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Nudging Consumers towards More Environmentally Sustainable Dietary Choices

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Abstract: This paper contributes to the emerging global discussion on how to orient government policy and action by organizations and individuals towards human diets that are environmentally sustainable. Emerging threats to global food security are resulting in action being taken involving transformations across the entire supply chain, from production to consumption. This paper provides an overview of the global food system and associated human diets before reviewing consumer behaviour in relation to dietary choices and identifying changes required for a more environmentally sustainable diet. Priority areas identified for policy and research that encourage consumers to change, based on high environmental impact and likelihood of consumers changing their behaviour, are reduction of "junk food" consumption and minimization of avoidable food waste.

Key words: marketing; food; consumer choices; environmentally sustainable diets
JEL code: M31

1. Introduction

Half a century ago it was predicted that the only complete solution for providing adequate food for humankind was to limit the rate of human reproduction (Slater, 1963). However, today the population has doubled and world's food system is being presented with the challenge of feeding a population that is continuing to grow — with an anticipated peak (due to declining birth rates resulting from increased affluence and education) of a further 50% increase around 2050 (Bongaarts, 2009).

To meet the world's future food security needs, production must grow substantially while, at the same time, to meet the world's sustainability goals, agriculture's environmental footprint must shrink dramatically (Foley et al., 2011). Measures of its current environmental impact include 30% of global biodiversity loss (mainly attributable to clearing land to grow animal feed for intensive livestock production) and 30% of greenhouse gas emissions in developed countries (e.g., UK) (WWF, 2012). Thus this most vital and resource intensive of all sectors (UNEP, 2012) is dealing with a triad of challenges — rising demand, adapting to climate change, and reducing greenhouse gas emissions (SCI, 2012). The relentless drivers behind rising demand are from a population that is growing in size and affluence whilst becoming increasingly urbanized. This more away from rural and into cities reduces an individual's capacity to produce some of their own food (UNEP, 2012).

Moving from a "hunter gatherer" lifestyle to modern mega-cities has been made possible through the

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successful application of humankind's ingenuity to producing food. The birth of modern agriculture commenced with the first tentative experiments in raising crops and domesticating animals over 10,000 years ago and now embraces multibillion dollar agribusiness corporations using global supply chains.

Technological advances over recent centuries have not altered the biological engine that drives food production. This includes management of land, water, energy from sun, nutrients, and carbon dioxide, to generate net food surpluses for human consumption (Slater, 1963). Increases in production have been achieved through using more of these resources (e.g., more land use for grazing and cultivation, more fresh water, and off farm sources of nutrients mainly nitrogen, phosphorus, potash) and intensification of production through applying new knowledge (e.g., professional farm management), technology (e.g., irrigation, pest and disease management, higher yielding crop varieties and livestock breeds, food processing and storage) and external sources of energy (e.g., fossil fuels and electricity — for farm work, processing, storage and transport). Much of this emphasis has been on increasing production per unit area of land and increasing cropping efficiency. This focus has resulted in a tremendous increase in food supply, particularly over the last 50 years, and is mainly due to increases in fertilizer use incorporated with new high yielding plants. This has been so significant that it is often referred to as the "green revolution" (Horlings & Marsden, 2011).

The Foresight Report on the Future of Food and Farming published by the UK Government stressed that the magnitude of the challenges facing the food system over the coming decades necessitates action on all fronts. This requires continued efforts to increase production, as previously discussed. It also highlights the desirability of changing consumer behaviour (GOS, 2011).

There is an emerging global discussion on what these changes may be, and how to achieve them. The following sections present an overview of global dietary profile and then identifies changes in behaviour required to achieve a more environmentally sustainable diet. It concludes with consideration of how further research from the discipline of food marketing could contribute evidence that will assist both policy makers and activists to achieve these changes.

2. Literature Review and Discussion

2.1 Global Dietary Profiles

In order to predict the range of impacts that different dietary choices could have on human health and sustainability, four global diets have been identified by the author. These have been referred to as the "fit", "fat", "famine", and "sustainable". The fit diet supports human health and wellbeing. Two of the other dietary profiles emerge from situations where consumers eat too much — the fat diet, or too little — the famine diet. From a human health perspective both of these are seen as being extremely problematic. Collectively the fit, fat or famine diets are leaving a heavy environmental footprint on the earth, hence it is valuable to consider a global diet that meets human health objectives whilst being sensitive to its impact on the natural resources — which is being referred to in this paper as the sustainable diet. The characteristics of these four diets are explained in greater detail as follows.

