

# Northumbria Research Link

Citation: Shokri, Alireza, Oglethorpe, David and Nabhani, Farhad (2012) Assessment of key sustainability indicators in a UK fast food supply chain: a life cycle perspective. In: 22nd International Conference on Flexible Automation and Intelligent Manufacturing, 10-13 June 2012, Helsinki, Finland.

URL: [http://webhotel2.tut.fi/csm-forum/FAIM2012\\_prelimi...](http://webhotel2.tut.fi/csm-forum/FAIM2012_prelimi...) <[http://webhotel2.tut.fi/csm-forum/FAIM2012\\_preliminary\\_CFP.pdf](http://webhotel2.tut.fi/csm-forum/FAIM2012_preliminary_CFP.pdf)>

This version was downloaded from Northumbria Research Link: <https://nrl.northumbria.ac.uk/id/eprint/11414/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)

# Assessment of key sustainability indicators in a UK fast food supply chain: a life cycle perspective

Alireza Shokri<sup>1\*</sup>, Farhad Nabhani<sup>2</sup>, David Oglethorpe<sup>3</sup>

<sup>1</sup>Newcastle Business School  
Northumbria University

<sup>2</sup>School of Science and Engineering  
Teesside University

<sup>3</sup>Newcastle Business School  
Northumbria University

Newcastle Upon Tyne, NE1 8ST, UK

Middlesbrough, TS15 9QW, UK

Newcastle Upon Tyne, NE1 8ST, UK

## ABSTRACT

*The purpose of this article is to investigate the understanding of businesses and end consumers of key sustainability measures in the UK fast food Supply Chain. A quantitative method was used in which two sets of well-structured questionnaires were designed separately for fast food businesses and end consumers. The data analysis was conducted through “cluster analysis”. It was found that social responsibility was scored as the most important fast food sustainability concern for businesses, whilst the end consumers were found to be more concern about environmental impact of fast food industry. However, no statistical difference was found between fast food businesses and end consumer views. This research was carried out in north of England, where may have different proportion of cultural, social and economical diversity. The collected data from fast food businesses was also not scattered evenly, as there were more responds from smaller fast food firms than food manufacturers and processors. More research attention is needed in this field in which there are various issues and challenges to promote a lean and green food supply chain. This research could partly investigate these challenges including the different trade-offs between social, environmental and economic measures of sustainability in a specific food supply chain. This article conducts a research investigation in three dimensional sustainability of fast food supply chain, which includes all types of businesses in this sector to investigate the differences between end consumers and businesses to promote lean and green fast food supply chain.*

## 1- Introduction

The UK sustainable Development Commission has suggested that a sustainable food supply chain is the combination of safety, transparency, localisation, land management, reducing energy consumption, social welfare, animal welfare and resource management [1]. There is widespread agreement between UK policy makers and major retailers that food supply chain sustainability needs to adopt more rigorous and systematic action towards sustainability development [2].

The aim of this research article is to demonstrate the significant role of sustainability indicators and their inter-relationship in fast food Supply Chains, by focusing on all three dimensions of sustainability development (Society, Environment and Economy) in the “fast food life cycle”. Sustainability often only has environmental connotations but sustainability in food supply chains and specifically fast food supply chains needs to be considered in a more holistic sense given its role in society and its economic significance. Notwithstanding, there is still a need for more research in food supply chain sustainability [3] and much research to date have been associated more with one-dimensional environmental issues rather than the ‘triple bottom line’ of sustainability, where a focus on environment, society and economy create the notion of sustainable development. Food production and consumption can have both a positive or negative effect on the environment and much of the analysis of this is well covered in the environmental and agricultural economics literature, but it can also have an impact on consumer health, social inclusivity, job satisfaction, animal welfare and a variety of other sustainability indicators [4]. In fact, given food production and consumption is all-pervasive and the whole of society are stakeholders in the food supply chain through their role as consumers, the importance of sustainability is substantial, where the values, awareness and mindsets of society play an important role in food supply chain decision makings [5]. As a result, social and environmental sustainability in food supply chains is highly promoted by EU and UK governments, also international organisation of standardisations and worldwide trade organisations and missions [6].

