

The effect of food conservation on food waste

Dr. Ramesh T.Prajapati

HoD & Associate Prof. in CE/IT,

Shree Swaminarayan Institute of Technology, Bhat, Gandhinagar

Abstract

The cause of this paper is to illustrate the connection among meals upkeep and lowering purchaser waste is of price in growing sustainable meal alternatives. The studies reviews insights into Indian market for frozen and sparkling meals which have been received from a purchaser survey. The purchaser survey methodologies suggest how upkeep can alternate meal making plans and decrease meals waste throughout frozen and sparkling and ambient meals purchases the use of freezing upkeep methods. The consequences display meals waste may be decreased with the aid of using six-fold whilst frozen meals are as compared with sparkling meals. This look at highlights the requirement for an extra know-how of the opportunity that precise meals could be wasted with appreciate to the frequency of purchase. This is an obstacle of the modern look at that has been investigated with the aid of using different researchers. This studies have enabled the identity of various meals waste quantities for unique meals product categories. The facts provided might be used to manual meals product improvement in order that much less purchaser waste is produced. The studies indicate a selection matrix technique may be used to can manual new product improvement and a version of this matrix is provided in order that it can offer fit-for-cause meals upkeep alternatives for consumers. This paper will preserve to focus on the unnoticed price of meals upkeep all through processing and production of meals and their coaching in households.

Keywords: Food value, Consumers, Sustainability, Food unused, Frozen foods, Food conservation

Introduction

Consumers produce the topmost quantum of food waste and loss in the food force chains of developing and developed husbandry (Gustavsson et al., 2011). A recent pan European food waste programme has linked consumer food waste as a major challenge (COST Action TD1203, EUBIS). The COST Network, EU network on food waste valorization has given attention to working the quantum of consumer food waste produced through technological and policy interventions (Morone et al., 2017; Privett et al., 2016). Reducing all food losses will affect in a more secure global food system and it's important for us to show how consumers can reduce food waste in homes. This is where food preservation has an important part in easing this waste reducing action because it improves the utilization of food. It has also been linked that understanding why food is wasted by consumers during mess occasions develops of waste reduction strategies that can be used for different foods and preservation styles (Martindale, 2014).

former food waste reduction enterprise has generally riveted outside of this consumer arena and they've riveted on manufacturing and retail food losses. They've been successful at designing out food waste using the right- weighting of food product (portion control) and light- weighting of packaging (material resource effectiveness). Their success has been made possible through collaborative conduct across the food assiduity that have developed common responsibility for food waste. It's essential that these enterprises now act to reduce the food that consumers

purchase but don't eat (Mena et al., 2011). likewise, FAO reported Food Balance statistics show food chain losses for food groups similar as meat, fruit and vegetables to be below 5 per cent of product or domestic food amounts (Martindale, 2017). While these food losses remain incredibly important it's reported by public agencies and government departments that consumers' food waste regularly reaches 20 per cent or further of food bought (Defra, 2017).

There has been an emergence of distribution schemes and community based conduct that have been successful at removing food waste from food chains. Redistribution of foods that are close to shelf- life limits and schemes that provide food to consumers similar as "community fridges" have an exceptionally important part to play in waste reduction particularly where communities witness limited availability and affordability of foods.

The redistribution of foods from retailers and manufacturers that are close to shelf life limits or charitable donations has also seen the impact of using on- line communication technologies that connect providers with consumers of redistributed foods(Aschemann- Witzel et al., 2017; Aschemann- Witzel et al., 2015). What has become apparent in this arena is the reduction of food wastes from the food chain to the point of consumer trade is dependent on the operation of numerous conduct. That is, there's no single result then and numerous conduct that redistribute, involve communities and use on- line technologies will help to reduce food waste and produce mindfulness of responsible use of foods. The study reported then highlights the value of preservation technologies and the need for food order models that take account of differing shelf life and quality considerations because these will help to guide food policy. former studies of fresh and frozen shelf life of foods have shown a reduction in food waste associated with frozen food use(Martindale, 2014).

