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Customer response to carbon labelling of groceries

Jerome K. Vanclay · John Shortiss · Scott Aulsebrook · Angus M. Gillespie ·
Ben C. Howell · Rhoda Johanni · Michael J. Maher · Kelly M. Mitchell ·
Mark D. Stewart · Jim Yates

Abstract Thirty-seven products were labelled to indicate embodied carbon emissions and sales were recorded over a 3-month period. Green (below average), yellow (near average) and black (above average) footprints indicated carbon emissions embodied in groceries. The overall change in purchasing pattern was small, with black-labelled sales decreasing 6%, and green-labelled sales increasing 4% after labelling. However, when green-labelled products were also the cheapest, the shift was more substantial, with a 20% switch from black- to green-label sales. These findings illustrate the potential for labelling to stimulate reductions in carbon emissions.

Keywords Carbon label · Ecological footprint · Emissions reduction · Green consumers · Consumer environmental purchasing behaviour

Despite a growing recognition that urgent action is needed to mitigate climate change (Garnaut 2008; Stern 2007), the focus of most government action has been industrial emissions, and the role of voluntary reductions by households has received less attention (Vandenbergh and Steinemann 2007). Groceries account for a substantial proportion of the greenhouse burden of an average household (ACF 2007; Wallace 2007), so informing shoppers about product choices has the potential to make a substantial reduction in greenhouse emissions, with minimal effort on the part of the consumer. We examined this proposition in a convenience store in the provincial Australian city of Ballina.

Literature

Despite an abundance of eco-labelling initiatives (Thøgersen 2002), few formal evaluations of consumer response to carbon labelling have been published. As Leire and Thidell (2005) and Thøgersen et al. (2010) emphasize, there is a need for a better understanding of consumer response to eco-labels. In the absence of reliable information specific to eco-labels, studies of other food labels offer some useful guidance (e.g., Ehrenberg 2000). Noussair et al. (2002) found that European consumers typically remained unaware of labelling regarding foods containing genetically-modified ingredients. Recent reviews of food labelling suggest that consumers make relatively little use of nutrition information, particularly if the information is complicated (Cowburn and Stockley 2005; Grunert and Wills 2007; Rex and Baumann 2007). Many researchers (e.g., Erskine and Collins 1997; Valor 2008; Weightman and McDonagh 2004) have reported that consumers are rarely influenced by claims of sustainability, but others have reported an increasing willingness to pay a premium for “green” products (Laroche et al. 2001; Young et al. 2010). A recent focus group conducted for the Tesco (UK) supermarket chain found that customers were concerned about climate change and interested in carbon labelling of supermarket products (Anon 2008), a view reflected in comparable studies concerning social conscience (e.g., Megicks et al. 2008; Rudell 2006). Several limitations and biases are known to occur with focus groups (Stewart et al. 2007), so this study examines purchasing preferences in a non-intrusive way by monitoring sales records recorded at point-of-sale.

Wallen et al. (2004) found that a wise choice within a product range could do more to minimize carbon emissions than a change in diet (e.g., vegetarian). Many researchers have observed consumer demand for eco-labels that would assist such wise decision-making by shoppers (e.g., Harris 2007; Howard 2006). Leire and Thidell (2005) reported that many Nordic shoppers were familiar with eco-labelling, and called for studies of the effect of eco-labels on purchasing decisions. This study seeks to address that need. Boardman (2008) discussed the practical complexities of carbon-

labelling of groceries, and this study examines the feasibility and customer response to such labelling.

Study Location and Conduct

The study was undertaken in a grocery store in East Ballina, a seaside suburb in northern New South Wales (Australia) with a demographic similar to the median for Australia. The 2006 census indicates that East Ballina closely matches the median Australian demography in many respects, but with somewhat fewer children and slightly higher rental costs than the national trend (ABS 2006). In East Ballina 35% of households comprise couples with children and 49% couples without children, compared to the national trend of 45% and 37% respectively. In 2006, the median rent in East Ballina was \$240 compared to the national median of \$190 (ABS 2006). In most other respects recorded in the national census, East Ballina resembles the national median.

The East Ballina FoodWorks store is located in a small suburban shopping mall, adjacent to a school and golf course, and sells fast food and snacks as well as grocery items. It is a large convenience store, selling approximately half a million grocery items per year. The store operates 7am to 8pm, seven days a week. Car parking is available immediately adjacent to the store. All purchases are scanned and an electronic record is kept, simplifying the capture and retrieval of data for analysis. The proprietors of the store kindly made this electronic record available to facilitate the choice of items to label and to judge the customer response.

