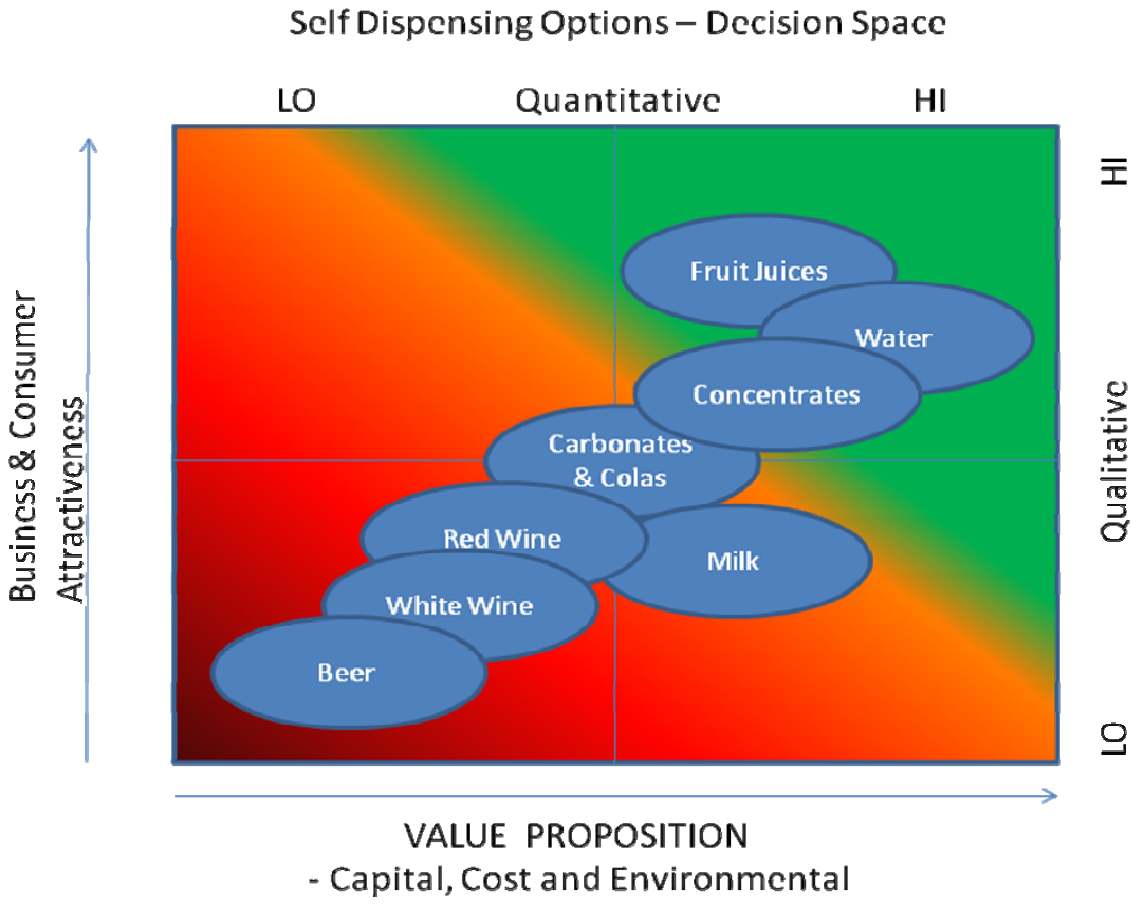
Within soft drinks, most attendees at the workshop agreed that carbonates would be the least attractive because of difficulties in carbonation, and particularly quality control for the major brands. Conversely, the retailers, although recognising the concerns over brand integrity did suggest that from initial consideration, carbonates would be one of their preferred options.

The consensus of the workshop group was that in-store self-dispensing was most appropriate for still soft drinks – water and fruit based drinks made from concentrate (juices or squashes). One of the retailers interviewed was less enthusiastic with the idea of fruit juices, because consumers associate juices with freshness and may not like the fact that a machine is producing the drink.

From this evaluation, we would suggest that orange juice from concentrate, i.e. as a post mix drink rather than ready to drink, or orange squash may prove to be the best initial beverage to prove or disprove the self-dispensing concept or alternatively provide the rationale to revise beverage selection and processes to validate a further trial. Both of these drinks offer the potential environmental and logistical benefits to be gained from post-mix production.

Although filtered water could offer similar benefits, less could be learnt from a trial involving this liquid that could inform on other types of beverages.

**Figure 18** Beverage Options – Decision Space




### *4.1.2 Environmental Benefits*

The potential environmental costs and benefits of the self-dispensing concept are discussed above in section 3.2. Further analysis has been conducted for those beverages identified as having best potential for a trial (fruit juices and fruit squashes), to assess potential quantities of packaging that might be saved. Water has also been considered, as it may be decided that since a machine using water in the production of drinks, for a marginal increase in cost, filtered water might be offered as an additional drink option.