A more recent study in the Netherlands has developed a stochastic model to show the influence of medium, frozen and fresh preservation on food waste (Janssen et al., 2017). This study is critically important because it shows how food preservation styles that extend shelf life of foods in the home can reduce food waste over periodic time ages. These studies also suggest that knowledge of food preservation and the stylish use of foods in homes are critical in waste reduction.

Schemes that engage and redistribute food to reduce food waste don't completely address the issue of food and drink products being wasted by consumers because they aren't designed to reduce food waste. They redistribute food that would else be waste; the study reported then focusses on reducing the destruction of food that's bought with the intention of using it. The preservation of foods and types of food preservation styles available to consumers can reduce this because it reduces food deterioration and improves the utilisation of food in the domestic terrain. This is a principle that has remained largely unplanned indeed though the product of food waste increases greenhouse gas emissions or the carbon footprint of food consumption (Garnett, 2013; O'Rourke, 2014). It's pivotal to consider food waste reduction as an outgrowth of using saved foods because exploration carried out preliminarily demonstrated it can help us to define the sustainability of food that consumers prepare (Martindale, 2017).

In this study, it's demonstrated how frozen preservation can give lesser utilisation of food by consumers and reduce food waste. It isn't intended to show frozen is the only option for reducing consumer food waste. It's hoped that the exploration will punctuate the use of preservation styles in reducing consumer food waste and that there are several factors that must work together in food waste reduction to be successful. former exploration carried out in the UK request compared fresh and frozen food use in homes and the quantum of consumer food

waste was dependent on food preservation system. The study showed a 47 per cent reduction in ménage food waste for frozen products compared to fresh products (Martindale, 2014).

Frozen food in this study is defined by all food that's firm'd via quick freezing; this ensures the cell intactness and preserves the nutritive value of the food. The process of indurating food in this ménage riveted study is defined as non-frozen food which gets frozen via a standard freezer(at home), as such this is slow freezing where cell structure isn't maintained and it's less salutary than quick freezing but adds to shelf life significantly. The description of fresh food in this study is all non-frozen and non-freezing.

Working with frozen foods not only gives us an occasion to consider the value of food preservation in homes but we must also consider manufacturing manufactories furnishing effective use of coffers and continual vacuity(Tukker, 2015). This provides us with the occasion to develop models of food preservation that identify control points in the force chain that can maximise food waste reduction. Frozen and nipping foods define this demand more effectively than numerous other food force chains that don't save foods. The consideration of frozen or nipping foods in this study has handed an occasion to probe these wider impacts on food resource use by consumers. For illustration, indurating foods provides vacuity of out- of- season yield which can be included in the sustainability assessments of frozen and fresh yield(Foster et al., 2014). While these benefits of food preservation are important it's the impact on consumer food waste that's delved then. The value of localising food force is important in the sustainability arena if it can give what consumers demand and increased adaptability. There are studies that show localising food force can achieve this, particularly where there are strong indigenous food individualities and a artistic preference of using food service(Caputo teal., 2017). Localisation and the value of it to the food system aren't within the compass of this current study indeed though it's important to consider food preservation has enabled the force of foods that are out of season to consumers. Indeed, this was why preservation of fruits and vegetables using pickling and bibulous conserving surfaced traditionally(Martindale, 2017).

Dealing with frozen food not only gives us the opportunity to think about the value of storing food at home, but also about the efficient use of cash registers and the production of products that allow for a certain amount of free space. Yes (Tukker, 2015). This provides an opportunity to develop food preservation models that identify power chain checkpoints that can maximize food waste reduction. Frozen and nibbled foods demonstrate this need more clearly than many other food power chains that do not preserve food. The inclusion of frozen or shredded foods in this study provided an opportunity to examine their broader impact on consumer use of food resources. As an example, cured foods provide a lack of off-season yield that can be factored into sustainability assessments of frozen and fresh yields (Foster et al., 2014). While these food storage benefits are significant, the impact on consumer food waste is even more severe. In the field of sustainability, the value of localizing the power of food is significant if it can meet consumer demand and increase adaptability. There is research showing that this can be achieved through the localization of the power of food, especially when indigenous people have strong food personalities and an artistic preference for the use of food services (Caputo teal., 2017). Indeed, localization and its value to the food system are beyond the scope of this current study, but it is important to consider that food preservation has enabled off-season food power for consumers which is the reason why fruits and vegetables are traditionally preserved by pickling or absorbent canning (Martindale, 2017).

