UBC Vancouver Climate-Friendly Food System Label:

Phase 1 and Phase 2

Prepared by: Yu Luo

Prepared for: UBC Food Services and UBC Botanical Gardens

University of British Columbia

Date: May 16, 2022

SEEDS Sustainability Program

UBC sustainability

Executive Summary

According to the UBC Climate Action Plan 2030, UBC campus food systems is the second-highest category of GHG emissions on campus. Thus, to mitigate the impact of food systems on climate change, UBC aims to achieve a 50% GHG emission reduction of food systems on campus by 2030. To achieve this ambitious target, this project was designed to increase climate-friendly food choices at UBC Vancouver Campus by examininghow climate-friendly food system labels impact food choices in a University dining setting. In Phase 1, we designed a simple label with a globe and a thermometer in green (i.e., low GHG emissions), yellow (i.e., moderate GHG emissions), and red (i.e., high GHG emissions) color. We then measured its impact on customers' food choices in an online survey and a field experiment at Mercante outlet, a pizza store on campus managed by UBC Food Services. In Phase 2, we improved the design of the CFFS label with the concept of traffic lights to increase inclusivity and measured its impact in an online survey and a field experiment at Mercante and Open Kitchen. We found that the CFFS labels, either the simple labels or complex labels, added next to the food items on a menu are supported by our survey respondents. In Phase 1, our field experiment also showed that the CFFS labels changed customers' actual food choices from high GHG emission food items to low GHG emission food items at Mercante. In Phase 2, we found a positive trend suggesting that the CFFS labels might maintain the choice of high GHG emission food items at the lowest among all other food items. Given the positive evidence found in this project, it is promising that implementing the climate-friendly food system labels on campus can have a significant impact on lowering UBC's GHG emissions over the next 10 years to meet the target of achieving a 50% GHG emission reduction of food systems.

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

1. UBC - University of British Columbia
2. CAP – Climate Action Plan
3. CFFS - Climate-Friendly Food System
4. GHG - Greenhouse Gas
5. SASSY- Six Americas Super Short Survey

1. INTRODUCTION

1.1 RESEARCH TOPIC AND RELEVANCE

In the University of British Columbia (UBC) Vancouver Climate Action Plan (CAP) 2030, UBC campus food system is listed as the second-highest category of greenhouse gas (GHG) emissions on campus after commuting. Globally, food systems are also one of the largest contributors to GHG emissions, as they contributed 19% to 29% of total anthropogenic GHG emissions in 2005 (Vermeulen et al., 2012), and this number increased to 34% in 2015 (Crippa et al., 2021). Given the enormous impact of food systems on climate change, UBC has set a target to achieve a 50% GHG emission reduction of food systems on campus by 2030 (UBC Campus & Community Planning). One of the short-term actions by 2024 is to develop a campus-wide Climate-Friendly Food System (CFFS) definition, mandatory CFFS labelling, and a toolkit to increase sustainable dietary choices and habits. Aligning with the target and actions proposed in the CAP 2030, we initiated this project by designing the CFFS labels, and then measuring the impact of the CFFS labels on customers' food choices in two phases in a hypothetical context using an online survey and in a real-world context at two different food service sites on UBC Vancouver campus.

1.2 PAST RESEARCH

Carbon labelling has been extensively investigated in part research. A recent study conducted at a University restaurant in Sweden showed implementing a label with GHG emission information for each dish shifted customers' food choices (Brunner et al., 2018). Specifically, sales of green labelled food items increased by 11.5% compared to the control phase and sales of red labelled food items decreased by 4.8%, suggesting that carbon labelling effectively changed consumers' food choices from high GHG emission food items to low GHG emission food items. In laboratory and online studies with a simulated setting, it was found that using labels with the concept of traffic lights had a positive effect on promoting climate-friendly dish choices (Osmon & Thornton, 2019). In another study, researchers showed that adding the carbon labels to the menu and setting the low emission dishes as the default choice in a hypothetical food ordering task can enhance the effect of choosing dishes with low GHG emissions (Betz et al., 2022). In their study, when the side dishes with low GHG emissions were set as the default option and shown with a green label, restaurant visitors were more likely to choose the food with the lowest

GHG emissions. Given all the positive findings from recent research, we designed our CFFS labels to promote sustainable food choices on campus.

1.3 PROJECT OBJECTIVES

The main objectives of this project were to increase climate-friendly food behaviours at UBC Vancouver Campus and examine how climate-friendly food labels impact food behaviour in a University dining setting. To achieve these objectives, we first conducted an online survey and a field experiment at Mercante in Phase 1. Subsequently, we expanded the project to Phase 2, where we conducted an online survey and a field experiment at Mercante and Open Kitchen outlets managed by Food Services.

