An exploration of the dynamics between household food sustainability practices and food acquisition routes

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Executive Summary

This research is part of the PLATEFORMS project, an ERA-NET Co-fund under Horizon 2020 conducted across five partner countries: Germany, Italy, Sweden, Norway, and Ireland. The PLATEFORMS project seeks to explore if, and how, food supply channels influence household food consumption practices in the context of sustainability. In this study a food supply channel is viewed as a particular route used to acquire food. Examples include grocery stores, online stores, farmers' markets, box schemes, community supported agriculture, food assembly platforms, among others. This research explores household food consumption practices across the different stages of consumption (provisioning/acquisition, storing, cooking, eating, and disposing) from four supply channels (see figure 1). The knowledge gained from this study aims to contribute to existing bodies of research centred on food practices and sustainable consumption.

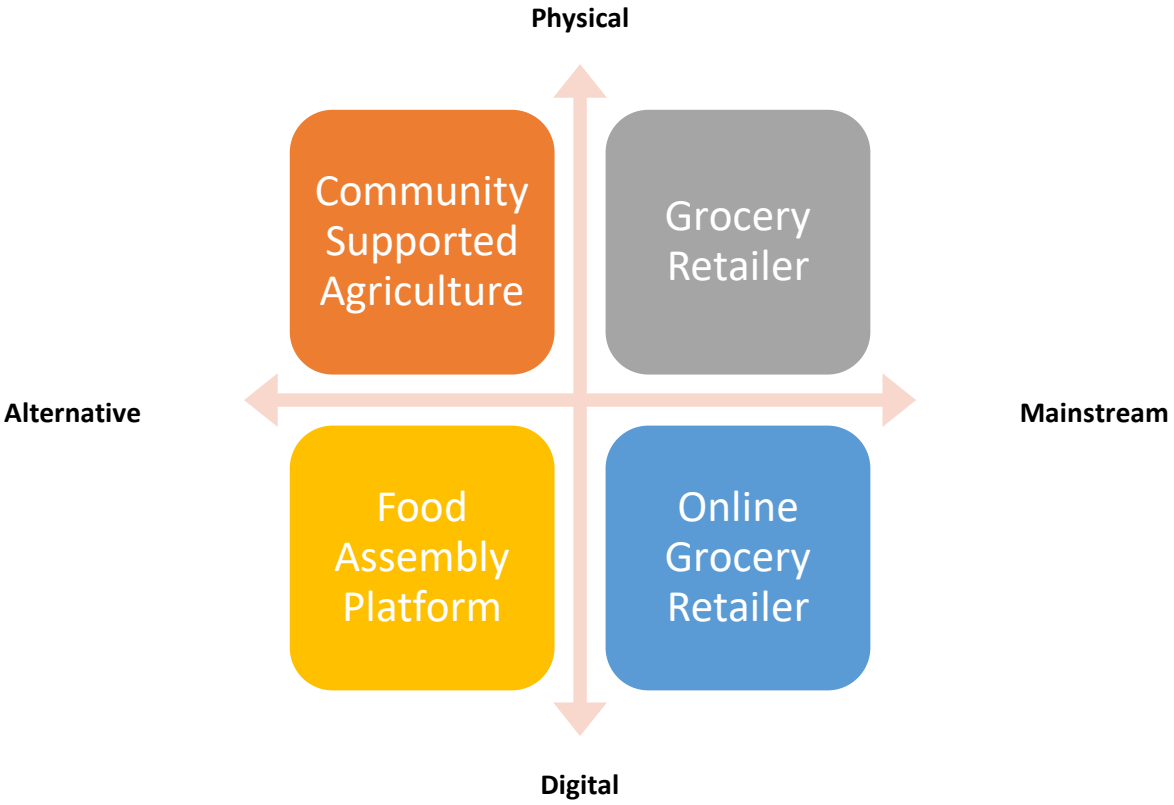

Figure 1. Supply channel selection

The qualitative data presented in this report is drawn from a sample of 42 in-depth interviews divided among the four cases of food supply channels detailed in figure 1. The research was based in the South and East of Ireland. An ethnographic-style framework was adopted, using in-depth interviews, and drawing on demonstration techniques such as photo diaries, non-participant observations, 'digital walkthroughs' and 'kitchen tours.' Thematic analysis was used to identify patterns and themes emerging from the interviews and was compared to data collected via the demonstration techniques which provides confidence in the findings and conclusions developed. The findings of this study provide insights to the nature of the household food practices carried out by consumers across the case groups and the factors that enabled/ hindered consumers in meeting sustainability goals.

- **Alternative physical:** the social infrastructure of the Community Supported Agriculture (CSA) promoted and facilitated more sustainable consumption practices centring strongly around local and seasonal foods. Co-learning processes among CSA members translated into effective food planning, improved cooking skills, sharing recipes, and practicing traditional preservation techniques to extend the lifespan of seasonal produce. These practices enabled members to adapt to seasonal availability of produce during different times of the year and thus presented as resourceful and competent in achieving food sustainably outcomes.

- **Alternative digital:** the technical infrastructure of the Food assembly (FA) platform presented as a convenient route for customers to access a wider range of local and seasonal foods. A higher value meaning was attributed to produce acquired from the FA by customers which tended to result in a minimisation and/or avoidance of wasting food acquired via this route.

  Mainstream physical: the brick-and-mortar grocery retail customers were met with many challenges in avoiding over-purchasing of food on a weekly basis, usually due to special offer temptations. However, some efforts were being made to purchase local and/or less packaged food where possible and to plan meals in order to minimise food waste. Customers however tended to struggle to avoid purchasing plastic packaging due to choice constraints while efforts to minimise and/or avoid food waste were compromised by 'value for money' special offers, lack of planning, and purchase of 'more than required' portions sizes.

- **Mainstream digital:** the online grocery retail customers were less likely to deviate from their 'usuals' list and thus impulse purchasing of special offers were less prevalent in this group. Where they encountered significant obstacles in seeking to avoid plastic waste, their lack of impulse purchasing and their ability to check stock as they ordered their weekly food resulted in a greater opportunity to avoid food waste. The online retail format evidently provided a favourable opportunity for customers to better their food sustainability outcomes.

The findings of this report advocate a design of interventions to promote and enable sustainable food consumption practices at both a household level and throughout the supply chain. The key recommendations arising from this report are as follows:

- ***Seasonal & local foods:*** practical and appropriate communications to mainstream physical and digital customers which seek to increase awareness and use of local and seasonal foods in meals may foster more consumption of such food produce. Initiatives such as training staff members to

provide customer assistance as 'sustainability ambassadors' and offering meal solutions for 'seasonal vegetable of the week' through social media are outlined.