**Primary Packaging**

Table 16 below provides study estimates of the tonnages of off-trade primary packaging for the identified beverage types. Estimates were made using packaging benchmark weights published by WRAP[36], and quantities of beverages identified in the market assessment in 2.2 above. Estimated proportions of beverage volumes packaged in each type of material are based on the data from Euromonitor[37].

Self-dispensing will never gain 100% market share from conventional packaged beverages, therefore packaging quantities under different market share penetrations are presented. At 20% market share, which may be considered an optimistic view on potential penetration, at least in medium term, would result in approximately 13k tonnes of primary packaging reduction for squashes, 25k tonnes for fruit juices and 14k tonnes for water. This reduction does not take account of the reusable bottles needed in self-dispensing, where the average number of cycles of reuse rates achievable is unclear.

**Table 16** Estimated Tonnages of Off-Trade Primary Packaging for Fruit Squash, Fruit Juice and Bottled Water

| '000 TONNES OF PACKAGING | % OF OFF-TRADE MARKET | | | | |
|---|---|---|---|---|---|
| | 5% | 10% | 20% | 50% | 100% |
| **FRUIT SQUASH** | | | | | |
| PET TOTAL | 1 | 2 | 4 | 9 | 18 |
| GLASS TOTAL | 2 | 5 | 10 | 24 | 48 |
| **TOTAL SQUASH** | **3** | **7** | **13** | **33** | **66** |
| | | | | | |
| **FRUIT JUICE** | | | | | |
| PET TOTAL | 1 | 3 | 6 | 14 | 28 |
| GLASS TOTAL | 2 | 4 | 7 | 19 | 37 |
| CARTON TOTAL | 3 | 6 | 11 | 28 | 57 |
| **TOTAL JUICE** | **6** | **12** | **24** | **61** | **122** |
| | | | | | |
| **STILL WATER** | | | | | |
| PET TOTAL | 2 | 4 | 8 | 19 | 39 |
| GLASS TOTAL | 2 | 3 | 6 | 16 | 32 |
| **TOTAL STILL WATER** | **4** | **7** | **14** | **36** | **71** |

**Secondary and Tertiary Packaging**

Data was provided by a drinks manufacturer on bottles per case, cases per pallet, and case weights for 1 litre and 2 litre fruit squash. It is estimated that 45kg of secondary packaging (corrugated and film) is consumed per pallet of 1 litre bottles (900 litres per pallet), and 32kg is consumed per pallet of 2 litre bottles (768 litres per pallet).

To place the quantity of secondary and tertiary packaging in perspective, in the example of fruit squash, the weight of primary PET packaging per pallet is 36kg for 1 litre bottles and 27kg for 2 litre bottles. Therefore in this example, secondary packaging is greater in weight than primary packaging, although it should be noted that almost all of this corrugated packaging will be collected for recycling.

Assuming these estimates are representative of all fruit squashes, and there is a 50:50 split between 1 and 2 litre sales by volume, approximately 25.6k tonnes of secondary packaging is consumed per year in all off-trade fruit squashes (see Table 17). Based on an average pallet weight of 25kg, just below 17k tonnes of tertiary packaging are used per year in the transport of fruit squashes, although of course this is reusable.

Table 17 compares the secondary and tertiary packaging requirements for ready-made fruit concentrates with post-mix syrups that could be used for producing fruit squash in a dispensing machine.

Secondary and tertiary packaging could be reduced significantly if using post-mix drinks for self-dispensing machines because of the reduction in liquid that requires transporting. A full pallet load of syrup for post-mix production of fruit squash requires 136 5-litre bulk containers, which could produce 3,400 litres of fruit squash in dispensing machines. To package this quantity of squash in the current system would require almost 4 pallet loads of 1 litre bottles.

[36] *WRAP – UK Packaging Benchmark - http://www.wrap.org.uk/retail/tools_for_change/uk_packaging_benchmark/index.html*
[37] *Euromonitor (2008) Beverage Packaging UK.*

The potential packaging savings clearly depend upon market penetration, but equates to a 70% saving in secondary packaging and a 75% saving in tertiary packaging. At 100% market penetration, post-mix production would result in approximately 18k tonnes savings in secondary packaging, and 12k tonnes savings in pallets required. At 20%, savings would be 3.6k tonnes and 2.5k tonnes respectively for secondary and tertiary packaging.

