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THE GREEN EATING PROJECT: WEB-BASED INTERVENTION TO PROMOTE ENVIRONMENTALLY CONSCIOUS EATING BEHAVIORS

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THE GREEN EATING PROJECT: WEB-BASED
INTERVENTION TO PROMOTE ENVIRONMENTALLY
CONSCIOUS EATING BEHAVIORS

BY

JESSICA T. NASH

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ABSTRACT

The food system has been cited as unsustainable due to the reliance on natural resources and contribution to global pollution. Technological advances will play a major role in mitigating these negative consequences but consumers will also play a role through food choices. Green Eating (GE) is the concept of practicing more environmentally conscious eating behaviors and is currently defined as: eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating. Little research exists investigating college student perspectives' of environmentally conscious food choices and few interventions exist motivating college students to adopt environmentally conscious eating behaviors. The objectives of these studies were to identify perceived benefits, barriers, and motivators of GE in college students and use that information to develop a web-based intervention to motivate college students to adopt GE behaviors. Four focus groups were conducted consisting of a sample of college females (n=20), stratified by stage of change (SOC) for GE into precontemplation/contemplation (PC) and action/maintenance (AM). Two focus groups were conducted per stage group. Questions included their perceived definition, benefits, barriers, and motivators of GE. Focus groups were recorded and transcribed verbatim to identify themes based on the questions. A majority of students discussed similar concepts as found in the definition for GE such as: choosing organic foods and shopping at farmers' markets but only a few students mentioned consuming less meat and reducing food waste. Students mentioned improving health and supporting the local community as benefits of GE. Most barriers of GE differed by

group with PC discussing a lack of knowledge and additional cost. Social pressure when eating with family or friends was one major barrier common between the two groups. A web-based intervention program (GE Project) was developed to motivate college students to adopt GE behaviors. The design was quasi-experimental as various general education classes were randomized into experimental (n=716) or control (n=575) group. The program was five weeks in duration and consisted of four modules based on GE concepts: an introduction to GE, local eating, reducing food waste, and choosing environmentally friendly proteins. Participants completed baseline (experimental: n=257; control: n=367) and post (experimental: n=198; control: n=304) assessments of the GE survey consisting of behaviors and various Transtheoretical Model concepts associated with motivating behavior change such as stage of change (SOC), decisional balance (DB) with factors split into pros and cons, and self-efficacy (SE) with factors split into school and home. Participants also completed knowledge items to demonstrate learning module content. The study was effective in significantly increasing GE behaviors, DB pros, SE school, and knowledge in experimental compared to control but did not reduce DB cons or increase SE home. Experimental participants were also more likely to be in later SOC for GE. The GE Project was effective in increasing GE behaviors in college students. Motivating consumers of any age towards adopting GE could assist in potentially mitigating negative consequences of the food system on the environment. Future research could conduct additional focus groups involving male participants or tailor the intervention to participant stage to further increase the motivational effects. The modules could also be designed for other populations such as adult consumers or other universities.

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PREFACE

The dissertation is written in manuscript format and presented in three parts: manuscript I, manuscript II, and literature review. Manuscript I explores the perceived benefits, barriers, and motivators of Green Eating in female college students through focus groups. Manuscript II investigates the effectiveness of an online, interactive program in motivating college students to adopt Green Eating behaviors. The literature review discusses aspects of Green Eating, both environmental and non-environmental, and existing literature about the perspectives and beliefs of environmentally conscious eating in the young adult population. The manuscripts are written in manuscript format for journal submission as cited below:

MANUSCRIPT I: Focus on Green Eating: What are college students' perceptions of environmentally conscious eating? (Formatted for submission to *Journal of American College Health*)

MANUSCRIPT II: The Green Eating Project: Web-based intervention to promote environmentally conscious eating behaviors (Formatted for submission to *Public Health Nutrition*)

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MANUSCRIPT I:

**FOCUS ON GREEN EATING: WHAT ARE COLLEGE STUDENTS'
PERCEPTIONS OF ENVIRONMENTALLY CONSCIOUS EATING?**

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ABSTRACT

Objective: Identify benefits, barriers, and motivators of Green Eating (GE) in college students. **Participants:** Twenty 18-24 year-old full-time female students at a public, Northeastern university. **Methods:** Participants were stratified by stage of change for GE [precontemplation/contemplation (PC) or action/maintenance (AM)] into one of four focus groups; two groups per stage were conducted. Major themes were identified through content analysis and confirmed via multiple reviews of the transcripts. **Results:** The majority of students described GE as choosing organic foods and shopping at farmers' markets. Only a few students mentioned consuming less meat and reducing food waste. Benefits of GE were described as healthier, consuming fewer chemicals, and supporting the local community. Barriers to GE were identified as lack of knowledge and social support and limited availability on campus. Knowledge, benefits, and barriers differed by stage. **Conclusions:** Interventions designed to motivate college students to adopt GE behaviors should focus on increasing knowledge, advocating benefits, and reducing barriers of GE.

The world population is predicted to increase to 9 billion by the year 2050 [1]. The challenge of feeding 9 billion people will become a critical environmental and public health issue as resources are being consumed faster than they can be replaced [1]. In the United States, the average meat-based diet requires more land, water, and fossil energy than a plant-based diet, however, both diets are currently considered unsustainable in the long-term [2]. Sustainability is the ability to meet current environmental, economical, and social needs without compromising the needs of future generations [3].

Green Eating (GE) has been defined as practicing sustainable eating habits such as eating locally grown foods, produce that is in season and limited intake of processed foods, consuming foods and beverages that are labeled fair trade certified or certified organic and consuming meatless meals weekly and (if consuming animal products) selecting meats, poultry and dairy that do not contain hormones or antibiotics [4]. Previous research developed a survey instrument to measure Transtheoretical Model (TTM) constructs for GE in college students [4]. The central organizing construct for TTM is the stage of change (SOC), which is the motivational readiness to change consisting of five stages of progress: precontemplation, contemplation, preparation, action, and maintenance. The construct SOC represents an individual's readiness to change a behavior with *behavioral intention* represented by precontemplation, contemplation and preparation and *duration of behavior* represented by preparation, action and maintenance [5].

Consuming local foods may reduce greenhouse gas (GHG) emissions by reducing transportation [6-11], especially of food imported by air [9], and also provide the local farmers a larger share of the food dollar by eliminating distributing and manufacturing

steps of the foods system [12-14]. Shifting diets towards animal and plant proteins that emit fewer GHGs and utilize less natural resources has been cited as more sustainable [2, 15, 16]. Organic food production has been shown to benefit aspects of soil fertility [17-20] but research is still inconclusive related to the nutrition content and safety of organic foods compared to conventionally produced foods [21-25]. Finally, reducing food waste has been cited as a way to reduce unnecessary waste of resources used to produce those foods [26]. Therefore, the GE definition for SOC has since been modified to eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating [27].

Universities have a unique role in providing a platform for increased awareness of sustainability, as they are responsible for teaching the generations of the future. Uhl and Anderson (2001) proposed nine ways for implementing sustainable practices in higher education [28], including eating food that was produced in a sustainable way [28]. The trend of offering sustainably produced food on campuses is expanding and some universities have started to provide more local or organic products due to sustainability goals and student demand [29]. Popular press has documented the increasing demand from students for sustainable choices in the dining halls and how this plays a role in determining which school the student will attend [30]. Aramark, a major food service company for universities, now offers a “how-to” guide for institutions to implement sustainable practices [31].

College students are an ideal target population because they are a captive, young consumer audience, who are in a learning stage of their life [28, 32]. At this phase, they

are forming their identity and solidifying the foundation of their beliefs and attitudes with the hopes of becoming active members of society [32]. Habits that are developed during the years at college may also continue to persist as students grow older [28, 32].

Although there has been a movement towards consuming sustainable, local foods among college students, there is limited evidence exploring college students' perceptions and behaviors related to this topic of GE. The majority of United States (U.S.) college students surveyed were aware of the terms seasonal and local foods (87% and 75%, respectively) relating seasonal food to availability or production such as "certain food available only during certain times of the year/certain season" or "food grown/produced in certain season/at certain time of year" [33]. Dahm, Samonte, and Shows (2009) found a majority of U.S. college students surveyed had neutral opinions about organic foods [34]. However, one study of students in Finland, Denmark and Italy found more positive attitudes as students labeled organic, environmentally friendly, natural and chemical-free products as ethical [35]. Those same European students associated unethical foods with the use of pesticides, fertilizers, coloring agents, preservatives, gene modification, and non-environmentally friendly production practices [35]. Similar studies have been conducted in other populations such as with high school students [36, 37] and adolescents [38] but none, to our knowledge have explored this concept in-depth as related to SOC in the college population. Therefore, the purpose of this study is to explore college students' perceptions, associated benefits, barriers, and motivators of GE by SOC, through focus groups, ultimately, to identify target areas for intervention development.

METHODS

This study was conducted in a sample of female college students attending a public university in Rhode Island. Students met the following eligibility criteria: female, 18 – 24 years of age and full-time students. All data were collected during spring 2013. The Institutional Review Board at the University of Rhode Island approved the research protocol.

Students were recruited by campus flyers and classroom announcements. Students were asked to email the research coordinator if interested in participating. Any student who emailed inquiring about participation was sent a list of screening questions asking about age, gender, year in school, official major and SOC for GE. This allowed the researchers to determine eligibility and stratify the participants based on stage: precontemplation/contemplation (PC) and action/maintenance (AM). Eligible students were then scheduled for one of four focus groups (two for PC and two for AM). Upon arrival to the focus group, informed consent was reviewed and signed. Students received a \$25 cash incentive for participating.

The researchers developed the content of the moderator guide used to lead the focus groups. This included an introduction to the group and an ice-breaker question, followed by six questions and associated probes (Table 1).

The four focus groups were held on campus during the week. Focus groups were moderated by a trained moderator and lasted 45 – 55 minutes. Focus groups were digitally recorded (Sony IC Recorder ICD-UX200, Tokyo Japan) and participant observations and additional notes were documented in each session by at least one other study staff (co-moderator). During the focus groups, the open-ended questions developed

for the moderator guide were posed to stimulate discussion. The digital recordings were transcribed verbatim for analysis. The analysis of the transcripts was completed in two phases. First, an independent researcher (JN) trained in qualitative data analysis identified concepts and themes in the transcribed narratives [39]. Then structural coding was used to categorize the data. Using the moderator guide as a starting point, questions and key phrases were used as structural codes [40]. With these codes, the transcripts were systematically reviewed

During this initial coding process, additional themes emerged from the data and were added to the existing themes. A comparison of concepts between those in PC and AM occurred during this phase. In the second phase of the analysis, concepts and themes were reviewed and discussed with the co-author (AT). Subsequently, a second and third pass of the transcripts was completed in order to ensure that all of the a priori and emergent themes were captured.

RESULTS

Participants

All twenty participants were female and were 19.8 ± 1.3 years on average. A total of four focus groups were conducted; two groups (n=5, n=3) for PC and two group (n=6, n=6) for AM. Overall, there were seven freshmen, three sophomores, five juniors and five seniors. With regards to SOC for GE, one participant was in precontemplation, seven in contemplation, zero in preparation, four in action and eight in maintenance.

Green Eating Meaning

When asked to describe what GE meant to them, many participants associated GE with organic foods. For example:

“Foods that are grown in a way that they don’t have hormones. Things that don’t have all these chemicals in them. Just pure.”

GE foods included “*natural grown food*”, “*grown out of the ground*”, and “*foods that come from the Earth*”. The association of locally produced foods or “*farm fresh*” and items purchased at farmers’ markets was considered GE in contrast to products which are shipped long distances. For example:

“...things that are shipped long distances [me and my friends] don’t really picture as green eating”.

Participants also labeled GE as “*healthier than any other kind of eating*”. One participant said she felt “*like its better for your body and it makes you more clean*” while another described it as “*cleansing to your body*”. Only one student considered eating “*less meat and dairy*” as GE whereas another “*wouldn’t consider less meat [as being green]*”. There were also some negative associations with GE that were reported such as being “*harder to do*” and “*more expensive*”.

Examples of Green Eating Behaviors

Depending on their SOC, participants reported different examples of their perceived GE. Participants in the PC groups referred to examples of GE at home. For example, “*at home, we try to buy organic or hormone-free milk*” and “*we buy meat that has no hormones*”. Much of what the participants discussed referred to other people such as family members. For example, “*my mom has a garden*” and “*my grandmother has a blueberry and strawberry and raspberry farm [near us] so we get a lot of fresh fruit there*”. When PC participants discussed GE examples while at school, the majority acknowledged that they thought their activities weren’t green. One participant said, “*I*

feel like I eat all carbs when I'm at school" while another said *"I usually go to the dining halls or eat at [restaurants on campus] or at McDonald's®"*. One participant did say she tried *"to do some days meatless"* while another said, *"I'm not a vegetarian or a vegan but I do like a lot of vegan and vegetarian meals"*.

In contrast, participants who were in AM discussed a variety of examples in which they practice GE on a daily basis whether at home or at school. Many participants talked about shopping at farmers' markets as well as growing their own food with one participant saying she *"raised and slaughtered [her] own chickens"*. A few other participants discussed how they hated wasting food and, therefore, had a compost container in their dorm room/apartment.

"It's better than the food going into a plastic bag that isn't biodegradable and then it's going to landfills and it's just going to rot there instead of going back into the environment and making it better".

Some discussed being vegetarian but their exclusions varied as one participant *"[doesn't] eat any meat or fish"*, while another *"stopped eating red meat last year"* and a third *"[doesn't] eat eggs or drink milk"*.

Consider the Environment when Making Food Choices

There were also differences by SOC when considering the environment and making food choices. Participants in PC admitted that when making a food choice they don't think about the environment at all. For example:

"It's not that much of a priority. I don't place that much importance of what I eat and it's effect on the environment compared to other things going on in the world"

and other priorities or commitments I have. I feel like I'm so busy throughout the day that eating is just one aspect of my day".

Other participants acknowledged they sometimes think about it depending on the scenario or "*should think about it more*".

"Sometimes, when I eat meat I think of that actual animal and I feel bad."

"In the summer, I'm more conscious of what I'm eating because summer is when everyone cares about what their body is looking like".

Others said if circumstances were different such as if they had a first-hand account of farming.

"I feel like if I physically saw what I was eating, how I was hurting the environment, I would probably convert to vegetarian or something."

"I feel like I would think about it more if I was more in a rural area but because I live closer to the city, I'm not really seeing anything that goes into farming so I don't really think much about how it's made and how it's getting to me."

Participants in AM on the other hand, reported that while they do tend to think about the environment when making food choices, convenience can alter their choice.

"Sometimes convenience gets in the way and you need something cheap, something fast and you're going to make a bad decision. Obviously, it's bad for your health, bad for the environment and I don't always make the right choice."

One topic that participants discussed in depth was avoiding wasting food.

"I definitely think about trying not to waste food because I know there's no reason to do that."

Social situations and pressure swayed GE decisions for all groups. For example, for PC participants, it depended on the people they were eating with.

“Usually depends on the people that you’re with. Sometimes I’m embarrassed to speak up and tell people to recycle.”

“If you’re with someone who is very passionate about recycling or green eating then it will make it easier for me [because] I can see what they’re eating. [...] Also, if you’re with someone who doesn’t know [about GE] then you forget and you’re going to do what tastes good.”

Comments were similar for participants in AM.

“If you’re somewhere out with your friends and your options are splitting a pizza or getting a salad, you’re going to split the pizza.”

Benefits of Green Eating

When asked to discuss benefits of GE, all groups reported that GE can benefit their health but the aspects of health differed by SOC. PC participants brought up the ability to lose weight, have fewer health complications such as cancer, high cholesterol and high blood pressure, and the ability for GE to give you energy.

“[GE] helps give you energy which could in turn help you exercise more that could help you lose weight and be healthier as well”.

In comparison, AM participants discussed the short-term feeling that comes while practicing GE: *“I feel like it’s better for your body and it makes you more clean and just feel better”*, and pertaining to helping others: *“When I go to a farmers’ market, I know I’m helping someone else making their life better”* and *“the good feeling you get from*

helping people that you know are going to benefit around you". AM participants also mentioned the benefit to the environment and being connected to your surroundings.

"This is where we live, this is where our kids are going to live in generations after [...] and we want to keep it well".

Barriers to Green Eating

There were common themes related to barriers of GE among all groups. The largest barrier was the dining hall and being on campus. Many students mentioned the lack of information for food ingredients or food origin in the dining hall.

"Reading labels can be really important but we can't do that here because nothing in the dining hall has any information about it, so you can't check what's in it and if you ask [the staff] they can't really tell you".

The lifestyle on campus also causes challenges when trying to eat green.