2. PHASE 1: METHODS

The purpose of Phase 1 was to evaluate the effectiveness and impact of CFFS labels on consumers' food purchasing behaviour and assess public views of the labels at the University of British Columbia (UBC) Vancouver. An online survey and a field experiment were conducted in the first phase.

2.1 PARTICIPANTS AND SITE

A total of 1460 participants from the UBC Vancouver community began our survey for a chance to win one of ten $50 prizes. Participants who did not reach the end of the survey were excluded from the analyses, leaving a final sample size of 1120 participants (728 females, mean age = 24.4). In our sample, 40% of the participants were Caucasian and 34% of the participants were Asian, and 78% of the participants were students at UBC. All phases in this project were approved by UBC Behavioural Research Ethics Board. All participants in the online survey provided informed consent. In addition to the online survey, Mercante, a pizza store, on the UBC Vancouver campus participated in the field experiment to examine the effectiveness of the food labels.

2.2 STIMULI

The stimuli consisted of CFFS labels that served as a guide for the greenhouse gas (GHG) emissions of food production. The shape of the labels was composed of a globe and a thermometer and was created in three colours: red, yellow, and green. The red label represented the "least" climate-friendly items, the yellow label represented somewhat climate-friendly items, and the green label represented the most climate-friendly items (Figure 1). In other words, items with a red label had the highest GHG

emissions in the production, followed by items with a yellow label, and items with a green label had the least GHG emissions in the production.

Figure 1: The red, yellow, and green icons were created with a globe and thermometer. These labels served as a guide for food production's greenhouse gas (GHG) emissions.

The GHG emissions of the items on the menu at Mercante were calculated using the total weight of the raw ingredients multiplied by their respective GHG emission factors. Items on the menu that exceeded 2.08 GHG emission kilograms per serving were assigned with a red label, those between 1.04 to 2.08 GHG emission kilograms per serving were assigned with a yellow label, and those below 1.04 GHG emission kilograms per serving were assigned with a green label. To meet the climate target of reducing 50% GHG emissions in food systems, the cut-off point for the green labels was set at 50% below the baseline. According to the calculations, there were two red pizzas, five yellow pizzas, and one green pizza on the menu. The menu with labels and without labels were shown in Figure 2.

No labels　　　　　　　　With labels

Figure 2: The left side shows the menu without labels and the right side shows the menu with CFFS label icons.

2.3 PROCEDURE

2.3.1 ONLINE SURVEY

The online survey was created and hosted on Qualtrics and was available from August to September 2021. In the first part of the survey, participants were first asked to imagine that they were about to get lunch from Mercante and order food using a menu without any labels. In the subsequent question, they were presented with the signage explaining the CFFS labels and asked to order again using the new menu with the labels. These two questions were designed to examine whether the labels would influence participants' self-reported food choices to provide additional evidence.

In the second part, we asked participants to rate whether they want to see the CFFS labels on menus in all cafes and restaurants on campus using a five-point scale from Strongly Agree to Strongly Disagree. We also asked participants whether they would like to see the following additional information along with the climate labels on the menu: water use footprint, land-use footprint, fertilizer use footprint, upcycled food, organic/low input/regenerative agricultural practices, and local food. Two questions examining participants' knowledge about GHG emissions were also created. First, participants estimated how many grams of GHG emissions are generated to produce 4 oz of beef, chicken, beans, cheese, and plant-based meat. Second, participants ranked the impact of the following individual actions on reducing

GHG emissions from the most impactful to the least impactful: reducing food waste, choosing a plant-based diet, and composting. We chose these three individual actions from the list of climate change mitigation solutions created by Project Drawdown (2021) to test participants' knowledge about GHG emissions, as they were the most relevant to food systems from the list.

In the third part, we measured participants' climate concerns by asking them to rate how important is the issue of climate change to them personally from Extremely Important to Not at All Important, and how worried they are about climate change from Very Worried to Not at All Worried, how much they think climate change will harm them personally from A Great Deal to Not at All, and how much they think climate change will harm future generations of people from A Great Deal to Not at All. These four items were taken from the Six Americas Super Short Survey (SASSY; Chryst et al., 2018). At the end of the survey, participants reported their gender, age, race, and status at UBC.

2.3.2   Field Experiment

The field experiment ran for a total of four weeks from July to August 2021. During the intervention period, we added the labels next to the dishes on the menu at Mercante. The labels were displayed on the menu throughout the intervention period. We also put signage on the counter to explain the labels associated with each item on the menu. At the end of the experiment, we collected the sales data for the intervention period with the help of the UBC Food Services team. The sales data included the number of items sold for each pizza on the menu. We also collected the sales data for the same period in 2020 and used them as the baseline period. There was no intervention applied during the baseline period. A comparison between the baseline period and intervention would indicate whether the labels effectively shifted customers' actual food choices from high GHG emission items to low GHG emission items.