Frozen foods have played a vital part in enabling the global food force chain to evolve and without that food losses would be increased in husbandry and processing. numerous of the food force chain issues stressed in current food loss and food waste exploration don't live with frozen foods because quick freezing leads to the extended shelf life earnings that numerous waste reduction enterprise seek(Parfitt teal., 2010). likewise, indurating keeps within the conditions of “ clean marker ” labelled trends and frequently provides lesser portion control in the home(Shove and Southerton, 2000). The “ clean marker ” trend is now easily linked in retail surroundings where there are demands for component labelling that clarifies constituents and communicates any implicit allergens introduced in processing and manufacturing(Asioli teal., 2017).

The Indian request exploration reported in this paper allows us to extend current understanding of the utilisation of frozen foods. It also leads us to consider the broader issue of what incentivises consumers to eat a more sustainable diet. Indian homes presently produce around 369,000 tons of packed and unpacked food waste each time and there's over23.4 million tonnes of food waste produced by homes across the EC member nations(Bräutigam teal., 2014; Stenmarck teal., 2016). A sustainable diet must exclude this food waste, the Indian food waste volume is original to 300€ of food thrown down per ménage time(Lebersorger and Schneider, 2011; Penker and Wytrzens, 2005).

The data presented then shows both firmed food purchases and ménage freezing drop food waste significantly and this has important counteraccusations for furnishing sustainable refections and diet during meal occasions develops of waste reduction strategies that can be used for different foods and preservation methods (Martindale, 2014). Previous food waste reduction initiatives have typically focused outside of this consumer arena and they have focused on manufacturing and retail food losses. They have been successful at designing out food waste using the right-weighting of food products (portion control) and light-weighting of packaging (material resource efficiency).

Their success has been made possible through cooperative actions across the food industry that have developed joint responsibility for food waste. It is essential that these initiatives now act to reduce the food that consumers purchase but do not eat (Mena et al., 2011). Furthermore, FAO reported Food Balance statistics show supply chain losses for food groups such as meat, fruit and vegetables to be below 5 per cent of production or domestic supply quantities (Martindale, 2017). While these food losses remain incredibly important it is reported by national agencies and government departments that consumers' food waste regularly reaches 20 per cent or more of food purchased (Defra, 2017)

There has been an emergence offer-distribution schemes and community riveted conduct that have been successful at removing food waste from force chains. Redivision of foods that are close to shelf- life limits and schemes that grease furnishing food to consumers similar as “community fridges” have an exceptionally important part to play in waste reduction particularly where communities witness limited availability and affordability of foods.

The redivision of foods from retailers and manufacturers that are close to shelf life limits or charitable donations has also seen the impact of using on- line communication technologies that connect providers with consumers of redistributed foods (Aschemann- Witzel teal., 2017; Aschemann- Witzel teal., 2015). What has come apparent in this arena is the reduction of food wastes from the food force chain to the point of consumer trade is dependent on the operation of numerous conduct. That is, there's no single result then and numerous conduct that redistribute,

involve communities and use on- line technologies will help to reduce food waste and produce mindfulness of responsible use of foods. The study reported then highlights the value of preservation technologies and the need for food order models that take account of differing shelf life and quality considerations because these will help to guide food policy. former studies of fresh and frozen shelf life of foods have shown a reduction in ménage waste associated with frozen food use (Martindale, 2014). A more recent study in the Netherlands has developed a stochastic model to show the influence of medium, firmed and fresh preservation on ménage food waste (Janssen teal., 2017). This study is critically important because it shows how food preservation styles that extend shelf life of foods in the home can reduce food waste over periodic time ages. These studies also suggest that knowledge of food medication and the stylish use of foods in homes are critical in waste reduction.