**Table 17** Comparison of Secondary and Tertiary Packaging Requirements for Ready-Made and Post-Mix Fruit Squashes

| | | Ready Made Fruit Concentrate | | | Post-Mix Fruit Concentrate | | |
|---|---|---|---|---|---|---|---|
| % of market | million litres (ready-made/post-mix equivalent) | Pallet Loads ('000s) | Secondary Packaging ('000 Tonnes) | Tertiary Packaging ('000 Tonnes) | Pallet Loads ('000s) | Secondary Packaging ('000 Tonnes) | Tertiary Packaging ('000 Tonnes) |
| 5% | 28 | 34 | 1 | 0.8 | 8 | 0.4 | 0.2 |
| 10% | 56 | 68 | 3 | 2 | 16 | 0.7 | 0.4 |
| 20% | 112 | 135 | 5 | 3 | 33 | 1 | 0.8 |
| 50% | 280 | 338 | 13 | 8 | 82 | 4 | 2 |
| 100% | 560 | 675 | 26 | 17 | 165 | 7 | 4 |

Notes:
Ready-made squash calculations based on PET bottles, with 50:50 split between 1 and 2 litre sales by volume.
Post-mix calculations based on 5-litre bulk containers.

**Transport**
Figures were provided by a drinks manufacturer on the number of bottles per pallet for fruit squashes in 1 and 2 litre PET bottles. Assuming a 50:50 split in volumes packaged in each, estimates have been made of the equivalent truck loads under different market shares. Approximately 30k equivalent truck loads of fruit squash are transported each year, travelling an estimated 7.2m km. Using DEFRA greenhouse gas emissions factors, it is estimated that this results in 6.7k tonnes of $CO_2$ emissions.

**Table 18** Transport Requirements for Delivery of Ready Bottled Fruit Squash

| | % OF OFF-TRADE MARKET | | | | |
|---|---|---|---|---|---|
| **million litres** | 5% | 10% | 20% | 50% | 100% |
| Total | 28 | 56 | 112 | 280 | 560 |
| 1 litre | 14 | 28 | 56 | 140 | 280 |
| 2 litre | 14 | 28 | 56 | 140 | 280 |
| **Truck loads ('000s)** | | | | | |
| 1 litre | 0.7 | 1 | 3 | 7 | 14 |
| 2 litre | 0.8 | 2 | 3 | 8 | 17 |
| TOTAL | 2 | 3 | 6 | 15 | 31 |
| | | | | | |
| av. length of haul beverages 2007 (km)* | 118 | 118 | 118 | 118 | 118 |
| total length return (km) | 236 | 236 | 236 | 236 | 236 |
| total distance ('000 km) | 362 | 724 | 1,448 | 3,621 | 7,242 |
| kg $CO_2$ per km ** | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| '000 tonnes of $CO_2$ | 0.3 | 0.7 | 1 | 3 | 7 |

Notes:
* DfT (2008) Road Freight Statistics 2007
** DEFRA (2008) Guidelines to Defra's GHG Conversion Factors

Data provided by a drinks manufacturer enabled a comparison of transport requirements to be made between ready made squash as illustrated above and a post-mix fruit squash. It has been assumed that 5 litre bulk containers are used for transporting syrups, and that the ratio of water to syrup in post-mix production is 4:1. It

is possible to get much higher ratios, up to 20:1 with no sugar cordials. Clearly the transport benefits with higher concentrations will be much greater.

A pallet can hold 136 5-litre bulk containers, or 680 litres of syrup in total. A pallet load of syrup is the equivalent of 3,400 litres of prepared squash. In comparison, a pallet load of ready made squash in 1 litre bottles contains 900 litres of liquid. The potential transport benefits of post-mix production are illustrated in Table 19 below. At 100% market penetration of fruit squashes, post-mix production would result in just below 7.5k truck loads, compared with 30k truck loads for ready made squash. This would result in a reduction of $CO_2$ emissions from 6.7 k tonnes to 1.6 k tonnes. At 20% market penetration, the $CO_2$ emissions benefits from transport savings are approximately 1,000 tonnes.

**Table 19** Transport Requirements for Delivery of Fruit Squash Syrups for Post Mix Production

| | % OF OFF-TRADE MARKET | | | | |
|---|---|---|---|---|---|
| **million litres** | 5% | 10% | 20% | 50% | 100% |
| Total | 28 | 56 | 112 | 280 | 560 |
| **Truck loads ('000s)** | | | | | |
| TOTAL | 0.4 | 0.7 | 1.5 | 3.7 | 7.5 |
| | | | | | |
| av. length of haul beverages 2007 (km)* | 118 | 118 | 118 | 118 | 118 |
| total length return (km) | 236 | 236 | 236 | 236 | 236 |
| total distance ('000 km) | 88 | 177 | 353 | 883 | 1,765 |
| kg $CO_2$ per km ** | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| '000 tonnes of $CO_2$ | 0.1 | 0.2 | 0.3 | 0.8 | 2 |

Notes:
* DfT (2008) Road Freight Statistics 2007
** DEFRA (2008) Guidelines to Defra's GHG Conversion Factors

## 5.0 Trial Specification

### *5.1.1 Introduction*

In the time available and drawing from our analysis and the views gathered from the brand owner and equipment provider workshop, there was a general consensus that a trial would be useful in proving the self-dispensing concept and in evaluating the potential sustainability of self-dispensing systems for wider application.