2.1.1 Diets for the Affluent and Informed — the "Fit Diet"

Many consumers in the world today are provided with an abundance of food from which they are able to make choices. For those who are affluent and have the knowledge to make healthy dietary choices, the current global food system could be seen as being "fit for purpose" in that it delivers food security, as defined by the

United Nations "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (2015b).

In accordance with healthy diet guidelines, most of the energy for this diet comes from complex carbohydrates (55%) with fat (30%) and protein (15%) making up the balance (Cordain et al., 2005). This fit diet is prevalent in developed countries, and an increasing number of consumers in developing countries are benefiting from it.

It has been estimated by the author of this paper that the current food system is supplying around 70% of the global population with a fit diet (This is based on deducting the portion of global population experiencing a fat, famine, and sustainable diet that are discussed in following paragraphs).

2.1.2 Diets Resulting in Over-nutrition as Manifest in Obesity — the "Fat Diet"

Eating too much, or too much of the wrong types of food, commonly results in an energy imbalance. In this situation energy consumed is in excess of that expended and this surplus is stored as body fat. Over time consuming a small surplus of energy leads to a dramatic gain in weight, for example, an adult who consumes 1% more than they expend (100 kJ a day) will gain around 1 kg a year (Lean, Lara, & O'Hill, 2006).

This consumption of energy in excess of bodily requirements has been labelled the fat diet. In its extreme form this manifests itself as obesity which is defined by the World Health Organization as having a Body Mass Index (BMI) greater than 30 (BMI = mass in kilograms/ square of height in meters). Obesity is often a result of "nutrition transition". This occurs when increasing affluence leads to a series of changes to people's diets, physical activity, health and nutrition, as a result of less physical work, greater food choices and the prioritization of convenience foods rather than well prepared and planned healthy meals (Popkin, Adair, & Ng, 2012).

The solution to reducing obesity includes balancing individual energy intake; increasing consumption of fruit, vegetables, legumes, whole grains and nuts; and limiting consumption of high salt-sugar-fat products which are commonly known as junk foods (Cordain et al., 2005).

The worldwide prevalence of obesity has almost doubled in the last 30 years, with estimates that now over half a billion people (10% of men and 14% of women) are obese. Obesity is common in developed countries (e.g., USA at 26%) but less pervasive in developing countries (e.g., South-East Asia at 3%) although it is increasing (WHO, 2012). From an environmental perspective eating an excess of food may be seen as a form of food waste (although some of the products may not be considered to be healthy foods). In addition, being obese increases health risks (e.g., chronic diseases of coronary heart disease, ischemic stroke, type 2 diabetes and some cancers).

Based on the preceding discussion fat diet is estimated by the author of this paper to affect around 15% of the world's population.

2.1.3 Diets of the Poor Resulting in Malnutrition — the "Famine" Diet

In contrast to obesity there is a diet associated with undernourishment or chronic hunger. This diet is often associated with extreme poverty and has been labeled the famine diet. It is more prevalent in developing countries and recent estimates suggest it affects 10-15% of global population (FAO, 2015a).

Measures to reduce undernourishment include improving access to high-quality foods and the benefit from increasing utilization of these foods through improving health care in terms of consumer knowledge about water, hygiene and communicable diseases. As undernourishment in children is largely irreversible, and contributes to many deaths of young children in developing countries, breast feeding for the first six months followed by complementary feeding practices are encouraged for all children particularly for the first two years of their life (UNWFP, 2015).

Based on preceding discussion it is estimated by the author that around 13% of the global population are affected by a famine diet.

2.1.4 Diets Sensitive to Environmental Resource Limits — the "Sustainable Diet"

This diet contributes to human health, by avoiding both obesity and malnutrition, whilst meeting food security expectations and being sensitive to the use of environmental resources.

Sustainable diets would form the ultimate source of demand for products from an environmentally sustainable food system. It is only recently that researchers have attempted to define a sustainable diet which captures inherent complexity of temporal and spatial variance in impacts of food production and consumption (Jones et al., 2015). This task is further complicated by trade-offs that exist between different sustainability indicators (WWF, 2012), such as maintaining soil fertility and water quality, protecting biodiversity, providing livelihoods for workers and their families along the supply chain, being sparing in use of non-renewable resources, and, discharging wastes are within the capacity of earth to absorb them.