- ***Social connection:*** drawing on the example of how the social infrastructure of the CSA promotes and facilitates co-learning amongst its members could provide ideas or mechanisms to foster such learnings and connections in the mainstream context. Social norms messaging and 'crowdsourcing of ideas' and digital awareness campaigns are suggested interventions.

- ***Cooking skills:*** cultivating households' culinary competencies in repurposing leftovers or unused foods is a useful means of fostering more sustainable consumption practices. A combination of in-store food stands, 'sustainability ambassadors,' online recipes and 'seasonal vegetable of the week' could enhance cooking skills.

- ***Plastic waste:*** interventions designed to minimise and/or prevent plastic waste at both retail and household level in order to overcome this considerable barrier to sustainable consumption practices are worth considering. Providing 'reuse and refill' facilities, a rewards scheme for customers who bring reusable bags for fruits and vegetables and 'reverse vending machines' for recycling bottles are suggested interventions seeking to prevent and reduce plastic waste.

- ***Food waste:*** drawing attention to the sustainability related trade-offs associated with package size and special offers in-store and developing strategies that better equip consumers to overcome such barriers warrant consideration. Creating digital content and engaging with influencer marketing that promotes alternative solutions to food waste can educate consumers.

- ***Household materials:*** highlighting the beneficial role and encouraging the use of household equipment such as food processors, freezers, and reusable containers in promoting sustainable consumption practices is worth considering.

Introduction

Amidst increasing awareness of, and concern for, environmental sustainability, one of the most considerable challenges of our time is to change our consumption habits in order to operate within planetary boundaries (IPCC, 2018). Our food practices have been identified as one of the cruxes of the urgently required transition to more sustainable food consumption (Springman et al., 2016; Tilman & Clark, 2014). Despite a significant increase in consumers' awareness of sustainability and more positive attitudes towards engaging in sustainable food practices, substantial behavioural change towards such practices remains a challenging task. Although consumers may be motivated to be more sustainable in their consumption practices, they may struggle to translate these intentions into strong sustainability behaviours due to a number of factors such as perceived ability to change, resources or understanding. This intention-behaviour gap can present challenges in capturing a true account of household food consumption practices. Consequently, there has been a call for research to focus on real world observations and behaviours by paying particular attention to everyday practices and routines.

The diverse ways in which food can be acquired have the potential to influence households' food consumption practices by providing consumers with broader options for food shopping and consumption. In addition to the well-established food supply channels, such as the mainstream food retail multiples

(physical and digital), many alternative food networks (AFNs) such as farmers' markets, box schemes, food assembly platforms and CSAs offer consumers a range of foods and meal solutions. Understanding the impact of these food supply channels on household food practices and how they can promote sustainable food consumption at a household level may help progress household food consumption towards more sustainable patterns on a larger scale.

This qualitative study seeks to explore the influence of four food supply channels (alternative [physical and digital] and mainstream [physical and digital]) on household food practices in the context of sustainability. This report details the methodology employed, the findings from the four case groups and concluding remarks on evidence of households' sustainable consumption practices, with some recommendations for food retailers, policymakers, and consumers, as a result.

Methodology

An ethnographic-style framework based on social practice theory (SPT) was used for this research. This 'practice-centred' framework focuses on the 'doings' of consumption to highlight the nature of household routines and everyday engagements with food. A sample of 42 households divided between four cases was used to explore household food consumption practices from acquisition to disposal. The selected four case groups and number of interviewees in each is detailed below. Participants were based in the South and East of Ireland. It should be noted that participants generally used more than one of these food supply channels but the case group they were assigned to accounts for a significant portion of their food-related consumption activity.

1. Alternative physical (CSA members) (10)
2. Alternative digital (FA consumers) (10)
3. Mainstream physical (in-store consumers) (16)
4. Mainstream digital (online consumers) (6)

Ethnographic-style in-depth interviews, and demonstration techniques (e.g., photo diaries, non-participant observations, kitchen walkabout, digital walkthrough) were used. Interviews were carried out in participants' homes, making it easier to integrate observations and demonstrations in the interview. This approach helped unpick the complexities of household consumption practices and understand how the 'doings' of consumption under each case group may account for sustainable consumption routines.

Findings

It is evident across all groups that food offers enjoyment and pleasure and is linked to nourishment, health, family, and socialising. For the CSA members social connections created through food were central to its role in their lives. According to this group "*food is eating together, cooking together (Ember)…shared meals (Ivy)...it is the way we get together with people (James)… it helps people connect and be together (Amy)…. Food is life, it is social (Roxy)…it means life (Rosie)…where you sit down, and you chat (Mary).*" The pleasure and enjoyment derived from food was central to their commitment to the range of activities they engaged in around food. This extended beyond the enjoyment of eating to the joy of sharing meals and food occasions and socialising. Consequently, the time invested in creating meals and preserving foods was seen as part of the overall experience.

Social dimensions were also central to many FA customers' relationship with food. This group used food to support expression of social and personal identity with culinary skills and food choices central to conveying oneself as, for example, carers or food connoisseurs. For Damien, "*the whole business of preparing, cooking sitting down and eating, and knowing that the stuff you have bought has come from people that you spoke to that morning is a whole process which I really love*" while Daniella used food to express her carer identity, *"it is how I show my family that I care for them and in return, their appreciation for what I have put in front of them makes me feel validated."* Pleasure derived from all elements of food practices, including connection with the people who supply the food, defined this cohort's relationship with food.

While social aspects were important to mainstream shoppers, both traditional and online, health, nutrition, and enjoyment of eating seemed more to the forefront of their thoughts. For this group, food helped them express elements of their identity or serve a functional purpose *"Food is about nutrition (Abi)… it means nutrition (Jackie)… nourishing (Kate)... what you eat is what you are (Ber)… I try to be health conscious (Dawn)… it is survival (Sara)... we need food to survive (Teresa)... well, without it we die (Lily)."* The reference to 'you are what you eat' extended the idea of food beyond food for health to represent the significant role that food played in their lives. For some, this related to being immersed in all household food activities and managing family diets, to exploring and experimenting with food.

Irrespective of the core meanings ascribed to foods across the cohorts it is evident that characteristics such as local, seasonal, artisan and organic held an elevated status and offered pleasure, health, social and environmental benefits.