The retailers interviewed were clearly interested in the concept; however they would need convincing of the business case before committing to a trial.

### *5.1.2 Aim*

The aim of the Trial would be to evaluate:

- **Consumer Response and Acceptability** – Positive consumer response is fundamental in pursuing the concept further and potentially proving a rationale for a further trial with a different beverage (benefiting from feedback on technology, operation, etc) or abandonment of the concept for the moment.
- **The Business Case** – While consumers may accept the concept of self-dispensing, it is only realisable if a substantive business case can be developed to validate the change commercially for the various stakeholders involved. An evaluation of orange juice or squash in particular and its potential elsewhere may or may not prove to be viable. That is not to say, however, that the concept is necessarily flawed but the initial beverage selection might be wrong. However, this initial trial will provide considerable evidence one way or the other.
- **Environmental Benefits** – Environmental benefits may come in a variety of forms and consequences. Packaging, transport, $CO_2$, energy, water could be early indicators of benefits that need to be positioned in line with customer acceptability, the business case and overall sustainability.
- **The Value of Time** – Time and timing are important dimensions for the trial; for consumers in terms of cleaning and then filling their bottles; time required to change consumer behaviour, time to change supply

chains and the time for further and wider change. It has taken some time for customers to take their own bags when shopping. Similar response time constraints may be a factor for consideration in this trial.

- **Regulations** – The trial will be undertaken, necessarily, within tight regulatory requirements, the precise nature and implications of those regulations will need to be identified for orange juice or squash and their wider implications for further trials and different beverage types

### *5.1.3 Trial Approach and Specification*

Having decided upon orange juice or squash as the trial beverage, it is possible to focus on orange juice or squash in particular, but also with the wider perspective on how this might affect further consideration in terms of beverage types and the other considerations outlined in the aims above.

We would suggest a 3 Stage approach to the initial Trial:

- Stage 1 – Establish Trial Management – How is it going to be done?
- Stage 2 – Trial Implementation – What is happening or happened?
- Stage 3 – Trial Evaluation and Recommendations for any further Trials – What does it tell us?

These Stages are considered further below.

### *5.1.4 Stage 1 Establish Trial Management*

To direct and facilitate the trial we would envisage a Project Board with a 'Project Champion' as Chair (presumably WRAP) and comprising representatives from the equipment provider, beverage supplier and retailer. In addition, a Project Manager would be appointed with responsibility for day to day co-ordination of activity and to report progress to the Board.

The tasks and considerations set out below reflect the level of detail possible within the time available for this project. Clearly, when the organisations involved in the trial are identified and the Board comes together, they will have their own views and opinions on the content of these stages. We would envisage the specific tasks as:

**The Board**

- Finalise the Trial Plan, including trial duration, with detailed specification of requirements for participating organisations.
- Produce trial budget, resources and IPR mechanisms.
- Define the supply chain in detail identifying processes and resources at nodes and links
- Agree the design and procurement process for the self-dispensing equipment
- Communicate roles and responsibilities, detailed requirements and co-ordinating instructions to participating organisations
- Agree method of evaluation and performance measures
- Initiate and direct trial implementation in conjunction with the project manager
- Evaluate and manage the budget
- Analyse data to conclude proof of concept or the need for further trials
- Agree consumer survey method, questionnaires, sample size, regularity etc
- Consider marketing or PR to create initial interest and demand
- Location and local consumer demographics
- Where necessary liaise with Regulatory Authorities for trial compliance

**Project Manager**

- Co-ordinate and monitor planned day to day activities
- Attend on-site as necessary to monitor activity
- Report and record any deviations from planned activity and take action if appropriate or recommend remedial action to the Board
- Periodic reporting of progress to the Board as required
- Collect, collate and analyse data reports

**Equipment Supplier**

- Design the self-dispensing equipment, in accordance with the Board's specification and provide a cost estimate for manufacturing
- If agreed, manufacture the equipment
- Install (including connection to water supply) and maintain the self-dispensing equipment at the store(s) location
- Provide agreed data

**Brand Owner**

- Provide the orange concentrate packaged in agreed format and transport to retailer RDC or store
- Provide a price for the orange juice
- Provide some suitable empty bottles for initiation of trial
- Coordinate with equipment provider on machine design
- Coordinate with retailer on delivery form, format and timing
- Provide agreed data

**Retailer**

- Provide a suitable store location and staff time to undertake implementation of the trial.
- Liaise with the equipment provider to install equipment (including connection to water supply)
- Provide a selling price for the orange juice
- Coordinate with equipment provider on design detail for labelling, pricing and method of sale
- Provide agreed data

### *5.1.5 Stage 2 – Trial Implementation*

We see the trial implementation to involve 4 elements:

- Confirm outputs of stage 1 and agree/re-affirm timescales and budget controls
- Collection of relevant data and opinions as the orange juice passes through the supply chain into a store location and then onto consumers. This data would be collected at the relevant nodes and links. Responsibility for data collection would be agreed in the Trial Plan.
- A consumer survey to collect views and opinions on-site. The survey would be undertaken using an agreed questionnaire to consider views on questions, such as:
    - Acceptability
    - Understanding of self-dispensing concept – reasons why?
    - Reason for self-dispensing on this occasion
    - Visual appeal and attractiveness
    - Value for money
    - Ease of use and convenience
    - Value of time – cleaning/filling
    - Re-use of containers
    - Remembering/willingness to bring a container(s)
    - Cleanliness and hygiene issues
    - 'Novelty' users/re-users
    - Consumer profile
- Filming consumer response by CCTV or with an overt camera to provide evidence for actual activity and consumer behaviour.