The Food and Agriculture Organization of the United Nations has defined a sustainable diet as being protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (FAO, 2011a).

In the absence of published information indicating the prevalence of a sustainable diet, or even an agreed protocol for measuring it, the professional opinion of author of this paper has that it is being chosen by a small percentage of the global population, and for the purposes of this discussion has been estimated to be around 2%.

The following figure provides a summary of these global dietary profiles which includes estimates of the world's population having a fat, fit, famine, or sustainable diet.

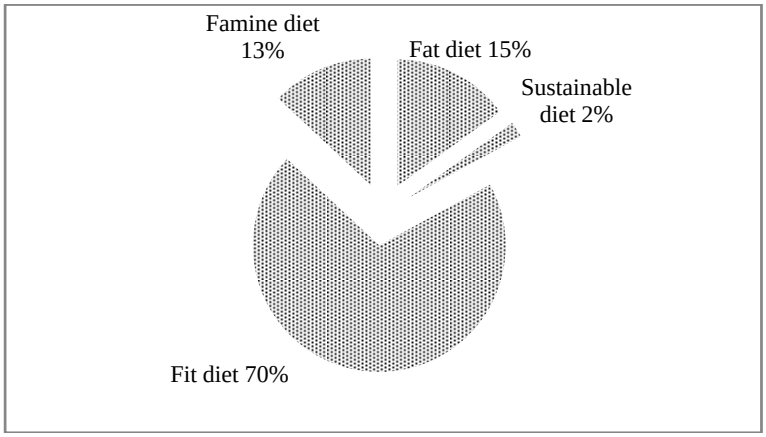

Figure 1 Current Dietary Profiles (% Global Population)

Source: based on preceding discussion

It has been argued that significant changes in consumption patterns will be required for humanity to live within planetary boundaries (Bongaarts, 2009; Daves, 2011; Godfray et al., 2010; Pearson, Friel & Lawrence, 2014). These changes require a significant "contraction" in resource usage. Further, many argue that "convergence" to reduce current inequalities in access to resources is also desirable (Raskin, Electris, & Rosen, 2010). This requires reducing the gap between high and low levels of consumption. In addition to the moral issue, this convergence may contribute to reducing hostilities both within and between nations around the globe.

There is considerable debate about the speed of these changes. Some suggest that developing food system

"resilience" is appropriate. This perspective emphasizes maintaining the status quo by preserving the current political-economy-societal regime and attempting to avoid system 'failure' through collapse (Nelson, Adger, & Brown, 2007). Others suggest "transition" with incremental changes that enhance system characteristics and functioning–including pervasive areas such as governance structures — is adequate (Rotmans, Kemp, & van Asselt, 2001). Whilst others argue that urgent action is required to achieve even greater changes–what has been referred to as transformation — which advocates the perspective that reform in overarching political-economy-societal regimes and associated cultural discourse is the only pathway for achieving a sustainable society in the long term (Pelling, 2010).

The shift in global dietary profiles that would emerge from these changes would require increasing take-up of the sustainable diet and commensurate shrinking of fit, fat and famine diets. For the purposes of this discussion this aspirational goal has been presented by the author of this paper as expansion of sustainable diet from 2% to 60%, and reduction in fit diet 70% to 30%, fat diet 15% to 5%, and famine diet 13% to 5% respectively.

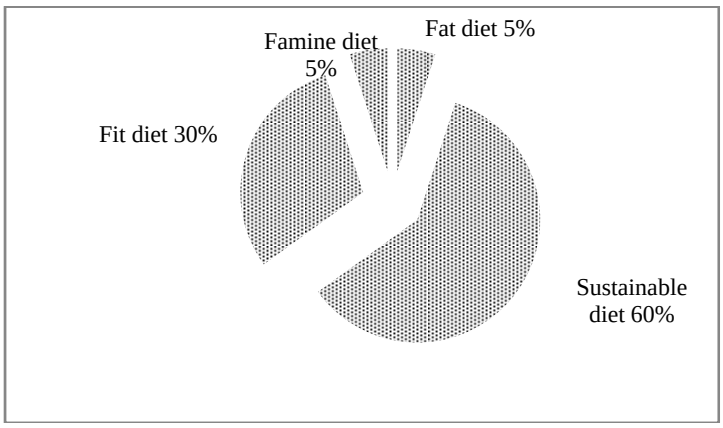

Figure 2 Aspirational Goal for Dietary Profiles (% Global Population)

Source: Based on preceding discussion

The specification of behavioural changes required to achieve these global dietary goals, in particular that of increasing sustainable diets, is an area of emerging research. The contribution to this research agenda from the food marketing discipline, and in particular that from the sub area of consumer behavior, is discussed in the following sections.