Within this broad context of meanings, the stages of household consumption practices from acquisition to disposal are explored in the four food supply channels with attention given to ways these channels enable/inhibit sustainable consumption practices in the home. The four cases are presented in turn with the first two cases focusing on alternative food networks, physical (CSA) and digital (FA). This is followed by the two mainstream cases, physical (grocery retail) and digital (online-grocery retail). The findings presented here focus on the elements of sustainability-focused practices most prevalent in each group so for example, in one case, cooking and storage may present the most richness in terms of sustainability whereas in other cases acquisition and/or disposal presents more evidence in terms of sustainable practices and are discussed accordingly.

Community supported agriculture (CSA)

CSA is a type of AFN model that directly connects the producer with consumers within

the local food system. Consumers pay an annual subscription to the network to become a member and gain a share of the farm's produce. Farm produce is delivered to a central location twice weekly and members collect from there according to their needs.

Acquisition practices

The CSA households depend primarily on the community farm and the surrounding lands in sourcing fresh and seasonal vegetables and fruit. Members generally continue to acquire their other food provisions from other food retailers. Vegetables and fruits are only bought via food retailers when farm produce is limited (e.g., hungry gap period). However, the CSA members appeared to have, in the main, moved away from major retail multiples, using instead alternative physical and online food suppliers, such as small independent food shops (e.g. local and organic shops), AFNs (e.g. direct farm sales), and collective online bulk suppliers.

Planned collection

Collection of farm produce is available twice a week from the CSA pick up point, where members are free to take the quantities they need of vegetables. Members expressed their consciousness of the importance of only taking what they need to: 1) avoid the laborious management and processing practices in their homes and 2) prevent waste of excess produce. Direct communication among the CSA board and the CSA members in terms of upcoming produce etc. enabled households to manage their stocks each week and plan ahead. For example, they sent harvesting reports informing them of limited quantities of produce available at given times, so as to consider other members when collecting produce, and also encouraged them to collect more and preserve when there was an abundant supply of specific produce.

Figure 2 CSA collection point

Box 1: Examples of planned acquisition

"So you just go up and kind of take a small handful of what you need… So there is lots of rhubarb around and I don't have any plans to do that at present, so there is no rush… so the trick is to not take too much food unless you actually are going to use it otherwise you end up wasting it. "Rosie/>70/F

"So, everybody knows the delivery days, we get an email on the delivery days telling us what's in that day's delivery. There is a basket left aside of food for people that are working away during the day so they can't call in until the evening time, so we all respect that, so that means that for the people who can't get there during the day, there's stuff left aside and they don't lose out as a result. And the system works well." James/60-69/M

Seasonal cooking and eating

CSA members believed that seasonal foods were better tasting, healthier and more nutritious. They held strong beliefs about the value of following the seasonal diet and enjoying different foods available throughout the different seasons. CSA membership resulted in households' adjusting their food cooking, eating, and storage practices. This was done to accommodate the seasonally bound availability of produce, (from both the farm and foraged), and to prevent food waste. Creativity and improvisation in the use of food was evident with cooking skills and capabilities

central to avoiding both waste and potential boredom from a limited and repeated meal repertoire. Furthermore, the availability of various new and often unusual varieties of vegetables (such as varying varieties of beetroot, celeriac, squashes, kale), spurred households' cooking creativity. This in turn triggered spontaneity and reinforced enjoyment around food. An annual food provisioning cycle becomes part of the ebb and flow of the household with seasonal cooking, eating and preservation being an integral element of many CSA household practices.

Figure 3 Seasonal meals

Box 2: Examples of Seasonal cooking & eating

"I never used to eat kale ever and I didn't know what it was, and now I'm eating kale. I'd say not every day exactly, but I'm eating kale at least once or twice a week, and that's incredibly nutritious, great vitamins and benefits in it. But it's not something I would have necessarily chosen to eat unless… As part of the farm I was made aware of the fact that this is a good seasonal vegetable. I definitely eat totally differently."- Ember/60-69/F

"It is the purple, have you had kohlrabi? It is an interesting vegetable and I finally learned how to prepare it, so I actually like it… I make it into a coleslaw. And I make a vegan mayonnaise so I mix that with grated carrots. What else did I put in carrot and lots of parsley or coriander if I have it and some of this vegan mayonnaise, which takes one minute to make. It is amazing. I am not sure what part of the world does it come from, but it grows really well here." Rosie/>70/F

"So there's been a lot of greens so we have to get inventive with what we do with our greens because that's been our main food for the last few weeks- I'd say for maybe a month it's been our main food." Amy/40-49/F

Storage and traditional preservation

To take full advantage of abundant supplies from the farm, several preservation techniques were commonly followed among the CSA households, such as pickling and fermenting vegetables, drying herbs, and freezing seasonal fruit. These practices enabled households to integrate and align consumption to the varying availability of produce in different seasons (e.g., hungry gap) and prevent food waste.

The households demonstrated know-how skills and experience, which were essential for preserving a range of produce. Making chutneys with courgettes and squashes, pickling cucumbers, drying chillies, pickling garlic, and fermenting cabbage by making kimchi and sauerkraut were common practices within many CSA households. Several materials and infrastructures were essential to complement these preservation practices, including a freezer, blenders, jars, and drying rooms.

Figure 4 Preserved seasonal food (fermented garlic, dried pepper)

Social co-learning

The ethical and social capital (e.g., environmental-friendliness, rebuilding of shared values, re-connections between producers and consumers, enabling a sense of engagement, etc.) embodied in the CSA infrastructure reinforced a form of collective action among the CSA members, which facilitated co-learning and knowledge transfer, such as sharing different cooking recipes and preservation methods and techniques. This greatly influenced food practices by bolstering both cooking skills and confidence. Additionally, this co-learning and knowledge transfer helped households to experiment with preservation techniques to respond to the seasonality of food and prevent food waste.

Box 3: Examples of co-learning

"I wouldn't be great at cooking. I can do various basic things, but I am learning. When you are in the coach house there might be somebody in there and you say, 'What do you do with that?' and they give you a recipe. They tell you about the likes of this. I got that off somebody else, just talking to someone. 'Try it this way and try it that way.'" Nick/60-69/M

"My friend Rosie showed me and our friend Josh was pickling in his back garden one day and showing me, throwing in handfuls of salt and vinegar and so on. He was doing it quite quickly, but it was a little living lesson, as it were. He was out the back chopping the cucumbers and all the rest and sticking them straight into the jars and showing me how it was done. And at Rosie's, when I go to her kitchen she will give me a bit of a cookery lesson, she's really a great fount of information. And then she has the step by step guides in her recipes as well…It's something you pick up from people around and all of those sources." Ember/60-69/F

Sustainable disposal

For the CSA households, composting was highlighted as a common practice. Their close connection with the farm allowed for effective disposing of compostable materials at the farm composters. Those performing gardening and growing practices were making and keeping their compost to use in their gardens.