## 2- Literature Review

Fast Food is a common name in recent industrialised world, which has been in the focus of some researchers in nutrition and consumer health. Fast food is defined as the sale of food and drinks for immediate consumption either on the premises or in designed eating areas shared with other food service operators, or for consumption elsewhere [7]. It is a low margin -high volume market, with a substantial market share: the UK fast food market, for example, had

---

\*Corresponding author: Tel: (+44)191- 2274965; E-Mail: [Alireza.shokri@northumbria.ac.uk](mailto:Alireza.shokri@northumbria.ac.uk)

Although more formal chains are often referred to as ‘food service’ we refer here to the broader fast food market which is widely fragmented with many independent as well as larger chains [7]. total revenue of \$7.8b with 2.7b transactions in 2009, representing a compound annual growth rate of 4.3% for the period spanning 2005-2009 [7]. This is expected to increase to \$9.5b revenue and 2.9b transactions by 2014 [7]. Fast food has also become integrated into society and economy and has also become synonymous with several environmental and nutritional issues in recent years. Nutritionists, economists and marketing researchers have shown that fast food consumption is likely to be habitual due to its convenience, ready accessibility and relatively lower cost [8,9,10] yet there is very limited research in fast food sustainability, which mainly focuses on big fast food chains [11] rather taking a more general view including smaller players, but it is these small players that can collectively have substantial sustainability impacts and for which it is worthwhile identifying indicators that would be of use to monitor their impact..

The fast food supply chain is complex, including different firms with different sources, policies and cultures and follows a life cycle that differentiates itself from food retail supply chains typically at the processing/manufacturing stage. Beyond this stage (see Figure 1) the key focus of the debate around fast food sustainability needs to be concentrated and the notion of appropriate sustainability indicators thought about.