3. Phase 1: Results

3.1 Survey Results

In the hypothetical pizza ordering task, we examined whether ordering pizzas with the labels on the menu changed participants' orders compared to ordering pizzas without the labels. We computed the total number of pizzas ordered for each label category and for each type of menu (Table 1). A Chi-Square test showed that the number of green pizzas ordered using the menu with labels was higher than the

number of green pizzas ordered using the menu without labels (i.e., a relative increase of 117%), and the number of red pizzas ordered was lower using the menu with labels compared to the menu without labels (i.e., a relative decrease of 67%) [$X^2(2)=276.4$, $p<.001$]. These results showed that adding the labels to the menu had effectively shifted consumers' food choices from high GHG emissions pizzas to low GHG emissions pizzas.

Table 1: Total number and percent share of pizzas ordered by menu type and label category

Menu type	Total number of green pizzas ordered (% share)	Total number of yellow pizzas ordered (% share)	Total number of red pizza ordered (% share)
No labels	285 (12%)	1554 (66%)	503 (21%)
With labels	553 (26%)	1412 (67%)	147 (7%)

In the second part of the survey, we found that 84% of the participants wanted to see the CFFS labels on menus in all cafes and restaurants on campus. The top three additional information along with the climate labels that participants wanted to see were: local food, water use footprint, and organic/low input/regenerative agricultural practices, respectively. We also found that participants underestimated the GHG emissions involved in the production of all five food items that we measured. The distribution of participants' estimation of the GHG emissions involved in the production of each food item is shown in Figure 3.
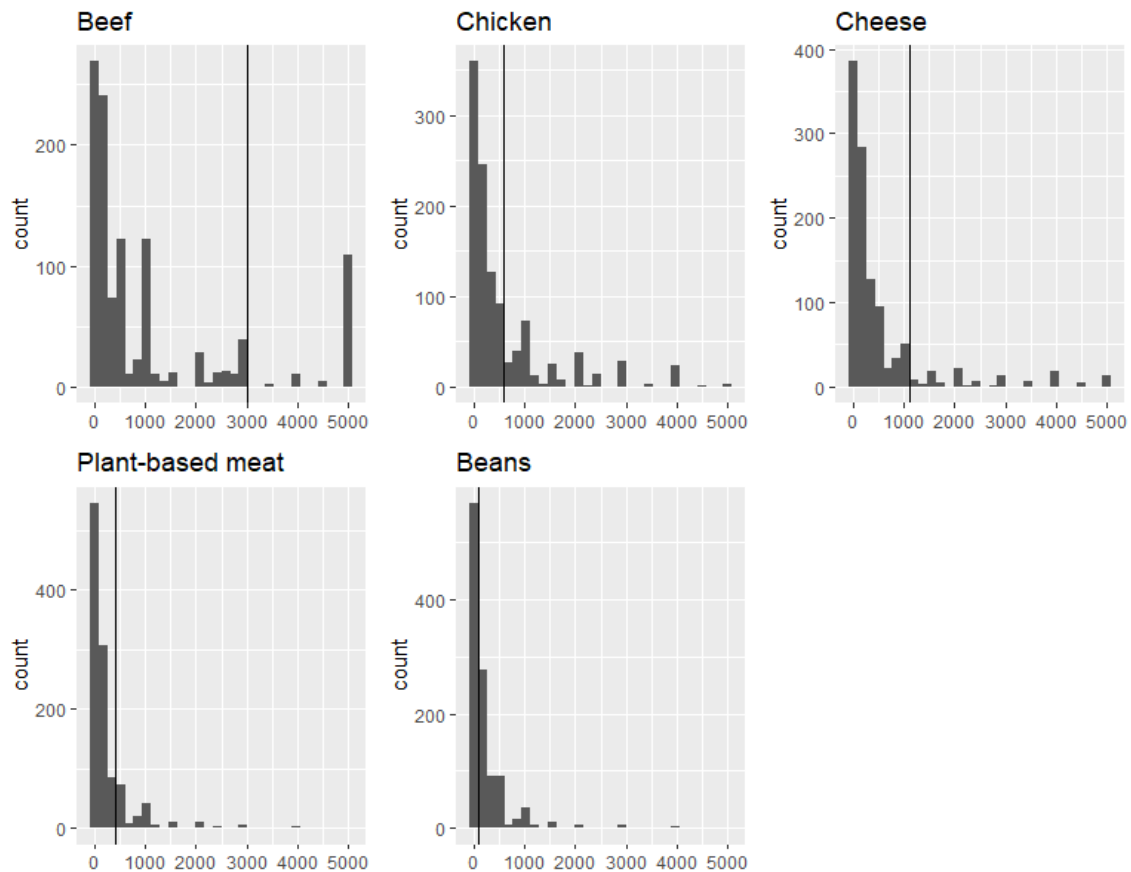
Figure 3: The distribution of participants' estimation of the GHG emissions involved in the production of each food item. The black line shows the correct GHG emissions involved in producing each food item. The x-axis represents the number of participants and the y-axis represents the GHG emissions in grams.