Households displayed various recycling activities, such as keeping small bins to reduce waste, and accumulating all recyclable materials (food and non-food) to take to recycling centres. Increasing media coverage on plastic waste and recycling and close C2C connections reinforced households' knowledge and information on what was suitable for recycling. Furthermore, solidarity among the CSA members/neighbours complemented these practices by sharing recycling bins.

Concluding remarks

The CSA findings draw a connection between social innovations in food provisioning and enabling sustainable household consumption practices. The social infrastructure of the CSA permitted consumers collective engagement with other CSA members and producers, which influenced a wide range of sustainability-related consumption practices. This is evident through improving household competencies (skills, knowledge, and experience) and building understanding, values, and beliefs of the importance of 'local' and 'seasonal' consumption. These allowed the CSA households to effectively reconfigure their consumption from acquisition to disposal towards a more sustainable routine. Three key areas of action identified that supported this reconfiguration were, 1) planning their food collection to avoid waste, 2) reinforcing cooking skills and sharing cooking recipes that permit seasonal cooking and eating practices, and 3) reviving traditional preservation practices by promoting co-learning of preservation techniques. The latter has reinforced households' ingenuity to manage and

take advantage of abundant supplies at feast and famine times, to lengthen the lifespan throughout, and to prevent food waste.

Food Assembly Platform

The food assembly platform (FA) is a centralised IT service providing an online local food marketplace where local producers/suppliers and consumers engage in transactions digitally. This offers an innovative type of direct selling mechanism between local producers/sellers and consumers in the local community and can be seen as a digital alternative to a farmers' market. Platform suppliers can vary from direct sale farms selling fruit, vegetables, meat, and honey, to businesses operating their own physical and/or online shop while also offering their produce through the platform (e.g., butchers, coffee roasters, and cheesemongers).

Acquisition practices

FA customers regularly purchased from the platform but their reliance on the platform as a supply channel varied and was subject to various considerations, such as product availability, price, and quality perceptions. The platform was usually used as part of a repertoire of food supply channels including supermarkets, various types of AFNs (e.g. farmers' market, vegetable box schemes) and independent local shops (e.g. health shops, co-ops, butchers, and fishmongers). The platform appeared to influence customers' broader shopping routines as produce purchased from other supply channels was shaped by the produce/products available and acquired via the FA (e.g. purchase of complementary products, staples not available or viewed as too expensive on the platform, etc.).

Perceived benefits

FA customers valued the easy access to a range of local suppliers and products. Supporting local, access to foods in season, and feelings of connection with producers and regions where foods come from were important value meanings in engaging with the platform. The overarching attribute linking these was sustainability. Shoppers' emphasised the platform's convenience in providing direct access to local suppliers and foods, unlike the traditional local food markets (e.g., farmers' markets), where accessibility might be hindered due to location and time constraints.

Box 4: Food Assembly: convenience

"I saw on Facebook for sure, I liked the name. I think it just makes sense and also the fact it was something new because we all know the farmers market but it's always in the morning and maybe you are working but this is something you can do like at midnight from your couch or whatever, so it was like a completely new idea. So the convenience of it was really exciting"-Charlotte/20-29/F

"It's changed I suppose in terms of before this, because I work during the week, I'd be limited in terms of being able to go to a farmer's market, being able to buy from certain farmers or producers would have been limited and I would have had to buy more from supermarkets. So now I'm able to effectively go to a farmer's market, so that has changed." Linda/30-39/ F

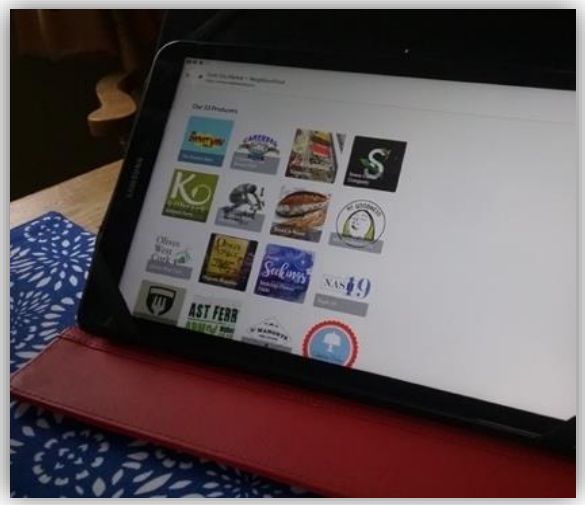

Figure 5 FA platform website navigation

Interestingly, the platform user's curiosity was aroused by the variety of unusual artisanal and seasonal food products available. This triggered a desire to experiment with food. Indeed, the novelty associated with these foods augmented user's emotional ties and reinforced their commitment to the platform. Thus, while fresh vegetables represent a staple in the majority of user's shopping baskets, the availability of more unique, 'non-everyday' products were significant to the overall customer experience with the platform.

Box 5: Novel purchases

"What I get is the (company name) which is something that I never thought I would have got. Their sauce and dry rub- I thought I'd never buy them but they're absolutely amazing. Amazing!"-Daisy/60-69/F

"There is a new seller on there that is doing baked stuff. We try to not spend more than a certain amount on treats, but we will try to add something new every other week so we can try. All of our family live up here so we will buy treats for them too"-Daniella/50-59/F

Perceived barriers

As previously mentioned, it was common for all the FA households to use the platform in combination with other physical and online grocery shopping stores. For a few households it represented the primary food supply channel, while for the majority, it served as a place for more specific food needs. Product price, loyalty, and the absence of face-to-face connection with the producer were mentioned as reasons for the households' lack of exclusive reliance on the platform for groceries acquisition.

The inherent strength of the platform, (i.e. digitally mediated connection between buyer and suppliers), is also a weakness. Indeed, the lack of personal or face-to-face interaction caused some customers to gravitate back towards alternatives that afforded them the possibility of one-to-one interaction with suppliers. Local shops, where the owner/seller are deemed to hold expertise and whose opinion and insight they value and trust, hold an attraction that is not currently replicated on the online alternative.