We researched the carbon footprint at the point of sale of several grocery lines with high turnover and multiple products, consistent with advice from Berry et al. (2008) to concentrate on the “big items.” We used the point of sale data from the preceding three months to identify five product lines that exhibited high turnover and sufficient customer choice. These five product lines included milk, spreadable butter, canned tomatoes, bottled water, and non-perishable pet foods. Within these five product lines, we labelled 37 products selected from these high-volume sales items for this store. These items were classified on the basis of CO₂ emissions as average

(yellow footprint), lower (green) and higher than average (black footprint) within each product range. This three-category scheme is consistent with the recommendations of Grankvist et al. (2004). Our choice of green-yellow-black was a minor variation on the familiar “traffic light” theme, with the black deliberately chosen to symbolize carbon. Our objective was not to stop the purchase of products with a large carbon burden, but to draw to consumer attention to the consequences of their choice. Coloured labels featuring a footprint about the same size as other promotional signs (about 6 x 12 cm; Fig. 1) were placed on shelves immediately adjacent to each product in these ranges. The combination of visual and verbal cues in this way (Fig. 1) has been found in other studies to improve the efficacy of product labels (Tang et al. 2004).

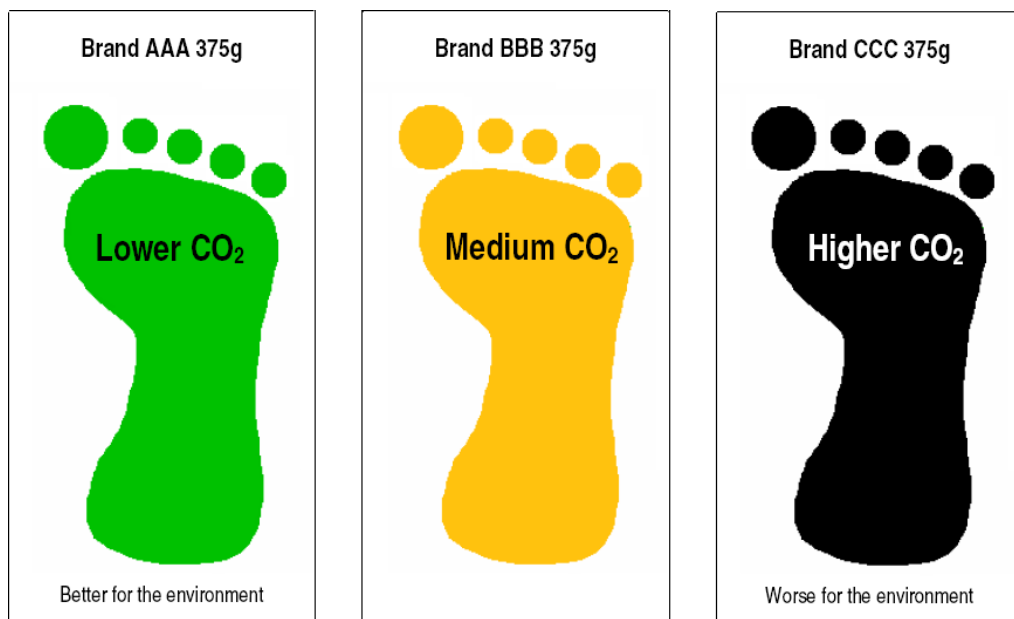


Fig. 1 Labels used in this study to indicate carbon footprints of grocery items

Within each of these product ranges, we compared all alternative brands representing likely consumer choices. Thus all brands of spreadable butter in tubs were labelled, but margarine and block butter (wrapped in paper) were excluded. Similarly, we labelled all fresh whole milk, but excluded flavoured and soy milk. The classification was strongly influenced

by the energy embodied in transport (e.g., bottled water, some of which was freighted long distances by road, and some of which was imported from overseas) and packaging (e.g., milk, all of which was local, but for which packaging varied). Because the carbon footprints of the various brands of bread in the store were very similar, bread was omitted from our study (as it would all have been labelled yellow). We attempted to calculate and compare the full CO₂ burden from point of production, including manufacturing, packaging and transport, and taking into account the transportation system (e.g., ship, road, rail) rather than to use food miles (Coley et al. 2009; Edwards-Jones 2008; Sirieix et al. 2008). Our calculations did not include any carbon offset arrangements that may have been used by some producers and suppliers. Despite these limitations and assumptions, we felt that the final classification into three footprint categories was reliable and consistent, and was fit-for-purpose to monitor customer response.