"I don't have a car so I can't get off campus to get groceries or fresh foods [...] then the closest supermarket is CVS because we can't get to any other supermarket and that's not even a supermarket. It doesn't have fresh foods."

"I feel like it's just hard at school because you're always on-the-go and you can just eat something really quick and it's not going to be good for you probably."

"Being a college student, I'm busy doing schoolwork, studying, and I have a job, too. I don't really have time to go out shopping or make a trip to a farmers market".

Many PC participants mentioned cost as a barrier to GE:

“I definitely think it’s more expensive and I think that’s why a lot of people don’t consider doing it because they hear about how expensive it is and then it just prevents them from even trying it out.”

As well as the additional effort it requires:

“It’s really hard because you think about it a lot and prepare more food for it. It’s definitely something that’s harder to do”.

Participants in the AM focus groups discussed the effort it requires to grow food in this environment year-round and how, for others, it may be difficult to practice GE while living on campus.

Another common barrier among all of the groups was social eating. At home with family and parents, it appears that traditions and set routines are hard to overcome. For example:

“My parents are very set in their ways and not open to change” and that it is “really hard [to do] living in a big family”.

“I definitely think family has a lot to do with it. When I’m back home, my parents are going to be paying for my groceries and they’re not going to want to pay extra for green eating and then I’m not going to want to pay any extra for green eating”.

It appears that friends also create challenges.

“I think I definitely influence what I eat based on who I’m with. My peers have an influence on me, if everyone was eating green then I would probably eat green too, because they’re doing it so I might as well.”

One participant in AM mentioned:

“Eating with your friends is a barrier within itself if people aren’t as cautious as you are.”

And another AM participant agreed:

“It makes people around you that eat with you and go out with you comment on what you’re eating.”

All groups cited a lack of education as another major barrier whether that lack of knowledge existed within themselves as with PC participants or in others as with AM participants. One PC participant said:

“People don’t always know. I know I don’t really know everything about green eating so people aren’t going to put the extra effort that it takes if they don’t know the true benefit of it”.

One AM participant said:

“I think lack of education. Not enough people know about it. I think people don’t really know the benefits, so they aren’t choosing those options.”

Motivators of Green Eating

The majority of examples reported as motivators by PC participants had to do with reducing barriers. Participants discussed that having GE items in the dining halls or a fresh food store on campus would help them make more GE choices. They also wanted *“more knowledge about it”* with one participant saying: *“I feel like if I learned more about it, I would be more interested”*. One participant reported a lack of popularity of GE:

“a lot of society hasn’t accepted it yet so it’s kind of like, why should I?”

They also discussed that changes in societal pressures could influence them.

“If I saw models in magazines saying ‘Oh, I got this way because I green eat’”

“If people around me practiced green eating, I’d probably do the same. I wouldn’t want to feel left out and because I’d want to be a healthier person”.

Other motivating factors were practicing GE *“in the future”* such as wanting to *“raise children with all natural food”* or when the participants *“actually have money”* or *“enough money to purchase it”*. Developing health complications such as *“a disease like diabetes”* or *“being heavier”* were mentioned as motivating factors to practice GE.

AM participants discussed motivating factors that currently help them practice GE such as their health and happiness.

“When you’re happier with your body and how you feel, you’re happier in general, your mind and body, everything is connected. If you eat green and healthy, you’re helping yourself become happier”.

They also appreciated being more connected to their food by *“wanting to be a part of food and making it”* and the corresponding *“empowering feeling to make those conscious decisions”*. One AM participant mentioned increasing knowledge in others as a way to motivate people towards GE.

“If more people had knowledge on it, they would probably try to make a better choice and if everyone saw they were making a better choice, they would probably adapt easier as a community”.

Increasing accessibility was also mentioned as a motivating factor for other people.

“If it was a bigger option at large places that you go, advertised at different restaurants or different food places, then people would see it and probably go to it”.

COMMENT

To the author's knowledge, this is the first study to integrate students' perceptions of environmentally conscious eating and motivational readiness to change. We found that students reported definitions consistent with the established definition of GE but did not always consider the environment when making food choices. They also reported on the health and social benefits of GE, and found college life and social situations as major barriers. Knowledge, benefits, barriers and motivators differed by SOC. Participants in PC were less knowledgeable about GE and did not participate in GE behaviors as often as AM participants. Additional cost and effort were barriers for PC participants but not for AM participants. Both groups, however, discussed social pressures from family or friends as a barrier to GE.

We found that students recognized the construct of GE. That is they were aware that GE was related to locally or seasonally grown foods, farm fresh foods, or foods that were grown from the ground. University students from three European countries described ethical foods as those grown very close to the consumer, from their own garden, or grown within the neighborhood, which are similar descriptions students in our study used to describe GE [35]. We also found that students associated GE with consumption of organic foods and believed that organic foods were healthier. These findings are similar to a study conducted among high school students whereby the majority believed organic foods were better for the environment (73.7%) and their health (74.8%), and a large proportion believed they tasted better (45.4%) [36]. Our findings differ however with that of Dahm et al.[34], where the majority of university students had neutral opinions towards organic foods. It is possible that differences exist because the

students in our study were all female, whereas Dahm et al. included male participants [34].

Although students were aware and could define GE, only one student related GE to reduced consumption of animal products and only students in the AM groups mentioned reducing plate waste. Consistent with our findings, a survey conducted in an adult consumer population in Switzerland found that respondents did not believe reducing meat intake was beneficial to the environment but did believe that reducing and recycling food packaging was extremely beneficial [41]. Students also believed that following a GE was very healthy. There is evidence to suggest that eating habits consistent with GE are associated with higher diet quality in college students [42, 43]. We found that students generally have a positive view about GE as they only reported on some negative aspects such as increased expense. Students may want to learn more about GE in the future given their positive attitudes related to this topic.

We also found that examples of GE varied among students in different stages. We found that compared to AM participants, the majority of PC participants did not practice GE behaviors unless others were involved. For example, at home participants mentioned that their parents had gardens or bought certain food products that the students considered green. Our results are similar to what Dahm et al. [34] found in that the home was the most frequent place university students consumed organic foods (45.5%), however, SOC was not assessed in that study. In contrast to PC students, AM students reported several GE behaviors, for example following certain eating habits such as reducing animal products, or being vegetarian, as well as having compost containers in their dorm rooms.

When asked if they consider the environment when making food choices, PC students reported that they were too busy and/or it wasn't a priority. Students in AM reported that while they do consider the environment when making food choices much of the time, convenience can still sway them to make other choices. Other qualitative studies in this population cited similar reasons such as lack of convenience, time, or other priorities in determining food choice and exercise behaviors [44, 45]. It is evident that GE behaviors differ by the SOC. Future GE interventions should be aware of these differences and tailor to SOC. For example, a potential strategy to motivate students in PC would be to provide small, achievable GE behavior goals. On the other hand, for those students who are in AM, strategies should include providing encouragement for continuing the behavior.

Reported benefits also differed among students in PC versus AM. PC students reported health benefits of GE as a way to lose weight or decrease the risk of developing chronic illnesses. In contrast, AM students reported happiness in practicing GE and the associated benefits of helping others such as when they shop at farmers' markets. Research has shown that when purchases were made at local businesses, more money stayed in the local economy than compared to purchases made at non-local businesses [46].

We found several barriers to practicing GE in this population including the dining hall, lack of accessibility, lack of knowledge and the influence of social situations. The majority of students perceived the options at the dining hall as the biggest obstacle towards adopting GE behaviors. As a way to overcome this barrier, students in our study suggested that the dining hall should display labels with nutrition and food origin

information. One study conducted in Russia surveyed university students and found that if foods were labeled as local, approximately 70% of students said they would make an effort to buy those foods [47]. It is worth noting that although the dining hall where this study was conducted does source some of its food locally [48], the students in our study were unaware of those options because the dining hall does not label foods as local.

Another reported barrier among the students in this study was the lack of accessibility on campus. Given that most students do not have cars on campus and have a meal plan, they felt like they could not access GE foods and had to rely on the food options on campus. Students reported being more willing to consume GE foods if those foods were available on campus (in the dining halls or restaurants). This is similar to another study, which found that if organic foods were offered on campus, 64% of students claimed they would purchase them [34].

Another reported barrier was the lack of knowledge, in particular for PC students. Among this group of students, they felt that unless they knew the benefits of GE, they would not engage in any GE behaviors. Students in AM felt that increasing knowledge helped them engage in GE behaviors and that this would be true for other students. One study found that increasing awareness of food waste in a college dining hall helped decrease the amount of food waste generated by 15% [49].

A final reported barrier was the influence of social situations. Students in PC felt that because their families and friends didn't practice GE, they weren't going to either. Friends were a major influence and if friends were not willing to make changes, neither were the PC participants. One student even mentioned being embarrassed to tell friends to recycle for fear of how that student would be perceived by others. Students reported

that they were not opposed to adopting GE but it would be easier to do with others. Participants in AM mentioned that while they consider themselves green eaters, peers still affect some of their choices. Previous qualitative research has found similar results in that if students had a support system, they would be more likely to follow through on the behavior, such as eating healthy [44]. Barriers were the most discussed topic pertaining to GE. Reducing perceived barriers were reported as motivators for students to adopt GE behaviors. For example, students reported increasing accessibility and knowledge about GE as motivating factors. Students in PC mentioned that if they knew more about GE, they would most likely start practicing it. Most AM students agreed that if other people knew more about GE, they would want to practice it. Increasing awareness and knowledge about GE would be the first step in motivating students to adopt GE behaviors.

This study found that students, although aware of GE concepts, had some misperceptions related to GE. For example, some students believed that organic foods are healthier than non-organic foods. Evidence supporting this is still inconclusive and it is unclear whether organically produced foods are healthier or safer than conventionally produced foods [21-25]. It is possible that popular media and marketing are influencing students' beliefs as media has been cited as an influencing factor in other populations [50]. Further research is also needed to determine whether GE is healthier than other eating behaviors or if GE can assist in disease prevention. Future research may consider designing interventions to increase knowledge and clarify the misperceptions.

Limitations

A few limitations of our study should be noted. First, although we conducted four focus groups, we were limited to two focus groups per stage of change. Even with the limited number of groups, we were able to identify commonalities and differences between groups in the areas of barriers and behaviors of GE. Second, our sample was female university students; therefore, the generalizability of these results to other populations is unknown.

Implications for future research

Conducting qualitative research with other populations such as males and adult consumers across different settings could provide more insight into the perceptions of GE. Results from this study can inform future interventions on how to motivate college students towards adopting GE behaviors according to the SOC. Increasing knowledge and awareness of the benefits of GE and providing small changes applicable to the college population to reduce barriers are some strategies that should be implemented.

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Table 1: Moderator Guide used for Focus Groups

<ol style="list-style-type: none"> 1. When you hear the words “green eating”, what does that mean to you? 2. What are some examples of green eating that you engage in? 3. When choosing what you’re going to eat, do you consider the effect it may have on the environment? Why or why not? 4. What are some benefits (if any) of green eating? 5. What are some barriers (if any) of green eating? 6. What would motivate you to become (more of) a green eater?

MANUSCRIPT II:

**THE GREEN EATING PROJECT: WEB-BASED INTERVENTION TO
PROMOTE ENVIRONMENTALLY CONSCIOUS EATING BEHAVIORS**

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Abstract

Objective: To investigate the effectiveness of an online, interactive program to motivate college students to adopt Green Eating (GE) behaviors.

Design: The study was quasi-experimental and integrated into courses for credit/extra credit. Courses with two or more sections were randomly stratified into experimental or non-treatment control. The five-week intervention consisted of four modules based on different GE topics: an introduction to GE, local eating, reducing food waste, and choosing environmentally friendly proteins. Participants completed the GE survey at baseline (experimental:n=241; control:n=367) and post (experimental:n=187; control:n=304). The GE survey has been previously validated and consists of Transtheoretical Model constructs including stage of change (SOC), decisional balance (DB: Pros and Cons) and self-efficacy (SE: School and Home), as well as behaviors for GE. Modules contained basic information regarding each topic and knowledge items to assess content learning.

Setting: The study took place at a public, Northeastern University.

Subjects: Participants were full-time students between the ages of 18-24.

Results: The study was effective in significantly increasing GE behaviors, DB Pros, SE School, and knowledge in experimental compared to control but did not reduce DB Cons or increase SE Home. Experimental participants were also more likely to be in later SOC for GE.

Conclusions: The GE Project was effective in increasing GE behaviors in college students. Motivating consumers towards adopting GE could assist in potentially mitigating negative consequences of the food system on the environment. Future research

could tailor the intervention to participant stage to further increase the effects or design the modules for other populations.

The food system can be defined as the production, processing, distribution, consumption, and disposal of food ⁽¹⁾. Aspects of the current food system can be considered unsustainable due to the excessive reliance on natural resources, loss of land and biodiversity, as well as air and water pollution ⁽²⁻⁶⁾. With the world population projected to increase to 9 billion by the year 2050, the challenges and complexities of feeding this population sustainably have come to the forefront ⁽²⁾.

Sustainability is the ability to meet current needs of food production, without compromising the ability of future generations to meet their needs and involves the environmental, economic, and social aspects of food production ⁽⁷⁾. A sustainable food system should not excessively use environmental or economic resources. A sustainable food system should also produce social benefits such as supporting the local community. Consumers have the opportunity to play a critical role in moving the food system towards sustainability through their dietary choices. Sustainable food choices, or Green Eating (GE), has been defined as eating locally grown foods, limiting amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating ^(8, 9).

GE encompasses eating habits that have environmental and non-environmental (economic and social) benefits. Transportation of local or domestically produced foods emits fewer greenhouse gases (GHG) compared to imported foods ⁽¹⁰⁻¹⁵⁾, particularly by air ⁽¹⁵⁾. Purchasing local foods can also positively impact the local economy by returning more money to local farmers instead of distributors or manufacturers ⁽¹⁶⁻¹⁸⁾. In regards to protein choice, differences exist in the extent of resource use and resulting pollution among animal and plant proteins. Certain animal production methods, such as with beef,

have been implicated as emitting more GHGs ^(14, 19) and utilizing more natural resources such as fossil fuel and water ^(20, 21) than other proteins. Shifting diets towards animal and plant protein sources that produce the least amount of GHGs and utilize less water and land has been cited as a more sustainable food choice ^(5, 22, 23). Reducing food waste, another aspect of GE, could potentially reduce the consumption of excess natural resources ⁽²⁴⁾. The amount of food waste in the United States is upwards of 40% ⁽²⁵⁾ and has been calculated to equal 300 million barrels of oil and one-quarter of freshwater use annually ⁽²⁴⁾. An additional 4 million Americans could be fed every day by diverting 5% of food waste from landfills ⁽²⁶⁾. In addition to the topics reviewed above, students considered organic foods and reducing processed/fast foods as meaningful parts of the GE construct ⁽⁹⁾ but these topics were not included in the GE Project due to resource limitations and, therefore, environmental effects of these topics is beyond the scope of the current manuscript.

Informing consumers of more sustainable food choices and eating habits within the food system could lead to behavior changes. College students are a unique target population because, at this stage in their life, they are forming their identity and solidifying the foundation of their beliefs and attitudes ⁽²⁷⁾. Studies have investigated college student perspectives and knowledge about topics similar to GE such as sustainable agriculture ⁽²⁸⁾, local/seasonal foods ⁽²⁹⁾, organic foods ⁽³⁰⁾, food waste ⁽³¹⁾ or a combination of these types of topics ^(32, 33). Other studies have investigated the association between attitudes towards these topics and dietary quality in college students ^(33, 34). Few interventions exist addressing these topics within the college population and either take place in the dining hall ⁽³¹⁾ or in a classroom setting ⁽³⁵⁾. Online interventions

focusing on other targets conducted in this population were successful in motivating dietary behavior changes⁽³⁶⁻³⁹⁾. To the knowledge of the researchers, no online intervention exists motivating college students to adopt GE behaviors. Therefore, the objective of this study was to investigate if an online intervention focused around sustainable aspects of GE (local eating, reducing waste, and choosing environmentally friendly proteins) could increase GE behaviors in college students. It is hypothesized that the experimental group exposed to the intervention will significantly increase GE behaviors compared to a non-treatment control group.

Methods

The study was integrated into four general education courses for credit or extra credit. The study utilized a quasi-experimental design; classes were randomized and those with multiple sections were stratified by section into the experimental or control groups. Class announcements were made and professors provided student contact information to researchers. Students (n = 1248) were sent a link to the program. They were provided instructions on how to register for the program by creating a username and password. The study was five weeks in duration with students completing baseline and post assessments, week 1 and week 5, respectively. The experimental group received the intervention consisting of one of four modules per week. The control group did not receive the intervention but completed an unrelated online survey as well as the pre and post assessments for class credit. Participants for the current study had to be students between the ages of 18-24 years and provide online consent for their data to be used for research. Participants were excluded if they were outside of the age range or did not provide

consent. The Institutional Review Board of the [name has been removed for blind review] approved this study.