The specification of data and its collection would be designed to provide evidence for:

- Consumer response, in conjunction with the customer survey
- Discussion regarding the business case for further development or the need for a further trial
- Substantiate the environmental implications for pursuing the self-dispensing option.

We have set out in Table 20 overleaf some considerations for specific areas of data requirement. Clearly, the extent and actual level of data collection will depend upon the organisations involved and their willingness to record data, allocate staff time, and reveal costs.

**Table 20** Data Requirements for Trial(s)

| | Packaging | Transport | Space | Energy | CO2 | Water | Cost/revenue | Time |
|---|---|---|---|---|---|---|---|---|
| | Used/Saved | Used/Saved | Used/Saved | Used/Saved | Used/Saved | Used/Saved | Used/Saved | Used/Saved |
| **Beverage Provider** | | | | | | | | |
| Produce orange concentrate | ✓ | | | | | ✓ | ✓ | |
| Packaging Overall | ✓ | | ✓ | | | | ✓ | ✓ |
| primary by type and weight | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| secondary by type and weight | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| tertiary by type and weight | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Store | | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| Time in storage | | | ✓ | ✓ | | | ✓ | ✓ |
| Sq m | | | ✓ | ✓ | | | ✓ | ✓ |
| Transport to Retailer site | | ✓ | | | ✓ | | ✓ | ✓ |
| Units per plt | | ✓ | ✓ | | | | ✓ | ✓ |
| Plts per vehicle | | ✓ | ✓ | | | | ✓ | ✓ |
| Journey time and distance | | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| Fuel consumption | | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| **Retailer** | | | | | | | | |
| Receive into store (1) | | | ✓ | ✓ | | | ✓ | ✓ |
| Move to location | | | ✓ | ✓ | | | ✓ | ✓ |
| Store | | | ✓ | ✓ | | | ✓ | ✓ |
| Time in storage | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ |
| Move to equipment | | | | ✓ | | | ✓ | ✓ |
| Fill Equipment | | | | ✓ | | ✓ | ✓ | ✓ |
| Dispense Overall | | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Time to clean | | | | | ✓ | | ✓ | ✓ |
| Time to dispense | | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| First time user | ✓ | | | | | ✓ | ✓ | ✓ |
| Reuser | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sales Overall | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Percentage penetration | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Swtch from pakaged product | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| New sales | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Pricing and dispensing accuracy | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Water used in dispensing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Waste disposal | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Training requirement | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Equipment Provider** | | | | | | | | |
| Production | | | | ✓ | ✓ | | ✓ | ✓ |
| Installation | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Servicing | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Repair | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ |

(1) Assuming that for the trial the concentrate will be delivered directly to the store

Some further issues that may be included and reviewed in the analysis are shown below.

**Beverage Provider**
- 'Packing line' switch-over
- Impact of Inventory reduction/expansion
- Perceived packaging benefits
- Overall logistical/supply chain change
- 'Promotional' opportunities/threats.
- Quality retention and brand integrity

**Retailer**
- Reliability of initial equipment and potential for improvement
- Impact on store revenue
- Integration with existing systems
- Acceptability, i.e. percent penetration/switching to self-dispensing/'new' sales
- In store operational processes and economics
- Locational influences – footfall, consumer profile
- Cleaning and replenishment, frequency and aisle disruption
- 'Promotional' opportunities/threats
- General compatibility with PoS and re-order systems
- Refund practices and procedures
- Staff training overall

**Equipment Provider**
In terms of this project duration and our limitations in experience in self-dispensing equipment design and manufacture, it would be entirely unrealistic to do anything other than suggest some considerations that have become apparent from the WRAP project brief and our interviews and workshops.

Our considerations are presented in that context:

- Be stable, safe and secure
- 'Store' sufficient concentrate
- Be replenished manually i.e. 20 -25kg 'packs' or accept feed from remote tank(s)
- Dispense a 'measured' amount
- Issue amount in acceptable time
- Purge / clean feed lines and nozzles
- Maintain liquid at optimum temperature
- Capture spillage, cleaning effluent
- Accept single or variable sized bottles
- Affix 'top' and seal container
- Sterilise consumer's container
- State on machine or on label regulatory requirements
- Label with issued quantity or cost of beverage compatible with existing PoS technology (container could be weighed at checkout).
- Optional:
  - Multiple flavours, e.g. barley water, lemon, apple, blackcurrant, in order to provide consumers with further choice.