Participants also misperceived the most impactful individual action on reducing GHG emissions as they rated adopting plant-based diets as more impactful than reducing food waste (Project Drawdown, 2021). In terms of climate concern, we first converted the four climate concern items into six levels using the SASSY converting tool. We found that 89% of the participants were either alarmed or concerned with climate change.

3.2 SALES RESULTS

We first examine whether the labels had shifted customers' actual food choices at Mercante by comparing the sales data between the baseline period in 2020 and the intervention period in 2021. We computed the total number of pizzas sold for each period and each label category (see Table 2). A Chi-Square test showed that the number of green pizzas sold in the intervention period was higher than the number of green pizzas sold in the baseline period (i.e., a relative increase of 175%), and the number

of red pizzas sold was lower in the intervention period comparing to the baseline period (i.e., a relative decrease of 18%) [$X^2(2)=55.1$, $p<.001$]. These results replicated the findings from the online survey, showing that adding the labels to the menu had effectively shifted consumers' food choices from high GHG emission pizzas to low GHG emission pizzas.

Table 2: Total number and percent share of pizzas sold by period and label category.

Period	Total number of green pizzas sold (% share)	Total number of yellow pizzas sold (% share)	Total number of red pizza sold (% share)
Baseline (2020)	52 (2%)	1633 (68%)	720 (30%)
Intervention (2021)	193 (5.5%)	2433 (70%)	856 (24.5%)

To further validate these results, we examined whether there was a difference in the mean number of items sold per day between the baseline period and intervention period for each category. Mann-Whitney U tests showed that the mean number of green pizzas sold in the intervention period was significantly higher than in the baseline period [W=874, p<.001] (Figure 4). The mean number of yellow pizzas sold in the intervention period was also significantly higher than in the baseline period [$W=11797$, $p<.001$]. However, the mean number of red pizzas sold in the intervention period did not differ from the baseline period [$W=2533.5$, $p=.33$]. The results of this analysis provided additional evidence that customers purchased more green pizzas and yellow pizzas when the labels were displayed on the menu.
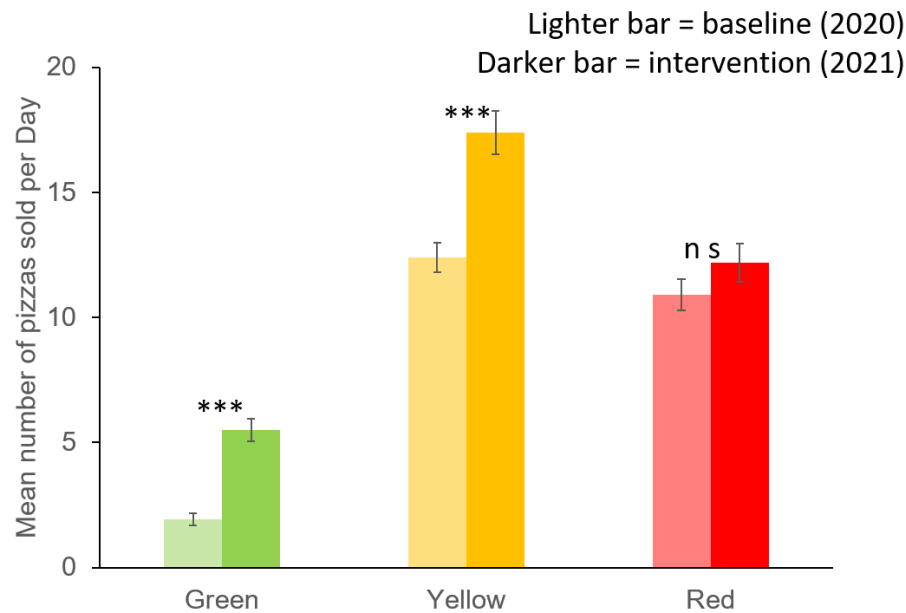
Figure 4: A comparison of the mean number of pizzas sold per day between the baseline period in 2020 and the intervention period in 2021. The lighter bars represent the baseline period and the darker bars represent the intervention period (error bars reflect ± 1 SEM, ***p<.001, n.s.=not significant).