Intervention

The experimental GE program contained four modules related to GE constructs: GE Intro, Local, Waste, and Protein (see Table 1). Each module began with an introductory quiz about the participant's habits corresponding to the module topic followed by feedback as a way to engage the participant. Content for the module consisted of basic information displayed as text, pictures, video clips and through interactive questions and answers. Each module had two specific learning objectives associated with the topic. Following the content, participants completed an assessment quiz to demonstrate their learning. Finally, participants were asked to choose a behavioral goal to follow through on the learning objectives.

Measurements

Green Eating Survey

The GE survey was completed to assess primary outcomes, demographic, and behavioral variables. The survey was developed in 2011 to assess participants' readiness to adopt GE behaviors. The survey measures various aspects of GE that correspond to the Transtheoretical Model (TTM) such as stage of change (SOC), decisional balance (DB), and self-efficacy (SE). The survey has been validated and has strong psychometrics ⁽⁹⁾.

The GE survey was administered online via the program at baseline and post intervention.

Behavior

The GE behavior scale consisted of 6 items ($\alpha = .81$)⁽⁹⁾ assessing the frequency of pro-environmental food choices such as: choosing locally grown products, shopping at farmer's markets, choosing organic or fair-trade foods and beverages, selecting meats that are raised without antibiotics or hormones, and frequency of purchasing meat or poultry labeled free range. The response options were on a 5-point anchored Likert scale: *Barely ever to never* (1); *Rarely 25%* (2); *Sometimes 50%* (3); *Often 75%* (4); *Almost Always* (5). In the current sample, the coefficient $\alpha = .82$ at baseline and $\alpha = .86$ at post.

Decisional Balance

The DB scale consisted of 12 items split between two factors assessing the pros ($\alpha = 0.81$), defined as advantages of or positive attitude towards GE, and cons ($\alpha = .72$), defined as barriers of or negative attitudes towards GE⁽⁹⁾. The response options were on a 5-point anchored Likert scale ranging from *Not at all important* (1) to *Extremely important* (5). In this sample, the coefficient $\alpha = .77$ for DB pro at baseline and $\alpha = .81$ at post; for DB con $\alpha = .66$ at baseline and $\alpha = .71$ at post.

Self-efficacy

The SE scale consisted of 8 items assessing situational SE to engage in GE behaviors at school and home resulting in two factors (SE School: 5 items, $\alpha = .85$; SE Home: 3 items, $\alpha = .83$)⁽⁹⁾. The response options were on a 5-point anchored Likert scale ranging from *Not at all confident* (1) to *Extremely confident* (5). For SE School in this sample, the coefficient $\alpha = .82$ at baseline and $\alpha = .83$ at post. For SE Home, the coefficient $\alpha = .85$ at baseline and $\alpha = .86$ at post.

Stage of Change

SOC reflects motivational readiness to change a behavior ⁽⁴⁰⁾. SOC in the GE survey was measured using a single-item. Participants were provided with the definition of GE: eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating. Participants were then asked, according to the definition, if they practice GE by choosing one statement, representing their perceived stage: 1) “No, and I do not intend to in the next 6 months” (Precontemplation); 2) “No, but I intend to in the next 6 months” (Contemplation); 3) “No, but I intend to in the next 30 days” (Preparation); 4) “Yes, I have been, but for less than six months” (Action); or 5) “Yes, I have been for the past six months” (Maintenance).

Module Assessment Quizzes (Knowledge)

Module assessment quizzes were used to determine participant knowledge of GE. The quizzes reflected content that was covered in the corresponding module. Questions consisted of multiple choice or true/false answers.

Module Variables

The introductory quiz questions were designed for self-assessment to provide feedback as a way to engage the participant. Feedback was based on three levels (low, middle, or high) and was worded to encourage the participant to learn about the topic for the first time (low), learn more about the topic (middle), or potentially learn something new to teach others (high). At the end of each module, participants were asked to choose one statement representing their perceived stage to measure their motivational readiness to change the target behavior (i.e. if they considered themselves a green eater, a local eater, if they make a conscious effort to reduce food waste or choose more

environmentally friendly proteins) using the same stage categories as GE SOC.

Participants were then asked to choose from a list of behavioral goals as a commitment to increasing awareness of the topic or making behavior changes; confidence in achieving that goal was assessed using a scale similar to that used for SE.

Module Evaluation

Participants were asked to evaluate the project using a modified (15-item) version of the Instructional Material Motivation Survey (IMMS) ⁽⁴¹⁾. The IMMS measures attention, relevance, confidence, and satisfaction of a learning program. The response options were on a 5-point Likert scale: *Not true; Slightly true; Moderately true; Mostly true; Very true*. In addition, using items developed for previous process evaluations ⁽⁴²⁾, participants were also asked to: 1) rate the degree to which the program motivated them to change with response options on a 5-point Likert scale: *Not at all; Slightly; Moderately; Mostly; Very much*; 2) their overall opinion of the program with response options on a 5-point Likert scale: *Not good at all; Needs improvement; Satisfactory; Good; Excellent*; and 3) how likely they would recommend the project to a friend based on a 5-point Likert scale: *Not at all; Slightly; Moderately; Mostly; Very much*. Open-ended questions included what the participants found useful and how to improve the program.

Data Analyses

Data were analyzed with SPSS, version 22.0 for Mac (IBM Corporation, Summers, NY, USA). Descriptive statistics were performed and skewness and kurtosis were analyzed to determine normality of the data. All data were normally distributed. Chi-square analysis was performed for categorical variables. A repeated measures

analysis of variance (ANOVA) was used to determine differences in GE behavior scores between intervention and control groups. A repeated measures multiple analysis of variance (MANOVA) was used to determine differences in TTM constructs DB (Pro and Con) and SE (School and Home) between intervention and control groups. An exploratory repeated measures ANOVA was used to determine differences in knowledge score between intervention and control groups. Descriptive statistics were also performed for program evaluation. Estimating effect size for η^2 as well as ϕ^2 was based on Cohen's determination for small (.01), medium (.06), and large effect size (.12)⁽⁴³⁾.

Results

Participants

A total of 1248 students were recruited to participate in the study and assigned to either intervention (n=673) or control (n=575); 71 students were excluded from the study sample. Differences between group sizes were due to differences in the roster size of courses that were randomized. A total of 608 participants completed baseline assessment (see Figure 1). Participants reported an average age of 18.9 ± 1.1 years, BMI of 23.9 kg/m^2 , and consumption of 3.3 ± 1.5 cups of fruits and vegetables per day. Participants were primarily female, white and freshmen. A majority (64.2%) consumed red meat 1-3 times per week and 71.6% were moderately or extremely interested in learning about GE. For SOC, a majority (62.8%) were not ready to change (precontemplation and contemplation stages). There was a higher proportion of females and non-freshmen in the control group compared to the experimental group but no difference for other variables (see Table 2). There was a 19.2% attrition rate of those who completed baseline assessment to post with no difference in attrition between experimental and control

groups, $\chi^2(1,608)=2.25$, $p=.13$. There was no difference in any variables comparing completers to non-completers (data not shown).

GE Constructs

There was no difference between groups at baseline for behaviors. There was also no significant difference for any GE constructs at baseline. There was a significant univariate effect for behavior with a small to medium effect size, $F_{(1, 405df)}=13.89$, $p<.001$, $\eta^2=.03$ (see Table 3). There was a significant multivariate effect for other GE constructs with a small to medium effect size: DB (Pro and Con) and SE (School and Home), Wilks' $\lambda=.96$, $F_{(3, 410df)}=5.12$, $p<.01$, $\eta^2=.04$. For DB Pro, univariate analyses showed a significant difference between groups with a small effect size, $F_{(1, 467df)}=5.06$, $p<.05$, $\eta^2=.01$ (see Table 4). For SE School, univariate analyses showed a significant difference between groups with a small to medium effect size, $F_{(1, 468df)}=15.62$, $p<.001$, $\eta^2=.03$. For DB Con, univariate analyses showed no significant difference between groups, $F_{(1, 427df)}=1.62$, $p=.20$, $\eta^2=.004$. For SE Home, univariate analyses showed no significant difference between groups, $F_{(1, 481df)}=2.92$, $p=.09$, $\eta^2=.006$. Within group analysis showed the experimental group significantly increased GE behaviors compared to control. For DB Pro and SE School, within group analyses showed a significant increase in the experimental group and no change in the control group. For DB Con, within group analysis showed a significant increase in Cons for the control group and no change for the experimental group. For SE Home, within group analysis showed a significant increase in the experimental group and no change for the control group.

GE SOC

There was no difference in GE SOC at baseline between groups, $\chi^2_{(4df)}=5.43$, $p=.25$, $\phi^2=.01$. There was a significant difference in stage distribution between groups at post with a small to medium effect size, $\chi^2_{(4df)}=26.81$, $p<.001$, $\phi^2=.05$. The experimental group was less likely to be in precontemplation and more likely to be in later stages compared to the control group (see Figure 2).

Knowledge

There was no difference in knowledge scores between groups at baseline. There was a significant difference between groups at post for Total GE Knowledge with a medium to large effect size, $F_{(1,407df)}=51.15$, $p<.001$, $\eta^2=.11$. Within group analysis showed the experimental group significantly increased knowledge score and the control group had no change in knowledge score (see Table 5).

Module Variables

Of the 201 experimental participants who accessed the modules, 78.1% completed all four modules, 10.2% accessed three modules, 7% accessed two modules and 4.7% accessed one module. The majority of participants received mid-level feedback based on intro quiz scores indicating moderate engagement in target behaviors. For the GE Intro, Local, and Protein modules, a large proportion of the participants (65.5%, 68% and 44%, respectively) were not ready to change (i.e. in precontemplation or contemplation SOC). For the Waste module, 46% were post-action (i.e. in action or maintenance SOC). For the GE Intro module, the majority chose the goal: *Assess what you're eating using the Green Eating Calculator and make one healthy change to your diet* (58.9%) and were somewhat confident in achieving that goal. For Eat Local, the majority of participants chose the

goal: *Find one locally produced food on or off campus and try it* (62.4%), and were between somewhat and very confident in achieving that goal. For Waste, the majority of participants chose the goal: *Take less food at one meal every day* (77.6%), and were very confident in achieving that goal. For Protein, a large proportion of participants chose the goal: *At breakfast, load up with colorful veggies instead of ham or bacon* (35.4%), and were between somewhat and very confident in achieving that goal (see Table 6).

Module Evaluation

Based on the IMMS, participants evaluated the modules as slightly above neutral in holding their attention, being relevant in their lives, and giving them a sense of satisfaction. Participants were mostly confident that they understood and could complete the modules. A majority of the participants rated the project as moderately to mostly motivational (69.1%), had a good to excellent overall opinion (77.1%), and would moderately to most likely recommend it to a friend (65.9%) (see Table 7). For the open-ended questions, students found the videos, language, and layout of the program useful. To improve the program, they recommended adding more applicable scenarios for students eating in the dining halls and to add more videos.

Discussion

To the knowledge of the researchers, this study was the first to investigate whether an online, interactive program would be successful in motivating college students to adopt GE behaviors. As hypothesized, the GE Project effectively increased GE behaviors in college students. In addition, the intervention increased DB Pros and SE School. There was also an increase in knowledge. This study was also the first to explore SOC constructs for each individual target behavior (i.e. local eating, reducing waste, and

choosing more environmentally friendly proteins). The GE Project could potentially serve as a template for other universities or other populations to promote GE behaviors and, ultimately, motivate consumers to play a role in mitigating the negative effects of the food system on the environment.

The results indicating the experimental group significantly increased GE behaviors, DB Pros, and SE School compared to control are similar to other studies utilizing online interventions in this age population. After completion of two 45-minute sessions of an online program to improve nutrition and fitness behaviors in college students, Franko et al. ⁽³⁶⁾ found the experimental group increased fruit and vegetable consumption and were more likely to advance a stage in readiness to eat more fruits and vegetables and decrease fat consumption compared to control. Greene et al. ⁽³⁷⁾ conducted a ten-week online intervention to promote healthful eating and physical activity in college students. The intervention was effective in increasing and maintaining fruit and vegetable consumption and physical activity levels in the intervention group at post and 15-month follow-up ⁽³⁷⁾. Milan and White ⁽³⁸⁾ compared the effects of an online stage-tailored versus a non-tailored traditional intervention to increase folic acid supplementation use in college females. The tailored intervention was effective in significantly increasing self-efficacy and the pros of the behavior. Poddar et al. ⁽³⁹⁾ conducted a five-week nutrition education intervention to increase dairy intake in college students and found the intervention was successful in significantly increasing self-efficacy for the behavior. The present study was not effective in increasing GE Home but this outcome was expected as the impact of the modules was intentionally designed for the university setting and not the home setting.

In addition to advantages of GE, DB Pros can also be defined as positive attitudes towards GE. Previous research has shown that positive attitudes towards similar aspects as those found within the GE definition are associated with increased dietary quality in college students^(33, 34). Although this study did not assess dietary quality in college students, previous research has found aspects of dietary quality increased with advancing GE stages⁽⁴⁴⁾. Further research is needed to determine if adopting GE behaviors increases dietary quality in college students.

The GE Project was not effective in reducing DB Cons. This is most likely due to the content of the program promoting the advantages of GE (DB Pro) and not addressing the barriers of GE (DB Cons). Research has shown that advancement through stages is associated with a reduction of cons for many health behaviors⁽⁴⁵⁾. Including more information on overcoming barriers of GE within the program could motivate students to adopt GE behaviors and advance them through the stages but this would require further investigation.

At baseline, the majority of participants (62.8%) were not ready to adopt GE behaviors. This is similar to previous research⁽⁹⁾. For the present study, at post intervention, participants in the experimental group were less likely to be in precontemplation and more likely to be in later stages compared to control. This is similar to the study conducted by Milan and White⁽³⁸⁾ in which the stage-tailored group was also more likely to be in a later stage compared to the non-tailored group. Although the present study was not stage-tailored, similar movement through stages was seen. To increase further movement through stages, future studies could tailor the GE modules to each participant's stage for the target behavior.

Knowledge scores also significantly increased in the experimental group compared to control. The knowledge items were created from content in the module and have not been validated, therefore, the increase in knowledge is exploratory. Another study found that, following exposure to a nutrition-based intervention, nutrition knowledge significantly increased in experimental students compared to control ⁽³⁶⁾. It is a limitation of the study that the knowledge items were not validated prior to study induction. Validating knowledge items would provide a more robust instrument for determining the effectiveness of the modules in achieving the learning objectives.

The SOC constructs created for each target behavior (local, waste, and protein) provide further insight into some of the individual aspects of the GE definition. First, following the local module, the majority of participants (68.3%) were in precontemplation or contemplation indicating they were not ready to change. Little research has been conducted investigating U.S. college students' perspectives about local food. International studies have found college students felt it was important for them to purchase foods from local farms ⁽³²⁾ and categorized descriptions associated with local foods as ethical ⁽²⁸⁾. In contrast, research has found that high school students from the United States were not concerned about where their food originated ⁽⁴⁶⁾ and did not find it personally important that foods be grown locally ^(47, 48). It is possible students in this present study found accessing local foods on campus or traveling to places that sell local foods difficult. Many underclassmen at the university where this study took place do not have cars on campus. It is also possible that students are unaware when they are consuming local foods. Although dining services at the university sources foods locally whenever possible, local foods were not labeled ⁽⁴⁹⁾.

Second, a large proportion of students (43.9%) were not ready to choose environmentally friendly proteins. A survey found college students cited lack of availability, lack of affordable options, and lack of protein in the diet as barriers towards following a plant-based diet ⁽⁵⁰⁾. It is possible the current sample of college students had similar thoughts but this would need to be confirmed by future research. Other studies conducted in adult consumers found there was also little knowledge about the environmental impact of animal production ⁽⁵¹⁾ and adult consumers believed reducing meat consumption would have little impact on the environment ⁽⁵²⁾.

Third, in contrast to the local and protein modules SOC, the waste module SOC showed a large proportion of students (46.3%) were in action or maintenance indicating they were actively reducing their food waste. Research has shown that increasing awareness about food waste can decrease the generation of food waste. One study found that using prompt-type poster messaging in a dining hall informing students to reduce their food waste resulted in a 15% decrease of food waste generation ⁽³¹⁾. The students in the present study were most likely in later stages due to environmental interventions currently in place to reduce food waste. The university dining halls have been trayless since 2007 ⁽⁴⁹⁾ and research has shown that going trayless in dining halls can reduce food waste between 25-32% ^(53, 54) by forcing students to only take what they can carry.

