Aspects of Applied Biology 87, 2008 - Greening the Food Chain, 3 and 4
3. Traceability: Tracking and tracing in the food chain; and
4. Supplying sustainable and innovative food and drink solutions

Food and beverage carbon dioxide emissions from producer to consumer - applying and communicating LCA

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Summary

The research presented determined the effectiveness of consumers in making decisions about nutritional and environmental characteristics of food and beverage products. Consumers have well developed understanding of the nutritional content of food and beverage products. Their understanding of environmental impact (as a carbon footprint) and food distribution (as 'food miles') was largely misunderstood. The results are discussed in the context of current issues in nutrition and public health. Developing frameworks of communicating environmental impact with the food supply chain is an important outcome of Life Cycle Assessment and Life Cycle Inventory focussed approaches. The data presented are extended to the possible public health applications.

Keywords: Public health, environment, carbon dioxide, diet, consumer

Introduction

Poor nutrition is a major cause of ill health and premature death in many developing and developed countries (Defra, 2006*a*, 2007). Obesity is responsible for an estimated 9,000 premature deaths per year in England and the estimated treatment cost for ill health due to poor diet is at least £4 billion each year. There is growing awareness of the implications of obesity and diabetes, guidance on healthy lifestyles and recommended daily intakes of various nutrients (Deloitte, 2007; Foresight, 2007; UK Cabinet Office Strategy Unit, 2008). Health and well-being led opportunities and innovations, including functional foods, have consequently emerged in the food and beverage industry (Slimainia *et al*., 2007). However, interactions between lifestyle, diet and public health issues are not as simple as many commentators have thought. For example, studies have shown that the fat content of diets in nations such as the United States of America have not changed in 30 years (Popkin & Siega-Riz, 2001). Reviews of carbohydrate consumption have shown significant increases over a similar time period which may account for increases in obesity (Popkin, 2001). However, such conclusions are not straightforward and the food and beverage industry linked to efficient food supply chains are often held responsible for the 'obesity epidemic' (WHO, 2003).

Many studies of purchase behaviours show convenience, price and quality are the over-riding factors determining product choice by consumers, producers, manufacturers and retailers in the food system (Deloitte, 2007; Foresight, 2007; UK Cabinet Office Strategy Unit, 2008). Understanding how food choice, health impact and pleasure components are associated with food purchase is therefore key in developing strategies that provide sustainable public health solutions (UK Cabinet

Office Strategy Unit, 2008). The 2007 Food Standards Agency (FSA) consumer attitudes survey showed 71% of people looked for nutritional information; only 5% looked for ethical information (FSA, 2007). The difficulty of communicating nutritional value has been acknowledged and the FSA have sought to simplify communication with the 'Traffic Light' scheme. The 'Traffic Light' scheme has not been without controversy and major retailers have developed schemes that are similar but emphasise the value of Guideline Daily Amounts (GDAs). Both competition and regulatory compliance are of significant importance in initiating change in food production and retailing (Deloitte, 2007). The research reported here asks if current consumer understanding of nutrition, nutritional labelling can used to develop schemes for reporting environmental impact.

Methodology

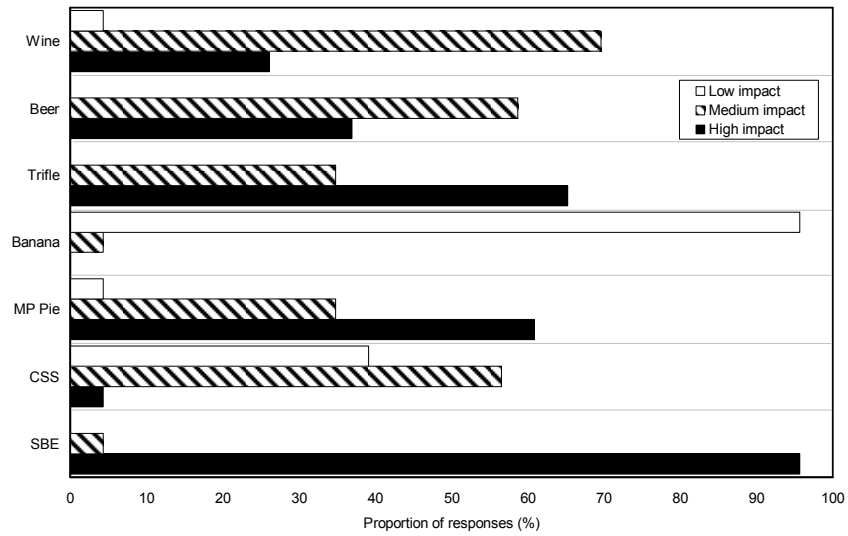
Forty-five people were recruited from the Sheffield and Sunderland areas by convenience sampling. The gender ratio was 18:27 (male to female); participants ranged from 21 to 60 years of age (mean average 28.2 years). A combination of focus group, interview and questionnaire techniques were employed to determine the opinions of the sample. As a way to assess nutritional and environmental knowledge, a questionnaire was devised that asked for the levels of calories, sugar, fat (and saturates), and salt within seven food types. Participants were asked to allocate a high, medium or a low impact in each category.

