CRANFIELD UNIVERSITY

EVA RUSNAKOVA

DETERMINING THE ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS OF A LOCAL FOOD MARKET STALL: A CASE STUDY OF THE VEG VAN.

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MSC THESIS

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Abstract

Increasing the supply and demand of fruit and vegetables that are produced locally and in season presents a possible strategy to meet UK government health and environmental objectives. In the London Borough of Sutton, a renovated milk float called the Veg Van has begun selling locally produced fruit and vegetables, aiming to increase the consumption of local and seasonal produce, as a part of the One Planet Food project, run by local charities.

The aim of this study was to determine the environmental and socio-economic impacts of the Veg Van. This was achieved through a survey of the Veg Van's customers and interviews with the Veg Van staff, project manager and its suppliers over a three weeks period in July and August 2010. Greenhouse gas (GHG) emissions from the Veg Van and its customers shopping trips were calculated and an economic local multiplier LM3 method was used to estimate local economic impacts.

Social interaction between customers and producers increased because of the Veg Van and was stated as highly important for both customers and stakeholders. Also, there was a perceived increase in the healthiness of diets through increased access to fresh produce. The GHG emission related to the Veg Van was relatively low compared with other vendors of fruit and vegetables, as a result of a low-carbon delivery system and the Veg Van's convenient location. The Veg Van had significant positive effects on the local economy, because the majority of money spent by the Veg Van was spent locally. The results from the local multiplier LM3 model showed that every £1 spent in the Veg Van would generate an additional £1.6 in the local economy, compared with just £0.4 when the same amount was spent in a supermarket.

The positive impacts of the Veg Van are expected to increase once it becomes more established. Further funding and support of projects with a similar concept also in other areas of the UK is recommended, as this study suggests such initiatives make important contributions to environmental, social and economic objectives.

Keywords: local food; seasonality, farmers' markets; fruit and vegetables.

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This thesis has been prepared in the format used for scientific papers appearing in the journal 'Ecological Economics'. The paper includes an extended literature review.

1 Introduction

The current state of the food sector is of concern to health and environmental specialists. According to the UK Government 2030 food strategy (DEFRA, 2010), the UK food chain is responsible for as much as 22% of all UK greenhouse gas (GHG) emissions from economic activity. Until recently, the environmental footprint of food has been measured by the distance that food travels, as "food miles". Although food miles, for the food basket of the average UK consumer, have increased substantially, in recent years, along with their environmental impact (The Healthy Leeds Partnership, 2006), life cycle analyses has shown that food miles are not an accurate measure of environmental impacts, as other factors besides transport, such as energy used in production, storage or cooking should be taken into account (DEFRA, 2010; Making Local Food Work, 2010).

In terms of GHG emissions from food consumption, meat and dairy was estimated to be the primary diet-related contributor to GHG emissions (Kim and Neff, 2009), followed by fruit and vegetables (BioRegional and London Sustainable Development Commission, 2009). Levels of GHG emissions of fruit and vegetables vary significantly according to means of transport, number of food miles, and also intensity of energy use within the food chain, for example, by use of heated greenhouses or refrigerators to grow or store food. The UK is a net importer of fruit (91% of the domestic supply is imported) and vegetables (38% imported) so the environmental impacts of fruit and vegetable consumption are significant (Garnett, 2006). Garnett (2006) defines air freighted produce, not in season Mediterranean style produce, pre-prepared, trimmed or chopped produce and fragile or highly perishable foods, as the most GHG intensive foods. On the other hand, local field-grown seasonal fruits and vegetables are considered to be a relatively low GHG emission activity.

Besides the environmental impact of food, it is necessary to consider also the health and nutritional characteristics of different food types within the UK food sector. The consumption of fruit and vegetables, in particular, is essential for a healthy diet, as they are good sources of vitamins and minerals, an excellent source of dietary fibre and usually also low in fat and calories, which helps to maintain a healthy weight (Glanz and Yaroch, 2004; National Health Service, 2009). Higher intakes of fruit and vegetables reduce the risk of cardiovascular disease, ischemic stroke and also cancer (Alaimo et al., 2008; Bazzano et

al., 2003; The Healthy Leeds Partnership, 2006). Despite the recommendation of the UK government to consume five portions of fruit and vegetables per day, and a number of campaigns to increase their consumption (DEFRA, 2010), the latest available statistics show that only 28% of the UK population achieved this recommended daily target. (DEFRA, 2003b)

A possible solution for both health and environmental concerns related to the fruit and vegetable sector is to use fruit and vegetables that are produced locally and in season. Typically, they are sold through various local food systems, for instance, farmers' markets, farm shops or box delivery schemes, community-supported agriculture, community food enterprises or farmers cooperatives (Nilsson, 2009; Pirog, 2009). Currently, there is no information available about the proportion of the UK domestically grown fruit and vegetables that are produced locally and in season. However, latest national statistics show that local food markets, including local fruit and vegetables, present only 1 – 5 % of total grocery market share (Defra, 2003a). But their popularity has been increasing in the recent years, as they have been promoted as sustainable alternatives to a globalised food system (Marsden et al., 2000).

Unlike in conventional food systems, supply chains of local food, including fruit and vegetables, are shorter and customers usually have direct contact with producers (Brown et al., 2009; Nilsson, 2009; Pirog, 2009). Local food is grown near to consumers; therefore, relative to conventional food chains, locally grown food reduces food miles and distribution costs, and also offers the possibility of increasing income in local communities (Defra, 2003a; Brown et al., 2009). In addition, locally produced food is claimed to be relatively fresher, more nutritious and has higher animal welfare standards (BioRegional Development Group, 2008). However, the sustainability of local systems depends on several factors and often they do not fulfil their potential (Edward-Jones et al., 2008).

In the fruit and vegetables sector, besides the issue of producing locally, seasonality is also important. Cold storage of fruit or vegetables that are out of season, or production in heated and/or lighted greenhouses has a significant environmental impact relative to outdoor production, even when grown locally (DEFRA, 2010). The UK government is aware of the importance to encourage growing and buying food locally, and seasonality has therefore been included in the UK Government's 'Food 2030' strategy.

As a consequence, many cities and communities within the UK have already developed their food strategies with focus on local food systems and seasonal produce.

In the London Borough of Sutton, the One Planet Food project aims to reduce the ecological footprint of the area and improve the local diet by making locally produced food more accessible and affordable to local residents. (BioRegional, 2010) The project is held by two local environmental charities BioRegional and EcoLocal, and funded by The Big Lottery Local Food Fund, Sutton and Merton NHS, Sutton Council and The Esmée Fairbairn Foundation. As a part of this three year project, a renovated local allotment will provide food growing, healthy eating and cooking activities. In addition, produce is grown on a community farm that was launched in February 2010. Also, an establishment of local food networks is planned to supply local produce to schools and hospitals in Sutton. Since March 2010, a renovated electric milk float called the Veg Van has been selling fresh, local and not for profit fruit and vegetables, grown on the community farm and produced by a local supplier, for two days per week in four different locations within the Sutton area during scheduled time periods (Table 1). Scheduled locations have been selected based on predictions of where the largest demand for fresh produce is likely to be and where alternative outlets are limited. Also, selling hours have been designed to be as convenient for Sutton's residents as possible. By using a Veg Van, the project seeks to provide health benefits for Sutton's residents in an environmentally friendly way, while strengthening a local economy and community at the same time.