Students rated the program with a total IMMS score greater than 3.5, which indicates a better than average rating ⁽⁴¹⁾. A majority of students (77.1%) had a positive overall opinion of the program rating it as good to excellent. Students also would moderately to most likely recommend it to a friend (65.9%). Students found the layout of the program and videos embedded in the modules useful. To improve the program, they

recommended adding even more videos and more interactivity. Although the students rated the program positively, increased interactivity and individual tailoring may be important for future interventions.

A few limitations of the study should be mentioned. Although the intervention was effective, the population was convenient and homogenous reducing the generalizability of this study to other populations. Interventions should be conducted in other universities or more diverse populations to determine effectiveness and the intervention would need to be modified for non-university populations. The module topics were also limited and, while important, they are in no way comprehensive. Future research could include more or other topics pertaining to GE such as processed and organic food. Also, this study was limited in duration and did not conduct a follow-up evaluation. Therefore, maintenance of the behavior is unknown. Longer duration studies with follow-up analysis should be conducted to determine how GE behaviors change over time.

Conclusions

Informing consumers of sustainable food choices such as those found within the GE project could potentially motivate them to adopt dietary changes and ultimately assist in mitigating the environmental impact of the food system. College students are a unique consumer population because at this stage in their life they are solidifying their beliefs. The GE Project was the first online, interactive program to effectively motivate college students to adopt GE behaviors. Future studies could use the GE Project as a template to motivate students at other universities or other populations such as adult consumers.

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Table 1: GE Project module content

Title	Educational Objectives	Behavioral Objectives
<i>Green Eating Intro</i> (21, 52, 55)	<ul style="list-style-type: none"> • What is Green Eating • Why eating green is important 	Increase awareness of GE
<i>Eat Local</i> (10-18)	<ul style="list-style-type: none"> • What eating local means • Why eating local is important 	Increase consumption of local foods
<i>Waste Less</i> (24, 25, 56, 57)	<ul style="list-style-type: none"> • What edible food waste means • How to reduce edible food waste 	Reduce edible food waste
<i>Got Protein?</i> (5, 14, 19-23)	<ul style="list-style-type: none"> • Environmental consequences of animal production • What environmentally friendly proteins means 	Choose environmentally conscious proteins

Figure 1: Participant distribution and completion

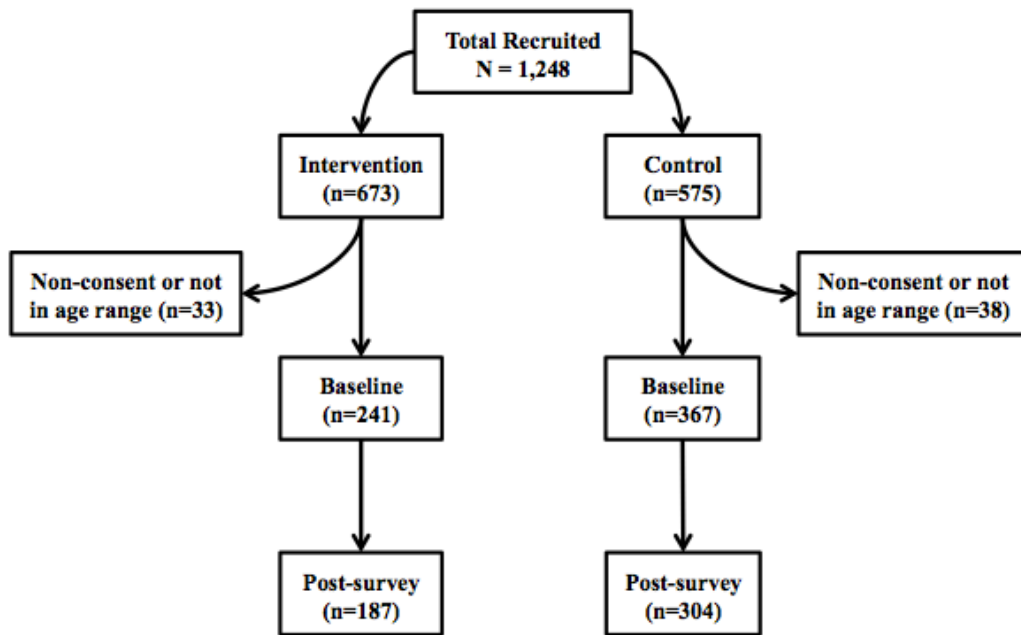


Table 2: Comparison of demographics between groups

		Experimental (E) (n=241)	Control (C) (n=367)	Total (n=607)	
		mean ± SD			F
Age (years)		18.81 ± 0.97	18.92 ± 1.11	18.88 ± 1.06	0.12
BMI (kg/m²)		23.80 ± 3.60	23.95 ± 4.14	23.88 ± 3.94	0.81
Fruit+Veg. (cups/day)		3.24 ± 1.48	3.35 ± 1.48	3.31 ± 1.48	0.00
		n (%)			Chi-square
Gender	Male	66 (27.4)	69 (18.9)	135 (22.2)	5.64*
	Female	175 (72.6)	297 (81.1)	472 (77.8)	
Race	White	202 (83.8)	310 (84.7)	512 (84.3)	0.03
	Non-white	39 (16.2)	56 (15.3)	95 (15.7)	
Year	Freshman	110 (45.6)	137 (37.4)	247 (40.7)	4.10*
	Non-freshman	131 (54.4)	229 (62.6)	360 (59.3)	
Red Meat Consumption	Never	47 (19.7)	76 (20.9)	123 (20.4)	6.9
	1-3 times/wk	143 (59.8)	244 (67)	387 (64.2)	
	4-6 times/wk	42 (17.6)	39 (10.7)	81 (13.4)	
	7 or more times/wk	7 (2.9)	5 (1.4)	12 (2)	
Interest in GE	Not at all	8 (3.3)	11 (3)	19 (3.1)	1.87
	Somewhat	41 (17.1)	62 (16.9)	103 (17)	
	Don't care either way	20 (8.3)	30 (8.2)	50 (8.3)	
	Moderately	118 (49.2)	165 (45.1)	283 (46.7)	
	Extremely	53 (22.1)	98 (26.8)	151 (24.9)	
Stage of Change for GE	Precontemplation	65 (27.9)	101 (28)	166 (27.9)	5.43
	Contemplation	84 (35.7)	124 (34.3)	208 (34.9)	
	Preparation	34 (14.5)	39 (10.8)	73 (12.2)	
	Action	18 (7.7)	47 (13)	65 (10.9)	
	Maintenance	34 (14.5)	50 (13.9)	86 (14.1)	

*p<.05, **p<.01, ***p<.001

Table 3: Univariate analysis for GE behaviors

		Baseline	Post	Within	Between	
		mean ± SD		t	F	η²
Behaviors	E (N=157)	2.33 ± .80	2.60 ± .81	-4.97***	13.89***	0.03
	C (N= 250)	2.45 ± .81	2.47 ± .85	-.59		

*p<.05, **p<.01, ***p<.001

Table 4: Univariate analyses for GE DB Pro, DB Con, SE School and SE Home

		Baseline	Post	Within	Between	
		mean ± SD		t	F	η ²
DB Pro	E (N=179)	3.75 ± .66	3.85 ± .61	-2.16*	5.06*	0.01
	C (N=290)	3.71 ± .68	3.68 ± .74	.91		
DB Con	E (N=162)	2.97 ± .69	3.05 ± .75	-1.31	1.62	0.004
	C (N=267)	2.98 ± .67	3.14 ± .71	-4.12***		
SE School	E (N=178)	2.46 ± .72	2.68 ± .73	-4.28***	15.62***	0.03
	C (N=292)	2.37 ± .76	2.35 ± .74	0.63		
SE Home	E (N=184)	3.38 ± .86	3.48 ± .83	-1.82	2.92	0.006
	C (N=299)	3.39 ± .91	3.38 ± .94	0.29		

Multivariate analyses: Wilks' λ=.96, F(3, 410)=5.12, p<.01, η²=.04

*p<.05, **p<.01, ***p<.001

Figure 2: SOC for participants at post

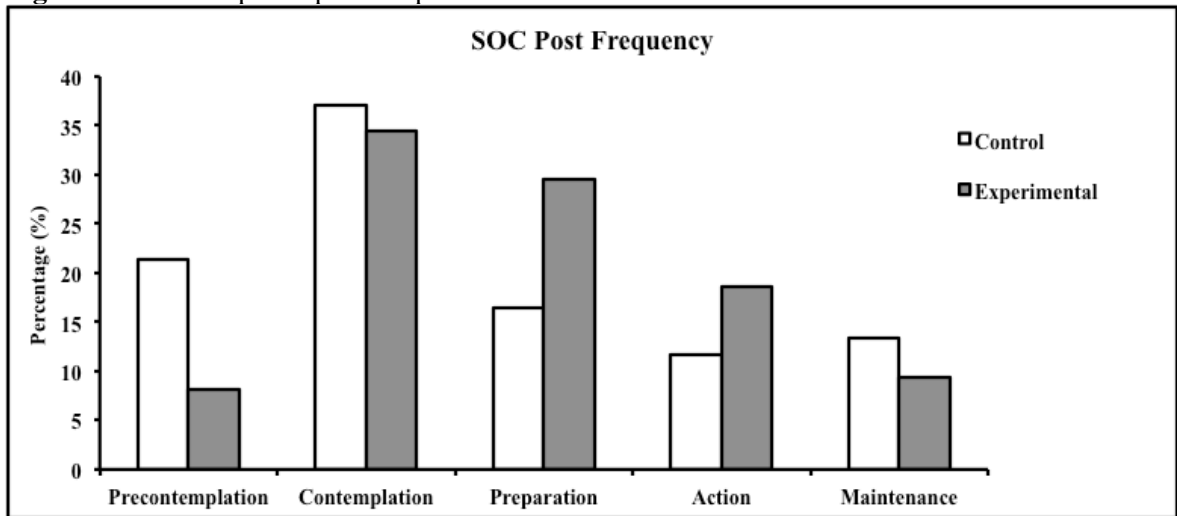


Table 5: Univariate analysis for Total GE Knowledge

		Baseline	Post	Within	Between	
		mean ± SD		t	F	η ²
Total Knowledge	E (N=105)	8.02 ± 2.24	10.16 ± 2.52	-8.17***	51.15***	0.11
	C (N=304)	7.82 ± 2.22	7.91 ± 2.47	-.673		

*p<.05, **p<.01, ***p<.001

Table 6: Module variables (intro quiz category, SOC, goal & confidence)

Module	Intro Quiz n (%)	SOC n (%)	Goal	n (%)	Confidence mean ± SD
GE Intro	Low 54 (27.7)	Cont. 67 (41.4)	Assess what you're eating	89 (58.9)	3.26 ± .81
			Watch the documentary: <i>Food Fight</i>	31 (20.5)	3.19 ± .65
			Visit URI East Farm	28 (18.5)	3.61 ± .83
High	Mid 130 (66.7)	Prep. 29 (17.9)	Join Slow Food URI – a group on campus dedicated to the sustainable food movement	3 (2)	3.00 ± 2.0
			Act. 13 (8)		
			Main. 14 (8.6)		
Local	Low 75 (40.3)	Cont. 85 (54.8)	Find one local food and try it	93 (62.4)	3.47 ± .77
			Find a local food in season and try it	26 (17.4)	3.5 ± .99
			Cook a local, in season recipe for your friends	23 (15.4)	3.87 ± .87
High	Mid 107 (57.5)	Prep. 20 (12.9)	Watch the documentary: <i>Ingredients: The local food movement takes root</i>	7 (4.7)	3.43 ± .79
			Act. 14 (9)		
			Main. 15 (9.7)		
Waste	Low 33 (20.1)	Cont. 25 (15.4)	Take less food at one meal every day	125 (77.6)	4.01 ± .80
			Talk to a friend about food waste	17 (10.6)	4.24 ± .83
			Keep a journal about food waste for 3 days	13 (8.1)	3.31 ± 1.0
High	Mid 110 (67.1)	Prep. 49 (30.2)	Watch the documentary: <i>Dive</i>	6 (3.7)	3.67 ± .82
			Act. 37 (22.8)		
			Main. 38 (23.5)		
Protein	Low 34 (20.2)	Cont. 54 (32.9)	At breakfast, load up on veggies instead of ham or bacon	57 (35.4)	3.56 ± .80
			Replace beef with chicken, beans, chickpeas, or edamame	49 (30.4)	3.39 ± .86
			Watch the documentary: <i>Meat the Truth</i>	28 (17.4)	3.32 ± .86
High	Mid 114 (67.9)	Prep. 54 (32.9)	If you already eat Meatless Mondays, try Meatless Tuesdays through Sundays	27 (16.8)	3.81 ± .90
			Act. 21 (12.8)		
			Main. 17 (10.4)		

Table 7: Program evaluation

		mean ± SD
IMMS (n=176)	Attention	3.40 ± .85
	Relevance	3.47 ± .91
	Confidence	4.10 ± .78
	Satisfaction	3.30 ± .96
	Total	3.62 ± .65
		n (%)
Motivation	Not at all	4 (2.2)
	Slightly	30 (16.2)
	Moderately	85 (45.9)
	Mostly	43 (23.2)
	Very much	23 (12.4)
Opinion	Not good at all	1 (.5)
	Needs improvement	5 (2.7)
	Satisfactory	36 (19.7)
	Good	96 (52.5)
	Excellent	45 (24.6)
Recommend to friend	Not at all	8 (4.3)
	Slightly	27 (14.6)
	Moderately	67 (36.2)
	Mostly	55 (29.7)
	Very much	28 (15.1)

n varies

LITERATURE REVIEW

INTRODUCTION

With the population estimated to increase to 9 billion in the next 35 years, the demand for food will also increase. The current way food is produced can be considered unsustainable due to the contribution to world pollution and the unsustainable reliance on natural resources. Consumers can play a role in either contributing to the problem or assisting in the solution to agricultural sustainability through their food choices. For example, Green Eating encompasses aspects of food choice and dietary habits that can be considered sustainable such as choosing local foods, reducing plate waste and choosing proteins with the least negative environmental impact. Informing consumers at a critical stage in their life, such as during their college years, could be a unique approach to increasing awareness about the impact of their food choices. This literature review is written in two parts. The first part discusses aspects of the food system that can be considered environmentally unsustainable and then discusses environmental, economic, and social sustainability aspects of each portion of the Green Eating definition: local foods, processed/fast foods, environmentally friendly proteins, organic, and food waste. The second part discusses current perspectives of environmentally conscious eating in the young adults and interventions pertaining to dietary behavior changes in the college population.

FOOD SYSTEM

The food system can be defined as the production, processing, distribution, consumption, and disposal of food (1). With the world population projected to increase to 9 billion by the year 2050, the challenges and complexities of feeding this population sustainably have come to the forefront because aspects of the current food system are potentially causing detrimental effects to the environment (2). Among the detrimental effects include pollution to air and water and reliance on excessive natural resources such as fossil fuels, soil, and water (2, 3).

Food System Related Pollution

Air

All aspects of the food system contribute to air pollution primarily due to greenhouse gas (GHG) emissions. All processes of the food system produce GHGs (4) including carbon dioxide, methane, halocarbon, nitrous oxide, ozone, and water vapor (5). According to the Intergovernmental Panel on Climate Change, carbon dioxide is the most important GHG, followed by methane, halocarbons, and nitrous oxide (5). Carbon dioxide is the most important because it occurs in the greatest amounts in the atmosphere. However, based on radiative forcing, which is a way to measure the potential of a gas to warm the Earth's atmosphere, methane and nitrous oxide are much more potent GHGs compared to carbon dioxide but occur in smaller amounts in the atmosphere (5). GHGs have the potential to create a greenhouse effect or the warming of Earth's atmosphere and have been implicated as causing a detrimental increase in climate temperatures (5). The warming of the Earth's atmosphere could cause an increase in catastrophic events such as

severe droughts, floods, hurricanes, and changes in sea levels (5). The U.S. Environmental Protection Agency (EPA) (6) estimates that approximately 6% of GHG emissions can be attributed to agriculture in the United States, whereas transportation accounts for about 26% of GHG emissions (7). Agriculture contributes the most to nitrous oxide and methane emissions in the United States primarily from livestock production (6).