2.2 Food related Consumer Behaviour

The reasons behind an individual's food choices are multiple and varied (e.g., Holmes & Yan, 2012; Lee & Lin, 2013; Rainbolt, Onozaka, & McFadden, 2012). Food related habits which emerge from culturally acquired traditions have a major influence on food choice (Beagan, Ristovski-Slijepcevic, & Chapman, 2010). Both supply-side (such as product availability and pricing) and demand-side factors (consumers' preferences) influence their choices. Some factors are real constraints, such as the availability of products within the consumer's locus of movement as well as their capacity to pay. Many other factors are not constraints, however they may influence choices. These include price, convenience, quality, brand, food labelling, and ethical considerations including concern about the environment (Asp, 1999; Furst et al., 1996).

Furthermore, the actual purchase may involve a compromise. This emerges when a consumer's preferred choice comes into conflict with other priorities within the broader context in which food provisioning activities are undertaken. For example, some consumers may express a strong desire to purchase organic food but

difficulties in finding it, and/or its higher price, mean that it is not purchased on a regular basis (Pearson, Henryks, & Jones, 2011). It has been reported that consumers' desire to purchase sustainable food products is influenced by socio-demographic characteristics, product knowledge, distance from food retailers, and proximity to metro-areas (Holmes & Yan, 2012). Another relevant example is found with the 'eat local' food mantra which is popular with many consumers, and continues to be promoted in many countries for social, economic and environmental reasons (Pearson et al., 2011). However, an individual's ability to engage in these behaviours is limited by the amount of time and money that they have, and food outlets that are available to them. Similarly, amongst consumers who have a strong interest in prominent issues in the discourse of sustainable food, such as cooking from fresh and minimally processed ingredients, coping with feeding the family within a busy day is still often the dominant concern (McIntyre & Rondeau, 2011). This means that many families purchase "convenience foods" more than they would ideally like (Lee & Lin, 2013).

Another important consideration is the extent to which consumers, who tend to allocate a limited amount of time to make food purchase decisions, either lack relevant information, or base decisions on a misunderstanding. For example, some consumers are confused in relation to food labels that show ethical and environmental product features (Rainbolt et al., 2012). This includes those consumers who assume that "free range" products are "certified organic" when in fact they are not (Henryks & Pearson, 2010). This confusion is exacerbated when similar terms are used to describe features that are essentially the same, such as the multiple organizations who certify organic products where each uses their own logo (Pearson & Henryks, 2008). This confusion in relation to certified organic products is likely to continue in individual countries until a widely used and credible labelling system is developed, such as the one mandatory label that has been used in the USA (USDA, 2015) and the European Union (EC, 2015).

2.3 Changes in Consumer Behaviour Required for Sustainable Diets

Recent research activities have given renewed impetus to understanding and ultimately influencing consumer behaviour in relation to environmental sustainability of human diets (Garnett, 2011; Godfray et al., 2010; NHMRC, 2013; WWF, 2011). Harnessing the collective power of food choices made by individuals has been referred to as demand led changes towards lower environmental impact diets (Defra, 2010). It also offers an area where most consumers are able to make a meaningful contribution to sustainability by engaging in more environmentally sensitive patterns of consumption in their daily routines.

The Sustainable Development Commission in the UK (SDC, 2009) developed a list of priority actions at the household level for improving sustainability of diets. This study used a very broad definition of sustainability, which included more than just ecological outcomes. It is based around the UK Government's principles of sustainable development by "ensuring a strong, healthy and just society and living within environmental limits" (p. 8) and it explicitly aimed at integration (rather than trade-offs) between environmental, social and economic outcomes. Thus, these recommendations are consistent with health guidelines (Defra, 2007). This hierarchy of recommendations is based on the relative ease, or difficulty, of implementation. It placed highest priority on actions they considered were "likely to have the most significant and immediate impact on making our diets more sustainable, in which health, environmental, economic and social impacts are more likely to complement each other" (p. 4).