Box 6: Examples of Social connection

"I guess the thing with the platform is a certain convenience. You can do it online. It is a different type of shopping. It differs completely in the sense you go to the English market and you see what is there, you see what is fresh, you see and you talk to the person there and you do that transaction individually. One stallholder, you move to the second stallholder, whereas the platform is you look online, they show you what they have and what is available, you click, you buy and you collect. It is all in a basket. It takes away that conversation that you may have with the person about the product" Coby/30-39/M

"I have a farmer in Mallow that I am also supporting and I have been shopping with him for years so if there is something that he is selling… When his cherry tomatoes become available, I will be buying from him first. I feel loyalty to him. I always place my order with him first, then whatever he doesn't have I fill in from the platform."- Daniella/50-59/F

Price was also influential in choices and the quantities of products purchased. In general, these decisions were based on a price quality evaluation. Where product quality was deemed higher than alternatives, the higher prices were justified as offering good value. Lower quantities of these higher priced products allowed the customers to satisfy their needs within their household budget constraints. However, if the price quality differential was not evident to the user the product would not be purchased from the platform. Users made these evaluations on a product-by-product basis.

Box 7: Examples of price sensitivity

"I'd never buy anything from (company name)…sorry now but I just wouldn't buy anything from (company name). I used to go there but it's just overpriced for what it is. "Daisy/60-69/F

"It's all really lovely food but mixed olives for 3.50 is too much for me whereas you can get a jar of olives for a euro somewhere else. So sometimes it's a treat but I wouldn't buy everything here." Heather/20-29/F

Seasonal cooking and eating

Figure 6 Improvised Dahl using available seasonal ingredients.

Seasonal food cooking and eating practices were actively integrated into several households' consumption routines, similar to the CSA. Households' engagement with seasonal food consumption was associated with a belief that foods consumed soon after harvest (in season), are more flavoursome and are healthier and more nutritious. Additionally, consuming freshly harvested foods was viewed as conforming to a 'natural seasonal order,' and for some resulted in expanding the varieties of vegetables consumed. Cooking capabilities and skills, such as creativity and improvisation, basic know-how experience, and knowledge of different recipes, were essential for actively engaging in seasonal food consumption practices. For example, making salads in the summer and soups and stews in the winter and the creative use of vegetables, such as beetroot.

Interestingly, relying on seasonal vegetables unlocked novel cooking practices by using unfamiliar varieties of vegetables and introducing new meal recipes. This spurred excitement about cooking and eating by expanding meal repertoires and preventing food waste. Radish salad, pumpkin gnocchi, roast turnips with apples were just some examples of the ways these vegetables were used.

Box 8: Examples of seasonal- novel cooking

"We used to get the whole organic beetroot and I always buy the kale from the platform, it is so nice. I like the things that it's kind of hard to get from the supermarket…." Charlotte/20-29/F

"I would probably prefer to get beetroot than celeriac in the box, but actually the quantities of beetroot have made us come up with more beetroot recipes and I quite like it now. Sometimes I'll maybe make a soup with the celeriac and then it might be hanging out for a few days while I work up to it.." June/40-49/F

"…we are discovering ways of using stuff anyway. So…radishes…we thought we hated radishes and then we discovered a fantastic way of eating them so now we love radishes. We've a lovely recipe for a radish salad." Daisy/60-69/F

Online searches and recipe books were central to the successful use of these new varieties of seasonal vegetables. It functioned as a source of inspiration for new meal ideas to expand meal repertoires. Availability of culinary equipment, such as kitchen processors and blenders were

important, particularly in making smoothies and soups.

Waste avoidance

FA customers' consciousness of food waste led to adjustments in some of their cooking practices. They concerned themselves with creating meals/foods that fitted with the vegetables and fruit leftovers to prevent food waste. Making pesto from available wilting ingredients, banana pancakes from soon-to-spoil bananas, soups from leftover vegetables, and cooking and mashing cauliflower to prevent it from waste were all examples of households cooking strategies to minimise/ prevent food waste.

Nevertheless, the portion size quandary created a tension for many as they attempted to gauge family requirements against food waste management. This was further complicated with the need to adjust standard recipes to the specificities of the household food demands (e.g. recipes for 6 portions when 4 portions are required).

> ***Box 9: Examples of waste aversion cooking-***
> *"The dishes I do are good for anything that looks like it is wilting. Any curry or tomato sauce, I can put them all in. Most stuff that is wilting will go into that. It is good for using up a lot of the vegetables." April/30-39/F*
>
> *"…to be honest the vegetable part for me is always interchangeable, I like to use up what ever in the fridge because you don't want to double buy it or throw the waste off."-Charlotte/20-29/F*

In attempting to prevent the wasting of these cooked leftovers, many adjusted subsequent consumption practices, such as freezing extra meal portions or repurposing as next day lunch solutions. Access to plastic containers, fridges and freezers was essential in enabling households to minimise waste from cooked leftovers. There was, however, a risk that these storage practices delayed rather than eliminated the wasting of foods.

Figure 7 Storage and packaging of meal leftovers

Sustainable Disposal

Many FA customers were composting food waste. They displayed tacit composting knowledge about what food products are suitable for compost, such as separating the cooked and uncooked food waste. Composted foods included preparation and eating leftovers, such as peelings, vegetables ends and fruit cores. Many dispose of cooked waste in the general bins with many of the household's relying on local waste collection services to dispose of food waste due to a lack of material infrastructure (e.g. gardens).

Box 10: Examples of lack of recycling knowledge

"And then that's the recycling. The tray is still considered as hard plastic I think. Again there's no information. I don't know what they consider hard and soft… Plastic milk bottles. I still put the soft plastics there as well sometimes. I feel that if they don't make it recyclable then they have to take responsibility for it."- Heather/20-29/F

"To be honest I am not so sure if things are actually recyclable like 100 % or not, especially with food packaging. Because if stained or if for example on the paper bag if there is some grease on it, I am like is that recyclable and actually I have no idea. Out of guilt, I actually put it in the recycling but maybe making things worse rather than better. So, …I don't know!"- Charlotte/20-29/F

Recycling of food packaging was common in FA households. Knowledge on what was suitable for recycling and the availability of separate collection bins that enabled waste separation was central to such practices. Activities, such as washing containers, an inspection of recycling labels, and the separation of recyclable materials, were endorsed within households to address some of their concerns around the impact of plastic waste on the environment.

A lack of adequate information and knowledge acted as barriers to effective recycling practices. Uncertainty concerning the suitability for recycling certain plastics (e.g., hard, and soft plastic), paper materials, and insufficient detail on packaging suitability for recycling were challenges cited by a few households.

A common practice in many of these households to minimise and prevent packaging waste was to reuse/ repurpose it (e.g., containers, glass bottles and jars). Packages were washed and stored for later use to, for example, store cooked leftovers or other home-prepared products (e.g. preserves).

Figure 9 Repurposing plastic containers for food storage

Concluding Remarks

The FA case findings highlight that this digital platform service enabled convenient access to local foods. Food acquisition via this food supply channel enabled greater access and exposure to a wide variety of seasonal vegetables which broadened diets by increasing consumption of wider varieties of vegetables and improved cooking skills as consumers sought innovative ways of using 'unusual' foods they were unfamiliar with. The perceived higher price associated with local and seasonal produce/products from AFNs constrained many households' spend on the platform but consequently these high price points resulted in consumers placing a higher value on these foods and thus greater motivation to avoid waste.