Water

Water pollution is caused by a number of agricultural practices and is another unsustainable aspect of the food system. The United States Environmental Protection Agency (EPA) estimates that the leading cause of water pollution is due to agricultural nonpoint source pollution including agricultural runoff, precipitation, and drainage (8). These can occur primarily as a result of activities involved with animal production such as overgrazing and poorly managed feeding operations, excessive tillage practices, and disproportionate use of pesticides and fertilizers (8). Pollutants in the water include soil sediments and nutrients, pathogens or bacteria from animal waste, and pesticides from excessive use on crops (8). Agricultural runoff has been implicated as a major contributor to hypoxic dead zones (9, 10). One of the largest dead zones exists in the Gulf of Mexico and is about the size of New Jersey (9, 10). Dead zones consist of eutrophication of water due to excess nitrogen present, which creates a hypoxic environment with oxygen levels too low to support marine life (11). Nonpoint sources have been estimated to contribute 90% of nitrogen levels in water in the majority of dead zones around the world (10).

Food System Reliance on Natural Resources: Fossil Fuel, Water and Land

The food system is dependent on a number of natural resources including fossil fuel, water, and soil but the excessive use of these resources has been questioned. Energy is used throughout the lifecycle of a food product with about 85% of total energy use coming from fossil fuels such as coal, natural gas, or petroleum (12). Examples of fossil fuel use include the tractor powered by gasoline to plant seeds or apply fertilizer or pesticides; the production of fertilizer and pesticides; distribution of fertilizer or pesticides and distribution of the food product; the production of packaging used to ship materials or food products; and the transportation to purchase the food (12). It is estimated that, in 2002, 14.4% of total energy use in the United States was dedicated to food production and this has increased to 15.7% in 2007 whereas 28.7% of total energy use was dedicated to transportation (12). The United States imports a majority of its oil supply, of which, worldwide amounts are strained and will continue to decrease as the population continues to grow (13).

Water is another natural resource becoming increasingly scarce (14, 15). All living things require water to grow and survive and water use for agriculture is unavoidable but its efficiency of use can be improved (2). It has been estimated that agriculture uses 70% of the global fresh water supply (16). Irrigation has allowed water depleted lands to be converted to croplands but this process can be economically and ecologically expensive (2, 17) as irrigation requires more energy and money to operate compared to crops that rely on rainwater (2). Consequences with irrigating land, such as salinization and waterlogging, can lead to reduced crop production and wasted water (2, 17, 18).

Agriculture also almost exclusively relies on land and soil. Topsoil contains the most organic matter and is essential in soil fertility (18). When topsoil is exposed due to agricultural practices such as tilling or not using a cover crop during the off growing season, wind and rain can exacerbate soil erosion (8, 18, 19). It has been estimated that present soil erosion amounts to 0.38 mm per year, which contribute to the abandonment of 10 million hectares of land due to erosion and desertification (20, 21). With more than 99.7% of food being produced on land (21), the conservation of soil fertility and soil health is a basic necessity in the production of food.

Sustainability within the Food System

Sustainability is the ability to meet current needs without compromising the ability of future generations to meet their needs (22). Sustainability encompasses environmental, economic and social aspects. A sustainable food system should provide support the local community and provide healthy, available food. The excessive use of natural resources and pollution make the current food system environmentally unsustainable. Many of the solutions to food system environmental unsustainability will be derived from technological advances such as improving productivity and efficiency of current food production without the use of more land or more animals, developing and adopting the use of renewable energy sources and adopting agricultural practices such as conservation agriculture, which is no or reduced tillage practices to maintain soil fertility (23). In addition to technology, some solutions will be derived from the consumer. There are choices that consumers can make within the food system that can be considered more sustainable, such as the concept of Green Eating (GE).

GREEN EATING

The concept of GE encompasses aspects of eating habits that can be considered sustainable including environmental, economic and social (i.e. non-environmental) benefits. The current definition of GE is: eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating (24), modified from the GE survey developed at University of Rhode Island (25). Each component of the GE definition, local foods, processed/fast foods, environmentally friendly proteins, organic foods, and food waste, can be related to environmental and non-environmental aspects of sustainability. It is also important to discuss the consumer role in each aspect of GE.

Local Foods

Local foods can be defined a number of ways. According to the USDA, there is no accepted mileage definition for what is considered “local” (26). However, the Food, Conservation and Energy Act of 2008 defined local agriculture products as originating from within 400 miles or within the state (27). The following definition was developed by our lab and used in the module: local eating is consuming foods that were produced within the state or region – for example, if in Rhode Island, consuming foods that were produced within New England.

Local can also be defined by the types of markets including farmer direct-to-consumer sales and farmer direct sales to establishments such as restaurants, universities or hospitals (26). Farmer direct-to-consumer sales include farmers’ markets, farm stands, “pick your own” farm operations, and community supported agriculture (CSA) (26). Farmers’ markets are an organized gathering of a few or several different farms in a

common area to sell products ranging from fresh produce to flowers to animal products (26). The number of farmers' markets in the U.S. has increased by 12% from 2011 to 2013 currently totaling 8,144 (28). Farmers' markets that are considered established occasionally hire an individual or organization to manage the markets (26). In the state of Rhode Island (RI), there is a non-profit organization called Farm Fresh RI that organizes and promotes the local food system (29). In RI, there are 55 farmers' markets including eight wintertime markets (30). The farmers' markets sell a range of products including produce, honey, eggs, dairy and flowers in which 100% of the products must be sourced in RI or the neighboring states of Connecticut and Massachusetts; artisanal products including bread and coffee must be crafted in the same three states; and prepared foods such as sandwiches and pastries must include at least one ingredient from one of the three states (30). Farm stands and on-farm stores can operate all year long either in a permanent building or from a mobile cart (26). Farm Fresh RI identifies over 80 farm stands in the state (31). Pick your own farm operations are popular for farms that have high labor but little harvesting knowledge requirements such as those that grow berries, apples, peaches or pumpkins (26). This type of operation allows the customers to pick their own produce on the farm. There are over 40 pick your own farm operations in Rhode Island (32). CSA is the concept of a group of people or community that purchase a portion of the harvest from a particular farm (26). In the U.S. in the 1980's, there were only two CSAs (33). That number has increased from 3,600 in 2011 (34) to over 4,000 in 2012 (35).

Reported benefits of supporting the local food systems can be classified into environmental and non-environmental aspects. For environmental benefits, reduced GHG

emissions resulting from reduced transportation have been reported but the research is conflicting. Potential economic and social benefits include strengthening the economic power of the local community and increasing access to fresh, healthy foods thereby reducing food insecurity in communities.

Environmental Benefits of Local Foods

The evidence of reducing GHG emissions through purchasing local foods is conflicting. Purchasing local foods has been cited as reducing the distance the food travels or decreasing the ‘food miles’. The average bite of food an American consumes has traveled 1,500 miles (36). However, the range of ‘food miles’ varies greatly with the type of food (36). For example, in Chicago, grapes can travel over 2,000 miles while pumpkins travel only about 230 miles (36). Domestically grown or locally grown foods have been shown to produce fewer GHG emissions (36-40) by as much as 27% (39). However, the research on percentage of GHG emissions from local foods is conflicting as Weber and Matthews (41) found that buying local could reduce GHG emissions by only 4-5% for the average American family. This is due to such a low percentage of GHG emissions coming from transportation that occurs between producer and retailer (41). The researchers also found that shifting one day’s worth of calories from animal products to more plant-based sources has the same impact as purchasing every food product locally (41). A lack of infrastructure in the local food system is also cited as a contradiction to the benefit of purchasing locally (42). A study conducted in the United Kingdom found that if a consumer drives longer than 6.7 km to purchase food, GHG emission would be greater than if an institution delivered the food products to the consumer’s doorstep (42).

Research shows the mode of transportation may be more significant than the distance food travels. For example, Saunders and Hayes (40) found that cherries imported from North America to Switzerland produced more GHG emissions compared to apples imported from New Zealand, a farther distance, because the cherries traveled by air whereas the apples traveled by sea (40). Other studies support the importance of mode of transportation stating that fruit imported by air emit as many GHGs as production of red meat (43).

Non-Environmental Benefits of Local Foods

There are both economic and social benefits of purchasing local foods. A possible economic benefit of purchasing directly from farmers is that farmers may receive a larger share of the food dollar by eliminating components of the food system such as distributors and some aspects of transportation (44). A study based in West Michigan found that with every \$100 spent at local businesses, \$68 stayed in the local economy (i.e. supplies, wages, taxes, donations, etc.) whereas only \$43 stayed in local economy when \$100 was spent at a non-local business (45). One report stated that for every dollar spent at farmers' markets in Iowa, an additional 58 cents would be generated in transactions in the local economy (indirect and induced sales) (46).

Another non-environmental benefit of purchasing and supporting local foods is the social aspect of potentially increasing access to fresh, healthy foods to low-income families. In 2012, Farm Fresh RI reported that 400 low-income families made 2,540 visits to their farmers' markets to participate in their *Healthy Foods, Healthy Families* program (47). In 2012, SNAP sales at farmers' markets increased by 32% from the previous year (47). Farm Fresh RI provided low-income families with over \$62,000 in incentives for

fresh, local fruit and vegetables (47). All of the farmers' markets accept Supplemental Nutrition Assistance Program (SNAP) and Women, Infants and Children (WIC) benefits. A 40% bonus is provided when those benefits are used at the markets (47). The incentives and accepted benefits at farmers' markets allow low-income families to purchase fresh produce that they may not have access to otherwise. Accepting benefits from low-income families expands the consumer base of local foods. Consumers in general are requesting that more foods come from local sources, which increases the popularity.

Consumer Perspectives of Local Foods

Despite conflicting evidence for environmental benefits, the purchasing of local foods has been increasing. In 2007, direct farmer to consumer sales in the U.S. totaled \$1.2 billion (26). Farm Fresh RI reported that, in 2012, \$2 million dollars were spent at farmers' markets in RI (47). Consumers have identified local foods as being fresher and that purchasing local foods supports the local economy and small farms (44). Similarly, a survey conducted in the Midwest found the top reasons consumers purchased local foods were freshness, taste, and supporting local farmers (48). Consumers valued a local label on food as being very to extremely important (48). Another study confirms that consumers are growing a preference for local foods is growing and a label stating the local origin increased the willingness-to-pay for such products (49). According to the National Restaurant Association (NRA), local foods are "trending" with locally sourced meats and seafood and locally grown produce being the top two culinary trends of 2014 (50). The NRA also reports that 64% of customers are more likely to visit a restaurant

that sources locally-produced foods (51). These trends demonstrate a shift towards locally sourced food items and potentially a shift away from processed/fast food items.

Processed/Fast Foods

The second aspect of the GE definition is reducing processed/fast food consumption. In 2007, the U.S. had about 270,000 fast food restaurants, also called limited service eating places (52). Limited service eating places are defined as having limited services such as limited to no wait staff and customers order from a prefixed menu and pay prior to eating (52). The top five most popular fast food restaurant chains, based on sales in 2011, were: McDonald's, Subway, Starbucks, Burger King and Wendy's (53).

Environmental Impact of Processed Foods

There is very little information regarding the direct environmental impact of processed/fast foods on the environment. It can be speculated that the environmental impact of processed/fast food overlap with other portions of the GE definition such as reducing waste. For example, in fast food restaurants, if food items are not sold after a certain amount of time, they are thrown away (54). Food waste is discussed in more detail below.

Non-Environmental Impact of Processed Foods

The fast food industry accounted for about 27% of total restaurant sales in 2012 equaling \$179 billion in the United States. (55). Consumption of processed/fast foods has been associated with increased intake of overall calories, total fat, and saturated fat and decreased intake of micronutrients, fruits and vegetables (56, 57). Consumption of processed/fast foods has also been associated with a higher probability of being

overweight (57). People who did not report consuming fast foods were associated with consuming fewer calories and more fruits and vegetables (56). Limiting intake of processed/fast foods may decrease the probability of displacing essential nutrients within the diet.

Environmentally Friendly Proteins

In developing countries, the demand for meat will double by the year 2050 increasing from 200 kcals per person per day to 400 kcals (58, 59). The increase in demand for meat will thereby increase the use of necessary resources, potentially increasing the environmental impact. Animal production has become more efficient through the ability to produce more commodities, meat, milk and eggs, in shorter amounts of time therefore reducing GHG per unit of meat or milk produced (60, 61). Maintaining these gains in production efficiency, along with improvements in waste management, will be necessary to meet the estimated increase in demand for meat.

Consumer choice in protein can also impact the environmental sustainability of the food system. Consuming mostly plant-based proteins has been shown to be more environmentally friendly than some animal-based proteins (43, 62, 63). This is due to the fact that raising animals for food produces GHGs and requires more natural resources such as fossil fuel, water and land compared to plant production (43, 62, 63). For example, when GHG emissions of animal and plant based proteins are directly compared, beef produces the most GHGs, eggs and fish produce mid-range levels whereas plant products such as soy and legumes produce the fewest GHGs (43, 64). Animal production also requires a greater input of energy versus plant production. An average fossil energy input of 25 kcal is required for 1 kcal of animal protein to be produced compared to plant

protein, which requires 2.2 kcals of fossil energy per 1 kcal of plant protein produced (65). Within animal products, however, exists a large range of fossil energy inputs. For example, chickens require 4 kcals of fossil energy to produce 1 kcal of protein, making chickens the most efficient animal protein compared to lambs with a ratio of 57:1 (65). Choosing more efficient, environmentally friendly proteins could possibly contribute less GHGs, utilize less land and water resources, and require less fossil fuel energy.

Environmental Comparisons of Proteins

GHG emissions are an important aspect to consider when measuring environmental impact but other factors exist. To understand a complete environmental impact, land erosion, water use, and water pollution also need to be assessed.

Air

GHGs, mainly methane, nitrous oxide and carbon dioxide, are released into the atmosphere through several agricultural processes associated with animal and plant protein production. While all food production contributes to the release of GHGs in some way, livestock production contributes to 18% of greenhouse gas emissions globally primarily due to deforestation (61). As written by Pitesky et al., (7) this estimation is in contrast with reports generated for livestock production in the United States (6) and California (66). Both reports state that only 2.8% of GHGs can be attributed to animal agriculture (6, 66), whereas transportation accounts for between 26% and 37% of GHGs (7). Despite contrasts in total estimations, agriculture, including animal and plant production, remains the main contributor of methane and nitrous oxide emissions at the state, national and global levels while transportation is the main contributor of carbon dioxide emissions (6, 7, 66). Methane and nitrous oxide are produced mainly due to

digestion by ruminant animals and animal waste management involved with animal protein production, and by plants via nitrogen transformations in soils by microbes (43, 67). Agricultural carbon dioxide is released through tillage practices and deforestation exposing organic soil carbon, which is released into the atmosphere (19).

Methane and nitrous oxide are a large proportion of GHGs from animal production due to enteric fermentation and manure management. Ruminant animals, such as cows and sheep, have the ability to convert land unfit for human consumption into edible protein (7). Through this conversion process, methane is formed as a byproduct of microbial digestion of cellulose and hemicellulose and is released via animal belching (7). Methane and nitrous oxide are also released due to the decomposition of manure produced from livestock (7). The intensification of animal production in animal feeding operations produces 500 million tons of manure each year (8). In these large farming operations, manure is typically managed and treated in liquid form (68), increasing the release of methane due to anaerobic conditions (7). Nitrification and denitrification of manure and urine contribute to the release of nitrous oxide into the atmosphere (7). While the United States has the highest levels of methane released via manure management globally, the high levels of methane are associated with high levels of productivity (i.e. dividing the total amount of GHGs released by the number of animals produced decreases the amount of GHGs released per animal) (61).

Land-use changes, such as converting land for raising livestock, has been estimated to contribute to 35% of total GHG emissions associated with animal agriculture (61). Deforestation contributes to the release of above and below ground carbon dioxide (7, 19). Conversion of land to feed crops and pasture in Latin America has contributed

the most GHG emissions globally from deforestation (61). In contrast, the United States has increased forestland by 25% in the last 25 years due to planting more trees than harvesting, thereby reducing GHG emissions caused by land-use changes (6, 7).

Crop production releases GHG emissions via agricultural practices such as plowing and tilling, which releases soil organic carbon into the atmosphere as carbon dioxide (19). Other plant production practices that contribute to GHG emissions include the application of synthetic fertilizers or animal manure to land, which undergoes conversion by microbes, releasing nitrous oxide into the atmosphere (7).

Comparison of GHG emissions from different foods demonstrates the range of GHG emissions in both animal and plant proteins. Vegetables, grains, legumes, and milk produced domestically, lower GHG emissions compared to eggs and chicken while beef, tropical fruit imported by plane, and cheese had the highest GHG emissions (43).

Land

In addition to contributing to GHGs through deforestation, human expansion into forested land is a major contributor to the loss of biodiversity of plants and animals due to habitat loss (2). Conserving biodiversity contributes to providing food and water, supplying clean air, and helping to stabilize the climate and balance of ecosystems as a whole (69, 70). Land management is also essential in preventing erosions in both animal and plant production. Overgrazing of animals, such as those found in poorly managed pasture-based systems, exposes topsoil and promotes erosion as the soil no longer has plants to keep it in place (8). Soil erosion also occurs in plant production through excessive tillage practices or leaving soils uncovered for lengthy periods of time, such as those found on farms that do not use cover crop during the off season (18, 19).