Schemes that engage and redistribute coffers to reduce food waste don't completely address the issue of food and drink products being wasted by consumers because they aren't designed to reduce food waste. They redistribute food that would else be waste; the study reported then focusses on reducing the destruction of food that's bought with the intention of using it. The preservation of foods and types of food preservation styles available to consumers can grease this because it reduces food declination and improves the utilization of food in the domestic terrain. This is a principle that has remained

largely unplanned indeed though the product of food waste increases hothouse gas emigrations or the carbon footmark of food consumption (Garnett, 2013; O'Rourke, 2014). It's pivotal to consider food waste reduction as an outgrowth of using saved foods because exploration carried out preliminarily demonstrated it can help us to define the sustainability of refection's that consumers prepare (Martindale, 2017).

In this study, it's demonstrated how frozen preservation can give lesser utilization of food by consumers and reduce ménage food waste. It isn't intended to show frozen is the only option for reducing consumer food waste. It's hoped that the exploration will punctuate the use of preservation styles in reducing consumer food waste and that there are several factors that must work together in food waste reduction is to be successful. former exploration carried out in the UK request compared fresh and frozen food use in homes and the quantum of consumer food waste was dependent on food preservation system. The study showed a 47 per cent reduction in ménage food waste for frozen products compared to fresh products (Martindale, 2014).

Frozen food in this study is defined by all food that's firmed via quick freezing; this ensures the cell intactness and preserves the nutritive value of the food. The process of indurating food in this ménage riveted study is defined as non frozen food which gets frozen via a standard freezer (at home), as such this is slow freezing where cell structure isn't maintained and it's less salutary than quick freezing but adds to shelf life significantly. The description of fresh food in this study is all non-frozen and nonfreezing food.

Working with frozen foods not only gives us an occasion to consider the value of food preservation in homes but we must also consider manufacturing manufactories furnishing effective use of coffers and continual vacuity (Tukker, 2015). This provides us with the occasion to develop models of food preservation that identify control points in the force chain that can maximise food waste reduction. Frozen and nipping foods define this demand more effectively than numerous other food force chains that don't save foods. The consideration of frozen or nipping foods in this study has handed an occasion to probe these wider impacts on food

resource use by consumers. For illustration, indurating foods provides vacuity of out- of- season yield which can be included in the sustainability assessments of frozen and fresh yield (Foster teal., 2014). While these benefits of food preservation are important it's the impact on consumer food waste that's delved then. The value of localising food force is important in the sustainability arena if it can give what consumers demand and increased adaptability. There are studies that show localising food force can achieve this, particularly where there are strong indigenous food individualities and an artistic preference of using food service (Caputo teal., 2017). Localisation and the value of it to the food system aren't within the compass of this current study indeed though it's important to consider food preservation has enabled the force of foods that are out of season to consumers. Indeed, this was why preservation of fruits and vegetables using pickling and bibulous conserving surfaced traditionally (Martindale, 2017).

Frozen foods have played a vital part in enabling the global food force chain to evolve and without that food losses would be increased in husbandry and processing. numerous of the food force chain issues stressed in current food loss and food waste exploration don't live with frozen foods because quick freezing leads to the extended shelf life earnings that numerous waste reduction enterprise seek (Parfitt teal., 2010). likewise, indurating keeps within the conditions of "clean marker" labelled trends and frequently provides lesser portion control in the home (Shove and Southerton, 2000). The "clean marker" trend is now easily linked in retail surroundings where there are demands for component labelling that clarifies constituents and communicates any implicit allergens introduced in processing and manufacturing (Aioli teal., 2017).

The Indian request exploration reported in this paper allows us to extend current understanding of the utilization of frozen foods. It also leads us to consider the broader issue of what incentivizes consumers to eat a more sustainable diet. Indian homes presently produce around 369,000 tons of packed and unpacked food waste each time and there's over 23.4 million tonnes of food waste produced by homes across the EC member nations (Bräutigam teal., 2014; Stenmarck teal., 2016). A sustainable diet must exclude this food waste, the Indian food waste volume is original to 300€ of food thrown down per ménage time (Lebersorger and Schneider, 2011; Penker and Wyrzens, 2005). The data presented then shows both firmed food purchases and ménage freezing drop food waste significantly and this has important counter accusations for furnishing sustainable refectations and diets.