Results and Discussion

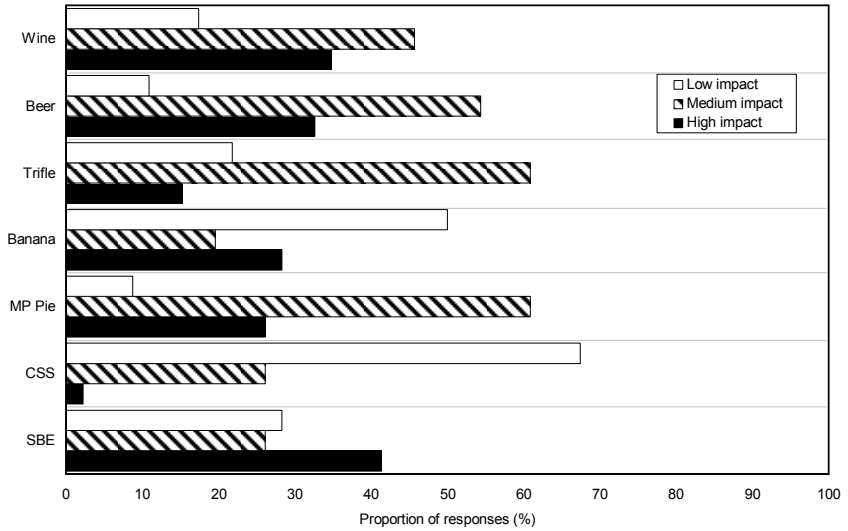
Foods that have traditionally been identified as unhealthy (or at least should be consumed in lower quantities) drew the highest levels of agreement (Fig. 1*a*), e.g. the sausage bacon and egg roll was identified as having high levels of all nutrient types by 80–100% of those surveyed; similarly the cream trifle also drew high levels of agreement of high health impact. In contrast, some of the other foods were associated with a mixed agreement, indicative of confusion and lack of nutritive knowledge. The cheese salad sandwich illustrates this uncertainty - no subtype drew more than 58% agreement in labelling. In contrast, the banana food choice provide high agreement for low health impact. There appears to be confusion regarding the relative 'healthiness' of particular foods, despite the contents of these nutrients being displayed in labels for a number of years. The 'Traffic Light' scheme communicates the basis of a healthy balanced diet.

Consumers understanding of environmental and distribution impacts for food and beverage products is more variable (Fig. 1*b* and *c*). Allied to this relatively new concept of environmental concern by the consumer is the issue of food transportation. Some sources now report that approximately 95% of fruit and 50% of vegetables eaten in the UK are imported (UK Cabinet Office Strategy Group, 2008). While these figures will constantly be a source of contention, they do raise important questions for food manufacturers and retailers responding to consumers requirements. For example, should we develop innovative methods of preserving foods that are in season so that they can be eaten out of season? How do such preservation-based food supply chains compare with ship and air freighted supply chains? The issues are far from straightforward (Defra, 2006*b*). For example, a study concerning the importing of apples have shown air freighting can result in less energy being used in the food system (Milà i Canals *et al.*, 2007). Succinct and evidence-based means of communicating these issues (indeed, life-cycle issues) to the consumer are becoming drivers for ethical retail trends.