The aim of this study is to determine the environmental and socio-economic impacts of the Veg Van. In order to achieve this aim, the following objectives were identified:

(1) to calculate the carbon footprint of the Veg Van, and assess its effect on consumers' shopping carbon footprint;

(2) to estimate the impacts of the Veg Van on the local economy;

(3) to ascertain and analyse the social effects of the Veg Van on its customers and staff, and;

(4) to determine the health impacts of the Veg Van by assessing changes in the consumption of fruit and vegetables by its customers.

2 Literature Review

2.1 Local food

There is no universally accepted definition of 'local food' (Edward-Jones et al., 2008; Brown et al., 2009; DEFRA, 2003a). In Sweden, the maximum distance of the local farmers' market is 250km (Nilsson, 2009), while National Farmers' Retail & Markets Association (FARMA) in the UK stated that a 160 km limit for local farmers' markets in the centre of a large urban environment. Markets outside London have defined a 50 km radius as an ideal distance and 80 km as an acceptable distance (DEFRA, 2003a; FARMA, 2002)

Local food has become so popular in recent years that a new word – locavores – labelling people who buy locally produced food, was added to the New Oxford American Dictionary, voted word of the year in 2007 (Severson, 2008). Furthermore, local food markets were one of the fastest-growing agricultural sectors in the United States by the year 2008 (Pirog, 2009). The main reasons why customers buy local food are the quality of produce, including taste, freshness and healthiness; desire to support local farmers; environmental reasons and ethical reasons such as animal welfare (Pirog, 2009; Brown et al., 2009). Although motivated by all these reasons, the relative importance customers place on each reason differs.

Brown et al. (2009) investigated motivations of French and English consumers who use local fruit and vegetables box schemes. They concluded that French customers rank quality as the most important factor, while English rank local community and the environment as their top reasons. The findings also showed that ecological commitment was the second most important for customers in both countries. In comparison, a study conducted by the Leopold Centre for Sustainable Agriculture showed that the main factors influencing the increase in local food sales were: knowing more about local food, for instance, where and how is it grown, as well as the willingness to support local farmers, and foods' quality (Pirog, 2009).

Overall impacts of local food systems are assessed from environmental, economic and social perspective. These impacts are discussed in the following sections.

2.2 Social Impacts

Numerous social benefits are accredited to local food systems, for instance, they enhance social capital (Edwards-Jones et al., 2008) by giving farmers and consumers a sense of belonging to a community. Furthermore, Nilsson (2009) showed that producers often see social interaction with customers as the most significant reason for attending markets, while interaction between the members was also important. In addition, customers often build relationship of trust with local producers at markets, and develop brand loyalty. This social interaction between customers and producers, but also between customers, strengthens a sense of community integration.

Buying fresh produce at local systems as more sustainable way of living can be attractive and achievable for consumers. Also, it can change the way people think about food (Making Local Food Work, 2010) and help them better understand its relationship to environment and health (Brighton and Hove Food Partnership, 2006). Local food enables people to reconnect with nature's cycles (BioRegional Development Group, 2008) and link the town and countryside (DEFRA, 2003a). Additionally, cooperation within local food systems can improve farmers' skills (Bullock, 2000), and in some cases, local food system can cause increased tourism in an area (Nilsson, 2009). Importantly, activities such as training, teaching food growing and cooking skills that offer additional social benefits are often related to projects supporting local food systems (DEFRA 2010). In urban areas, community gardens and allotment projects are important for providing such activities. Although a level of support community regeneration by local food projects can be considerable, it is difficult to measure (DEFRA, 2003a).

Local food systems can also reduce inequalities and provide access to fresh fruit and vegetables, helping to improve the diets of consumers, who would otherwise not be able to access them, such as customers living in inner city area (Bullock, 2000). Usually, customers also benefit from the lower prices of locally offered produce, as cutting off the middleman can significantly reduce mark-ups of supermarkets (Pirog, 2009). Bullock (2000) estimated that organic vegetables were 33% less expensive at farmers' markets than in supermarkets. Bullock also (2000) believes that local food markets have a considerable ability to help solve problems of the UK 'food deserts', which have appeared as a result of supermarkets relocating to out-of-town sites.

2.3 Economic impacts

Local food systems add value to local economies (BioRegional Development Group, 2008). Generally, local food systems increase local employment, and improve the skills and knowledge of employees (Brighton and Hove Food Partnership, 2006). Furthermore, local systems strengthen local economies by using buildings or markets that already exist (Defra, 2003a) and also by increased circulation of the food pound within the local economy (Pirog, 2009).

However, the economic effects of local food systems are difficult to measure (DEFRA, 2003a). Generally, two types of economic effects are distinguished: firstly, direct economic effects, which occur as a result of investment and spending decisions of public or private businesses; and secondly, indirect, induced and dynamic economic effects (the multiplier effect)s, which follow from all direct effects (Weisbrod and Weisbrod, 1997). Weisbrod and Weisbrod (1997) define the Multiplier effect as 'the total impact of a shift in spending on food, clothing, shelter and other consumer goods and services, as a consequence of the change in workers and payroll of directly and indirectly affected businesses.' Indirect and induced effects play an important role in considering the economic effects of local food systems and projects, because they can make total economic impact considerably larger than the direct effects alone. The New Economics Foundation (2008) also believes that the circulation of money in a local economy is more important than the quantity of money spent, making it important to measure the multiplier effects. Increased circulation of money helps to raise income levels and improves the well being of the local area (Edwards-Jones et al., 2008).

In addition, the economic output of local producers depends on their market and on the proximity of alternative markets. (DEFRA, 2010) A study conducted by Communities and Local Government (1998) in England estimated that market share of food retailers in town centre dropped 13-50% after opening of a large food store in the area.

Despite a general trend of supermarkets' centralised purchasing to increase their efficiency and minimal dealing with small local producers, slow movements towards retailing local food can be currently seen. These potential opportunities for small local producers are consequences of customer demand, and the recognised advantage of the innovative approach of small local producers and their high quality products (DEFRA,

2003a), although not all local producers are large or productive enough to sufficiently supply conventional markets (Pirog, 2009).