The high priority actions are:

- lowering consumption of meat,
- lowering consumption of dairy products,
- consuming less low nutritional value products (i.e., "junk food"), and
- reducing food waste.

Actions which were likely to result in trade-offs between different aspects of sustainability were given a lower priority. These were:

- increasing consumption of seasonal and field grown fresh fruits and vegetables (and reducing consumption of foods grown in heated greenhouses),
- only eating fish from sustainable sources, and
- increasing consumption of food produced with respect to the environment (e.g., organic food).

Actions expected to make a smaller contribution towards sustainability were given the lowest priority. These were:

- reducing energy use in food purchases and cooking, and finally,
- drinking tap water rather than from bottles.

In summary, it is recognized that diets, and their associated food systems, are hugely complex and that there are many areas in which environmental sustainability may be improved (Collins & Fairchild, 2007). In addition, consumers' purchasing decisions are a result of many factors, with environmental impact being just one of them.

2.4 Culturally Specific Example of Behaviour Changes Required

Previous research (Pearson, Friel, & Lawrence, 2014) has explored consumers' current behaviour, and willingness to change, in the nine priority areas identified and previously discussed through a proof of concept study with early adopters of a sustainable diets in one cultural context (Canberra in Australia. Whilst the method used is relevant to all cultural contexts the specific food related behaviours are likely to differ). These were organized into three categories that are relevant to consumers: the product purchased (such as red meat versus beans), its source (i.e., where the food comes from), and provisioning behaviour (i.e., around food purchasing storage, cooking and disposal) (Figure 3).

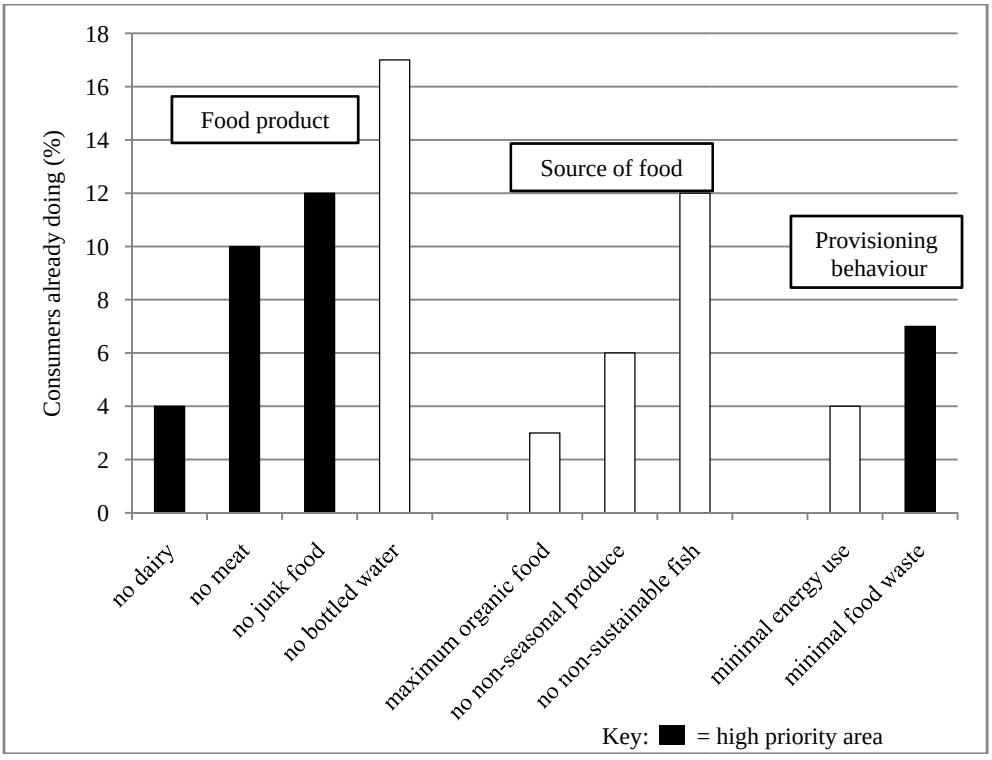

Figure 3 What Are Consumers Doing? (Pearson, Friel, & Lawrence, 2014)

These results (Figure 3) support other research (Davies, 2011) that suggests there is a significant opportunity to engage many more consumers in sustainable dietary behaviours as only a small number, around 1 in 10, are already engaging in these behaviours. As these results were from a pilot study of "early adopters" it would be expected that an even smaller portion of the total national population are engaging in them.