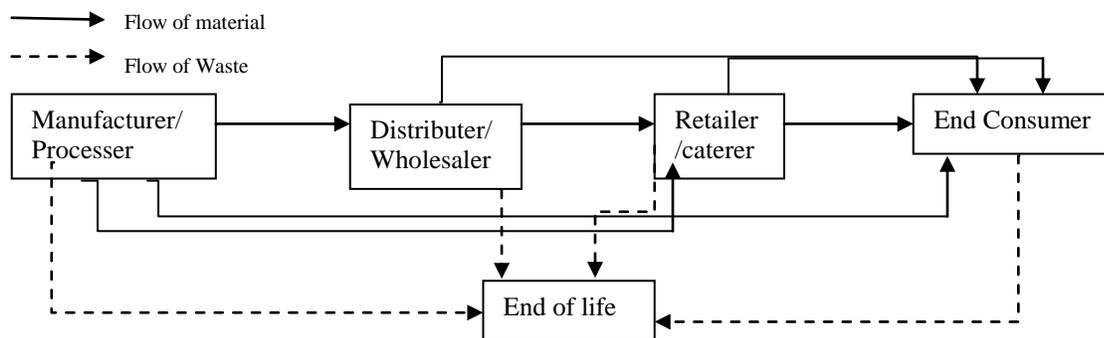


Figure 1- Integrated fast Food SC and fast food life cycle

### 2-1- Social Sustainability in Fast Food SC

Social sustainability in fast food can be studied in six different categories: consumer health, transparency, food safety and quality, animal welfare, labour and ethics [6]. Fast food also has the potential to impact directly and visibly on people’s well-being and consumer value [12,13,14]. Improvement in nutritional value and dietary intakes has already been highlighted by the UK food governing bodies [12,15,16]. Transparency in fast food supply chains could be considered as traceability, labelling, and product specification. A good traceability system offers the possibility of effective flow of product and information, quality assurance, food safety and security, and consumer health [4,6,11,17]. For instance, information on the origin of the food is an important issue in food supply chains [1,4,18]. However, given the complexity of fast food supply chains, there is little prospect of being able to trace all single fast food products back to their origin, due to the complexity in supply bases within fast food SC. Food safety is another aspect of social responsibility for all fast food businesses, which is in the centre of attention from government officials, agencies and EU consumers [18] after facing health and safety challenges including BSE and Foot & Mouth diseases in the UK. There were serious debates about the relationship between GM and organic foods and their role in sustainability within media and research activities [19,20], which results in consumer confusion to use these products [6,19,20]. Using GM and organic foods might be sustainable in terms of using less pesticide, herbicide or chemicals, but they might not be sustainable in terms of cost, availability and Green House Gas (GHG) emission [19,20,21]. Clear and understandable labeling could be an advantageous to end consumers to be informed about use of biotechnology, nutritional values and even origin of the food [1,20,22,23]. Animal welfare is introduced as an important ethical, economic, cultural and regulatory issue in the western European countries associated with social sustainability, since many of the fast food product ranges are produced from meat [12,15,22].

Labour standards are a social performance aspect of sustainability, which can be integrated within supply chain controls [11] and given that fast food businesses are relatively labour intensive [7] and subject to the fair labour standards Act regulations [24], there is a potential trade-off between social and economic sustainability perspectives. Ethics, linked often to labour use and treatment, is another important corporate social responsibility, which could also

be reviewed in fast food through “fair trade”, “Halal food”, and “trust”. “Halal food” is one of the most important religious taboos around the world, which has become an important social responsibility for any fast food related industry. It is an important food requirement for Muslim community around the Europe, as 84% of Muslims in France follow this rule, which is concerned about the way of slaughtering and type of meat [25].

### ***2-2- Environmental Sustainability in fast food SC***

The food industry has many impacts on the environment in terms of waste disposal, chemicals, packaging, food miles, Green House Gas (GHG) emission and energy use [6]. However, it is also believed that the environmental impact of the fast food industry could be more serious due to less monitoring and control procedures on different factors such as waste, recycling and energy use. The energy consumed by the sector is an immediate environmental indicator of fast food supply chain through using different storage and cooking facilities [26,27]. Waste recycling and management is also considered as an important factor of environmental sustainability in food supply chain. The UK has the worst records in the EU on waste management and recycling [2,28] and large-scale meat production factories [15] and fast food caterers are two particular examples that produce substantial amount of food wastes such as fat, by-products and left over foods. GHG emissions is another environmental element in fast food supply chain, driven by the climate change agenda with key the impacts arising from transport and logistics operations [3,29]. Whilst localisation in food supply [1,4] has been suggested as an effective strategy to reduce the GHG emission in food supply chain this has more recently been contested due to the economies of scale that can be lost in resource use by localising supply chains [3]. Overall, reducing the environmental impact of fast food supply chain is complex due a wide array of trade-offs between different sustainability indicators, a lack of interest and accountability and also a lack of awareness and regulation. In the UK, it is still not even clear, for example, how or to what extent restaurants or takeaways are dealing with their leftover food, wasted fat or even the industrial and commercial solid wastes such as packaging because such issues are simply not effectively monitored or controlled.

### ***2-3- Economic Sustainability in fast food SC***

There are some specific economic characteristics of the fast food supply chain that characterise its nature as a low-margin, high volume sector – it has price sensitive consumers, uses discount and promotions extensively and there are high levels of competition. Transaction cost, price, promotion and branding are thus common factors that govern the economic sustainability of fast food Supply. Promotional activity has been shown to be an effective strategy to increase market share and demand for price-conscious consumers, although more a careful aggregate impact of promotion on society is required [8]. Branding and price are two economic strategies that have an important impact on enhancing the reputation of the fast food industry and increasing consumer loyalty through more competitiveness [12]. The transparency in the communication of branding values within fast food supply chains is critical, and it is fair to say that fast food caterers fall some way behind retailers.

The win-win aspect of sustainability in which economic development paths can reduce environmental impact of resources in any supply chain is very elusive in fast food supply chains, which generates more trade-offs [29,30]. Low profitability and high competition within fast food businesses offer financial insulation and less financial devotion for employees, which will result in greater risk towards ethical responsibility [6,31]. The high impact of economic strategies in fast food supply chain to increase obesity and diabetes rates is currently a common claim [8,16].