It is also possible that increasing consumption of locally produced food can have negative impacts on the prosperity of communities in developing countries that rely on sales from exports (DEFRA, 2010, Pirog, 2009) Also, the lower cost effectiveness and higher labour intensity of local food systems, relative to global systems, can reduce economic output. Many local food systems cooperate or share resources and equipment or form partnerships with other farmers and customers to guarantee markets and maximise financial returns (Pirog, 2009).

Although farmers' markets are not a panacea for economic development, they present considerable income flow for small farmers, who would otherwise go out of business (DEFRA, 2003a). This claim is supported by a case study of 12 farmers' markets in London, which estimated that without these markets, half of the associated farmers wouldn't be in business. Moreover, the study found that those 12 farmers' markets bring £3 million pounds back into the rural economy each year (DEFRA, 2003a). On the other hand, Nilsson's study (2009) indicates that income is not the main reason for selling farmers' produce at markets, as this is generally small, less than 5% of their yearly income. The study shows that a possibility to present their business and their products is much more important for the farmers. Hence, farmers' markets should be considered as an important part of wide local development strategies (Bullock, 2000).

2.4 Environmental impacts

Advocates of local food systems claim that they offer several environmental benefits, of which the most important are arguably increasing energy and natural resource usage efficiency (BioRegional Development Group, 2008; DEFRA, 2010; Making Local Food Work, 2010; Pirog, 2009). The number of food miles of locally produced fruit and vegetables is much lower than in the global food system; therefore, less fuel is used and fewer emissions released (Brighton and Hove Food Partnership, 2006; Edwards-Jones et al., 2008; Nilsson, 2009). Results from Iowa (the Leopold Centre for Sustainable Agriculture 2001) showed that GHG emissions from food transport across the United States were four times higher than emissions from local food transport (Pirog, 2009).

Besides food miles, other factors that affect total emissions are the fuel efficiency of delivery vehicles, the energy intensity of the distribution system, types of energy sources, and the seasonality of the food. Because of the variability in these factors, the actual impacts of a food system will be site and season specific (Edwards-Jones et al., 2008).

Nilsson's study of Swedish farmers' markets conducted in 2009 confirms how important it is to consider transport efficiency in the local system. Its results showed that even when local food travelled much shorter distances than the food from supermarkets, the differences between their energy usages were minimal because of the lower efficiency of local delivery vehicles. Mariola (2008) also suggest that the reason for low fuel efficiency in local food transport systems is their inability to compete with modern transport systems developed by economies of scale. However, the efficiency of delivery can be increased by collaboration and cooperation between members of local systems (Brighton and Hove Food Partnership, 2006; Nilsson, 2009). Moreover, reducing fertilisers or pesticide use, increasing green waste recycling and using renewable fuels also diminish environmental impacts of local food systems (DEFRA, 2003a). Therefore, a farm shop selling fruits and vegetables grown on-site release minimal emissions relative to food from the global system, despite the use of relatively inefficient vehicles (Making Local Food Work, 2010,).

Food production related CO_2 emissions are often higher for food that is grown out of season in greenhouses, than food that is grown naturally and flown to another country for consumption. Smith et al. (2005) and Pirog (2009) completed a life cycle analysis the production of tomatoes in the UK and Sweden respectively. They found that local fruit and vegetables do not always have a lower environmental impact than air freighted tomatoes. GHG emissions generated from growing open field tomatoes in Spain and transported to the country of consumption were compared with emissions of tomatoes grown in heated greenhouses in the UK, or Sweden and consumed in those countries. In both cases, the quantity of energy used in greenhouses was higher than that of the tomatoes grown in Spain.

When considering the environmental impacts of fruit and vegetables, it is important to highlight the impacts of supermarkets, which tend to source food internationally, using

mobile temperature controlled storage during the transport and stationary cold storage – refrigerators. (Garnett, 2006) Even supermarket ranges of locally produced foods are firstly transported to centralised distribution centres and then to outlets, even if a producer is closer to a supermarket than the distribution centre (Islington Council and NHS Islington, 2010). However, the DEFRA report on local food (2003a) states that Waitrose, for example, as the first and only multiple retailer have started to label food 'locally produced' if it is produced within a 30 km radius.

The environmental impacts of fruit and vegetables sold by supermarkets are considerable also because of the cosmetic standards for the produce, as well as possible inefficient ordering (Making Local Food Work, 2010). Even if produce is only slightly damaged but still nutritious and edible, it is thrown away by supermarkets. Local systems usually have lower cosmetic standards and food is ordered efficiently, therefore, is relatively less wasteful. Additionally, using less packaging and special offers for edible leftover produce to local catering outlets also prevents waste (BioRegional Development Group, 2008; Making Local Food Work, 2010).

Finally, consumers of fruit and vegetables can reduce greenhouse gas emissions too, by reducing the distance they travel to purchase food. Nilsson (2009) argued that despite low food miles associated with Swedish farmers' markets, the overall environmental benefits were negatively affected by customer transport, because half the customers travelled by car. Findings from another study (Pretty et al., 2005) showed that restricting travel to a 20km radius reduced environmental costs by approximately £2,119 million in the UK per year.

Local food systems have various environmental, economic and social impacts. The aim of this paper is to assess these effects in the case of the Veg Van, a local food market stall in Sutton.

3 Materials and Methods

A variety of methods were used to obtain the data required for the analysis. These included a survey of customers of the Veg Van and interviews with key informant stakeholders, to determine the change of shopping habits and the Veg Van's environmental, economic and social impacts.

3.1 Questionnaire survey of Veg Van customers

A questionnaire was developed and used during face-to-face interviews with Veg Van customers during July and August 2010 (see Appendix A). Respondents were asked to respond to a series of open and closed format questions aimed at understanding the environmental and social impacts of the Veg Van. In particular, respondents were asked about their transport habits and possible changes in those habits related to the Veg Van, whilst the social impacts of the Veg Van were investigated by using questions that focused on how changes in social interaction were occurring. The Veg Van's potential effects on health were assessed through investigating the changes in customers' physical activity related to the Veg Van and changes in their consumption of fruit and vegetables. The face-to-face interviews with customers of the Veg Van, who purchased food and were willing to participate, took place at four different locations during scheduled selling hours (see Table 1). In addition, the questionnaire was also made available online, at the Veg Van's official web page (http://www.vegvan.org.uk/survey/). In total, 71 responses were obtained.

Table 1. Weekly location and scheduled selling hours of the Veg Van.

	Wednesdays	**Time**	**Thursdays**	**Time**
Location	Hackbridge Rail Station;	4.30 pm – 8 pm	Denmark Rd, Hackbridge;	2.15 pm– 4 pm
	St Helier Hospital	12 pm – 3 pm	Wallington Corner, Pub	4.30 pm – 6 pm

*No data were collected in Wallington Corner, as no customers responded.

3.2 Semi-structured key informants interviews

Semi-structured face-to-face interviews were also undertaken with key informants. In addition, telephone interviews were undertaken, where face-to-face interviews could not

be undertaken for logistical reasons. Data from interviews were collected between July and August 2010.