Research method

The Indian request data was collected via an online check carried out by the Institute of Marketing & Innovation, University of Natural coffers and Life lores, Vienna(BOKU) and Gesellschaft for Konsum for schung(GfK SE) during July 2015(GfK, 2016). The check questionnaire attained data from 2,800 actors on the frequency of their food purchases for fresh and frozen foods.

The check actors were named to represent the typical Indian population with regard to age and educational position. The selection made for geographic distribution across the Federal States was commensurable to the population in each Federal State. The selection to the panel of 2,800 was made using the GfK request check styles used for request exploration. GfK are a marketable and transnational company that handed the check panel of 2,800 homes. GfK's services are routinely used by the food sector by manufacturers and retailers to develop business conditioning and identify food and drink trends. The actors used in this check bought food and drink for their ménage and were asked how important food they wasted across six food groups as a chance of the total quantum of the food they bought. The six food groups were named because they were

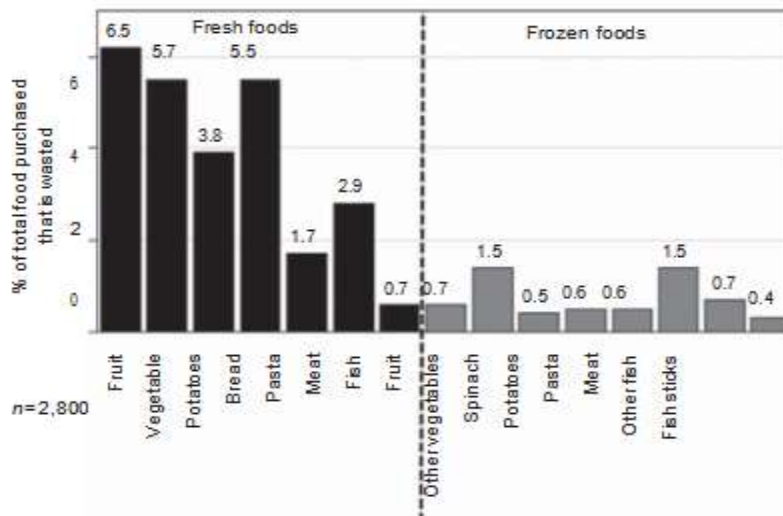
important food orders in Austria that have both firm and fresh options. Specially this included chuck where the offer and purchasing of frozen chuck rolls is typical for Indian consumers.

The actors of the check were asked to consider their ménage food waste in a week from the food they bought, incompletely utilized food, leavings (plate waste) and medication remainders. The core questions of the check that asked actors to report their proportion of food bought that was wasted as a chance were as follows

- 1) fresh food from your ménage purchases do you throw down?
- 2) frozen food from your ménage purchases do you throw down?
- 3) fresh food from your ménage purchases do you throw down per following product groups?
- 4) frozen food from your ménage purchases do you throw down per following product groups?

The food groups were fruit; vegetables (including specific questions for potatoes and spinach); chuck (fresh only); pasta; meat; and, fish (fish sticks also known as fish fritters for frozen foods). The core questions were developed in terms of what food product groups were wasted in homes. The check also collected demographic information so that the 2,800 actors reflected a typical sample of the Indian population and this was determined using GfK's demographic styles.

Research results



The quantum of food waste produced in the sample of 2,800 Indian homes. The data show that actors reported wasted 9.3 per cent of total fresh food bought and 1.6 per cent of total frozen food bought. therefore, the quantum of reported food waste deduced from the fresh foods is 5.8-fold lesser than that of frozen foods in the 2,800 homes assessed. This means that the six fresh food groups have a reported food waste that's 5.8-fold lesser than similar frozen food groups (see, Figure 1).