Water

Both animal and plant protein production can contribute to water pollution. For animal production, if the manure produced on farms is not managed properly, this waste can contribute to ground water and nearby river and stream pollution (68). For plant production, improper land management such as excessive tillage, can expose topsoil to wind and water (19) causing the soil sediments to wash into nearby bodies of water contributing to water pollution (2). Also, application of synthetic fertilizers and applying animal manure to crops, in excess of amounts that can be absorbed in the soil, can also contribute to the pollution of water (8). Animal production also requires more water than plant production due to the combination of water required to produce animal feed and the water animals need to drink. Water usage for producing 1 pound of animal protein is 100 times greater than producing 1 pound of plant protein (65, 71) with over 2100 gallons of water required to produce 1 pound of beef (72). In addition to environmental aspects of plant and animal protein, non-environmental comparisons should be considered such as the impact on health in shifting diets to choosing proteins with less negative environmental impact.

Non-environmental Comparisons of Proteins

There are positives and negatives associated with shifting dietary patterns towards more plant-based proteins in regards to health. Red meat consumption is associated with adverse health effects including being linked to some types of cancers (73) and consumption of animal proteins including red meat and dairy have been linked to increased CHD mortality risk (74). Low intake of red meat has been linked to decreased mortality risk (75). Compared to regular meat eaters (defined as eating meat one or more

times per week), mortality from ischemic heart disease was lower for occasional meat eaters (defined as eating meat less than one day per week), people who ate fish but not meat, lactoovo vegetarians and vegans by 20%, 34%, 34%, and 26%, respectively (76). Consequently, fruit and vegetable consumption is strongly associated with reduced risk of hypertension, CHD, and stroke (77).

Simply eliminating meat from the diet versus reducing intake could cause problems depending on where one lives in the world (78). For example, in developed societies, health burdens can be caused by overconsumption of calories, including excess fat and protein, where replacement with plant-based foods may be beneficial (78). In societies in which health burdens can be caused by under-nutrition and animal proteins do not make up a large portion of the diet, animal products can be a good source of protein, Vitamin B12, and iron (78). Using beverages as the reference food item, one study investigated whether the nutrient composition negates the GHG emissions of the food product (79). Beverages were scored based on a Nutrient Density to Climate Impact (NDCI) index, indicating a ratio between nutrient quality and GHG emissions (i.e. the higher the NDCI index scores, the more nutrient dense in relation to GHG emissions) (79). Due to the high level of nutrients, milk scored the highest on the NDCI index, followed by orange juice and a soy based beverage (79). Carbonated water, soda, and beer scored the lowest (79). This study demonstrates that nutrient density and benefit to human health may outweigh negative effects on the environment and may be important when accounting for the environmental impact of food products.

Consumer Role and Perspective of Protein Choice

Food production efficiency will have the major role in mitigating the environmental impact of protein, especially with animal products (80, 81). Consumer choice will also play a smaller role (82), as diets may need to shift away from foods with high GHG emissions (4). In addition to technological advances in agricultural methods, Garnett (4) identified two high priority shifts that consumers can make towards mitigating the environmental impact of protein choice: 1) consuming fewer meat and dairy products and 2) eating only what is required to maintain a healthy body weight. Choosing more efficient, environmentally conscious proteins, could contribute less GHGs, require less fossil fuel energy, and utilize less land and water resources and, therefore, preserving environmental resources. However, motivating the public to make those dietary changes may pose to be challenging. One study surveyed Australians and found they believed that reducing food packaging was the most important aspect of environmental consciousness and reducing meat consumption was the least important (83). The most common practiced food-related environmental behavior by survey participants was composting and purchasing local foods (83). There was also little knowledge about the environmental impact of animal production (83). Another study conducted in Switzerland found very similar results with survey participants believing excessive packaging was the most detrimental to the environment while reducing meat consumption would have little impact on the environment (84). LCA analysis has shown that agricultural production of animal products causes the largest environmental impact (62, 85) whereas excessive packaging has a smaller environmental impact (85). Research

regarding current perceptions of the environmental impact of various proteins demonstrates the challenge and the need to increase public knowledge.

Organic

Organic agriculture can be defined as an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity (86). It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony (86). In the United States, to receive organic certification, a farm must meet specific requirements that are verified by a 3rd party USDA accredited agent (87). Crops need to be grown without the use of synthetic fertilizers, pesticides, sewage sludge, genetically modified organisms, and irradiation (87). Organic crops have to be grown on land that has not been exposed to prohibited substances for three years prior (88). Livestock needs to be raised consuming 100% organic feed, having exposure to the outdoors, with no use of hormones or antibiotics, and meet animal health and welfare standards (87). The only materials that can be used to assist in growth of crops or raising of livestock have been placed on the National List of Allowed and Prohibited Substances (88). Examples of items on that list include synthetic materials that can be broken down easily and waste from animals and crops (88). In comparison, conventional agriculture does not have the same restrictions. Numerous studies have been conducted investigating differences in environmental, economic, and health impacts of organic and conventional agriculture.

Environmental Comparisons of Organic and Conventional Agriculture

Pimentel et al. (89) examined results of a 21-year study comparing conventional farming to organic animal-based farming and organic legume-based farming. Several

components of farming were measured including soil carbon and nitrogen levels, nitrate and herbicide leaching, and fossil fuel inputs. Soil carbon, a measurement of overall soil health, was significantly higher in both organic systems compared to conventional (89). Soil nitrogen, a key element for plant growth, significantly increased in the organic farming systems over the 21-year period compared to control, which remained unchanged (89). Nitrate leaching was similar among all three farming systems (89). Two herbicides, atrazine and metolachlor, were detected in water samples collected from the conventional system (89). Energy inputs for both organic systems were 28 – 32% less compared to the conventional agricultural system (89). As reviewed by Gomiero et al. (90), other long-term studies have also found similar results with increased soil benefits and improved soil fertility (91-93), reduced nitrate leaching (94), and increased water holding capacity (89, 95) in organic farming systems compared to conventional. However, research is conflicting as one 18-year study found no significant differences in soil carbon levels between organic and conventional farming systems and that using organic farming practices can actually lead to increased nitrate leaching (96).

Venkat (97) investigated the level of GHG emissions in organic, transitional (i.e. transitioning from conventional to organic farming) and conventional farming systems and found that organic released an average of 10.6% more GHG emissions than the other farming systems. Reasons included lower yields and large amounts of compost that organic farming systems produce (97). Transitional farming produced an average of 17.7% fewer emissions compared to organic and conventional farming due to the assumed increase of soil carbon storage (97). These results suggest that there are practices within both systems that can be utilized to reduce GHG emissions. No-till, or

conservation tillage (23), practices have been shown to be the best method of reducing GHG emissions in crop agriculture (98). Research for environmental benefits of organic versus conventional farming practices is conflicting as is the case when comparing non-environmental aspects of organic and conventional food products.

Non-Environmental Comparisons of Organically- and Conventionally-Grown Foods

Organically- and conventionally-grown foods have been extensively studied for differences in pesticide levels and nutritional components. As reviewed by Winter and Davis (88), organic fruits and vegetables are exposed to fewer pesticides and, therefore, contain fewer pesticide residues. However, because organic fruits and vegetables do not rely on pesticides to control pests, those foods could develop naturally occurring toxins (88). Bacteria from organically raised animals was less resistant to antibiotics compared to bacteria on food products from animals raised conventionally (88). Despite these differences, the authors state that there is not enough evidence to declare one farming practice as better than the other when comparing safety and nutrition (88). Another review paper found similar results in that consuming organic food may reduce exposure to pesticide residues and antibiotic-resistant bacteria but stated that current research lacks strong evidence to state significant differences between organic and conventional food products in terms of safety and nutrition (99). Other studies found similar, inconclusive evidence when comparing flavonoids (100), nutrition-related health effects (101) and animal products (102) between organic and conventional foods.

Consumer Perspectives of Organic

Regardless of inconclusive evidence of health benefits of organic foods, consumers continue to purchase organic products. In 2007, the organic industry in the

U.S. was valued at \$3.6 billion dollars (103). In 2011, sales for the organic industry exceeded \$31.5 billion representing 4.2% of all U.S. food sales (104). In 2009, a survey found that about 75% of American families purchased at least some organic products claiming that it was healthier for themselves or their children (105). Consumers that were considered non-buyers cited price as the highest motivating factor against buying organic (105). However, a majority of the non-buyers also stated that they had very little to no knowledge about organic foods (105). A study conducted in the Midwest found the top reasons for purchasing organic food products was to avoid chemicals/pesticides, for health and nutrition, and taste (48). A study conducted in New England found that freshness, nutrition, taste, and safety were among the top reasons people purchased organic foods (106). Similarly, a survey conducted in Italy found that consumers held generally positive views towards foods grown organically (107).

Waste

The final aspect of the GE definition is reducing plate waste by only taking what one plans on eating. The amount of food wasted throughout the food system is upwards of 40% (108, 109). The amount of food wasted in the U.S. is equal to about 1400 kcals per person per day, adding up to 150 trillion kcals per year, an increase of about 50% from 1974 (110). There are several places within the food system supply chain in which waste can occur: during farming, harvesting, processing, distribution, retail, and consumption (109). At the farming level, it has been estimated that up to seven percent of crops are not harvested (111) due to elements such as weather and pests (109, 112). Crops can also be left in the field due to changes at the time of harvest such as a farmer planting extra crop to prepare for unexpected losses during the growing season (109). The

nutrients from those crops can be returned to the soil but are not utilized as sources of food (109). At the harvesting level, workers are trained in the process of culling to pick the best product before shipment (109). Crops that don't meet certain criteria such as color, size, and shape will not be shipped to processing and distribution plants. During processing, products can be lost to preparation methods such as trimming or creating pre-cut produce (109). During distribution, mishandling of perishable foods such as incorrect temperature storage can lead to losses (109).

Retail has many aspects that cause food waste. In 2008, food losses in stores accounted for about 10% of total retail food supply equating to about 43 billion pounds (112). The majority of in-store losses are among fresh fruits and vegetables (113) due to consumers only picking produce of a certain appearance, removal of damaged products, and store turnover to provide the freshest items to consumers (109). Consumers play a major role in the retail level as well as the consumption level of the food system, which includes food service and households. In 2008, 86 billion pounds or 19% of the total food supply at the food service and household level was lost (112). In food service systems, plate waste accounts for a majority of those losses with 17% of meals left uneaten (54). Those meals then potentially become leftovers in the household. In the United Kingdom, consumers contribute to the majority of waste with two-thirds of household waste coming from leftovers (114). In America, 25% of foods and beverages purchased for homes is thrown out (54). Some reasons include confusion about the dates found on the labels and spoilage (109).

Environmental Impact of Food Waste

Wasted food means the resources required to produce that food are also wasted; fossil fuel and water being two major resources. The energy embedded in food waste for the year 2007 was estimated to be about 2030 BTU, which was equivalent to 2% of the yearly energy consumption in the United States (115). With the estimation that 15.7% of total annual energy consumption was dedicated to produce food in the United States in 2007 (12), wasted food represented a major fraction of that percentage. Using the estimate that an average American farm uses 3 kcal of fossil fuel energy to produce 1 kcal of food energy (17), Hall et al. (110) calculated wasted food equals about 300 million barrels of oil per year. Based on the estimate that agriculture uses 70% of the freshwater supply (16), food waste in the United States accounts for one-quarter of freshwater use (110). Worldwide food waste is equivalent to 3.3 billion tons of carbon dioxide, 250 cubic kilometers of water, and 1.4 billion hectares of land (116). Reducing wasted food could lead to reducing wasted resources.

Food waste consisted of 14.5% of all municipal solid waste in the United States in 2011 (117). It has been estimated that about 97% of food waste ends up in landfills (118) equating to approximately 36 million tons of food in 2011, with the remaining percentage being utilized as compost (119). Landfills are responsible for 16% of total methane emissions in the United States (6) and, because food scraps decompose so rapidly, food in landfills contributes significantly to this percentage (109). Methane has 21 to 25 times the global warming capacity of carbon dioxide (109, 119, 120) making it a very potent GHG.

The EPA recommends a hierarchy of ways to divert foods from ending up in landfills: 1) prevent it before it is created; 2) donate food to those in need such as to food banks; 3) donate to farms to use as animal feed; 3) utilizing fats or grease as biofuel; and

4) composting (119). Reducing food waste has the potential of reducing excess consumption of natural resources such as fossil fuels and water and reducing GHG emissions by preventing food from going to landfills.

Non-Environmental Benefits of Food Waste

There are also non-environmental benefits of limiting food waste including reducing costs. Worldwide food loss costs \$750 billion per year (116). In the United States, the estimated cost of wasted food in 2008 was \$165.6 billion (121). This amount of waste was equal to approximately 10% of the money spent on food per consumer in 2008 or 1% of the disposable income on average (121). The same study found animal products (meat, poultry, and fish), vegetables, and dairy products made up the top three categories of food loss value at 41%, 17%, and 14%, respectively (121). Reducing food waste could potentially save billions of dollars and impact families, businesses, and the government.

Another non-environmental benefit of the strategies to reduce food waste is the potential to improve health. One recommended way to reduce plate waste is to reduce portion sizes (109). Portion sizes have increased dramatically since the 1970s (122). These increased portion sizes have been cited as a contributing factor to the increased overweight and obesity prevalence (122, 123). Reducing portion sizes has also been cited as a method of preventing excess weight and obesity (124, 125). Portion size reduction has the potential to decrease plate waste and improve overall health by reducing the intake of excess calories. Repurposing food waste to feed the hungry is another potential health benefit. It has been estimated that recovering 5% of food waste could feed an additional 4 to 14 million Americans every day (126, 127). Food recovery programs such

as Feeding America are trying to make that number a reality by providing meals to low-income families (127). In 2013, Feeding America provided 3.2 billion meals to families in need (127).

Consumer Role in Food Waste

Consumers contribute to the majority of waste found downstream at the consumption level of the food supply chain but there are ways to decrease the amount. Gunders (109) recommends that consumers should shop from a planned list, understand the dates that are printed on the labels, buy products with cosmetic flaws, and taking or serving smaller portion sizes to reduce plate waste. Making small changes to eating habits could potentially reduce food waste and, ultimately, the environmental impact of food waste.

Consumers have a powerful role in mitigating the negative effects of the food system on the environment including reducing food waste and shifting diets towards foods that do not produce as many GHGs and utilize less natural resources. Informing consumers about aspects of GE that can be considered sustainable at a critical stage in their life, such as during their college years, is a potentially effective strategy.

YOUNG ADULT POPULATION

For a majority of college students, the transition from high school to college is the first time they are independently making decisions about their health without the direction of a parent or guardian. Many institutions require that first year students buy a meal plan where they are constantly exposed to all-you-can-eat dining halls (128), allowing students to make their own food choices among an abundance of options (129). It is well documented that college students, between the ages of 18 – 24 years, have poor

dietary habits (130-133). College students consume only 1 cup of fruit and 1.5 cups of vegetables compared to the recommended 2 to 2.5 cups for each (134). College students also consume 28% more than the recommended amount of total fats with 35% of their total fat coming from saturated fat (134) resulting in an overall poor dietary quality.

A few studies have linked positive attitudes and perceptions of environmentally conscious eating with increased dietary quality in college students and adolescents. One research group investigated the relationship between attitudes towards alternative production practices including organic, local, and sustainable foods and dietary quality of college students. The cross-sectional survey of 2-year and 4-year college students (n = 1,201) showed that young adults who placed high importance on these practices consumed 1.3 more servings of fruits and vegetables, more dietary fiber, fewer added sugars and less fat (135). Another study found similar results with an increase in the overall diet quality mean score with positive associations towards local foods and negative association towards genetically modified foods (136). Robinson-O'Brien et al. found that adolescents who reported two or more alternative food production practices (locally grown, organic, not genetically engineered, not processed) as somewhat to very important were more likely to meet the Healthy People 2010 objectives (137).

Perspectives and Knowledge of Environmentally Conscious Eating

There is little research investigating perspectives of environmentally conscious foods in college students. Including studies that investigate perspectives of adolescents and high school students in addition to college students provides a broader scope of current beliefs in this population. Existing literature has investigated perspectives, beliefs,

and knowledge about similar aspects to GE such as the general food system, sustainable agriculture, local and seasonal foods, and organic foods.