Mainstream Physical Grocery Retail

In Ireland, the mainstream retail supply channels hold the largest share of the food market sales, accounting for approx. 90% of sales in the Irish food market. Hence, mainstream retail has considerable potential to influence sustainable household food practices. In this section, the primary focus is on acquisition and disposal practices. Similar to other case groups, cooking and eating practices were influenced by a desire to avoid/minimise food waste by many. Planning meals from available ingredients, using cooked leftovers in other meals, attempts to gauge cooking portions, and freezing practices were mentioned. However, seasonal cooking and eating was not mentioned by this group, although some declared preferences for 'local' food and producers. Cooking skills and knowledge, and materials such as weighing scales and pre-portioned options (e.g. boil in the bag) were central in households' ability to prevent food waste. Success in minimising waste varied across households and across food categories.

Acquisition practices

Similar to FA consumers, mainstream grocery stores were used as part of a repertoire of food supply channels including various types of AFNs (e.g. farmers market, vegetable box schemes) and independent local shops (e.g. health shops, butchers, and fishmongers) but the vast majority of food was purchased via the mainstream store. For households relying on brick-and-mortar grocery stores for their food acquisition, a set of routines were evident, in particular ones in which addressed potential food waste issues. Key routines included planning food shopping by using shopping lists to meet household food needs and minimising impulse buying. Checking store cupboards stocks ahead of shopping and purchasing foods that align with household preferences was also common. While in the store, consumers engaged in date-checking during shopping to avoid the spoiling of foods ahead of planned consumption.

Storage practices were also used to avoid waste. This was particularly the case for impulse bought items, where some food items were purchased on special offers to take advantage of discounts and save money; the surplus foods were frozen for later consumption and to prevent food waste.

Box 11: Examples of acquisition Waste Avoidance Strategies

"…we would buy one fruit at a time. We don't buy loads of fruit. So we would buy a thing of oranges and go through them. We don't keep a big fruit basket because we'd just throw everything out." Dawn/30-39/F

"I would normally buy the small sliced pan because I find if I buy the big one it has gone off by the end of the week so I will buy a small one and might pop down to the local shop then to buy another small one to last the rest of the week." Kate/30-39/F

"For blueberries […] I always look out for dates. I am constantly watching. If it is in four or five days you know it is going to be gone. I always look for mould or anything like that you see. If it is going to be two days, I wouldn't get it." Theo/20-29/M

However, these households' ability to avoid waste arising from acquisition practices varied and was hindered due to a range of environmental and personal factors such as:

- Minimum package size exceeding their requirements for perishable foods, such as spinach, carrots, mushrooms, and breads.
- Lack of planning and checking food stocks before shopping.
- Impulse buying of special offers on perishable products.
- Buying foods that did not fit within routine household food practice, which often were forgotten and eventually thrown out.

Figure 10 Food waste from packaging size

There was also an awareness about packaging waste and perceived environmental implications. Increasing media coverage and children sharing information from school on the 'plastic waste' issue had fore-fronted households' awareness. In response, few adjusted their acquisition practices in terms of retail outlet(s) and product selections. In terms of outlets, some households shifted towards plastic free shops/markets, such as farmers markets, independent food shops (e.g., butchers, health food shops) and to supermarkets that offer more plastic-free options. In product selection strategies, some households revised their product selection and in-store navigation routine to avoid packaged food.

Examples of this included avoiding packaged food aisles and packaged produce, buying in bulk, buying bigger packages, and choosing more sustainable packaging, such as cardboard.

Box 12: Examples of plastic free
"And then when I go to a supermarket, I just get stuff that's unpackaged, apart from frozen fruit sometimes… And usually I feel quite restricted in the fruits I eat because I usually buy them from the supermarkets, and most of it is packaged in plastic apart from apples and bananas." Naomi/20-29/F

"I would be more careful with the packaging. So if I see something that's got loads of plastic in it that I know I can't recycle, I won't buy that product. For me, the sustainability factor is more important when it comes to the waste and it's something that I'm looking at more and more. I would be choosing products that have cardboard rather than plastic.." Chloe/40-49/F

Nevertheless, the willingness and ability to adjust acquisition practices in light of these emerging plastic concerns have varied. Reasons cited for not making desired adjustments related, mainly, to convenience and price concerns and included:

- Convenience of current shopping location.
- Convenient handling and selection of packaged produce.
- Appropriateness of product ranges.
- Packaging on attractive special offers (e.g., buy 2 for the price of one).
- Perception of higher prices charged in alternative shops offering more extensive plastic-free options.

Figure 11 Food packaging

Sustainable Disposal

Similar to FA, there was some variability in the disposal practices among this cohort with some engaging in food composting practices. However, similar to FA, lack of material infrastructure (such as gardens, composters, compost baskets), inconvenience of composting (e.g., smell and rodents) and lack of composting skills and experience, hindered households' composting. Many households relied on general waste bins, local waste collection services and the presence of animals and wildlife to dispose of food waste, particularly cooked leftovers.

However, similar to FA, lack of material infrastructure (such as gardens, composters, compost baskets), inconvenience of composting (e.g., smell and rodents) and lack of composting skills and experience, hindered households' composting. Many households relied on general waste bins, local waste collection services and the presence of animals and wildlife to dispose of food waste, particularly cooked leftovers.

Figure 12 Composting material

Figure 13 Food waste thrown in general bins

As for the previous group, recycling of food packaging was commonplace where knowledge and skills on what could be recycled, along with supporting infrastructure that enabled waste separation, (separate collection bins for recycling) were central to such practices. Activities, such as washing containers, inspection of recycle labels and separation of recyclable materials were enacted within households to address some of their concerns regarding the environmental impact of plastic waste.

Figure 14 Recycling

The lack of adequate recycling knowledge and information were barriers to effective recycling practices. Uncertainty with regards to suitability for recycling of certain containers (e.g. plastics & aluminium) and paper materials, confusion around recycling logos and, in some cases, insufficient recycling information on the package were regularly cited concerns. Reusing/ repurposing plastic food containers and glass bottles and jars was used by some to minimise packaging waste.