Key informants included the Veg Van's project manager, who was interviewed to collect data for analysis of the Veg Van's carbon footprint and economic impacts. The project manager of the Sutton community farm was interviewed to provide an overview of the Veg Van's delivery system. For the same purpose, a local supplier was interviewed, providing the necessary data for calculation of the Veg Van's environmental and economic impact. Finally, three interviews with Veg Van staff were undertaken to collect information on expenditure on local supplies for the economic analysis as well as to understand their perceptions of the Veg Van's social benefits and the Veg Van's price policy.

In total, five face-to-face interviews with the project manager, three members of staff and project manager of community farm were completed, and one telephone interview with the supplier in Kent was undertaken.

3.3 Economic impacts analysis using LM3 multiplier method

The local economic impacts of the Veg Van were analysed by using the LM3 tool, developed by New Economic Foundation (2008). The tool was developed to help local initiatives find the leaks in their local economies by assessing the economic benefits for the local economy if the money is re-circulated in the local area, rather than spent on goods from a non-local area (New Economics Foundation and The Countryside Agency, 2002). The LM3 for the Veg Van project was calculated for an average month from its beginning in March to July 2010 in five steps (Table 2).

Table 2. Calculation of the LM3 for the Veg Van project per month

1	Round 1	Project income (combination of income from selling and funding)	£ 1,760
2	Round 2	Amount of project's income from Round 1 that is spent locally* by local business and local employees.	£ 1,652
3	Round 3	Amount of local expenditures of local businesses and local employees from Round 2 that is again re-spent locally.	£ 1,153
4	Total	Total income generated, from the project income from Round 1, for the local economy. (Round 1 + Round 2 + Round 3)	£ 4,565
5	LM3	Ratio (Total/Round 1)	2.59

*The local area was considered a radius of 100 miles, according to London Farmers' Markets definition of local markets for urban areas (FARMA, 2002).

Data for the calculations were provided by interviews with the Veg Van's project manager, staff and the supplier. The LM3 calculation enabled the multiplier impacts of the Veg Van project on the local economy to be assessed by investigating the proportion of the project income spent locally and again re-spent locally by local businesses and people. A total amount of money generated for the local economy from the project income was provided, together with the LM3 multiplier, which presented how much money was generated for the local economy from each pound spent at the project

From ten local businesses in Round 2, only one of them, the local supplier, was used for calculations in Round 3 for practical reasons: from all Veg Van's money spent on local businesses almost 77 % goes to this particular local supplier, while the others shares the remainder, with no individual source exceeding 5%. The economic analysis was validated by the developer of the LM3 tool to ensure reliability.

3.4 Assessment of the Veg Van's carbon footprint

The environmental impacts of the Veg Van were investigated through assessing of GHG emissions related to the Veg Van, considering four different sources of those emissions (Table 3). The GHG emissions were calculated using Defra's Guidelines for calculation of GHG emissions (DEFRA 2009).

Table 3. Sources of investigated GHG emissions related to the Veg Van.

1	Charging of the electric Veg Van.
2	Delivery of the produce from suppliers to the Veg Van.
3	Customers' transport to the Veg Van
4	Customers' shopping trips to supermarket that were saved because of the Veg Van

3.4.1 GHG emissions from charging the Veg Van.

Technical details about the battery used for powering the Veg Van and its charging frequency, provided by the interviewed project manager were used to calculate amount of electricity in Kilowatt Hours (kWh) consumed by the Veg Van per month (Table 4).

Table 4. Veg Van battery technical details.

Distance per week	15	miles
Battery current rating	250	Ah
Battery voltage	40	V
Battery Capacity	10	kWh
Battery efficiency (charging)	85	%
Battery charging (every week)	**11.76**	**kWh**

Calculated consumption was compared with the consumption of an electric vehicle with similar technical parameters (Morrison Electricar, 1969) to make sure the results were calculated correctly. The GHG emissions from charging the Veg Van were calculated and

the results were compared with theoretical emissions released by a similar type of vehicle powered by diesel, to see what carbon saving could be made from the decision to use the van powered by electricity (Table 9).

3.4.2 Delivery of the produce from suppliers to the Veg Van

The GHG emissions from produce delivery were assessed for the produce from the Sutton's community farm and from the local supplier in Kent, according to transport details provided by the project manager of the community farm and the local supplier.

3.4.3 Customers' transport to the Veg Van

The survey provided information about the number of customers who used any particular means of transport for getting to the Veg Van. The GHG emissions from this customers' additional transport to the Veg Van were estimated by tracing the travelled distance and means of transport used.

3.4.4 Saved supermarket shopping trips

The Veg Van's effect on customers' shopping trips to a supermarket was assessed by using information about changes in the frequency of shopping trips to a supermarket investigated by the survey. The GHG emissions for each saved trip to supermarket were calculated, according to means of transport, distance to a supermarket and number of saved trips per month, collected by the survey (Table 11).

4 Results

4.1 Social impacts

4.1.1 Customers' shopping habits and preferences

When determining the viability of the stall, it is important to examine the reasons why customers are shopping at the Veg Van in order to be able to determine whether they will return again. In the present study, from all 71 respondents, only four people who were visiting the area did not express a willingness to return to the stall again.

More than 25% of respondents viewed local production as the most important factor when buying fruit and vegetables and 18% claimed organic growing as crucial. In addition, 11% of respondents stated seasonality was the most important reason, while only 8% stated price as the main influencing factor. These results indicate that people who choose shopping at the Veg Van put generally higher value on environmental issues than the price of food (Table 5).

Table 5 shows which characteristics of the produce sold at the Veg Van were most valued by regular customers. For the purposes of this study, customers who have shopped at the Veg Van at least twice were considered regular (34 people). Fifty percent of respondents considered the freshness and nutritious content of produce to be the main reason for buying their fruit and vegetables at the Veg Van, whilst the remaining customers considered the reduced environmental impacts of the produce (41%) and seasonality (9%) to be the most important criteria.

When asked why they preferred the act of shopping at the Veg Van (Table 5), almost 60% of regular customers claimed convenience as the main reason for choosing to shop at the Veg Van, followed by 26% who stated that they found it friendly and enjoyable.

Ten percent of regular customers stated that they buy the majority of their fruit and vegetables at the Veg Van and 67% said they had reduced shopping of produce at supermarkets.

The questionnaire result also showed that more than 66% of respondents would be interested in making use of a future box delivery scheme, although there was some concern about minimum ordering levels and delivery hours.

Table 5. Customers' responses from the survey on shopping habits

General responses

Characteristics considered the most important by customers when choosing fruit and vegetables.

Local	Personal taste/preference	Organic	Seasonal	UK origin	Price	Freshness
25%	21%	18%	11%	10%	8%	6%

Related to Veg Van

The most valued characteristics of the produce sold at the Veg Van as stated by customers.