Food System and Sustainable Agriculture

Perspectives

Perspectives of the food system seem to be contradictory in this age population. Harmon and Maretzki (138) surveyed United States high school students' attitudes towards the food system and found about half of the students thought it was important to keep farmers in business (51%) and a majority agreed on farmland preservation (68%). However, 41% of students liked seeing new developments such as housing complexes or malls (138). Bissonnette and Contento (139) found similar results when they investigated perspectives of environmentally conscious eating of high school seniors. Over half of the students surveyed believed that conventional farming was harmful to the environment (51.3%), used an abundance of fossil fuels (61.5%), and generated pollution when transported from farms located far away (50.5%) (139). Students also worried that pesticides could leak into drinking water (63.5%) and animal production damaged the environment (54.8%) but it was not enough for them to act on their beliefs (139). The authors discuss the discrepancies in the answers and behaviors may be due to limited ability or limited knowledge in how to transition their interests into action (139).

Bagdonis and Bruening (140) conducted a study to investigate Russian college students' perceptions of sustainable agriculture. The researchers found that nearly all of the students (95%) thought that farmers should be educated in sustainable agricultural practices but two-thirds did not know which agricultural practices were sustainable (140). In addition, 63.4% of students thought that applying sustainable practices to agriculture

would be difficult (140). The authors state that contradictions in the replies from the students can be attributed to the lack of sustainable agriculture information in the curriculum (140). Including sustainable agriculture in education would be an effective way to structure an interdisciplinary program at the college level (140).

Knowledge

Harmon and Marezki (138) also surveyed high school students about their knowledge of the food system. Participants were least knowledgeable about agriculture with less than a third knowing that United States exports, farm size, and food per acre on farms have increased in the last 50 years (20%, 17%, 32%, respectively) (138). Eighty-seven percent of students incorrectly answered the percentage of the United States population's involvement in farming (138). Most students did not know the meaning of monoculture (60%) and 65% of students were confused about the components of the food system (138). Only 12% of students knew the environmental "cost" of food is not calculated in the monetary cost (138). A majority of students were also unable to correctly identify the origin of foods such as tortilla chips and macaroni and also could not correctly identify the animal from which foods such as butter, yogurt, and buffalo wings originated (138). Students were familiar with foods available in the summer with only 40% able to identify foods available in fall and 20% for winter (138). Increasing knowledge about aspects of the food system including ways to make a difference could increase positive attitudes and behaviors in support of environmentally conscious eating.

Local

Perspectives

Student perceptions of local foods are contradicting. A little less than half of surveyed high school students from Pennsylvania were not concerned about where their food originated (44%) but about one third would like to see more local products in the grocery stores and cafeteria (34% and 32%, respectively) (138). Another study found that about 40% of high school students did not know if the taste of local foods was better or if local foods were better for their health and environment (139). Students were not worried about local farms going out of business and a majority (80%) did not find it personally important that foods be grown nearby (139). However, a majority of students (66.2%) agreed that more local foods should be available to them (139). In contrast, Robinson-O'Brien (137) found the smallest proportion of adolescents surveyed ranked having foods grown locally as important (compared to organic, not genetically engineered and not processed). Finish, Dutch and Italian college students associated ethical foods as those grown very close to the consumer, from their own garden, or grown within the neighborhood or country whereas foods from multinational corporations were associated with unethical foods (141). Seventy percent of Russian college students surveyed felt it was important for them to purchase foods from local farms and 71.7% of students claimed that, if labeled as such, they would make an effort to buy foods that originated in the country (140). However, 78.3% of students claimed they preferred to shop at grocery stores instead of local markets (21.7%) (140). The authors state that the contradictory nature of the answers is due to the students' inability to see their role as making a difference or being unconcerned about the future (138-140).

Knowledge

When university students were surveyed about seasonal and local foods, a majority of students had heard the terms before (87% and 75%, respectively) (142). When asked the meaning of seasonal food, a majority of students reported definitions related to availability or production such as “certain food available only during certain times of the year/certain season” or “food grown/produced in certain season/at certain time of year” (142). The most frequent foods identified as seasonal were strawberries, watermelon, and apples whereas the most frequent foods identified as not seasonal were bread, milk and meat (142). The most frequent foods identified as local were apples, corn and milk whereas bananas, pineapples, and oranges were most frequently identified as not local (the study was conducted in Atlanta, GA) (142). Using educational strategies to fill the gaps of knowledge about seasonal and local foods could increase knowledge and potentially alter behaviors when choosing foods.

Organic

Perspectives

One study found a majority of adolescents believed that organic foods were better for the environment (73.7%) and their health (74.8%), tasted better (45.4%), but were more expensive (53.8%) (139). Adolescents agreed that organic foods should be available to them (69.1%) but did not think that it was personally important that food be grown organically (71.8%) (139). Another study found a majority of college students to have neutral opinions towards organic foods (143). About one-third of students believed organic foods tasted the same as conventional foods compared to 15.8% believing they tasted better and 12.3% believing they tasted worse (143). Home was the most frequent

place students consumed organic foods (45.5%) followed by campus and restaurants (143). Produce was the most frequent food item purchased as organic (40.4%) followed by grains (28.2%) and dairy (22.8%) (143). If organic foods were offered on campus, 64% of participants claimed they would purchase them (143). Robinson-O'Brien et al. (137) surveyed adolescents and young adults and found that of all the alternative production practices listed (locally grown, organic, not genetically engineered, and not processed) the largest proportion believed their food should not be genetically engineered.

When asked to make associations with the terms ethical and unethical foods, college students in Finland, Denmark and Italy most often associated organic, environmentally friendly, natural and chemical-free products as ethical (141). Unethical foods were associated with the use of pesticides, fertilizers, coloring agents, preservatives, gene modification, and non-environmentally friendly production practices (141).

Knowledge

Dahm, Samonte, and Shows (2009) surveyed college students about organic foods and 49% of students were able to choose the correct definition whereas only 31.7% of students could correctly identify the USDA-approved organic seal (143). A majority of students knew they could purchase organic foods in grocery stores (72.2%) and health food stores (79%). Students were also asked to choose which foods were available in organic and the majority chose produce, grains and dairy (87.1%, 72.2%, and 53.5%, respectively) (143).

Sustainable Eating at Universities

Uhl and Anderson (2001) proposed nine ways for implementing sustainable practices in higher education (144). One of particular interest is the concept of environmentally conscious eating or eating food that was produced in a sustainable way (144). As reviewed by Barlett (2011), the trend of offering sustainable food on campuses is expanding (145). As Barlett explains, the reasons universities are making the transition from conventional purchasing to including more sustainable foods vary from the goal of becoming climate neutral to environmental issues to student demand (145). Popular press has documented the increasing demand from students for sustainable choices in the dining halls and, in some cases, plays a role in determining which school the student will attend (146). Aramark, a major food service company, now offers a “how-to” guide for institutions to implement sustainable practices (147).

Universities have a unique role in providing a platform for increased awareness of environmental sustainability. Not only do universities have a profound effect on the environment but they can also be influential in their surrounding communities (144). College students are an ideal target population because they are currently and will continue to be consumers within the world (144, 148). Universities serve the purpose of educating and shaping the minds of students who will graduate and move on to become active members of society. At this stage in their life, they are forming their identity and solidifying the foundation of their beliefs and attitudes (148). Habits that are developed during the years at college may continue to persist as students grow older (148). Interventions have been conducted investigating if increased knowledge about environmentally conscious eating would change behaviors in college students.

Interventions

Few interventions exist addressing environmentally conscious eating behaviors and were either conducted in a classroom setting or dining hall. Hekler, Gardner, and Robinson (149) investigated if a college course about societal issues of food and food production would affect students eating behaviors compared to class focused on health issues. The food and society course was effective in significantly increasing vegetable consumption and decreasing high-fat dairy consumption compared to the students in the health class (149). The class was also successful in increasing the students' beliefs in the importance of: the environment, animal rights, and a healthy diet (149).

Sarjahani, Serrano and Johnson (2009) conducted a study to quantify the amount of food waste generated when students used trays in the dining halls compared to going trayless (150). During the week of using trays, 6940 pounds of food waste with about 84% being considered edible (150). The trayless week had significantly lower amounts of food waste at 5150 total pounds of waste with about 80% being considered edible (150). The authors calculated that going trayless would reduce edible food waste by 25% annually (150). Kim and Marawsik (2012) conducted a similar study at a different university and found that without trays, patrons reduced food waste by 32% and also used 27% less dishes (151).

Whitehair, Shanklin, and Brannon (152) administered a 6-week intervention to improve edible food waste behaviors in students. Edible food waste and survey data was collected from a dining hall during the first two weeks of the intervention (152). During the third and fourth week of the intervention, the researchers posted prompt-type and feedback-based flyers, respectively, informing students not to waste food (152). Edible

food waste was collected throughout the remainder of the study (152). The flyers were successful in decreasing food waste by 15% (152). Students also showed a positive belief towards sustainability by ranking the importance of environmental sustainability above neutral (152). These results show that an increase in awareness or knowledge of environmental issues associated with food choice can change behavior. Interventions focusing on non-environmental aspects conducted in the college population have been administered online and were successful in motivating dietary behavior changes.

Web-based

Many research groups have successfully utilized the Internet as a cost effective, accessible vehicle for nutrition interventions in this population. Franko et al. (153) used an interactive Internet-based program, MyStudentBody.com-Nutrition (MSB-N), to improve nutrition and fitness behaviors in college students at six universities. Of the 800 students recruited, 606 were eligible and 476 agreed to participate in the study. The participants were divided into three groups: 1) Experimental I was instructed to use MSB-N during two 45 minute sessions within a 2-week time period, 2) Experimental II was also instructed to use MSB-N during two 45 minute sessions as well as a “booster” session, and 3) Control was instructed to complete activities on an anatomy website for two sessions (153). At baseline and post-intervention, participants were assessed on dietary intake using a food frequency questionnaire, readiness to make behavioral changes, nutrition knowledge, physical activity frequency, self-efficacy for dietary changes and perceived benefits or barriers of exercise (153). At post-intervention, both experimental groups indicated an increase in fruit and vegetable consumption compared to control, were more likely to advance a stage in readiness to eat more fruits and

vegetables and decrease fat consumption and also increased nutrition knowledge compared to control (153).

Poddar et al. (154) conducted a 5-week nutrition education intervention to increase dairy intake in college students. The intervention was delivered online to the experimental group (n = 135) involving email messages, posted information and behavior checklists with tailored feedback (154). The control group (n = 136) did not receive access to the online intervention (154). The use of self-regulatory strategies and self-efficacy towards consuming 3 or more servings of dairy per day significantly increased in the experimental group compared to control (154). Utilizing the social cognitive theory in the intervention design was successful in modifying some constructs towards behavior change with dairy consumption in college students (154).

Milan and White (155) compared the effects of an online stage-tailored versus a non-tailored traditional intervention to increase folic acid supplementation use in college females. The online intervention group (n=204) received online modules while the traditional group (n=204) received brochures, both over the course of 4 weeks (155). At post-test, the stage-tailored group significantly increased self-efficacy and the pros of the behavior (155). The stage-tailored group was also 2.5 times more likely to be in a later stage compared to the non-tailored group (155). The stage-tailored online modules were more effective in advancing the subjects through the stages of change thereby increasing readiness to adopt the consumption of a folic-acid containing supplement compared to the traditional non-tailored brochures (155).

Greene, et al. (156) conducted a 10-week online intervention to promote healthful eating and physical activity in college students. The intervention group increased fruit

and vegetable consumption and maintained physical activity levels compared to the control group at post and 15-month follow-up (156). While these interventions were successful in motivating dietary behavior changes, they did not address the environmental aspects of food choice.

Previous Green Eating Research

Instruments needed to be developed to assess motivation of college students to adopt environmentally conscious eating behaviors prior to the development of interventions. The GE survey was developed in 2011 to assess participants' readiness to adopt GE behaviors (25). The survey measured various aspects of GE that correspond to the Transtheoretical Model (TTM) such as stage of change (SOC), decisional balance (DB), self-efficacy (SE) as well as behaviors (25). The TTM of behavior change has been previously described (157) and used to effectively tailor interventions to improve several health behaviors including smoking cessation (158). The key construct for TTM is the SOC consisting of five stages of progress: precontemplation, contemplation, preparation, action, and maintenance. SOC represents an individual's readiness to change a behavior with *behavioral intention* represented by precontemplation, contemplation and preparation and *duration of behavior* represented by preparation, action and maintenance (157). Another construct of TTM is DB, which represents the weighing of pros and cons associated with behavior change (159). The third construct of TTM is SE, which represents situation specific confidence an individual possesses to maintain the behavior (160). The GE survey was validated at URI using confirmatory factor analysis (25). Survey results found that 60% of college students were in the pre-action stages for GE and, therefore, were not ready to adopt GE behaviors (25). In 2012, a pilot intervention

was created to encourage students to adopt GE behaviors. Class sections were stratified to either intervention (receiving modules based on GE) or control (receiving modules based on an unrelated topic). Modules were administered online and delivered via PowerPoint®. The intervention was unable to motivate students to adopt GE behaviors, however, students appeared interested in the topic as 72% of the sample accessed the modules, which was significantly higher compared to control (161).

CONCLUSION

Consumers will play a role in mitigating the negative consequences of the food system through alternative food choices. Informing consumers of GE could potentially lead to behaviors changes. College students are a unique target population as they are shaping their beliefs and will most likely carry behaviors developed in college throughout adulthood. More research is needed to investigate current perspectives of GE in college students. Web-based interventions have been successful in changing dietary behaviors in this population but more research is needed to investigate if web-based interventions promoting environmentally conscious eating behaviors would be successful in changing GE behaviors.

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APPENDIX A: FOCUS ON GREEN EATING MODERATOR GUIDE

Focus on Green Eating Project
University of Rhode Island Nutrition and Food Sciences Department
Focus Group Moderator Guide

General Information

The intent of this portion of the agenda is to welcome participants and make them as comfortable as possible by explaining the focus group and letting them know what to expect from the experience. Facilitators can also set ground rules for confidentiality, and explain how data will be dealt with (stored, transcribed, and analyzed).

About the topic: Green eating includes participating in most of the following behaviors: eating locally grown foods, produce that is in season and limited intake of processed foods, consuming foods and beverages that are labeled fair trade certified or certified organic, consuming meatless meals weekly and (if consuming animal products) selecting meats, poultry and dairy that do not contain hormones or antibiotics. The results will help us learn how to communicate about green eating behaviors.

1. Ground rules:
 - a. Respect all opinions. There are no wrong answers, only different points of view.
 - b. Contributions are voluntary; please feel free to express opinions and share ideas.
 - c. Confidentiality: we ask that you respect the private nature of what you might hear and not discuss it outside the meeting in any way that might identify the people you met here.
 - d. Talking one at a time: we want to be able to hear everyone's thoughts and opinions. Please try not to "talk over each other".
2. Purpose of the focus group:
 - a. Explore how young adult college students feel about green eating at URI.
 - b. To learn about how to communicate about green eating behaviors to college students.
3. Audiotapes:
 - a. The tapes are kept private and safe.
 - b. When the tapes are transcribed, participants will be identified by a code.
 - c. Anonymous quotations may go into reports or publications.

Format of Focus Group

Overall Design

Have participants help themselves to food and beverages (not sure if this will be available?)

- | | |
|---------------------------------|-------------|
| 1. Pre-focus group consent form | (5 minutes) |
| 2. Welcome | (5 minutes) |

3. Introductions	(5 minutes)
4. Questions	(45 minutes)
7. Compensation	(5 minutes)
Total:	1 hour (above times are estimates)

Opening

Welcome (~ 5 minutes)

Thank you for participating in this focus group. My name is Jessica and I am graduate student in the department of Nutrition and Food Sciences here at URI. We appreciate your willingness to take time to participate. A focus group is a group discussion. We want you to know that each of your opinions and perspectives are important to us. There are no right or wrong answers. We only ask that you be as open and honest with us as possible. You have been chosen to participate in this focus group because you are an undergraduate student between the ages of 18 and 24.

My role is to be your guide by asking questions and keeping us on time; but this is really YOUR time to talk. You will notice that we are taping this group in order to accurately report all ideas. Your name will NOT be associated with anything you say. Also, the tapes will be kept private and safe. When the tapes are transcribed, participants will be identified by a code.

At this point please turn off your cell phones if you have not done so already.

In addition, guidelines for participating in focus groups should be clarified and expressed. Focus group members should be told:

It is important to ‘be a good group member’. This means that participants should be non-judgmental and not critical of others. Please speak when you have something to say, even if it is a different opinion than others might have. You are allowed to disagree, but please be sure not to interrupt other members.

Also, if you notice that I am not giving you eye contact, I am not trying to be rude, I just want you to speak to the other people here, not to me.

In order to maintain confidentiality, please do not discuss what you hear in this group with people outside this group in any way that might identify the people you met here.