Labels were first displayed on Monday 25 August 2008 and remained in place for eight weeks. Sales data were retrieved from the store's sales system for the 12-week period spanning 4 weeks before and 8 weeks after labelling. This period was chosen to comply with operational requirements (the research formed part of the undergraduate subject FOR00110 Natural Resource Policy within the School of Environmental Science and Management at Southern Cross University) and seasonality (to avoid major changes in customer demography that occur during holiday periods). During this 12-week period, 2890 labelled items were sold.

Results

The placement of labels on Monday 25 August 2008 generated considerable media interest, with coverage in local press, radio and television during the following week. Store staff mentioned discussions with many customers who showed an interest in the new labels, and gross store turnover increased by 12% during the fortnight following the placement of labels, and by 4% overall during the 8 week study period following labelling. In the week

following the placement of labels, customers took over a hundred leaflets describing the study from a dispenser displayed near the checkout, and more were taken during subsequent weeks. In the fourth week of the study, stocks of green-labelled bottled water were temporarily depleted due to higher than usual demand. It is possible that media attention may have altered customer demography and behaviour, but media coverage was considered to be the most effective way to inform customers about the new labels and about the purpose of the study. Any bias from the media attention and customer demography is likely to have been short-lived, evident in the first week, but not the final weeks of the study.

Point-of-sales data revealed an increase in total sales of labelled items, with black-labelled sales declining from 32% to 26%, and green-labelled sales increasing from 53% to 57% of total sales during the eight weeks following labelling (Table 1). Although substantial, this aggregate shift in purchasing pattern was not statistically significant ($\chi^2=6.3$, $P=0.18$).

Table 1 Relative sales volumes overall (by number of items)

Label	Before labelling	1 st month	2 nd month
Black	32%	28%	26%
Yellow	15%	17%	17%
Green	53%	55%	57%
Total	100%	100%	100%

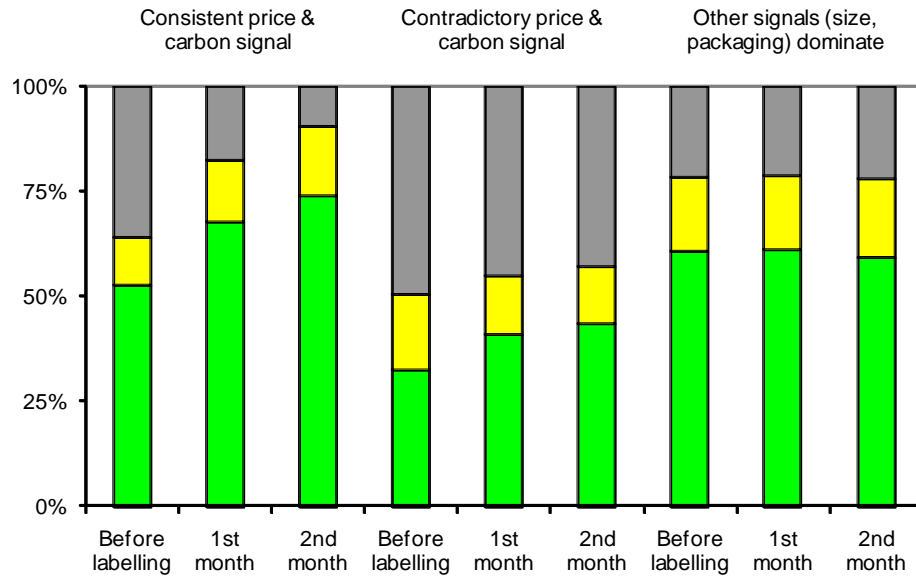


Fig. 2 Purchasing trends for three categories of labelled products over a 3-month period including one month before, and two months after labelling. (Top bar represents black-labelled product sales, middle bar represents yellow, and bottom bar represents green-labelled product sales)

However, it was possible to distinguish three different trends of customer response according to the relative carbon and price signals: when the product with the lowest embodied carbon is also the cheapest, when the product with the lowest embodied carbon is not the cheapest, and when other factors dominate over carbon footprint and price (e.g., with perishable goods such as fresh milk). When there was a consistent signal with the green-labelled product being cheapest (as with butter and canned tomatoes) there was a strong response of about 20% (Fig. 2) that was statistically significant ($\chi^2=29.1$, $P<0.001$). When the signal was contradictory and the green-labelled product was not the cheapest (as with bottled water and pet food), there was a weaker response ($\chi^2=8.3$, $P=0.08$).