Fresh, nutritious	Environmentally friendly	Seasonal	UK origin	Price
50%	41%	9%	0%	0%

The main reason for preferring the act of shopping at the Veg Van to elsewhere.

Convenience	Friendly, enjoyable	Supports local economy	Different supply	Physical activity	Other
59%	26%	12%	3%	0%	0%

Outlets where customers buy the majority of their fruit and vegetables since the Veg Van opened.

Supermarket	Local/Farmers' market	Veg Van	Greengrocers	Local Shop	Delivery
68%	15%	9%	3%	3%	3%

Outlets where the Veg Van customers have reduced their purchase of fruit and vegetables.

Supermarket	Greengrocers	Local/Farmers' market	Local Shop	Delivery
67%	33%	0%	0%	0%

Customers' interest in box scheme delivery.

Yes	No
66%	34%

Usual means of transport for getting to the Veg Van.

Public transport	Walk	Car	Bicycle	Other
53%	38%	6%	3%	0

Based on survey results, the typical profile of the Veg Van's customers that were surveyed was 25-34 year old, female, Caucasian, employed, with a higher degree and average yearly income of £20-40k, with no children.

4.2 Social Impacts

4.2.1 Social interaction

The results from the survey showed that 9% of regular customers believed that their social interaction with other residents improved because of the Veg Van (Table 6). However, the majority of respondents claimed no change, as they saw no link between their relationships with neighbours and shopping at the Veg Van.

On the other hand, social interaction between customers and the Veg Van staff were important when customers were asked to compare their preferences for shopping at the Veg Van in comparison to the local supermarket. The enjoyable and friendly atmosphere was the main reason why 66% of the respondents preferred shopping at the Veg Van. For the remaining 24% of respondents who preferred shopping in a supermarket, the variety of produce was the main reason (Table 7).

Likewise, staff considered social interaction with customers as one of the main benefits of working on the Veg Van and working on the Veg Van was considered to be an ethical job, which also increased their consideration of food's ecological impacts and therefore reduced their ecological footprint.

4.2.2 Impacts of the Veg Van on customers' healthy life style

More than 38 % of customers already walk to the Veg Van (Table 5), and the Veg Van's effect on customers' physical activity was relatively small, as only 9% of them reported an increase in physical activity to get to the Veg Van (Table 6). However, almost 27% of regular customers claimed increased consumption of fresh produce, whilst 12% stated decreased consumption of processed, prepared or frozen fruit and vegetables (Table 6).

Table 6. Social and health effects accredited to Veg Van.

Changes in relationships between customers.		
No change	Improved	Unknown
82%	9%	9%
Changes in customers' physical activity (walking, cycling).		
No	Yes	
91%	9%	
Changes in consumption of fresh fruit and vegetables.		
No change	Increased	
74%	26%	
Changes in consumption of other forms (prepared, processed) of fruit and vegetables.		
No change	Decreased	
88%	12%	

Table 7. Shopping preferences.

Preferred choice of shopping between the Veg Van and a supermarket			
Veg Van	Supermarket	No preference	Unknown
66%	24%	7%	3%
Reason for preferring the Veg Van			
Friendly, enjoyable	Fresh		
79%	21%		
Reasons for preferring a supermarket			
Variety	Price		
67%	33%		

4.2.3 Affordability

As a part of the strategy to provide more accessible and affordable fresh produce, staff compared prices of Veg Van produce with those in supermarkets, so that they were broadly similar. This was therefore not investigated further.

4.3 Economic Impacts

The results from the LM3 model (Table 8) showed that almost 94%, of the Veg Van income was spent in the local economy (defined as within a 100 mile radius for an urban area). In addition, the model demonstrated that the proportion of money received by

local businesses and staff from the Veg Van that was spent within the local economy was 70%. The overall monthly income generated for the local economy was £4,565 from the average Veg Van project income of £1,760 per month. The calculated ratio of these two figures presents the estimated economic LM3 multiplier of 2.59, which means that every £1 in the Veg Van generates additional £1.59 for the local economy.

Table 8. Calculated economic LM3 multiplier of the Veg Van project per month.

Round 1	**Project income**	**£ 1,759.78**	
Round 2	Local expenditures	Local Businesses	£ 907.74
		Local Staff	£ 744.39
		Sub-total	£ 1,652.13
Round 3	Locally re-spent expenditures	Local Businesses	£ 557.57
		Local Staff	£ 595.51
		Sub-total	£ 1,153.09
Total	Income for the local economy	£ 4,564.99	
LM3	Total / Round1	2.59	

In contrast, the financial data provided by interviewed Veg Van project manager shows that the total profit from its inception in March until the end of the July only was £197, an average of £40 per month. As the Veg Van is a not-for-profit enterprise, the investigation of the economic impacts of the Veg van was focused on its effects on the local economy and not on its own profitability.

4.4 Environmental Impacts

4.4.1 Emissions from energy consumption

The Veg Van's carbon footprint was calculated to be 25.6 kg CO_2 eq per 60 miles travelled in total per month. Table 9 shows that using an electric van instead of diesel is an energy efficient choice, as 3.51 kg of CO_2 eq is saved every month.

Table 9. Comparison of GHG emissions from the electric Veg Van and diesel equivalent per month.

	Unit	Number of units/ Distance per month	GHG emissions (kg CO_2 eq) per unit	Total GHG emissions (kg CO_2 eq)
Electric van	kWh	47	0.544	25.6
Theoretical diesel van	miles	60	0.485	29.1

Bicycle deliveries of the produce from the community farm four times per month had no GHG emissions (Table 10). Nevertheless, only a small proportion of the Veg Van's fruit and vegetables is grown at the Sutton's community farm, as the majority of fruit and vegetables are produced by the local supplier in Kent. This is because the community garden is still being developed and the amount of produce is below full capacity. Therefore, currently transport by bicycle is sufficient.

Table 10. GHG emissions from the Veg Van produce delivery per month.

Suppliers	Means of transport	Distance (miles)	GHG emissions per mile (kg CO_2 eq)	Total GHG emissions (kg CO_2 eq)
Local supplier in Kent	Diesel Van (Class III)	520	0.485	252.2
Sutton community farm	Bicycle	24	0	0

Carbon emissions calculated for delivery from the local supplier in Kent were over 252 kg CO_2eq per month (Table 10). This amount was the total emissions for one van making four journeys per month. However, these journeys are made as part of longer

journeys to other customers, where the proportion of produce delivered to the Veg Van is minimal. As the current supplier was deliberately chosen for this reason, the contribution of these supply routes to the Veg Van's total emissions was considered to be close to zero.

In total, 25.6 kg of GHG emissions released each month from charging the electric Veg Van were considered to be the total emissions linked to the transport produce provided by the Veg Van.