4. PHASE 2: METHODS

Given the positive results found in Phase 1, we expanded the field experiment to a larger scale in Phase 2. Another critical change was that we redesigned the labels based on participants' feedback in the online survey. Thus, in Phase 2, we conducted a field experiment at Mercante and Open Kitchen on UBC Vancouver campus to examine the effectiveness of the new labels on customers' food choices. Also, we concurrently ran an online survey to seek additional evidence.

4.1 PARTICIPANTS AND SITES

A total of 376 participants started our survey for a chance to win one of ten $50 prizes. After excluding participants who did not complete the survey, a final sample size of 252 participants (169 females, mean age = 28.4) remained. In our sample, 40% of the participants were Caucasian and 35% of the participants were Asian, and 66% of the participants were students at UBC. In addition to the online survey, Mercante and Open Kitchen (i.e., experimental site) at the Orchard Commons residence on the UBC Vancouver campus participated in the field experiment to examine the effectiveness of the food labels. We also used Gather at the Vanier residence as a control site for Open Kitchen because both of them are dining halls at a student residence on campus.

4.2 Stimuli

Based on the feedback that we received from the survey participants, we redesigned our CFFS labels to accommodate color-blind individuals. The shape of the new labels was composed of a globe and a traffic light and the labels were created in three colors. The layout of the traffic lights could enhance the difference between labels. Same as in Phase 1, the red light label represented the least climate-friendly items, the yellow light label represented somewhat climate-friendly items, and the green light label represented the most climate-friendly items (Figure 5).
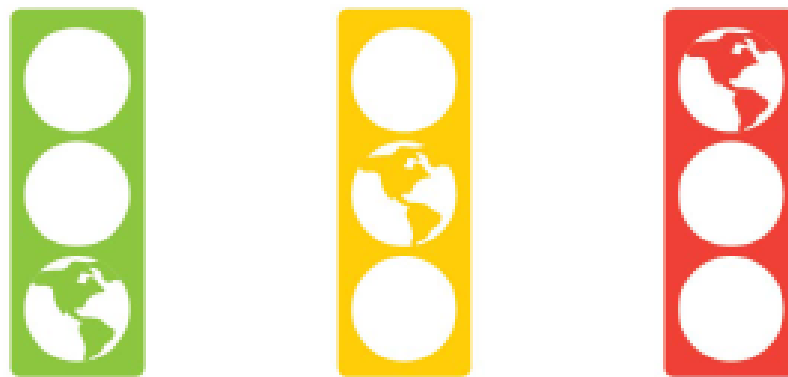
Figure 5: The red, yellow, and green icons were created with a globe and traffic lights. These labels served as a guide to food production's greenhouse gas (GHG) emissions.

After designing the new traffic-light CFFS label icons, we calculated the cut-off points for the food items on the menu. At Mercante and Open Kitchen, food items that exceeded 360.25 GHG emission grams per 100 grams of food were assigned with a red label, those between 180.12 GHG emission grams to 360.25 GHG emission grams per 100 grams of food were assigned with a yellow label, and those below 180.12 GHG emission grams were assigned with a green label. Mercante's menu with the new traffic light label was shown in Figure 6. For the control site (i.e., Gather), although no labels were implemented at the site during the intervention period, we categorized the food items into green, yellow, and red categories, based on our cut-off points.

Figure 6: The left side shows the menu without labels and the right side shows the menu with CFFS label icons.

4.3 PROCEDURE

4.3.1 ONLINE SURVEY

The online survey was created and hosted on Qualtrics and was available from October 2021 to January 2022. The content of the survey was identical to Phase 1. In the first part, participants did the hypothetical food ordering task using Mercante's menu without the labels and then with the new traffic light labels. In the second part of the survey, participants were asked about their support for the implementation of the new CFFS labels on UBC Vancouver campus and were tested on their knowledge of GHG emissions by estimating the GHG emissions involved in food production and identifying the impact of individual actions on reducing GHG emissions. In the third part, we asked them to report their climate concerns and their demographic information.

4.3.2 FIELD EXPERIMENT

The field experiment ran for a total of eight weeks from October 18 to December 8, 2021. During the intervention period, the labels were added next to the items on the menu at Mercante and Open Kitchen. At Open Kitchen, the labels were also added to the online menu at

https://ubc.nutrislice.com/menu/ubc-open-kitchen. The labels were displayed on the physical and online menus throughout the intervention period. We also put signage on the counter to explain the labels associated with each item on the menu. We collected the sales data for each food item on the menu at Mercante and Open Kitchen during the intervention period. We also collected the sales data for eight weeks before the intervention period to serve as the baseline period (i.e., September 1 to October 17, 2021). Moreover, we extracted the sales data for the same periods at Gather to serve as a control for Open Kitchen.