Figure 1- shows the food waste for fresh and similar frozen food groups

Percentage of fresh food purchase Food	Percentage of frozen food purchase Wasted	Fresh to frozen food waste Ratio
Fruit	6.5	0.7
Vegetables	5.7	1.5
Potatoes	3.8	0.5
Pasta	1.7	0.6
Meat	2.9	1.5
Fish	0.7	0.7

The food groups are fruits, vegetables, chuck, pasta, meat and fish. Data attained for the vegetable group were also specifically attained for potatoes and spinach because of the significance of these products in the frozen orders. An analogous approach was taken for fish products where fish sticks (also known as fish fritters) are an important frozen product order. It shows the quantum of food waste deduced from fresh food purchases is lesser than frozen food purchases across the six food groups assessed piecemeal from fish which is assessed as “other fish” in the reported frozen products then. These data are summarized in Table I where the rate of fresh to frozen food waste is handed.

Table I, shows the ratio of fresh to frozen food waste across the food groups shown

Research analysis

The goal of the research reported is to show how food waste behaviours connect many sustainability issues across the complex food choices consumers make when meals are prepared. Our research shows food manufacturers and food retailers occupy critical points in supply that can determine how these food consumption behaviours can be transformed into more sustainable ones. An important way of achieving this is through reducing the food waste associated with every meal.

Figure 1, shows fresh foods purchased have a reported 5.8-fold greater food waste compared to frozen food purchases in a survey of 2,800 Indian households. The assessment of waste from different food groups provides important insights into how households utilize fresh and frozen foods. Table I, shows the ratio of fresh to frozen food waste across the food groups shown. It can be seen that fresh food is wasted in greater amounts than frozen food in every category except fish where fresh food waste is 0.9 of frozen food waste. The ratios show that the greatest differences between fresh and frozen food groups are seen for fruit where fresh is 10.3-fold greater than frozen and potatoes where fresh is 7.8-fold greater than frozen.

Notably, the fresh to frozen ratio of specific food products include fresh vegetables and frozen spinach which is 13.8; and, for fresh fish and frozen fish sticks (also known as fish fingers) it is 2.0 in Indian households. Spinach and fish sticks are specifically tested here because they are extremely popular for meal purchases in the Indian and other European marketplaces. The 13.8-fold greater fresh vegetable waste than frozen spinach waste; and 2.0-fold greater fresh fish waste than fish stick waste is important because these products are developed to be directly placed into meals. They emphasize the impact of food product development when it is aligned to the portioning of food in meal preparation and if this is made to be optimal there is less food waste. This relationship between method of food preservation and portioning is also apparent with other food groups such as potatoes and pasta (Table I).

The reduction of food waste and correct meal portioning of specific food products are important because when they align and work together they can reduce food waste. This means data collected from consumers regarding what they consider to be the correct portion size in a meal is exceptionally valuable in waste reduction actions and it is rarely done. Obtaining such data is a challenge future research into food waste will need to address so that it can be transferred to food product development operations for maximum impact. The data collected here does not consider correct portion size data specifically but it does indicate its importance. The Indian research reported here has shown that the fresh food thrown away per household per person for this sample was 37.48 kg each year while the frozen food thrown away per household per person was 6.46 kg and per year. The nutritional losses associated with food waste have yet to be fully characterized but they are an important component of food waste projections (Halloran et al., 2014).

While we can determine the environmental impact of consuming foods in terms of their carbon footprint, it is the impact of wasting foods as an outcome of consumption that concerns us here. This is important because assessment of the environmental value of foods requires considerable investment of finance, knowledge and skills. It seems futile to make this investment if the assessed foods are wasted downstream in the food supply chain as they are prepared and consumed. New supply chain models are required to promote the value of reducing food waste and guide processes such as freezing that can reduce food waste. The data presented in Figure 1, clearly demonstrate a means to reduce the environmental impact of the food we choose to eat by reducing waste if frozen and freezing options are considered. The difficulty is that consumers choose foods based on what they like and this frequently changes, the choices made will rarely consider the impact of high level issues such as climate change but food waste reduction will be considered. This is because there is a very clear financial benefit to eliminating household food waste.

Current carbon foot printing methods show us that agri-production and global distribution can be the least of our problems because food wastage can be up to 20 per cent of food purchases and food losses across the supply chain can be far greater than this (Foster et al., 2014). It is difficult to communicate such sustainability trade-offs in consumer arenas because debates are too complex to be made at the point of purchase. This is partly because carbon foot printing results are extremely variable due to the diversity of different food production systems and this has been tackled by developing certifications that target many sustainability goals.