4.4.2 GHG Emissions from customers' shopping at the Veg Van

GHG emissions from customers' shopping at the Veg Van were investigated, using regular customers to obtain more representative results. Only 6% of respondents used a car to get to the Veg Van (Table 5) and this was combined with travel to and from work. Furthermore, all respondents who used public transport (53%) stated that the Veg Van as a secondary destination in their trip they were already making. Therefore, there were no net GHG emissions estimated from customer' shopping at the Veg Van.

4 4.3 Customers' avoided shopping trips to supermarket

Almost 30% of regular customers claimed that they reduced their shopping trips to the supermarket because of the Veg Van, whilst the remainder did not, as they had other things to buy there (Appendix B).

Based on customer responses regarding shopping habits (Appendix B), Table 11 shows the calculated per trip savings in GHG emissions from shopping at the Veg Van rather than the closest supermarket. Transport by train made the lowest contribution to the GHG emissions per unit distance. However, calculations showed that the most GHG efficient option for shopping trips was by bus since indirect train links doubled the distance to the supermarkets. In total, eleven shopping trips to the supermarket per month were claimed to have been avoided by regular customers, of which three were on foot and were not included in the calculation of emissions. Using different methods of travel (Table 11), six respondents claimed one avoided trip per month each, and one respondent (using a

large diesel car) claimed two avoided trips per month. In total, 8.1 kg of CO_2 eq per month were claimed to be saved by the respondents because of the Veg Van.

Table 11. Saved GHG emissions from customers' reduced shopping trips to a supermarket per month.

Method of travel	Small petrol car	Large diesel car	Bus	Train
Distance, return (miles)	4	4	4	8
GHG emission per mile (kg CO_2 eq)	0.293	0.415	0.135	0.098
GHG emissions per trip (kg CO_2 eq)	1.172	1.658	0.539	0.784
Number of avoided trips	2	2	3	1
Saved GHG emissions from avoided trips (kg CO_2 eq)	2.344	3.316	1.617	0.784
Total saved GHG emissions (kg CO_2 eq)			8.061	

Using the results from Table 11, GHG emissions saved per month by average number of customers were calculated. The average number of purchases at the Veg Van per month is 361 purchases. Assuming that each of these purchases requires a trip to the Veg Van, during the three week period of the survey, 271 trips to the Veg Van by customers were made, of which 71 of these trips were made by the were interviewed customers. By using the data on number of trips avoided by those customers interviewed, a calculation was made to assess the impact of avoided trips by all customers at the Veg Van (see Appendix C for more information). This enabled the overall environmental impacts of the Veg Van in terms of GHG reduction to be calculated, by making the assumption that the sample was representative and that every purchase involved a trip to the Veg Van by a customer. The results showed that 56 trips to the supermarket would be avoided, of which 15 were on foot. The remaining 41 avoided trips saved almost 42 kg CO_2 eq GHG emissions per month. Taking into account the 26 kg CO_2 eq of emissions from the Veg Van's energy consumption, almost 16 kg CO_2 eq of emissions were saved per month as a result of the Veg Van, because of avoided customer trips to the supermarket.

5. Discussion

The aim of the study was to determine the environmental, social and economic impacts of the Veg Van. Table 12 presents the summary of the main impacts estimated during the research, which were all estimated as beneficial at present.

Table 12. Summary of the main impacts of the Veg Van.

Category	Sub-category	Benefits
Social	Social interaction	Increased interaction between customers (reported by 9% of questionnaire respondents) Increased interaction between producers and customers (related to claimed friendly and personal atmosphere reported by 15 % of questionnaire respondents)
	Health	Increased physical activity (9%) Improved diets (26%)
Economic	Economic	Greater support for local economy (LM3 of 2.6 for Veg Van instead of 1.4 for supermarket)
Environment	GHG emission	Low GHG emissions relative to conventional diesel vehicle (released of 26kg CO_2eq per month by Veg Van instead of 29kg CO_2eq by conventional diesel vehicle) Reduced shopping at supermarkets (Reduction of 41kg CO_2eq per month)

5.1 Social impacts

The findings from the study confirmed that customers consider shopping locally as an enjoyable and valued social experience, which enables face-to-face communication with the producers, allowing a discussion over the quality of the food. La Trobe (2001) shows that from the producers' point of view, social interaction between producer and customer is seen as a significant reason for selling at a market. Similarly, the results from the Veg Van study suggested that the Veg Van staff attribute high importance to interaction with customers.

However, while the interaction between different producers selling at farmers' markets provides considerable social benefits (Nilsson, 2009), the Veg Van staff do not have access to this benefit, as the stall is not included within a farmers' market. In addition, even if the number of local suppliers for the Veg Van increases in the future, additional

social interactions with producers is not expected, as they will not be in contact with either the customers or the other producers personally.

A small proportion of the Veg Van customers felt that there was only a small increase in customer-to-customer interaction which they viewed positively. This was in contrast with customers of farmers' markets, who consider interaction between each other as one of the main benefits of the market (Tiemann, 2008). The relatively small impact of the Veg Van in this respect can be explained by the lower concentration of people in one place at the same time, in comparison with farmers' markets. Selling in front of the schools during the school year, as planned, and organising occasional activities or events may be an effective way to attract customers and possibly increase the future level of customer to customer interaction.

A convenient location that is close to public transport and is in close proximity to customers homes is essential for attracting customers. In this way the local food systems can also increase customers' physical activity by enabling them to walk or cycle to buy their local food (Making Local Food Work, 2010). The Veg Van has the advantage over traditional farmers' market stalls of being mobile, although its optimal locations in order to attract as many of Sutton's residents as possible still has to be determined. Interesting differences between different locations of the Veg Van appeared during the survey. For example, convenient locations near public transport locations have positive effects on customers' environmental impacts and a healthy diet, but do not increase their interaction with other customers or their physical activity, as people returning from work are usually en route and in a hurry.

The increase of the fruit and vegetables consumption reported by some Veg Van customers appears to support Bullock's (2000) findings that local food systems can also reduce inequalities in access to fresh fruit and vegetables, and therefore help to improve the diet of consumers who would otherwise have difficulties getting them, such as people living in the inner city. La Trobe (2001) believes that in order to increase the intake even more, it is also useful to sell more produce types in order to maximise variety. However, she suggested putting this into practice by using more than one farmers' stall, selling various fruit and vegetables in one place.

While selling local and seasonal produce, it is also important to encourage people to eat local and seasonal fruit and vegetables by educating them about the varying energy intensities of different fruit and vegetables and the possible ecological consequences of this. A number of respondents chose produce according to their personal taste, regardless of seasonality and local issues (21%). These results support Brown's study (2008), which investigated the motivation of French and English consumers using fruit and vegetable box schemes. This showed that for English respondents, the biggest obstacle to buying local and seasonal produce is the fact that they 'still like to eat some foods out of season'.