## **3- Methodology**

The methodology of this research study was formulated from two sets of structured questionnaires. The first set was designed for different businesses involved in the fast food supply chain. The second set of questionnaire was designed for the end consumers in local communities of the north east and north west of England. The first questionnaire considered the type and size of the organisations, while the second questionnaire considered the gender and age of the respondents. Both questionnaires had three sections of questions about the importance of social, environmental and economic sustainability indicators. The first questionnaire was communicated with businesses through two different ways as on-line and face-to-face interview. The total number of feedback for this questionnaire was from 285 businesses including food manufacturers, wholesalers, distributors, retailers, takeaways, hotels, cafes and fast food chains. The second questionnaire was communicated through social networking and face-to-face interview. The total number of feedback for this questionnaire was 577 responses from different genders and age ranges of public.

All attitudinal/response questions used a likert scale for scoring (from 1 as strongly not important to 7 as strongly

important) which allowed an analysis between different clusters of businesses and the public with sustainability dimensions being evaluated in order to compare the results within and between each sector.

#### 4- Finding and discussion

The result of first questionnaire indicated that retailers had the highest concern about social sustainability with the average score of 5.48, while wholesalers, distributors and restaurants had the lowest score as the average of 4.98. The social responsibility of the fast food takeaways was scored as average 5.20. Retailers have also had the highest environmental concern about the fast food supply chain with the score of 5.30, while the cafes, wholesalers, distributors and fast food chains had the lowest concern with the score of 5.04. It was also found out that retailers still were the most sustainable business within fast food supply chains having an average score of 5.40, while manufacturers, wholesalers, restaurants and distributors were the least sustainable business with the average score of 5.07. The economic sustainability of the fast food takeaways was reported as the average score of 5.11. The mean value of the sustainability importance over all fast food supply chains, reported in Table 1, indicates no significant difference between the three dimensions.

Table 1 – The importance of sustainability dimensions for fast food businesses

Type		Social Sustainability	Environmenta I Sustainability	Economic Sustainability
Manufacturer	Mean	5.0300	5.6640	5.3820
	Std. Deviation	.54383	.49878	.77290
Wholesaler/Distributor	Mean	4.0750	4.5000	4.8583
	Std. Deviation	.97455	.63709	.51732
Retailer	Mean	5.4766	5.2903	5.3772
	Std. Deviation	.68697	.64238	.71322
Hotel	Mean	5.5333	5.1100	5.3489
	Std. Deviation	.56734	.55061	.57938
Restaurant	Mean	5.0024	4.9181	5.0576
	Std. Deviation	1.00243	.94573	1.04309
Takeaway/Fish & chips	Mean	5.1954	5.0882	5.1146
	Std. Deviation	.52476	.44357	.54020
Cafe	Mean	5.1050	4.9850	5.1990
	Std. Deviation	.45427	.38733	.55107
Chain	Mean	5.6571	5.2276	5.4095
	Std. Deviation	.38350	.40341	.63061
Total	Mean	5.2500	5.1138	5.2102
	Std. Deviation	.69744	.59454	.67779

The result of second questionnaire indicated that female respondents with 60% share had more concern about social responsibility, environmental and economic impact in using fast food than male respondents. However, the result in table 2 indicates no significant difference between two different genders in all three sustainability dimensions, although in overall, the public was more concern about environmental impact of the fast food SC.

It was found out that people with the age of 36 years and more had the highest social responsibility and economic concern in using fast food, whilst the younger people with the age of 18 to 25 had the lowest concern. This was different in terms of environmental sustainability in which the people with the age range of 36 to 45 had the higher concern than younger or older people. The overall result in table 3 is also indicating no significant difference between the age ranges, although environmental impact was still scored as the most important sustainability issue within public who is using fast food.