These have changed consumption of food by highlighting specific issues so that more ethical purchases are made such as those concerned with sustainable fishing, rainforest produce and so on. But it is day-to-day food waste at home and in supply chains that can make any diet unsustainable regardless of food certification used. Different preservation formats can reduce food waste and in the case of frozen food we know it can be reduced with respect to fresh foods because less of it is thrown away. There is no evidence that the nutritional values of frozen foods are any different to fresh foods if robust quality standards are in place from farm to fork. The nutritional losses resulting from food waste are significant and it is important to develop a food supply chain that is not losing these resources through wastage. There is not currently a certification that shows food produced with less waste or the use of food products that result in less waste and it is evident that there is a requirement to at least highlight the value of reducing consumer food waste. Food certification schemes that take household food waste reduction into account must be a future consideration in food and drink fast-moving consumer goods.

These ideas lead us to summarize the research presented here as a decision matrix model (Table II). The decision matrix highlights the major themes of consumer food waste reduction using frozen foods or freezing foods in households. It is proposed that such a matrix can be used to help food technologists guide the development of products with respect to preservation format and household food waste reduction. What is evident from the decision matrix analysis is a requirement to highlight the value of food preservation in reducing household food waste in the consumer space. This can be achieved by communicating through food companies' Corporate Social Responsibility programmers.

Table II. The decision matrix used to define the use of food preservation to reduce consumer food waste

Defining issues	Intervention issues identified by alternate and specific terms	Qualifier and outcome identifiers
Is frozen or freezing suitable for the food	Is the food material is suitable? Is the frozen market realistic (requiring market research)? Continuity of supply is required (e.g. to allow eating out-of-season)	LCA metrics can be used to improve the communication of environmental impact (e.g. the Carbon Footprint of a product)
How do you know it will reduce food waste	There is a fresh equivalent Current volumes of food waste need to be reduced Supply format provides convenience	There is currently a lack of tools to provide consumer advice. The research presented here helps to identify the benefits of preserving foods by freezing
How are consumption trends identified	Consumers must be familiar with product format. They may not typically use frozen formats	Peer review research studies must be used
How do we change behaviours when more sustainable ones are identified	Feedback from consumer's will determine efficacy of using freezing as a preservation method	There is currently a lack of tools to provide consumer guidance A need for more robust methods to demonstrate specific food preparations can result in less waste

Research conclusion

The research reported here shows purchased fresh foods have a six-fold greater food waste compared to purchased frozen food in a survey of 2,800 Indian households. The research supports previous research conducted in the UK where a 47 per cent food waste reduction was demonstrated for frozen foods compared to fresh foods. This relationship shows maximal resource use is achieved for frozen food products that are manufactured for the convenience of being included in meals. The conclusion is that food manufacturers, food retailers and policy makers must consider the role of food preservation in delivering a sustainable diet. The decision matrix approach here provides initial guidance in new product development a basis for doing this and it is supported by data sets that have now been obtained in the Indian and UK markets.

References

- 1.Aschemann-Witzel, J., De Hooge, I.E., Rohm, H., Normann, A., Bossle, M.B., Grønhøj, A. and Oostindjer, M. (2017), “Key characteristics and success factors of supply chain initiatives tackling consumer- related food waste – a multiple case study”, Journal of Cleaner Production, Vol. 155 No. 2, pp. 33-45.
- 2.Aschemann-Witzel, J., de Hooge, I., Amani, P., Bech-Larsen, T. and Oostindjer, M. (2015), “Consumer- related food waste: causes and potential for action”, Sustainability, Vol. 7 No. 6, pp. 6457-6477.