5. PHASE 2: RESULTS

5.1 SURVEY RESULTS

In the first part, we examined whether ordering pizzas with the new traffic light labels on the menu changed participants' orders compared to ordering pizzas without the labels. We computed the total number of pizzas ordered for each label category and each type of menu (Table 3). A Chi-Square test showed that the number of green pizzas and yellow pizzas ordered using the menu with labels were higher than the number of green pizzas (i.e., a relative increase of 182%) and yellow pizzas (i.e., a relative increase of 38%) ordered using the menu without labels, and the number of red pizzas ordered was lower using the menu with labels comparing to the menu without labels (i.e., a relative decrease of 61%) [X^2(2)=136.2, p<.001]. These results were consistent with the findings in Phase 1, suggesting that the new traffic light labels effectively shifted consumers' food choices from high GHG emission pizzas to low GHG emission pizzas.

Table 3: Total number and percent share of pizzas ordered by menu type and label category

Menu type	Total number of green pizzas ordered (% share)	Total number of yellow pizzas ordered (% share)	Total number of red pizza ordered (% share)
No labels	56 (8.3%)	280 (41.3%)	342 (50.4%)
With labels	121 (23.4%)	295 (57.0%)	101 (19.5%)

In the second part, we found that 83% of the participants wanted to see the CFFS labels on menus in all cafes and restaurants on campus. Same as in Phase 1, participants underestimated the GHG emissions

involved in the production of all five food items that we measured. However, participants accurately identified the most impactful individual action on reducing GHG emissions in this survey. In terms of climate concern, we found that 99.6% of the participants were either alarmed or concerned with climate change on the SASSY scale.

5.2 MERCANTE RESULTS

We first examine whether the new traffic light labels had shifted customers' actual food choices at Mercante by comparing the sales data between the baseline period and the intervention period. The total number of pizzas sold for each period and each label category are in Table 4. A Chi-Square test showed that the number of green pizzas sold relatively increased by 23.7% from the baseline period to the intervention period; however, the number of red pizzas also increased from the baseline period to the intervention period [$X^2(2)=185.2$, $p<.001$]. These results suggested that adding the new traffic light labels to the menu increased the purchase of the green pizzas but also increased the sales of the red pizzas.

Table 4: Total number and percent share of pizzas sold by period and label category.

Period	Total number of green pizzas sold (% share)	Total number of yellow pizzas sold (% share)	Total number of red pizza sold (% share)
Baseline (Sep1-Oct17)	649 (3.8%)	8,940 (49%)	8,601 (47.2%)
Intervention (Oct18-Dec8)	859 (4.7%)	7,692 (42%)	9,769 (53.3%)

5.3 OPEN KITCHEN RESULTS

Given that the menu at Open Kitchen and Gather varied daily during the intervention period, we only included food items available during the baseline period and the intervention period. Additionally, the number of green, yellow, and red items available on each day also varied. We divided the total number of items sold by the total number of items available for each day and each label category.

After cleaning the data, we conducted a 3 (label: green, yellow, vs red) X 2 (period: baseline vs intervention) X 2 (site: experimental vs. control) ANOVA to examine the effectiveness of the traffic light

labels. We found a main effect of period [$F(1,588)=8.1$, $p=.005$], a main effect of site [$F(1,588)=307.0$, $p<.001$], and an interaction between label and site [$F(2,588)=3.3$, $p=.04$].