Concluding remarks

Households' consumption practices associated with the mainstream physical grocery stores provided insights into sustainability issues concerning food and plastic waste. First, there is a sense that generating plastic waste is unavoidable for them due to a lack of choice. Second, despite consumers' effort to reduce food waste from consumption, it is a primary outcome of buying more than needed and shopping without pre-planning. The influence of special offers on purchase decisions was resulting in increased food waste in many of these households (e.g., buy one get one free), particularly within the perishables short shelf-life product categories (e.g. fresh produce and breads). It should be noted that this waste was much less evident in the meat category.

Mainstream Digital Grocery Retail

Shopping from the mainstream digital (online) grocery stores has grown in popularity in recent years. This case group provides some insight into household shopping routines from online supermarkets and their impact on subsequent household food practices. The patterns and practices associated with the cooking, eating, disposal stages in this group were similar to the mainstream physical group thus attention in this section will be given to aspects that make this group different and on how this impacts on sustainability.

Acquisition practices

Online grocery shopping from grocery stores offers its users an easy and time-saving acquisition alternative. Avoidance of inconveniences, such as carrying heavy bags, finding parking, packing bags, and managing children during the shopping process, were valued by users of this platform. Website

material (e.g., user-friendliness and saved previous order/favourites) is considered an essential infrastructure that promotes a convenient and efficient e-shopping experience. Benefits of this were saving time on food shopping and better shopping and meal planning.

Box 13: Examples of online acquisition enabling better planning

"If we were doing the online shop we would kind of just decide a few dishes we would make and one of us would put in the different things…So before we started doing online shops, we found we were doing a lot of just ad-hoc, getting bits and pieces in the local shop and never quite having enough of the right ingredients and then there's no stuff for a snack so you're eating chocolate or things. There were parts of a dish or whatever, so we were trying to improve on that, so then we did some online shopping." Darcie/30-39/F

"I can't imagine myself being the kind of person who would sit down in the traditional manner and write out a list and go to a store and tick off ... The way I used to shop was to go to each aisle and have a rough idea of what I wanted, but more or less impulse purchase as I went along, find I would come home and that most of what I bought didn't create a meal because I had just picked up everything at random. Whereas the online shopping I think makes it a lot more organised. I know my salmon is going to go with my rice, my steak can go with mashed potatoes or something like that. And then I pick up items that might make a fry or something for the weekend." Eva/30-39/F

Similar to the previous case groups, households used mainstream digital grocery retailers in combination with other physical and online grocery outlets such as local butchers, local greengrocers, local milkmen, and online vegetable box schemes. Sustainability values, such as reducing unnecessary food miles, support local/Irish suppliers, plastic-free alternatives, trust, and quality were key attributes sought when engaging with these additional provisioning services.

Similar to the mainstream physical case, food waste consciousness was reflected in these households' acquisition practices. These practices included:

- Routinised grocery orders to fit with the weekly meal plans.
- Buying frozen instead of fresh vegetables.
- Need-based shopping of fresh vegetables and fruits throughout the week.
- Date-checking on received online orders to ensure adequate longevity.
- Checking food stock before and during the ordering/acquisition process.

Similar to other groups, food purchased on offer for later use were portioned according to use plans and frozen until needed.

The barriers experienced by these households' in their endeavours to avoid food waste were similar to those highlighted by the mainstream physical group. Furthermore, for these households, a plastic free food world seemed somewhat unattainable as many foods, such as meat, fish, vegetables, and fruit were plastic wrapped, particularly when involving home delivery.

Concluding remarks

Mainstream digital grocery retailers appeared to support several sustainability-related consumption practices in our study of households. Shopping online helped to put structure on the buying process by: 1) providing a shopping list that reflected previous purchases 2) facilitating the store cupboards stock checking during the purchasing process and, 3) reducing impulsivity. This structure helped the user to save time while also enabling them to achieve personal and family healthy eating goals. Nevertheless, similar to the mainstream physical case, shopping via online channels has inevitable consequences on some sustainability issues, particularly concerning unavoidable plastic and food waste from food packaging.

Conclusions and Recommendations

Designing interventions that enable households to better address sustainable food consumption practices offers value at both an individual and societal level. Insights from this research strongly support the approach of targeting household routines to promote sustainable food consumption in the home. Based on our findings across the four case groups, households' sustainable consumption practices cannot be reduced to consumers alone; rather, enabling sustainable consumption practices is achievable through reinforcing collective action among all stakeholders in the food supply chain. The following section will present the most promising supply-channel-enabled sustainable consumption practices. Recommendations to guide practical actions are identified, such as promoting consumption of seasonal foods, promoting social connection (C2C, B2C and C2B), improving cooking knowledge and skills, preservation techniques and skills, and addressing packaging challenges.

Seasonal & local

In-store communications, promotions and activities that increase customers' familiarity with, and knowledge of local seasonal produce could enhance household members' cooking confidence and abilities in using unfamiliar produce. In-store visuals illustrating, for example, local seasonal produce and harvest seasons along with tips on how to use these to maximise eating experience could trigger greater engagement with these products. Visuals could also communicate tips of the week on how to use, preserve or extend the life of various produce. Prime placement of local and seasonal foods both in store and online could incentivise customers to purchase.

Creating a 'market stall environment' (in larger retail stores) with an identifiable 'greengrocer' character who is available for face-to-face interactions with customers warrants consideration. This could help build confidence through building rapport and a relationship based on social connection, trust, and familiarity, and over time, help facilitate behaviour change through enhancing consumer knowledge and links with this category. The 'greengrocer' would act as a form of "sustainability ambassador" with expertise on effective and creative use of produce to minimise waste and maximise eating experience. For example, the 'greengrocer' could expose consumers to the value of 'sub-optimal' or 'ugly' fruit and vegetables that often present in local/seasonal produce and in conversing with the consumer, the 'greengrocer' could normalise such produce so that consumers alter their quality cues to value all food produce, regardless of aesthetics.

Showcasing meal solutions for seasonal produce that consumers may be unfamiliar with could incentivise and promote purchase of more sustainable products. Running a 'seasonal vegetable of the week' campaign could be potentially beneficial in this context, for example, creating and promoting a recipe box around a selected local seasonal vegetable each week. An easy-to-follow meal solution, similar to a 'pizza kit' or 'lasagne kit' would facilitate consumer learning and build confidence. Similarly, this could be achieved through the use of digital promotion tools such as social media by using creative content such as Reels, TikToks and IGTV to promote recipes that utilise local and seasonal produce available in store.