a) Perceived nutritional impact



b) Perceived environmental impact



c) Perceived distribution or 'food-miles' impact

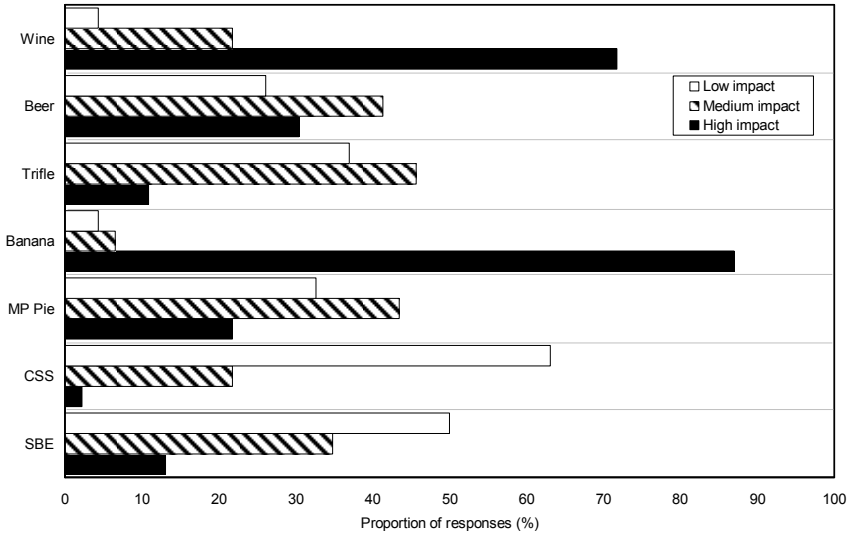


Fig. 1. Focus groups' perceptions of high, medium or low impact for a) nutritional impact, b) environmental impact and c) distribution / 'food miles' impact for seven food groups: SBE = sausage, bacon and egg roll; CSS = cheese salad sandwich; MP pie = meat and potato pie; banana; cream trifle; beer; and wine.

The value of ethical purchases in the food system is increasingly seen as a potential area to develop innovative retailing of food and beverage products. Assurance and traceability schemes have already made significant impact in the retail sector (Bredahl *et al.*, 2001; UK Parliament Environment, Food and Rural Affairs Committee, 2005; Defra, 2007, 2008). The Carbon Trust (2006) and British Standard Institute's (2008) PAS2050 are developing frameworks for environmental impact labelling for products with regard to carbon dioxide (equivalent) emissions. There may be an opportunity to co-develop these schemes with nutritional labelling schemes.

Our analysis suggests there is a relationship between the CO2 emissions and Global Warming Potentials (GWPs) associated with food products and their Calorific energy content (Fig. 2). Applying this type of analysis using published GWP figures for over 50 food products (Fig. 3) suggests that there are three food groups that can be ranked in terms of their GWP and Calorific content. Type 1 products which include horticultural produce (produced in heated glasshouses), pork, hot beverages have relatively low Calorie content and high GWP values; Type 2 products which include fresh and unprocessed products having relatively low Calorie content and potentially high GWP; and, Type 3 products which include processed and manufactured products that have relatively high Calorie content and low GWP. Such correlations could be vitally important in the development of public health communications and policies. However, incorporating such an analysis into a balanced nutritional and environmental policy is a challenge for further research.