For the vast majority, the remaining 9 out of every 10, there is the possibility of them changing their behaviour to contribute to environmental sustainability, results exploring this follow (Figure 4).

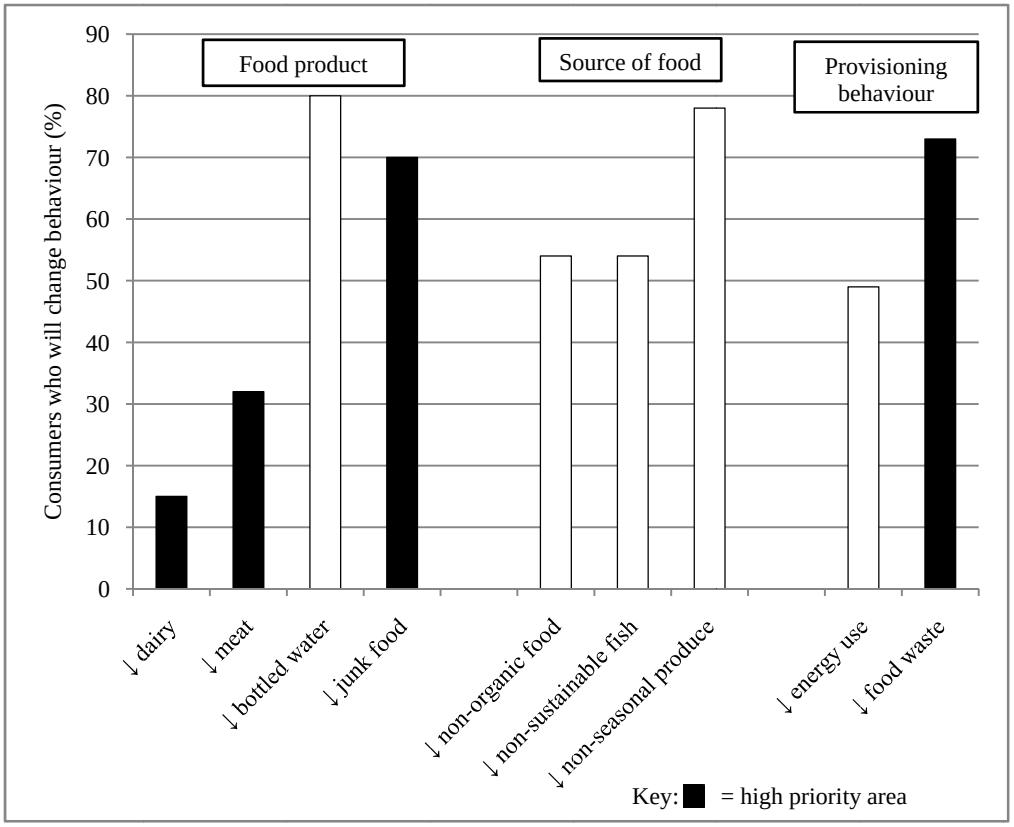

Figure 4 What Will Consumers Do? (Pearson, Friel, & Lawrence, 2014)

Note: *Sum of respondents who are "extremely likely" and "very likely" on a four point scale (with numerical anchors from 4 to 1) which included "somewhat likely" and "not likely".

These results (Figure 4) show the most prospective areas for encouraging a more environmentally sustainable diet, where most consumers 7 out of every 10 would consider changing their behaviour, are reducing consumption of junk food (which relates to the specific products chosen) and amount of food waste (which relates to food provisioning behaviour). These behaviours have a relatively large negative impact on the environment (as discussed in previous section), and these results show that many consumers indicate a willingness to make these changes. Reducing purchases of junk food also offers potential co-benefits of encouraging a healthier diet. Reducing food 'wasted' through the related behaviour of overeating also contributes to human health and wellbeing by reducing obesity. While elimination of junk food and food waste are not realistic, nor are rapid changes in human diets likely without massive external shocks, acknowledgement of these as priority areas in policy is likely to be extremely beneficial (FAO, 2011b).

In summary the transformation to a more environmentally sustainable diet will require changes in consumer

behaviours. To reduce the environmental burden these will need to be aligned with a general trend towards consuming less (particularly resource-intensive foods such as meat and dairy from intensive production systems). The specific priority areas for changing behavior are seeking reductions in consumption of junk food consumption and reductions in the amount of food waste.