### *5.1.6 Stage 3 – Trial Evaluation and Recommendations*
The aim of this final stage is to enable the trial Board to evaluate trial data and opinion to make recommendations with regard to:

- Confirm outputs of stage 2 and agree/re-affirm timescales and budget controls.
- Self-dispensing concept feasibility with regard to beverages
- Identification of the business case and the environmental benefits
- Areas for improvement on initial design and supply chain processes
- Potential for a further trial with a different beverage
- Packaging waste reduction opportunities
- The potential to act as a catalyst for change and provide information for:
- Change in consumer behaviour
- Change in retailer supply chains
- The potential for self-dispensing of other liquid products, i.e. soap, cleaning products, shampoo, cooking oil, etc.

## 6.0 Conclusions

This Scoping Study has been undertaken in a relatively short time. Thus it has not been possible to provide a detailed business case or detailed environmental data.

On that basis and in these conclusions we have included some wider ranging questions that have occurred to us during the course of the project, as well as the more tactical and operational considerations in particular.

Product innovation, consumer behaviour, market penetration and environmental impact are all subjects that are notoriously difficult areas to research. Through BERR and other organisations, the UK government continuously seeks ways of encouraging corporations to bring new designs to the market. The concept of self-dispensing requires innovative equipment and new ways for retailers to offer consumers access to beverages which they can 'dispense' into containers they re-use.

In the UK, retailing has changed over the last half century to a situation where supermarkets dominate the selling of food and drink. These large organisations often find it difficult to bring innovative ideas to the market place. Often their lengthy decision making processes and business structure filters out new approaches and concepts. Frequently it is committed individuals who have the clarity of thought that drive forward innovation. An example is Anita Roddick founder of the Body Shop who brought a new approach to ethical and responsible retailing that captured a latent consumer demand. These entrepreneurial innovators often crystallise change in consumer's behaviour then larger companies observe this momentum and further exploit the opportunity.

It is the nature of drinks retailing that the potential environmental savings from self-dispensing will require the participation of the major supermarkets. A trial is one way in which the data and evidence they require for their investment, market penetration and cost benefit analyses can be developed. However we are mindful that the 'micro-production' style of operations that the vending equipment will perform does generate opportunities for small agile niche businesses. For these businesses their location in a culturally and demographically sympathetic area would be crucial. Consequently a trial is the only potential and efficient manner in which all the many and varied parameters embodied in the concept of self-dispensing can be investigated

Clearly, unless a trial is undertaken, the concept of self-dispensing in retail stores will remain just a possibility for beverages in the UK. The concept has been considered by UK retailers in the past, but in their estimation and reaction it has not hitherto provided a sufficiently robust business case for them to pursue further; for beverages, as well as for other liquids. Retailers interviewed have confirmed that in so many words. But from their response, they also appear willing to consider a trial now, possibly in light of changing circumstances and perspectives, albeit with provisos. We have been unable to establish whether in the past any potential retailer considerations were explored with brand owners or equipment providers at the time and in any detail.

To establish a sustainable reason for self-dispensing, i.e. pursuing both cost and environmental benefits, involves all players in the 'end to end' supply chain. The financial costs and benefits from self-dispensing will not be equitably split within the supply chain, initially, or over time. There will be some perceived winners and some losers in various areas. Thus precise detail from the trial will be essential regarding the logistic and environmental benefits in establishing the business case, not only for those involved but also for wider stakeholder advantages.

Many and various concerns have been raised that exemplify the 'issues' that need to be addressed when considering a trial. It is also fair to say that most of these hurdles also appear to have workable solutions, at a cost, but also with potential and realisable benefits. The selection of orange juice and squash overcomes many of these difficulties.

As discussed above, the cost and the time taken for the research, design and manufacturing of a machine that is equipped to sanitise returned bottles could be a major challenge in initiating a trial in the short term. In the circumstances it may be appropriate to consider equipment that is simpler or already available. A system such as that developed by Waterwerkz could be used to prove the concept and while it does not encourage reuse of packaging, it could lead to a reduction in packaging, and also exemplify the advantages arising from transport, particularly the transport of water.

The essential decision is whether the investment in a trial will achieve the potential benefits that might accrue from the trial acting as a catalyst for wider application, and whether the overall environmental benefits that might be achievable warrant the financial cost. Time and timing of activities is likely to be fundamental as well as cost in realising aims and objectives. We are aware of other trials being considered for non-beverage liquids. These

trials, whichever comes first, will necessarily provide additional information for self-dispensing of beverages as to the business case and the resulting environmental benefits.

It is possible that the litmus test for any trial(s) will be in the willingness of organisations to become project partners. While there was a positive response for a trial in general, direct involvement in a trial was more muted.