To further understand the interaction, we conducted a 3 (label: green, yellow, vs red) X 2 (period: baseline vs intervention) ANOVA for each site. For the experimental site (i.e., Open Kitchen), we found that there was a marginal effect period [$F(1,294)=3.0$, $p=.08$], suggesting a decrease in sales for all categories from baseline to intervention (Figure 7). For the control site (i.e., Gather), we found a main effect of label [$F(2,294)=18.6$, $p<.001$], suggesting that there were more red items sold than green and yellow items in both baseline and intervention periods. We also found a main effect of period [$F(1,294)=12.1$, $p<.001$], suggesting a decrease in sales for all three label categories from baseline to intervention.
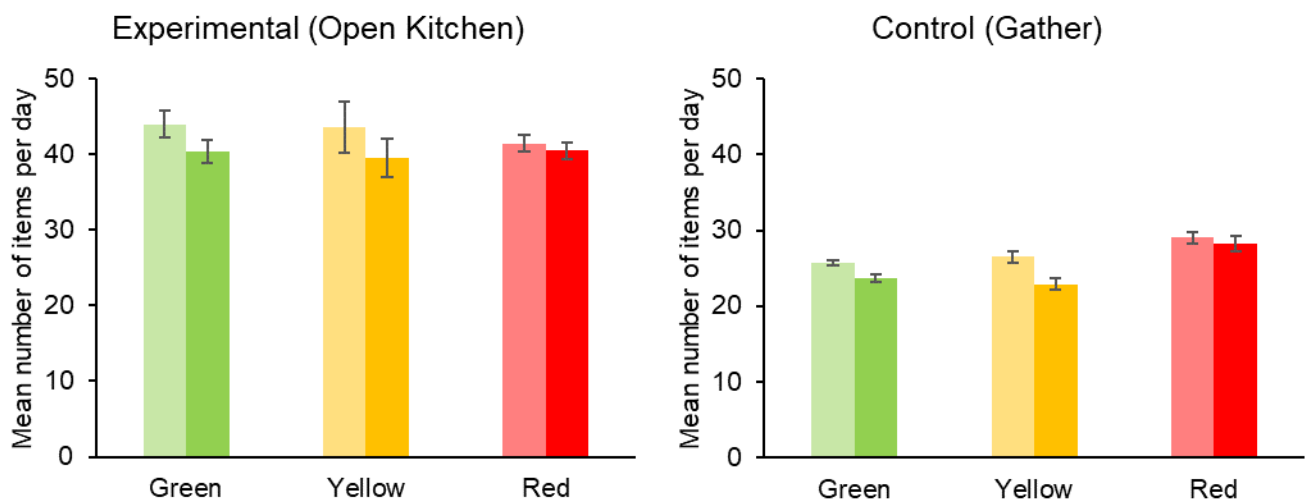
Figure 7: Mean number of items sold per day for green, yellow, and red items at the experimental site (i.e., Open Kitchen) and the control site (i.e., Gather) by periods. The lighter bars represent the baseline period and the darker bars represent the intervention period (error bars reflect ± 1 SEM).

6. GENERAL DISCUSSION

In this project, we examined whether the CFFS labels could effectively shift consumers' food choices from high GHG emission food items to low GHG emission food items. In Phase 1, we found that the label in the shape of a globe and a thermometer effectively changed participants' orders from pizzas with a red label (i.e., high GHG emission) to pizzas with a green label or yellow label (i.e., low GHG emission) in our online survey and the majority supported the implementation of the CFFS labels at all restaurants on UBC Vancouver campus.

Importantly, we found that the CFFS labels increased the actual sales of pizzas with a green label (i.e., low GHG emission) at Mercante and reduced the actual sales of pizzas with a red label (i.e, high GHG emission) in the intervention period in 2021 compared to the baseline period in 2020, providing clear evidence that the CFFS labels used in this phase effectively changed customers' food choices from high GHG emission food to low GHG emission food. These findings support the implementation of our CFFS labels on campus.

One limitation of this finding is that this was a quasi-experiment design by comparing the baseline period to the intervention period. To establish the causal relationship between our CFFS labels and the change in food choices, we would have to find a control site, a similar pizza store on campus, and compare its sales data with Mercante.

In Phase 2 of the project, we redesigned the labels with the concept of traffic lights to accommodate colour-blind individuals. In our online survey, we again found that participants ordered more green pizzas and fewer red pizzas using the menu with the traffic light labels and most participants supported the implementation of the traffic light labels on campus. In the field experiment, we found some positive trends in the actual sales. At Mercante, we found that the sales of green pizzas increased, suggesting that traffic light labels effectively increased the choice of the green items.

Besides, the sales of red pizzas also increased in the intervention period compared to the baseline period at Mercante. Noteworthy, In Phase 2, the baseline was the first half of the academic term and the intervention period was the second half of the academic term. Typically, the second half of the term was filled with assignments and midterms which could lead to high academic stress. Past research showed that high stress is associated with excess intake of high calories food (O'Connor et al., 2008; Zellner et al., 2006). Thus, students might choose more red pizzas which have higher calories than green pizzas due to academic stress during the intervention period.

At our experimental site, Open Kitchen, where we implemented the traffic light labels in the intervention period, we found that the sales of all green, yellow, and red items decreased from baseline to intervention. We also found a decrease in sales for all three categories at our control site, Gather, where we did not implement any labels. Moreover, we found that the sales of red items remained the highest at Gather from baseline to intervention; however, the sales of the red items were the lowest at

Open Kitchen from the baseline to intervention. This might suggest that our traffic labels helped maintain the choice of red items at the lowest at Open Kitchen.

One explanation for these mixed results is that the sales of green items were already the highest among the three label categories at Open Kitchen which could lead to a ceiling effect. Thus, customers at Open Kitchen who could be influenced by the CFFS labels had already chosen green food items as behavioural interventions can only influence up to certain subgroups in the population (Deans et al., 2021; Zhao et al., 2021). Another explanation is that the impact of labels could be overpowered by the effect of academic stress, as we used the first half of the academic term as the baseline period and the second half of the term as the intervention period. A third explanation is that the size of the vertical traffic light labels was too small for customers to see from a distance in a dining hall. If consumers could not see the labels, they would not understand the meaning of the labels and thus not change their food choices.