As evident from the study many consumers are experiencing time famines and look to minimise time spent on grocery shopping however, and importantly, the purpose of all grocery shopping events are not the same. The 'essential shop' or 'big shop' may present as primarily functional in nature, focussed on efficiency, and described as a 'get in, get out'

approach with consumers feeling pressed for time. On the other hand, many also use non-essential food shopping trips as a form of 'retail therapy' that is a more 'leisurely' and 'pleasure-seeking' trip where the customer has more time on their hands. Based on the findings of this study it may be worth leveraging such more 'leisurely' shopping trips as a window of opportunity for sustainability ambassadors to engage with consumers and build a rapport. The life hacks suggested by ambassadors may be more effective in these situations as consumers may be more willing to take the time to listen and chat.

The confidence and ability that consumers may gain from these suggested interventions could lead to greater demand for seasonal products and help consumers achieve some of their sustainability goals. Suggested advantages of seasonal food consumption practices include: 1) reduction of the environmental stress from global trade and, 2) restoration of old varieties of crops, which contribute to food security.

Promote social connection (C2C, B2C and C2B)

The CSA case showed the importance of increasing various forms of social connection in food provisioning. This social innovation was pivotal to enabling a form of C2C co-learning among the farm members. The co-learning and knowledge sharing promoted various sustainable practices, such as planned acquisition, improving cooking skills and knowledge (e.g., seasonal), and promoting preservation techniques. This has enabled community farm households to better utilise farm produce and benefit from perceived high-quality, nutritious food and minimise and prevent food waste. Mechanisms to promote such co-learning in other food supply contexts are worthy of consideration. Potential interventions may include pop-up stands in-store where food producers or chefs interact with customers demonstrating and sharing recipe ideas, and techniques to preserve seasonal and local foods as well as distributing free food samples of such.

Furthermore, mainstream retailers can potentially learn from how pro-environmental social norms and values in the CSA appear to play an important role in promoting and enabling more sustainable food practices among its members. In-store social norm messaging, subsequently warrant consideration in this context. Examples of such messaging could include signs saying 'Join the thousands of Irish consumers that buy seasonal produce' in the vegetable section of the store.

Additionally, the manner in which CSA members have an input in decision making in the CSA suggests that further endeavours to empower and involve consumers may be worth considering. A suggestion put forward by Balan (2021) in this regard is that of 'crowdsourcing of ideas' whereby food supply channels develop initiatives that promote more sustainable food consumption practices through direct collaboration with consumers. Providing consumers with the opportunity to make suggestions and contributions to the design of product offerings, in-store or on-line services and experiences offered, and communication and educational campaigns therefore warrants consideration. The creation of an on-line social network for the sharing of ideas and experiences that can minimise waste through, for example, using meal leftovers in the creation of new meals or as lunch solutions, thus enhancing value for money**.**

Cooking knowledge and skills

Cooking skills and knowledge were essential competencies for households to efficiently adjust their cooking practices to utilise meal leftovers and potential food waste. These skills gave household members the confidence to come up with creative solutions for leftover and unused foods. Hence, promoting households' culinary skills, techniques, and knowledge is essential in promoting sustainable consumption.

The recommendations relating to in-store food stands, 'seasonal vegetable meal solutions' and 'sustainability ambassadors' outlined in the two previous sections may foster improved cooking skills in a fun, social and informal manner. Similarly, the use of creative content to generate awareness such as recipes and ideas for leftovers can be shared on social media. The use of digital advertising and influencer marketing could bring further awareness to a wider audience.

Plastic waste

Despite the household's effort to prevent plastic waste from acquisition, plastic packaging was strongly dependent on retail store offerings. Implementing strategies to reduce plastic packaging and strengthening consumers' recycling knowledge and skills is essential to better manage plastic waste. At a distribution and retail level, initiatives seeking to minimise and prevent use of plastic packaging of product offerings in-store may address some of the trade-off's consumers make between factors such as price, health, convenience, and sustainability. Such initiatives could involve adapting store offerings (providing refill facilities) to enable consumers to reuse and refill their plastic or glass containers in food categories where it is feasible and practical (e.g., rice, pasta, oats, spices, and nuts). Offering relevant materials such as uniform sized containers or reusable pouches that enable reuse and refill and positioning such materials beside relevant foods in-store is also worth considering in this regard. Special offers or rewards schemes may play an important role here to entice initial use.

In relation to recycling, a considerable obstacle for consumers is confusion about how to segregate different plastics due to insufficient knowledge and understanding of such. An example of an initiative that could address this issue is the provision of 'reverse vending machines' for recycling plastic containers. This concept encourages consumers to return their plastic bottles and other containers to the store in exchange for loyalty card points or vouchers by putting them into the reverse vending machine. Ireland's first reverse vending machine in a retail setting started operating in 2019 (RTE.ie, 2019). This service can have both functional and educational benefits. The functional role of the machine can be to facilitate more effective recycling of plastics. The educational role would seek to enhance consumer knowledge about recycling by promoting 'learning by doing' processes whereby the consumers see first-hand which plastics are recyclable and which are not.

Food waste

Many issues connected to household practices across all stages of consumption cause food waste, such as lack of acquisition planning, overbuying, and cooking planning and portioning. However, one of the common factors for unavoidable food waste across the four case groups was food packaging in terms of package size due to the inability to buy package size suitable to their needs. Provision of 'reuse and refill' facilities in store may allow consumers to purchase portion sizes that are tailored to their needs and therefore prevent the food waste problems evidenced in this report. Such initiatives therefore warrant consideration in the context of combating food waste as well as plastic waste. Additionally, special offers were a source of tension where perceived value for money competed with waste in purchase decisions. In many cases this led to increased waste, particularly in the fresh produce category, where health benefits of increased consumption also influenced purchase decisions. Special offers that take better account of households' routinised practices in critical product categories could result in positive outcomes from a sustainability and health perspective, particularly in resource stressed households. Life hacks for extending the lifespan of fresh produce that could be strategically positioned in the store (physical and on-line) is worth consideration. Similar to recommendations for cooking skills, the use of creative content and influencer

marketing on social media could promote recipes for stocks and soups that reduce food waste.

Household materials

Household technologies and equipment enabled/hindered efforts to enact more sustainable practices. Initiatives that aid households to acquire the necessary resources to support more sustainable practices are also worthy of consideration. Such initiatives may include awarding coupons and promotions to encourage the purchase of such household technologies. For example, for every €10 spent on local and seasonal produce in-store the consumer receives a €1 voucher off cooking and preservation aids such as food processors or dehydrators/dryers. Inclusion of reusable jars and containers in product offerings as mentioned in the plastic waste and food waste sections are also worth considering in this context.

Final Comment

To capitalise on the study findings, food manufacturers, retailers and policymakers need to continue to address packaging and food waste issues, incentivise more consumption of seasonal foods, promote social connections and knowledge exchange, and additionally consider the sustainability consequences of promotions that are designed around healthy eating and value for money.

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