A further investigation is needed to assess the affordability of the Veg Van's produce, as for the purposes of this study the survey was carried out only with Veg Van customers. A more comprehensive survey could investigate how affordable the Veg Van produce is for other Sutton residents.

5.2 Economic Impacts

Results from the research conducted here showed that almost 94% of the Veg Van's expenditure was local. In contrast, results from the New Economics Foundation and The Countryside Agency (2002) show that the average supermarket spends only 10.2% of its expenditure locally. This difference increases when compared with the value for Sainsbury's (9%), the most popular supermarket within the Veg Van area of operation.

The LM3 multiplier was calculated to be 2.59, which means that for every £1 of Veg Van income, an additional £1.59 is generated within the local economy. However, the economic contribution of the Veg Van to the local community is likely to be greater than this, since due to logistical difficulties, not all economic expenditure made by the Veg Van in small local businesses could be included.

The results are similar to those for a local box scheme calculated in a UK study (Ward and Lewis, 2002), which compared the multiplier effect of fruit and vegetables delivered in box–scheme and bought from a supermarket. This showed that for every £1 spent locally, an additional £1.5 was generated within the local economy, whereas only an additional £0.4 was generated when the same amount was spent in a supermarket.

These results suggest that whilst local systems are currently much smaller in overall traded volumes than supermarkets, they have the potential to contribute substantially more to the output of local economies per unit customer expenditure.

Positive economic effects on small local producers who are planning to be involved in the Veg Van project in the future are expected, as farmers can sell their produce for a better price at the market than in supermarkets (La Trobe, 2001).

5.3 Environmental impacts

The findings from the study show that fruit and vegetables sold at the Veg Van have minimal food miles and therefore a much lower ecological footprint than conventionally transported produce. A study of Brighton and Hove Food Partnership (2006) comparing local food systems with supermarkets, estimated that a Sunday lunch sourced locally from farmers' markets would have travelled less than 400 miles, but the same ingredients sourced from a supermarket would have travelled 24,000 food miles.

In addition, it is not only distance that matters when cutting down the environmental impacts of food transport, but the means of transport and the way it is arranged and organised (Making Local Food Work, 2010). Using an electric vehicle instead of standard diesel vehicle, a bicycle instead of van and combining the delivery of produce with other deliveries minimised the GHG emissions of the Veg Van delivery system even more.

These findings are in contrast with Mariola's (2008) claims that local food systems have much more inefficient delivery system and therefore cannot compete with modern transport systems' developed economies of scale. A study of Swedish local markets also showed that emissions from local and conventional systems were almost identical, because of inefficient use of delivery vehicles in local markets (Nilsson, 2009). However, even if local farmer delivery systems are less efficient than international systems, the results from the Veg Van and findings from other studies (Brighton and Hove Food Partnership, 2006; DEFRA 2003a; Making Local Food Work, 2010; Nilsson 2009) suggest that because of the significantly lower food miles in local food systems, the overall GHG emissions from local

produce are lower and the delivery inefficiency is often compensated for by cooperation, collaboration, and use of alternative sources of energy for transport.

Over the next three years of the Veg Van project, the level of GHG emissions will be affected by a planned increase in the voltage of the electric batteries and provision of produce through a box-scheme, which may increase emissions. To counter this, solar panels on the roof of the Veg Van have been considered for the future, although they are too expensive for the project budget at the moment. The decision on whether to use solar panels on the Veg Van's roof to reduce GHG emissions will be important. Also, the Veg Van encourages local allotments and the smallholdings around the community farm to supply the Veg Van with their produce and plans to reduce supply from the Kent producer. The environmental effect of shifting from the Kent producer to a number of smaller producers within the Sutton area will depend on the means of transport used, efficiency of the vehicles, and mainly on the capacity to combine delivery of Veg Van produce with other deliveries. The Veg Van plans to continue to supply Sutton residents with fruit and vegetables also during the winter, although they will be imported. If this goes ahead, a detailed investigation of delivery of imported produce is necessary to assess and compare environmental impacts of selling imported produce in winter against not selling in winter at all.

Findings from the calculation of saved GHG emissions from customers' shopping trips to supermarkets per month showed that the local food market stall can have a considerable impact on customers shopping habits and related emissions. According to the results, the Veg Van's environmental impact was estimated not only to be neutral, but positive with every additional saved trip to supermarket. However, when interpreting the results, it is important to consider the limitations caused by the assumptions made.

GHG emissions from the Veg Van could be further reduced if the produce was sold at farmers' markets, as this would enable customers to buy more products in one place, potentially reducing the emissions associated with customer travel to supermarkets. However, joining a farmers' market is not currently a planned initiative for the Veg Van. As an alternative, the possibility of selling local bread, as well as fruit and vegetables has been deliberated.

5.4 Future research

This study has several limitations. Firstly, the study is limited to the consideration of GHG emissions related only to the Veg Van and its transport, excluding other possible sources of emissions such as the growing stage of the produce. Secondly, this study is focused only on the Veg Van's impacts, without considering the social, economic and environmental effects of the community farm that will eventually provide much of its produce. A combined investigation of both the Veg Van and community farm, including Life Cycle Analysis, could improve the research to determine their impacts as a part of the One Planet Food Sutton project. Thirdly, the calculation of the local economic multiplier was simplified by considering only the biggest local business. A more comprehensive approach would require a longer time period for establishing contacts with the other businesses and obtaining all necessary financial data.

Moreover, the survey with customers was limited by several factors that need to be taken into consideration when interpreting the results. The survey was only carried out with Veg Van customers; therefore no general conclusions about Sutton's residents can be made. Considering that the Veg Van project started in March 2010, the possibility that the survey was carried out too soon to provide sufficient data should be considered as another limitation of the research. The time limitation of the study, and also only two selling days per week, limited the survey to six days within a three weeks period in July and August 2010, resulting in a survey that may have covered a relatively small part of the customer base. Also, the emissions from customers' avoided shopping trips, calculated from the survey sample, were estimated by assessing the average emissions saved by customers per month. These results are limited by assumptions that the sample is representative and that every purchase was made by a different customer. A long-term investigation is required to provide more reliable findings that could be based on a larger sample. The need for a longer survey that also takes into account changes in suppliers, the impacts of seasonal changes on shopping habits and the customer base should also be considered.

The positive results of the study imply that projects and initiatives that combine the promotion of healthy eating with a focus on local and seasonal food are very important for local areas, and should therefore be supported and applied in other areas of the UK. Fiscal policy instruments in combination with government support related to practical issues such

as lowering restrictions for selling produce from local allotments could be helpful. This would help small local producers to join the market and sell their produce through the Veg Van.