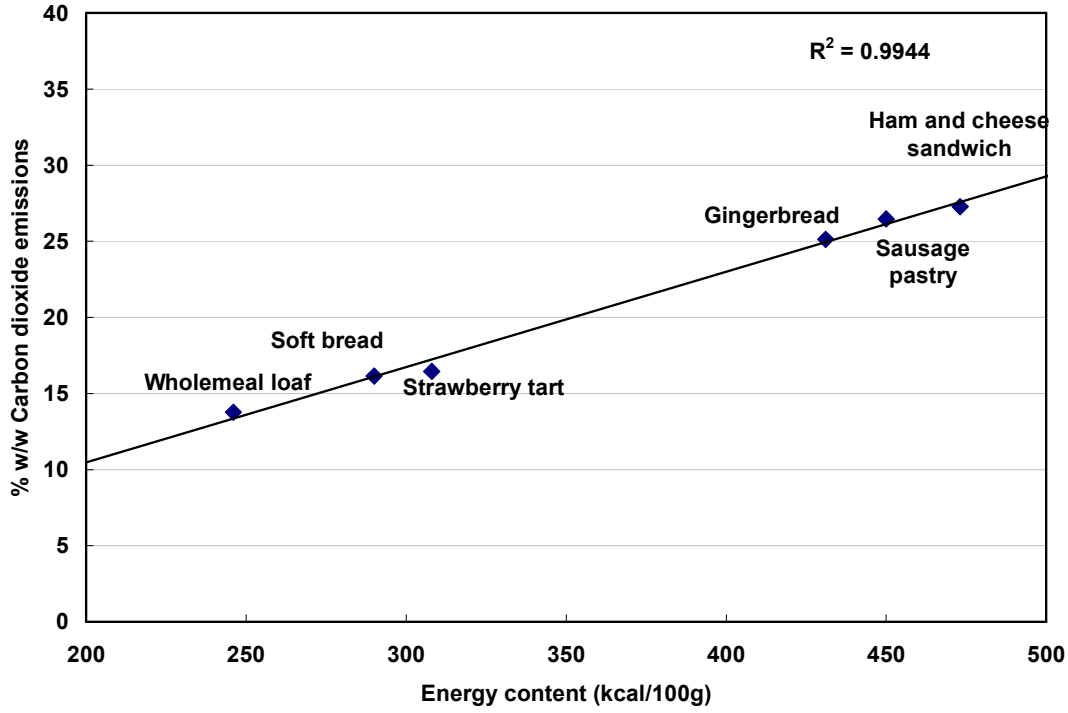


Fig. 2. The relationship between carbon dioxide emissions (Martindale *et al*., 2008; this proceedings) associated with the production of ingredients (primary production); the drying, milling and baking of products (secondary processing); and, the energy content of the food product.

Conclusion

Current systems of communicating health attributes of food and beverage products are perceived as a valuable and useful resource by consumers. Consumers understand nutritive contents of foods - what's healthy and what isn't. However, they are unsure about environmental impact or food miles involved in production processes but seem capable of understanding such information presented on a label. In motivational terms they are pre-contemplative - they lack the volition to go ahead and make changes and are waiting for some impetus or critical mass to be reached

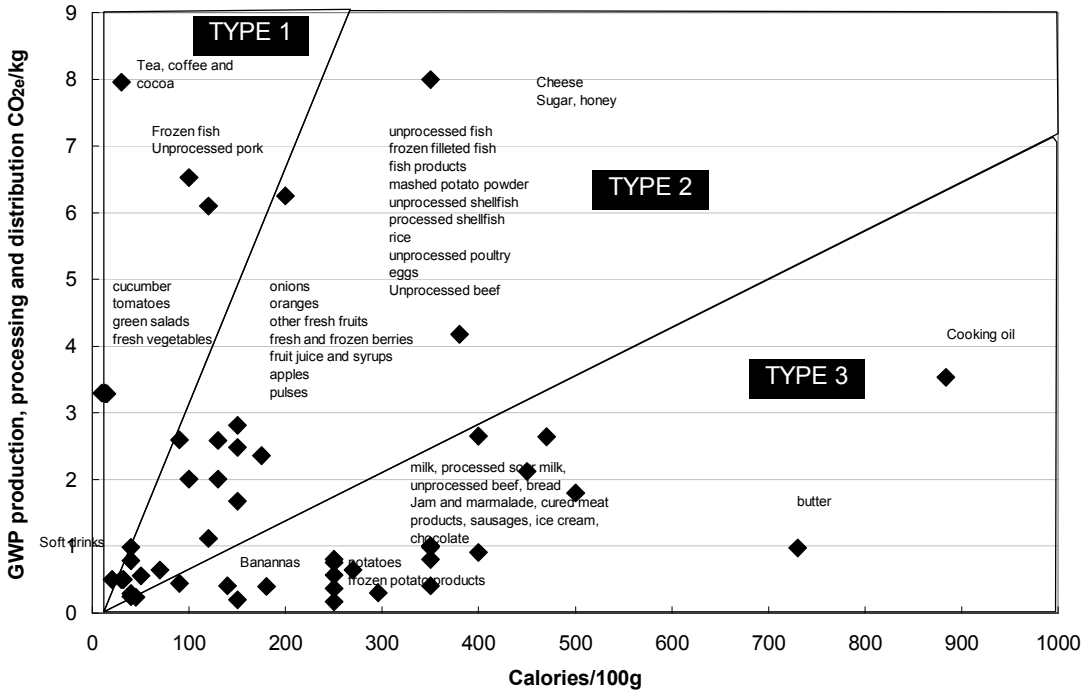


Fig. 3. The relationship between Global Warming Potential (GWP) associated with the production, manufacture, retailing and distribution of food and beverage products (obtained from Wallén *et al*., 2004) and, the energy content of the food product.

so as to bring about this change. Developing labelling systems that integrate nutritional and environmental impact may provide a vehicle for this change.

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