3. Garnett, T. (2013), "Food sustainability: problems, perspectives and solutions", Proceedings of the Nutrition Society, Vol. 72 No. 1, pp. 29-39.
4. Asioli, D., Aschemann-Witzel, J., Caputo, V., Vecchio, R., Annunziata, A., Næs, T. and Varela, P. (2017), "Making sense of the 'clean label' trends: a review of consumer food choice behavior and discussion of industry implications", Food Research International, Vol. 99 No. 1, pp. 58-71.
5. Bräutigam, K.-R., Jörisen, J. and Priefer, C. (2014), "The extent of food waste generation across EU-27: different calculation methods and the reliability of their results", Waste Management & Research, Vol. 32 No. 8, pp. 683-694.
6. Caputo, P., Clementi, M., Ducoli, C., Corsi, S. and Scudo, G. (2017), "Food chain evaluator, a tool for analyzing the impacts and designing scenarios for the institutional catering in Lombardy (Italy)", Journal of Cleaner Production, Vol. 140 No. 2, pp. 1014-1026.
7. Defra (2017), "Food statistics pocketbook: office of national statistics", available at: www.gov.uk/overnment/uploads/system/uploads/attachment_data/file/553390/foodpocketbook-2016report-rev-15sep16.pdf (accessed 10 March 2017).
8. Foster, C., Guében, C., Holmes, M., Wiltshire, J. and Wynn, S. (2014), "The environmental effects of seasonal food purchase: a raspberry case study", in van der Werf, H.M.G., Garnett, T., Corson, M.S., Hayashi, K. and Cederberg, C. (Eds), Towards Eco-Efficient Agriculture and Food
9. GfK (2016), "We are GfK", available at: www.gfk.com/de-at/ (accessed 24 February 2017).
10. Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R. and Meybeck, A. (2011), Global Food Losses and Food Waste, Food and Agriculture Organization of the United Nations, Rome.
11. Morone, P., Papendiek, F. and Tartiu, V.E. (2017), Food Waste Reduction and Valorisation: Sustainability Assessment and Policy Analysis, Springer International Publishing AG.
12. O'Rourke, D. (2014), "The science of sustainable supply chains", Science, Vol. 344 No. 6188, pp. 1124-1127.
13. Parfitt, J., Barthel, M. and Macnaughton, S. (2010), "Food waste within food supply chains: quantification and potential for change to 2050", Philosophical Transactions of the Royal Society B: Biological Sciences, Vol. 365 No. 1554, pp. 3065-3081.
14. Penker, M. and Wyrzens, H.K. (2005), "Scenarios for the Indian food chain in 2020 and its landscape impacts", Landscape and Urban Planning, Vol. 71 No. 2, pp. 175-189.
15. Privett, K., Clark, J.H., Arshadi, M., Koutinas, A., Gathergood, N., Morone, P. and Luque, R. (2016), "Food supply chain waste: emerging opportunities", Chemicals and Fuels from Bio-based Building Blocks, pp. 667-680.
16. Janssen, A.M., Nijenhuis-de Vries, M.A., Boer, E.P. and Kremer, S. (2017), "Fresh, frozen, or ambient food equivalents and their impact on food waste generation in Dutch households", Waste Management, Vol. 67, New York, NY, pp. 298-307.
17. Lebersorger, S. and Schneider, F. (2011), "Discussion on the methodology for determining food waste in household waste composition studies", Waste Management, Vol. 31 No. 9, pp. 1924-1933.
18. Martindale, W. (2014), "Using consumer surveys to determine food sustainability", British Food Journal, Vol. 116 No. 7, pp. 1194-1204, available at: <https://doi.org/10.1108/BFJ-09-2013-0242>

18. Tukker, A. (2015), "Product services for a resource-efficient and circular economy – a review", in Vezzoli, C., Ceschin, F., Diehl, J.C. and Kohtala, C. (Eds), Why have Sustainable Product-Service Systems' not been Widely Implemented?, Vol. 97, pp. 76-91.
19. Martindale, W. (2017), "The potential of food preservation to reduce food waste", Proceedings of the Nutrition Society, Vol. 76 No. 1, pp. 28-33.
20. Shove, E. and Southerton, D. (2000), "Defrosting the freezer: from novelty to convenience a narrative of normalization", Journal of Material Culture, Vol. 5 No. 3, pp. 301-319.
21. Stenmarck, A., Jensen, C., Quested, T., Moates, G., Buksti, M., Cseh, B. and Redlingshofer, B. (2016), "Estimates of European Food Waste Levels", IVL, Swedish Environmental Research Institute, Stockholm.