6 Conclusion

Findings from the research suggest that the overall economic, environmental and also social impacts of the Veg Van were positive. The calculated carbon footprint of the Veg Van and its customers was relatively small, with additional reductions of GHG emissions occurring because of avoided customer trips to the supermarket. Overall environmental effects of the Veg Van per month could be considered as positive, as a higher quantify of GHG emissions from reduced shopping at supermarkets were saved than were produced by the Veg Van. The calculated local multiplier provides evidence that the multiplier effect of the Veg Van is substantial and increases the economic output of the local economy. Positive social effects were estimated in terms of social interaction between the Veg Van staff and its customers and also between customers. The quality of customers' diets was improved by an increase in fruit and vegetable consumption. However, additional research is needed to consider a broader customer base and the long-term effects of seasonality on customer responses and shopping habits with regards to the Veg Van. This study could provide important policy implications in on-going efforts to improve diets using environmentally sustainable means. Results suggest that the Veg Van provides benefits for local communities, economies and the environment, and support of similar projects and initiatives, in a practical and financial context, is recommended.

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Appendices

Appendix A. Questionnaire

1. Your shopping habits

Which characteristic do you consider the most important when choosing fruit and vegetables?

- ☐ organic
- ☐ local
- ☐ UK origin
- ☐ seasonal
- ☐ personal taste/preferences
- ☐ price
- ☐ other

If other, please explain

Where did you usually buy majority of your fruit & vegetables <u>before</u> the Veg Van opened?

- ☐ supermarket _____
- ☐ local or farmers' market
- ☐ greengrocers
- ☐ local shop
- ☐ other

If other, please explain

Where do you usually buy your fruit & vegetables now, <u>since</u> the VegVan opened?

- ☐ supermarket _____
- ☐ local or farmers' market
- ☐ greengrocers
- ☐ local shop
- ☐ Veg Van
- ☐ other

If other, please explain

Would you be interested in fruit & vegetables box scheme delivery?

☐ **yes** ☐ **no**

2. Shopping at the Veg Van

How long have you been using the Veg Van?

Please state _____

Which characteristic of the produce sold at the Veg Van do you value the most?

- ☐ local and therefore fresher and more nutritious
- ☐ local and therefore environmentally friendly
- ☐ seasonal
- ☐ UK origin
- ☐ cheap

Why do you prefer the act of shopping at Veg Van?

- ☐ is convenient
- ☐ allows cycle/walk to there, or other physical activity
- ☐ different supply than in the supermarkets
- ☐ supports local economy
- ☐ is enjoyable, friendly
- ☐ other

If other, please explain

How do you usually get to the VegVan?

☐ Car ☐ Public transport ☐ Walk ☐ Bike ☐ Other

If other, please explain

If you use your car or public transport, is it especially because of this purchase or are you on your way back from/to somewhere else?

- ☐ only because of this purchase
- ☐ purchase in more than this shop
- ☐ on my way back from /to somewhere else
- ☐ other

If other, please explain

Can you see any changes in your walking, cycling or any other physical activity since you have started to buy the fruit & vegetables in the Veg Van?

If yes, please specify

Has your consumption of <u>fresh</u> fruits & vegetables changed because of the Veg Van?

If so, how?

☐ increased ☐ decreased ☐ no change

Has the Veg Van influenced your consumption of <u>other form of fruit & vegetables</u>, for instance frozen, chilled/prepared, or canned?

☐ yes ☐ no

If yes, how?

☐ increased ☐ decreased ☐ no change

Would you say that your relationships with the neighbours have improved since the VegVan opened?

☐ yes ☐ no ☐ I don't know

If yes, please explain

Has the number of people who you know by name in the area increased since shopping at the Veg Van?

☐ yes ☐ no ☐ I don't know

If yes, please explain

3. Supermarkets and shopping trips

What means of transport do you use for shopping trips to the supermarket?

☐ Bike ☐ Bus ☐ Car ☐ Train ☐ Walk ☐ Other

If other, please explain

Please compare your experiences of shopping at the Veg Van and shopping in the supermarket. Which do you prefer and why?

☐ Veg Van ☐ Supermarket ☐ I don't care

Please explain your answer

Do you think that shopping at the VegVan has changed the frequency of your shopping trips to the supermarket?

☐ Yes ☐ No

If yes, how?

☐ **Increased** ☐ **Decreased**

If the frequency of your shopping trips has changed, please tell us how often you went to supermarket before the VegVan opened and how often you go now.

Before ☐ every week
☐ 3 times per month
☐ every 2 weeks
☐ monthly
☐ other number____

After ☐ every week
☐ 3 times per month
☐ every 2 weeks
☐ monthly
☐ other number____

If you have reduced your shopping trips, we would like to calculate your saving of co_2 emissions. Please provide us with the following details about your car:

☐ diesel ☐ petrol ☐ hybrid ☐ electric ☐ other ☐ I don't know

a. model (and year) .....

b. engine size .....

c. consumption in miles per gallon if known .....

d. distance of the supermarket from your house .....

If the distance is unknown for question (d), please give:

i. the approximate location of your house .....

ii. the name of the supermarket you shop in .....

4. Some facts about you

Male/female

Male ☐ Female ☐

Age group

16-24 ☐ 25-34 ☐ 35-49 ☐ 50-64 ☐ 65-74 ☐ 75+ ☐

Ethnic background

White ☐ Mixed ☐ Asian or Asian British ☐

Black or Black British ☐ Other ☐

Occupation

Professional ☐ Non-professional ☐ Never worked/retired ☐ Student ☐

Qualifications

Higher degree ☐ A levels or equivalent ☐ Other qualifications ☐ First degree (BA, BSc) ☐ GCSE/O levels ☐ No qualifications ☐

Income <20k ☐ 20k – 40k ☐ >40k ☐ Don't want to specify ☐

Number of children: _____

Thank you again for your participation in this study.

Appendix B. Changes in shopping frequency because of Veg Van

Claimed changes in frequency of shopping trips to supermarket				
No change	Decreased			
71%	29%			
Means of transport that would be used for shopping trips				
Bus	Walk	Petrol car	Diesel car	Train
30%	30%	20%	10%	10%

Appendix C. Calculation of reduction in supermarket shopping trips

Based on the results from Table 8, monthly savings of GHG emissions were calculated. Of the interviewed customers, it was claimed that 11 trips to the supermarket were saved each month. 8 of these were using motorised transport, representing 11.3% of the total number interviewed. The savings of GHG emissions from these trips was calculated as 8.061 kg CO_2 eq. Average total purchases at the Veg Van were calculated as 361 per month. Assuming the same proportion of total customers using GHG emitting transport (11.3%) saved trips as those interviewed, it was estimated that the total emissions savings from customers using the Veg Van is 41.3 kg CO_2 eq. per month.

	Total	**Saved trips**	**Trips not on foot**	**Total GHG emissions (kg Co_2 eq)**
	100%	**15.50%**	**11.30%**	
Interviewed customers	71	11	8	8.061
All customers*	361	56	41	41.313

* Average number of purchases was assumed to be equal to the average number of customers per month.