More specific conclusions are as follows:

- The drinks market is big, but it is fragmented across a multitude of flavours, brands, supply networks and containers styles and sizes. Consequently to achieve environmental benefits from reduced packaging requires the self-dispensing concept to be widely adopted.
- Machine technology is not a barrier but the cost of developing a device that will not only dispense liquids in a hygienic, controlled and consumer effective manner but also allow brand quality to be maintained is a challenge.
- Alcoholic drinks are probably not suitable for social reasons, and they are technically more challenging.
- Carbonated drinks are likely to lose 'gas' quickly degrading the quality so this sector is also less suitable for self-dispensing.
- Regional water taste is important in assuring brand quality.
- Milk is sold in considerable volumes, there are few players in the supply chain and it is a relatively homogeneous product. Hygiene control is perceived as a major challenge.
- Post mix fruit juices and squashes have supply chain advantages from reducing the transport of water. The volume of sales and the relatively few equipment suppliers indicate these beverage types as potential candidates for pilot trials.
- Potential trial stakeholders are unlikely to provide trial funding without a comprehensive cost-benefit case being made. This suggests any pilot project should be conducted in Phases so that any investment can be validated in a progressive and risk contained approach.
- The 'prototype' machine would represent a significant cost if it includes bottle cleaning. Stakeholders will need to decide on the number of machines needed for the trial and whether a single site, single machine would provide sufficiently robust data for generalisation of the market penetration of the concept to be assessed.
- More refined research and discussions between potential trial stakeholders will undoubtedly be required before a trial programme is agreed.

## 6.1 Recommended Next Steps

The initiation of a trial should consider how the environmental impacts will be measured. In this instance the change to self-dispensing has the potential to affect the upstream supply chain from drinks manufacture through to the consumer. Whilst there are apparent benefits in terms of reduced packaging and transport, additional environmental impacts will result from activities such as machine manufacture and operation. Bottle washing, whether undertaken by consumers or the machine, will have impacts in terms of water and energy that need to be clearly understood.

The 'pilot' panel of stakeholders would be advised to use computer simulation to map these processes and assess the anticipated magnitude of change in carbon, cost, energy and water before finalising the trial schedule.

# Appendix 1 Summary of Workshop

A workshop was conducted at WRAP's offices in Banbury on 5th March with stakeholders in the drinks manufacturing and dispensing equipment sectors to explore the feasibility of in-store beverage self-dispensing.

The aim of the Workshop meeting was to explore and rank the issues surrounding the viability of beverage self-dispensing in retail outlets.

To supplement the project briefing note provided to attendees prior to the workshop, a presentation was made that provided background to the project including aims and objectives, followed by an outline of the key findings from the desktop research.

Attendees discussed the key issues surrounding self-dispensing in mixed groups, before a combined group discussion attempted to arrive at consensus on the opportunities and constraints, and potential feasibility of such systems being implemented.

The table below summarises the views of the workshop members on the opportunities and constraints for different stakeholder groups.

| | Opportunities | Constraints |
|---|---|---|
| **Vending Machine Maker** | There is a business opportunity in a new market.<br><br>Technical issues are not necessarily a problem for soft drinks. Most of these technologies already exist in on/off-trade machines.<br><br>Many of the problem issues identified have been overcome in the on-trade<br><br>Need to make equipment attractive e.g. children like watching the internal mechanics of machines. | Development costs could be high (quoted at £1m by one attendee), therefore this would need subsidising.<br><br>When in 'full' production a machine might cost £7k - £11k<br><br>Cycle time/difficulty in washing containers for reuse.<br><br>Who pays for equipment is a significant constraint. Equipment is usually free on loan, from Drink manufacturer with the customer (retailer) paying for maintenance.<br><br>Carbonates – challenges including chilling and retaining level of carbonation before closure.<br><br>Coping with different bottle sizes |
| **Drinks Manufacturer** | For new or newer market entrants, could be an opportunity to enter market.<br><br>In comparison with the major carbonate brands, quality control is less of an issue for new market entrants, own brands and in juices/cordials.<br><br>Might be a better opportunity for new/own brands, because established brands are concerned more with keeping existing markets rather than looking for new ones.<br><br>CSR benefits.<br><br>Potential access to alternative outlets. | Brand owners have invested heavily in factories. Effectively this system would involve further investment in 'micro-factories'. In their own factories quality is assured. In self-dispensing machines, quality would not be assured. Quality control would need a 'police force'.<br><br>For major brands, quality is a constraint. Brand control – complexity in using post-mix.<br><br>Immediate loss of significant carbonation<br><br>Ownership and maintenance of equipment – brand owners would need to retain control |