2.5 Contribution from Food Marketing

Research from the food marketing discipline has a major role to play in contributing to understanding choices made by consumers and the potential to nudge these in directions that will reduce environmental impacts of the food system. Food marketing offers a method for creating knowledge of consumer motivations within temporal, social and spatial lived experiences where food related decisions occur. Such research will contribute valuable insights in relation to specific products including their price, promotion, and physical distribution.

Part of this food marketing research is to identify the target audience for behavioural change. This research may focus on opinion leaders, or "early adopters", who pioneer new behaviours that others copy including "followers" and eventually "laggards" (Arndt, 1967).

Taking this market research perspective also leads to consideration of the context in which choices are made (Park, Iyer & Smith, 1989). In relation to the priority behaviour changes in a developed country, such as junk food and food waste in Australia, this leads to consideration over who makes food purchases in a supermarket — which is relevant to junk food, and subsequently who is responsible for food in the home — which is relevant to food waste. It should be noted that gaining an understanding of the context for purchases of meals away from home is also important, as they are increasing in many developed countries, including Australia (Poti, & Popkin, 2011).

As diets vary due to cultural as well as national agronomic and economic conditions further effort is required to undertake market research in individual countries (Kittler & Sucher, 1990). In addition, it would be valuable to develop methodological protocols that provide a suitable balance between the depth of information gathered using qualitative techniques such as interviews, and generalizations available from more quantitative approaches such as questionnaires (Hanson & Grimmer, 2007). It is also important to note that most market research relies on information from self-reporting questionnaires (which may be biased), rather than observation of actual behaviour (being the area in which behaviour change is sought).

More research has been undertaken by the author to identify additional behaviour changes (beyond the list of nine as previously reported in Pearson, Friel, & Lawrence, 2014) that engage consumers in improving the environmental sustainability of their diets. This has identified a list of 12 behaviours that have been presented according to the product, where it is from, and provisioning behavior.

Food product:

- adjusting consumption of meat to recommended amount
- adjusting consumption of dairy products to recommended amount
- consuming 'junk food' in moderation and for enjoyment
- hydrating from tap water supplies which reduces purchases of bottled water

Where food product is from:

- selecting seasonal and field grown fresh fruits and vegetables
- selecting food options produced with respect to the environment (e.g., organic food)
- selecting food options with minimal packaging being that required to avoid product damage
- selection most locally sourced food products to minimize transport
- eating fish from sustainable sources

Food provisioning behavior:

- reducing energy use in food purchases and cooking
- avoiding eating above individual energy requirements
- reducing avoidable waste.

It addition to more detailed research in these 12 areas, it would be valuable to explore the consequences that emerge from any behaviour change that requires a reduction in consumption in one area. This is known as the "rebound" effect (Hertwich, 2005). For example, it is likely that a reduction in the consumption of junk food will lead to an increase in consumption of something else, which may, or may not, a smaller negative impact on the environment.

3. Conclusion

Thankfully the prediction of half a century ago that "famine, revolution and war" (Slater, 1963) would emerge from an inevitable scarcity of food has not come to pass for most countries, and individuals in them, around the world. Today, numerous research activities are contributing to food security's grand challenge of feeding a growing population, with rising demand for meat and high-calorie diets, whilst simultaneously minimizing its global environmental impacts (Seufert, Ramankutty, & Foley, 2012).

The actions required to bring about widespread adoption of dietary changes are numerous and require action by multiple stakeholders. In relation to planetary boundaries, it has been suggested that the world still has choices–but not for much longer (SCI, 2012). Hence it would appear timely for national governments to lead the development of a clear definition of a sustainable diet through comprehensive market research, in conjunction with other stakeholders (in particular retailers who have a central role in monitoring and influencing consumer sentiment) and convert this definition into specific dietary guidance (WWF, 2012). The transformation to more sustainable diets could simultaneously improve food availability and reduce environmental harm (Foley et al., 2011). These shifts in consumption will require complementary fiscal, regulatory and infrastructural measures that collectively reorient behaviours towards healthy and sustainable dietary choices (Garnett, 2011).

In summary, the food marketing discipline has an opportunity to contribute further research that contributes to informed policy choices. In particular identification of target audiences and the decision making context of individuals for environmentally sensitive dietary behaviours associated with individual products, where they are from, and food provisioning. Collectively this will contribute to the globally important area of improving environmental sustainability of human food system.

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