Table 2 – The importance of sustainability dimensions between different public genders

Gender		Social Sustainability	Environmental Sustainability	Economic Sustainability
Male	Mean	4.7272	4.9116	4.8050
	Std. Deviation	.81589	.87207	.89933
Female	Mean	4.8008	5.1032	4.9981
	Std. Deviation	.83261	.87121	.83161
Total	Mean	4.7698	5.0226	4.9168
	Std. Deviation	.82549	.87572	.86504

Table 3 – The importance of sustainability dimensions between different public genders

Age		Social Sustainability	Environmental Sustainability	Economic Sustainability
18-25	Mean	4.6907	4.9997	4.8514
	Std. Deviation	.84563	.93096	.89382
26-35	Mean	4.7791	4.9704	4.9926
	Std. Deviation	.80363	.79125	.87527
36-45	Mean	4.8500	4.9730	4.8889
	Std. Deviation	.83553	.90312	.80210
46-55	Mean	5.0541	5.2997	5.0816
	Std. Deviation	.72422	.70155	.75780
More than 55	Mean	5.0458	5.2767	5.2308
	Std. Deviation	.64613	.63049	.69713
Total	Mean	4.7698	5.0226	4.9168
	Std. Deviation	.82549	.87572	.86504

## 5- Conclusion and future works

The significant role of fast food supply chains in sustainability measures is increasingly important, both to academia and government. However, a lack of transparency, numerous trade-offs and social and environmental ignorance from businesses involved in this supply chain increase the need of more research activities and greater understanding. It was concluded from the result of this study that fast food businesses have more social concern towards sustainability. This is in spite of many difficulties and complexities in fast food supply chain in terms of transparency, obesity and animal welfare. It was also concluded that public were more concern about environmental impact of fast food supply chain such as recycling and solid waste. The close result of economic sustainability and other two dimensions for both end consumers and fast food businesses determines more complexity in dealing with fast food sustainability trade-off between economic sustainability and other two dimensions. It was reported in the literature that there are lots of contradictions between economic sustainability indicators and environmental or social sustainability indicators. However, the result of this study found that economic sustainability is as important as environmental and social impact of the fast food sector. This will emphasise the greatness of essential works on reducing the impact of the sustainability trade-off within fast food SC.

It was concluded from this study that the sustainability point of view of the fast food supply chain is different between end consumers and fast food businesses, although no significant difference was found between these two sectors in terms of importance level of the three dimensions. Therefore, more research study in more details towards specific sustainability indicators and trade-offs is required for the future study to generate more significant result about the sustainability in fast food supply chain as an emerging social study in food industry.