| | Opportunities | Constraints |
|---|---|---|
| | Potential for cost reduction<br><br>Differentiation from competitors<br><br>An opportunity for new product range where customers choose a mix of flavours. | Investment/agreement with retailer. It could create tension between supply chain partners (i.e. retailers and brands).<br><br>In using branded drinks, there are marketing constraints where competitors e.g. Pepsi and Coke won't want to mix brands on machines.<br><br>Branding/labelling on bottles – how do they ensure brand identity.<br><br>Differences in taste of water in different areas<br><br>Marketing/PR costs |
| **Supply Chain Logistics** | If using post-mix, reduction in transport of water.<br><br>Reduced packaging (primary and secondary), and therefore packaging responsibilities | Investment required in building 'micro-factories' and associated infrastructure and supply chains.<br><br>Changed packaging, storage and transport of new product types and sizes<br>Shelf life reduced for larger volume<br><br>Would it require different tankers for different products?<br><br>Shelf life reduced for larger volume<br><br>Stock reduction/increase |
| **Retailer** | Opportunities from a new (emerging) market<br><br>Cost reduction<br><br>Own brand growth<br><br>Differentiation/CSR<br><br>An opportunity for new product range where customers choose a mix of flavours.<br><br>'He who owns water is king' – if post-mix, then retailer has potential for greater margins. | Labelling - ensuring all the necessary information e.g. ingredients, dates, barcode, etc. was provided on each label for each drink dispensed<br><br>Economics – will it be cheaper than current alternatives?<br><br>Taxation on carbon and water in the future – this type of system would increase costs for retailers<br><br>Shelf life and sell by dates – shelf life is decreased by larger volume containers (fruit juices etc)<br><br>Would require a licence for breaking seal on alcohol<br><br>Age control for alcohol<br><br>Encouraging sale of cheaper alcohol against current moves by Government/Scotland.<br><br>Regulatory requirements for alcohol<br><br>Staff training on machine operation, replenishment, manual handling, etc., a |

| | Opportunities | Constraints |
|---|---|---|
| | | significant issue with retailers where many workers including those on part-time/shift work may need to be trained.<br><br>Issues about own bottle - hygiene, sizes, material, sealing, recording content, labelling, bar coding<br><br>Opportunity cost – shelf loss.<br><br>H&S/Hygiene/Liability<br><br>Potential for commoditisation<br><br>Downtime<br><br>Risk/insurance from contamination/hygiene problems.<br><br>Refunds – what would be mechanism if went wrong<br><br>Provision of bottles, storage, range of sizes.<br><br>Ownership and maintenance of equipment<br><br>Cleaning of equipment |
| **Consumer** | Feel-good factor from 'green' purchase<br><br>Potential to save money<br><br>The ability for consumers to choose mixes of drink flavours<br><br>Weight reduction<br><br>Minimise landfill (potential future penalties) | There needs to be a readily perceived benefit for the consumer, and this must be cost first, then feel-good factor.<br><br>Expectation of the same level of quality<br><br>Requires organisation - dealing with bottles – keeping empty bottles at home (space), remembering to return<br><br>Value of time – how long will consumers wait for cleaning and refill?<br><br>Lack of a container could preclude impulse buying |
| **Regulators** | Labelling – much of the information can be provided on the machine rather than the packaging<br><br>License fees | Control of alcohol – weights and measures |
| **Environment** | Post-mix offers great potential to reduce transport of water.<br><br>The closer production and consumption are together the greater the potential benefits.<br><br>Therefore even greater benefits could be | There are still questions to be answered – the environmental arguments are more complex than just packaging e.g. what are the environmental impacts of cleaning bottles? More machinery to operate and maintain may be more carbon intensive. |

| | Opportunities | Constraints |
|---|---|---|
| | gained by producing products that people make at home, e.g. syrups/powders | Have gone from glass to PET. Are we going backwards?<br><br>LCA would be complex - complex supply chains. However, would need examining in trial. |

**Which Beverage?**

One attendee did not believe it was worth piloting at the moment as there are "too many holes "– it needs better understanding. However, the majority of other attendees believed that despite the many constraints, it would be worth exploring further but only in certain types of beverage.

The general consensus of the group, including the opinion of a representative from the alcoholic drinks sector was that the potential regulatory and practical obstacles surrounding alcoholic drinks meant that self-dispensing in-store was more appropriate for soft drinks.

The view of one representative from the milk industry was that the technical issues regarding milk and the concerns over hygiene meant that milk should be excluded from further consideration in terms of trials.

Within soft drinks, most agreed that carbonates would be the least attractive because of difficulties in carbonation, and particularly quality control for the major brands.

Therefore, the consensus of the workshop group was that in-store self-dispensing was most appropriate for still soft drinks – water, juices and concentrates.

There was also agreement that self-dispensing of non-beverage liquids also held potential.

**Waste & Resources Action Programme**

The Old Academy
21 Horse Fair
Banbury, Oxon
OX16 0AH

Tel: 01295 819 900
Fax: 01295 819 911
E-mail: info@wrap.org.uk

Helpline freephone
0808 100 2040

www.wrap.org.uk/retail

recycle