No consumer response was observed with fresh milk ($\chi^2=1.5$, $P>0.8$). With the milk products, the carbon labels corresponded to container size, and it appeared that consumers have a strong preference for a particular size of package. All the milk in this study originated from the same processing facility, so carbon footprints depended on packaging, with 2 and 3 litre

plastic containers labelled green, 600 ml and 1 litre cartons labelled yellow, and 1 litre plastic containers labelled black because of the packaging burden per unit of contents. Two-litre milk containers are ranked highest amongst items sold in the store, and casual observation (of customers pausing while observing labels before selecting a black or yellow labelled 1-litre product) suggests that many customers habitually select the same sized container, perhaps balancing household consumption and product longevity. We speculate that small households with low consumption may not need more than one litre of milk in a single purchase, and after allowing for spoilage and waste that may occur when milk reaches its expiry date, may be optimizing their carbon footprint at point of consumption rather than at point of sale.

Discussion

We calculated carbon footprints at point of sale, and overlooked emissions that may arise later in a product life cycle, savings that may be made through recycling of containers, and any carbon offset schemes utilized by manufacturers. We concentrated on CO₂ emissions, overlooking other emissions that may contribute up to 25% of greenhouse effect (Kramer et al. 1999), because this study focused on customer response rather than the precision of greenhouse calculations and labels. Because we considered relative carbon emissions within a product range, we concentrated on packaging, storage, and transport of products, even though these may in some cases contribute a relatively small part of the total lifecycle impact (Carlsson-Kanyama 1998). Our study was primarily concerned with the customer response about labelling, and the reliability of labels was a secondary concern to maintain faith with customers and manufacturers.

Our decision to draw media attention to the study was based on the need to alert customers about the labels prior to their arrival in store, since many convenience store customers are unlikely to loiter whilst shopping. Forewarning customers in this way was intended to reduce any confusion, and to avoid the need for shoppers to read the in-store brochures before shopping. However, media interest was greater than was initially

anticipated, with local radio and television coverage on 25 August 2008 (the day the labels were placed in store), press coverage in four local daily and weekly newspapers during 26-28 August, and follow-up newspaper items at the end of the study on 2 October and 20 December.

The interest of the media (newspapers, radio and television) and the increase in grocery sales following the launch of the labels indicates strong community curiosity about mechanisms for reducing greenhouse emissions. Anecdotal feedback from shop assistants suggests that many customers were genuinely concerned for the environment and interested to see carbon-labelling in practice, but the contribution from “idle curiosity” cannot be estimated and should not be discounted, as the reasons for purchase decisions are many and varied (Biel et al. 2005; Grankvist et al. 2007; Pedersen and Neergaard 2005; Radas et al. 2008).

We had not initially anticipated that consumer responses would differ for perishable (e.g., milk, butter) and non-perishable items (e.g., canned tomatoes, pet foods), but with hindsight, this difference is logical as many customers at convenience stores have no need for large containers of milk, notwithstanding differences in labelling. The conduct of this study in a convenience store may have dampened results, and customers may have been motivated more by the availability and size of the selected product than in its carbon footprint. Thus the evidence detected this situation suggests a strong response to labelling. The influence of media attention may have biased results, but the trends observed were consistent, and continued to strengthen during the second month after labelling, suggesting that any initial bias introduced by any unrepresentative visitors was minimal.

The strong response evident when the price and carbon signals coincide suggests that the combination of a price incentive (via a carbon tax or emissions trading system) and a carbon label could be effective in reducing the greenhouse footprint of groceries, lending empirical support to the analysis by Rubik et al. (2007). However, we cannot rule out the possibility that some of the response may be because carbon labels may have raised awareness of purchasing decisions by customers, and caused

them to think more carefully about all aspects of their purchasing decision – price, quality and environmental footprint.

While this study was limited in scope and duration, and lacks a rigorous experimental design, it offers an insight not previously reported from a commercial in-store context. While some aspects (e.g., media attention, convenience store) limit the ability to extrapolate these findings to a broader context, the empirical data recorded suggests that these limitations will have had a relatively minor effect on findings.

Conclusion

This study, based on sales of 2890 items during a 12-week period (4 weeks before and 8 weeks after labelling) is too limited to draw decisive conclusions, but illustrates the potential – despite public complacency (Serman and Sweeney 2007) – for voluntary reductions in domestic emissions, especially when price signals and carbon signals coincide. Our study indicates that when consumers receive appropriate guidance about embodied carbon emissions, they may adjust purchasing preferences and favour green-labelled goods, collectively representing about 5% of total purchases. When carbon and price signals coincide (i.e., when green-labelled products were the cheapest alternative), the change in preference will be greater (up to 20% in our study). These findings illustrate the potential for labelling to stimulate both conviction-related and price-related reductions in household emissions.

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