## References

- [1] B. Gail Smith, "Developing sustainable food supply chains", *Philosophical Transactions of The Royal Society*, No.363, pp. 849-861, 2008.
- [2] P. Jones; D. comfort; and D. Hillier, "Moving towards sustainable food retailing", *International Journal of Retail and Distribution Management*, Vol. 36, No. 12, pp. 995-1001, 2008.
- [3] D. Oglethorpe, "Optimising economic, environmental, and social objectives: a goal-programming approach in the food sector", *Environment and Planning*, Vol. 42, pp. 1239-1254, 2010.
- [4] B. Ilbery, "Food supply chain and sustainability: evidence from specialist food producers in the Scottish/English borders", *Land Use Policy*, Vol. 22, pp. 331-344, 2005.
- [5] B. Cetinkaya, "Developing a Sustainable Supply Chain Strategy", *Sustainable Supply Chain Management*, Springer, 2011.
- [6] M.J. Maloni, and M.E. Brown, "Corporate Social Responsibility in the Supply Chain: An Application in the Food Industry", *Journal of Business Ethics*, Vol.68, pp. 35-52, 2006.
- [7] [http:// www.datamonitor.com](http://www.datamonitor.com) ( *Fast food in the UK*, accessed Sep 2010, published Sep 2010 ).
- [8] T. J. Richards and L. Padilia, "Promotion and Fast Food Demand", *American Journal of Agriculture Economics*, Vol.91, No.1, pp.168-183, 2009.
- [9] S. Rice, E.J. McAllister and NV. Dhurandhar, "Fast Food: Friendly?", *International Journal of Obesity*, No.31, pp.884-886, 2007.
- [10] T. Aarnio, A. Hamalainen, "Challenges in packaging waste management in the fast food industry", *Resources, Conservation and Recycling*, No.52, pp. 612-621, 2008.
- [11] J. Hamprescht et al., "Controlling the sustainability of food supply chains", *Supply Chain management: an International Journal*, Vol.10, No.1, pp. 7-10, 2005.
- [12] M.J.A. Schroder and M.G. McEacher, "Fast foods and ethical consumer value: a focus on McDonald's and KFC", *British Food Journal*, Vol. 107, No. 4, pp. 212-224, 2005.
- [13] D.P. Van Donk et al., "Opportunities and realities of the case of food manufacturers", *British Food Journal*, Vol. 110, No. 2, pp. 218-235, 2008.
- [14] H. Aiking and J. De Boer, "Food Sustainability", *British Food Journal*, Vol. 106, No. 5, pp.359-365, 2004.
- [15] R. J. Adams, "Fast Food and Animal Rights: An Examination and Assessment of the Industry's Response to Social Pressure", *Business and Society Review*, Vol. 113, No. 3, pp. 301-328, 2008.
- [16] R. Denyer, "Healthy, enjoyable and Sustainable eating", *The Journal of the Royal Society for the promotion of Health*, Vol.128, No.5, pp.221, 2008.
- [17] P.M. Wognum et al., "Systems for sustainability and transparency of food supply chains – Current status and challenges", *Advanced Engineering Information*, Vol.25, pp.65-76, 2011.
- [18] Dr.ir. Van Der Vorst, "Product traceability in food-supply chains", *Accred Quality Assurance*, Vol.11, pp.33-37, 2006.
- [19] S. Lockie, "Capturing the sustainability agenda: Organic foods and media discourses on food scares, environment, genetic engineering, and health", *Agriculture and Human Values*, Vol.23, pp. 313-323, 2006.
- [20] D. Barling et al., "The social aspects of food biotechnology: a European view", *Environmental technology and Pharmacology*, Vol. 7, pp. 85-93, 1999.
- [21] P. Roy et al., "A review of life cycle assessment (LCA) on some food products", *Journal of food engineering*, Vol. 90, pp.1-10, 2009.
- [22] C.T. Hoogland, J. De Boer, and J.J. Boersema, "Food and sustainability: Do consumers recognise, understand and value on-package information on production standards?", *Appetite*, Vol. 49, pp.47-57, 2007.
- [23] A. Sibbel, "The sustainability of functional foods", *Social Science & Medicine*, Vol. 64, PP. 554-561, 2007.
- [24] J. Mueller, and B.H. Kleiner, "Determining exempt and non-exempt status in the Fast Food Industry", *Management Research News*, Vol. 27, No. 10, pp. 51-57, 2004.
- [25] K. Bonne, and W. Verbeke, "Muslim consumer trust in halal meat status and control in Belgium", *Meat Science*, Vol. 79, pp.

113-123, 2008.

[26] M.C. Heller, and G.A. Keoleian, "Assessing the sustainability of the US food system: a life cycle perspective", *Agriculture Systems*, Vol. 76, pp. 1007-1041, 2003.

[27] S. Zanoni, L. Zavanella, "Chilled or frozen: Decision strategies for sustainable food supply chains", *International Journal of Production Economics*, article in press, 2011.

[28] N. Wei, "Environmental Sustainability Metrics", [www.pollutionengineering.com](http://www.pollutionengineering.com), June 2009, accessed Sep 2010.

[29] J. Quariguasi et al., "Designing and evaluating sustainable logistics networks", *International Journal of Production Economics*, Vol. 111, pp. 195-208, 2008.

[30] C.R. Carter, and D.S. Rogers, "A framework of sustainable supply chain management: moving toward new theory", *International Journal of Physical Distribution and Logistics Management*, Vol. 38, No. 5, pp. 360-387, 2008.

[31] B. Keating et al., "In pursuit of a sustainable supply chain: insight from Westpac Banking Corporation", *Supply Chain management: An International Journal*, Vol. 13, No. 3, pp. 175-179, 2008.