One challenge that we encountered during Phase 2 was that the menu at Open Kitchen changed frequently. It was difficult to compare the sales of the same food items between the baseline period and the intervention period. Additionally, the food items between the experimental site and the control site were also different. Thus, a direct comparison between the same food items was not feasible in Phase 2 which could lead to mixed effects. For future research, it would be ideal to use sites that share similar food items and have a stable menu during the intervention period. Moreover, a comparison between the same periods across years or between two academic terms could reduce the influence of academic stress on the results. Moreover, we had received a few concerns regarding the morally-loaded framing that can be perceived by the traffic-light system, as some customers might feel guilty for purchasing red items. Thus, in Phase 3 of this project, we took these concerns into account and designed a new single positive icon to promote low emission food choices.

7. RECOMMENDATIONS

7.1 RECOMMENDATIONS FOR ACTION AND IMPLEMENTATION

1. Implement the CFFS labels at all sites on UBC Vancouver Campus as they are supported by the majority of our survey respondents, the empirical evidence found in Phase 1, and the positive trends discovered in Phase 2.

2. Use simple labels rather than complex labels to improve the visibility of the labels on the physical menu.

3. Enlarge the legend (e.g., bigger signage on the counter) to explain the meaning of the labels.

7.2 Recommendations for future research

1. Recruit a control site for Mercante to establish the causal relationship between the CFFS labels and the changes in customers' food choices.

2. Use sites that share similar food items and have a consistent menu as the experimental and control sites to improve the reliability of the sales data comparisons.

3. Compare the same periods between years or between academic terms to avoid the effect of academic stress on customers' food choices.

8. Conclusion

In conclusion, we found that the CFFS labels, either the simple labels or complex labels, implemented next to the food items on a menu are supported by our survey respondents. In Phase 1, our field experiment also showed that the CFFS labels changed customers' actual food choices from high GHG emission food items to low GHG emission food items at a pizza store on UBC Vancouver Campus. In Phase 2, we found a positive trend suggesting that the CFFS labels might maintain the choice of high GHG emission food items at the lowest among all other food items. Given the empirical evidence found in this project, it is promising that implementing the CFFS labels on campus can have a significant impact on lowering UBC's GHG emissions over the next 10 years to meet the target of achieving a 50% GHG emission reduction of food systems.

References

Betz, A. K., Seger, B. T., & Nieding, G. (2022). How can carbon labels and climate-friendly default options on restaurant menus contribute to the reduction of greenhouse gas emissions associated with dining?. PLOS Climate, 1(5), e0000028.

Brunner, F., Kurz, V., Bryngelsson, D., & Hedenus, F. (2018). Carbon label at a university restaurant–label implementation and evaluation. Ecological economics, 146, 658-667.

Chryst, B., Marlon, J., van der Linden, S., Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2018). Global warming's "Six Americas Short Survey": Audience segmentation of climate change views using a four question instrument. Environmental Communication, 12(8), 1109-1122.

Crippa, M., Solazzo, E., Guizzardi, D., Monforti-Ferrario, F., Tubiello, F. N., & Leip, A. J. N. F. (2021). Food systems are responsible for a third of global anthropogenic GHG emissions. Nature Food, 2(3), 198-209.

Deans, N., Naito, R., Luo, Y., & Zhao, J. (2021). The science behind collective climate action. Impakter.

O'Connor, D. B., Jones, F., Conner, M., McMillan, B., & Ferguson, E. (2008). Effects of daily hassles and eating style on eating behavior. Health Psychology, 27(1S), S20.

Osman, M., & Thornton, K. (2019). Traffic light labelling of meals to promote sustainable consumption and healthy eating. Appetite, 138, 60-71.

Project Drawdown. (2021, August 16). Table of solutions. Retrieved May 13, 2022, from https://drawdown.org/solutions/table-of-solutions

UBC Campus & Community Planning. (n.d.). CAP 2030 Targets and Actions: Food Systems Planning.ubc.ca. Retrieved May 16, 2022, from https://planning.ubc.ca/sustainability/sustainability-action-plans/climate-action-plan-2030/cap-2030-targets-and-actions-food-systems

Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. (2012). Climate change and food systems. Annual review of environment and resources, 37, 195-222.

Zellner, D. A., Loaiza, S., Gonzalez, Z., Pita, J., Morales, J., Pecora, D., & Wolf, A. (2006). Food selection changes under stress. Physiology & behavior, 87(4), 789-793.

Zhao, J., Naito, R., Luo, Y., & Deans, N. (2021). Getting everyone to act on climate change. SDG Action.