Finally, there is a lot of information that we would like to cover today, so there may be times that I need to stop you and move on to a new topic. We expect this will take about 1.5 hours.

The restrooms are located downstairs. You are free to get up to use the restroom if you need to, quietly of course. Also, please help yourself to refreshments and food during the group discussion.

Are there any questions before we get started?

Introductions (~ 5 minutes)

We are going to start with some introductions. We will not go in order around the room please just jump in when you'd like to. (*Do not have them go around the room - Popcorn it!*)

Please share with us:

1. Your first name
2. Your favorite food

To get the ball rolling, I will start. *Say your first name and your favorite food.*

Content (~ 45 minutes)

Now that we are getting to know each other, let's go to the questions we have for you today.

1. When you hear the words "green eating", what does that mean to you?

Probe: Such as eating locally grown foods?

Probe: What comes to mind when you hear "green eating"? What does that mean to you?

Probe: What thoughts do you have about green eating?

2. What are some examples of green eating that you engage in?

From your own experience, what are some examples of green eating?

Probe: What eating behaviors are you doing that you would qualify as green eating?

Probe: Do you consider eating local as "green"? Buying organic? Not eating processed foods? Not labeled as fair trade?

3. When choosing what you are going eat, do you consider the effect it may have environment when making that choice?

3a. Why or why not?

3b. Does it depend on something else?

Probe: Occasion? People you are with?

4. What are some of the benefits (if any) of green eating?

Probe: For example, it reduces waste, food tastes better...

4a. Why do you believe those are benefits?

5. What are some of the barriers (if any) of green eating?

Probe: Too expensive; too much effort...

5a. Why do you believe those are barriers?

6. What would motivate you to become a green eater? What could you do to become more of a green eater?

6a. What would be some of the challenges or barriers?

Probe: Cost, flexibility, availability, taste...

6b. Would this be a priority for you? Why or why not?

APPENDIX B: GREEN EATING SURVEY (PRE-SURVEY)

What is your age (in years)?

- <18
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 24+
- Choose not to answer

What is your gender?

- Male
- Female
- Choose not to answer

Which one of the following best applies to you?

- White
- Black or African American
- Hispanic/Latino
- Asian
- Native Hawaiian or other Pacific Islander
- American Indian or Alaskan Native
- Mixed
- Other
- Choose not to answer

What is your year in school?

- Freshman
- Sophomore
- Junior
- Senior

As per the US Dietary Guidelines recommendations, one serving of fruit or As per the US Dietary Guidelines recommendations, one serving of fruit or vegetables is equal to one cup. Below are some examples that are equivalent to a "1 cup" serving:

- 1 cup cooked or raw fruits or vegetables
- 2 cups garden salad
- One medium sized piece of fruit
- 1/2 cup dried fruit
- 8 fl. oz. (1 cup) of 100% fruit or vegetable juice

In total, approximately how many cups of fruits AND vegetables do you consume per day?

- Less than 1 cup
- 1 cup
- 2 cups
- 3 cups
- 4 cups
- 5 cups
- 6 cups
- 7 or more cups
- Choose not to answer

On average, how many Calories are wasted per person per day?

- 800
- 1250
- 1400
- 2000

Green Eating is: Eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating.

Are you a green eater?

- No, and I do not intend to start within the next 6 months
- No, but I am thinking about becoming a green eater within the next 6 months
- No, but I am planning on becoming a green eater within the next 30 days
- Yes, I am a green eater and have been for less than 6 months
- Yes, I am a green eater and have been doing so for 6 months or more
- I choose not to answer

Please select the answer that BEST describes your usual behavior.

	Barely ever to never	Rarely (25%)	Sometimes (50%)	Often (75%)	Almost always	Choose not to answer
Locally grown foods are grown within 100 miles of your location. Based on this, how often do you eat locally grown foods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When in season, how often do you shop at farmer's markets?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you choose foods that are	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

labeled certified organic?						
How often do you select meats, poultry, and dairy products that are raised without antibiotics or hormones?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you select food or beverages that are labeled fair trade certified?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you buy meat or poultry products labeled "free range" or "cage free"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On average how many times per week do you consume red meat?

- Never
- 1 – 3 times per week
- 4 – 6 times per week
- 7 or more times per week
- Choose not to answer

Please answer the following questions based on your current level of interest.

	Not at all interested	Somewhat interested	I don't care either way	Moderately interested	Extremely interested	Choose not to answer
I am interested in learning more on how to eat green.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Here are some advantages and disadvantages of green eating. Please indicate how important each one is in your deciding to eat green.

	Not at all important	A little important	Neutral	Very important	Supremely important	Choose not to answer
Eating green is not practical in my life right now	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating green can be too expensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

By eating green, I can help protect the planet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating green would be too difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating minimally processed foods is better for my health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
By eating green I can improve the quality of my diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
By eating green I can support the local economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sustainably produced foods aren't available to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am proud that I can help the environment by eating green	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can't find green foods where I shop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

REMINDER: Green Eating is: Eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating.
Please rate HOW CONFIDENT you feel that you could eat green under each of the following circumstances?

	Not at all Confident	Not very Confident	Somewhat Confident	Very Confident	Extremely Confident	Choose not to answer
When I am busy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am at school during the semester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am at home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When It is inconvenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am with my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I go out to eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I eat in the dining halls or cafeterias	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Over the summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please answer the following to the best of your ability:

Which of the following is NOT a benefit of eating local?

- Supports local farmers
- Reduces "food miles"
- Supports Fair Trade
- All of the above are benefits of eating local

The average bite of food the American eats travels more than 1500 miles

- True
- False

What is a "locavore"?

- A person who runs a farmers market
- A person who eats at local restaurants
- A person who only eats foods grown within a 100 mile radius
- A person who only eats local produce

As of 2012, how many farmers' markets existed in the United States?

- 8261
- 7864
- 5043
- 2604
- 4876

Which of these foods likely traveled the farthest to get to the grocery store in the middle of winter?

- Wheat Grass
- Mushrooms
- Peaches
- Sprouts
- Cauliflower

What is the largest source of food waste in the US?

- Waste on-farm
- Waste from grocery stores
- Left-overs
- Take-out food

Of the food produced in the US:

- 5-10% is wasted each year
- 10-20% is wasted each year
- 20-30% is wasted each year
- 30-40% is wasted each year

How much food in landfills is actually edible?

- 10%
- 25%
- 30%
- 50%

Green eating means:

- Eating foods that are the color green
- Eating only expensive foods.
- Eating foods that are produced using sustainable environmental practices.

Sustainability refers to a process that degrades resources as to not leave any for future generations.

- TRUE
- FALSE

What best describes a food system?

- The way food is grown and produced
- The way food is manufactured
- The way food transported
- The way food is bought and eaten
- All of the above describe a food system

The Dead Zone in the Gulf of Mexico is caused by:

- Oil spills
- Overpopulation of fish
- Agricultural runoff
- Under-population of fish

What percentage of all fossil fuels is used to produce food?

- 10%
- 17%
- 32%
- 50%

Animal production has roughly the same "cost" to the environment as plant production.

- True
- False

Of the choices below, what causes the most pollution?

- Uneaten meat in landfills
- Runoff from factory farms
- Methane gas from pigs
- Transportation to grocery stores only

The Amazon Rainforest is being cleared to:

- Plant crops that will be used as animal feed
- Reduce greenhouse gas emissions
- Increase biodiversity
- Allow farm animals more land for grazing

It takes how many gallons of water to produce one pound of beef?

- 1200
- 1600
- 2000
- 2400

APPENDIX C: GREEN EATING SURVEY (POST SURVEY EXPERIMENTAL GROUP)

Green Eating is: Eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating.

Are you a green eater?

- No, and I do not intend to start within the next 6 months
- No, but I am thinking about becoming a green eater within the next 6 months
- No, but I am planning on becoming a green eater within the next 30 days
- Yes, I am a green eater and have been for less than 6 months
- Yes, I am a green eater and have been doing so for 6 months or more
- I choose not to answer

Please select the answer that BEST describes your usual behavior.

	Barely ever to never	Rarely (25%)	Sometimes (50%)	Often (75%)	Almost always	Choose not to answer
Locally grown foods are grown within 100 miles of your location. Based on this, how often do you eat locally grown foods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When in season, how often do you shop at farmer's markets?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you choose foods that are labeled certified organic?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you select meats, poultry, and dairy products that are raised without antibiotics or hormones?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you select food or beverages that are labeled fair trade certified?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you buy meat or poultry products labeled "free	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

range" or "cage free"?						
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As per the US Dietary Guidelines recommendations, one serving of fruit or vegetables is equal to one cup. Below are some examples that are equivalent to a "1 cup" serving:

- 1 cup cooked or raw fruits or vegetables
- 2 cups garden salad
- One medium sized piece of fruit
- 1/2 cup dried fruit
- 8 fl. oz. (1 cup) of 100% fruit or vegetable juice

In total, approximately how many cups of fruits AND vegetables do you consume per day?

- Less than 1 cup
- 1 cup
- 2 cups
- 3 cups
- 4 cups
- 5 cups
- 6 cups
- 7 or more cups
- Choose not to answer

On average how many times per week do you consume red meat?

- Never
- 1 – 3 times per week
- 4 – 6 times per week
- 7 or more times per week
- Choose not to answer

Here are some advantages and disadvantages of green eating. Please indicate how important each one is in your deciding to eat green.

	Not at all important	A little important	Neutral	Very important	Supremely important	Choose not to answer
Eating green is not practical in my life right now	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating green can be too expensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
By eating green, I can help protect the planet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating green would be too difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating minimally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

processed foods is better for my health						
By eating green I can improve the quality of my diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
By eating green I can support the local economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sustainably produced foods aren't available to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am proud that I can help the environment by eating green	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can't find green foods where I shop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

REMINDER: Green Eating is: Eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating.
Please rate HOW CONFIDENT you feel that you could eat green under each of the following circumstances?

	Not at all Confident	Not very Confident	Somewhat Confident	Very Confident	Extremely Confident	Choose not to answer
When I am busy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am at school during the semester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am at home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When It is inconvenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am with my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I go out to eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I eat in the dining halls or cafeterias	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Over the summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please think about each statement in relation to the Green Eating Project you have recently completed and indicate how true it is. Give the answer that truly applies to you, and not what you would like to be true, or what you think others want to hear. Think about each question by itself and indicate how true it is. Do not be influenced by your answers to other statements.

This material is harder to understand than I would like.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

Completing the exercises in the module gave me a satisfying feeling of accomplishment.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

Most of the pages had so much information that it was hard to pick out the important things.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

The quality of the writing helped to hold my attention.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

The content of this material is relevant to my interests.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

The way the information is arranged helped keep my attention.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

The exercises in the program were too difficult.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

This program has things that interest me.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

I like learning from this program.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

I feel rewarded for my efforts by doing the activities.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

The variety of reading passages, exercises, pictures, etc., helped keep my attention.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

I could relate the content of this module to things I have seen, done, or thought about in my own life.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

I find the content of this material useful.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

I could not understand a lot of the material.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

The content is well organized and helped me learn it.

- Not true
- Slightly true
- Moderately true
- Mostly true
- Very true
- Choose not to answer

Please think about the following statements in relation to the Green Eating program you have recently completed, and give the answer that applies to you.

Rate the degree to which the module motivated you to change:

- Not at all
- Slightly
- Moderately
- Mostly
- Very much
- Choose not to answer

What was your overall opinion of the program?

- Not good at all
- Needs improvement
- Satisfactory
- Good
- Excellent
- Choose not to answer

How likely would you be to recommend the program to a friend?

- Not at all
- Slightly
- Moderately
- Mostly
- Very much
- Choose not to answer

Height in feet

- 4
- 5
- 6
- 7

Height in inches

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11

How much do you weigh in pounds?

What did you find really helpful/useful in this project?

What would you change to better reach college students?

APPENDIX D: GREEN EATING SURVEY (POST SURVEY CONTROL GROUP)

As per the US Dietary Guidelines recommendations, one serving of fruit or As per the US Dietary Guidelines recommendations, one serving of fruit or vegetables is equal to one cup. Below are some examples that are equivalent to a "1 cup" serving:

- 1 cup cooked or raw fruits or vegetables
- 2 cups garden salad
- One medium sized piece of fruit
- 1/2 cup dried fruit
- 8 fl. oz. (1 cup) of 100% fruit or vegetable juice

In total, approximately how many cups of fruits AND vegetables do you consume per day?

- Less than 1 cup
- 1 cup
- 2 cups
- 3 cups
- 4 cups
- 5 cups
- 6 cups
- 7 or more cups
- Choose not to answer

On average, how many Calories are wasted per person per day?

- 800
- 1250
- 1400
- 2000

Green Eating is: Eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating.

Are you a green eater?

- No, and I do not intend to start within the next 6 months
- No, but I am thinking about becoming a green eater within the next 6 months
- No, but I am planning on becoming a green eater within the next 30 days
- Yes, I am a green eater and have been for less than 6 months
- Yes, I am a green eater and have been doing so for 6 months or more
- I choose not to answer

Please select the answer that BEST describes your usual behavior.

	Barely ever to never	Rarely (25%)	Sometimes (50%)	Often (75%)	Almost always	Choose not to answer
Locally grown foods are grown within 100 miles of your location. Based on this, how often do you eat locally grown foods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When in season, how often do you shop at farmer's markets?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you choose foods that are labeled certified organic?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you select meats, poultry, and dairy products that are raised without antibiotics or hormones?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you select food or beverages that are labeled fair trade certified?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you buy meat or poultry products labeled "free range" or "cage free"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On average how many times per week do you consume red meat?

- Never
- 1 – 3 times per week
- 4 – 6 times per week
- 7 or more times per week
- Choose not to answer

Here are some advantages and disadvantages of green eating. Please indicate how important each one is in your deciding to eat green.

	Not at all important	A little important	Neutral	Very important	Supremely important	Choose not to answer
Eating green is not practical in my life right now	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating green can be too expensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
By eating green, I can help protect the planet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating green would be too difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating minimally processed foods is better for my health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
By eating green I can improve the quality of my diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
By eating green I can support the local economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sustainably produced foods aren't available to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am proud that I can help the environment by eating green	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can't find green foods where I shop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

REMINDER: Green Eating is: Eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating.

Please rate HOW CONFIDENT you feel that you could eat green under each of the following circumstances?

	Not at all Confident	Not very Confident	Somewhat Confident	Very Confident	Extremely Confident	Choose not to answer
When I am busy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am at school during the semester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am at home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When It is inconvenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am with my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I go out to eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I eat in the dining halls or cafeterias	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Over the summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please answer the following to the best of your ability:

Which of the following is NOT a benefit of eating local?

- Supports local farmers
- Reduces "food miles"
- Supports Fair Trade
- All of the above are benefits of eating local

The average bite of food the American eats travels more than 1500 miles

- True
- False

What is a "locavore"?

- A person who runs a farmers market
- A person who eats at local restaurants
- A person who only eats foods grown within a 100 mile radius
- A person who only eats local produce

As of 2012, how many farmers' markets existed in the United States?

- 8261
- 7864
- 5043
- 2604
- 4876

Which of these foods likely traveled the farthest to get to the grocery store in the middle of winter?

- Wheat Grass
- Mushrooms
- Peaches
- Sprouts
- Cauliflower

What is the largest source of food waste in the US?

- Waste on-farm
- Waste from grocery stores
- Left-overs
- Take-out food

Of the food produced in the US:

- 5-10% is wasted each year
- 10-20% is wasted each year
- 20-30% is wasted each year
- 30-40% is wasted each year

How much food in landfills is actually edible?

- 10%
- 25%
- 30%
- 50%

Green eating means:

- Eating foods that are the color green
- Eating only expensive foods.
- Eating foods that are produced using sustainable environmental practices.

Sustainability refers to a process that degrades resources as to not leave any for future generations.

- TRUE
- FALSE

What best describes a food system?

- The way food is grown and produced
- The way food is manufactured
- The way food transported
- The way food is bought and eaten
- All of the above describe a food system

The Dead Zone in the Gulf of Mexico is caused by:

- Oil spills
- Overpopulation of fish
- Agricultural runoff
- Under-population of fish

What percentage of all fossil fuels is used to produce food?

- 10%
- 17%
- 32%
- 50%

Animal production has roughly the same "cost" to the environment as plant production.

- True
- False

Of the choices below, what causes the most pollution?

- Uneaten meat in landfills
- Runoff from factory farms
- Methane gas from pigs
- Transportation to grocery stores only

The Amazon Rainforest is being cleared to:

- Plant crops that will be used as animal feed
- Reduce greenhouse gas emissions
- Increase biodiversity
- Allow farm animals more land for grazing

It takes how many gallons of water to produce one pound of beef?

- 1200
- 1600
- 2000
- 2400

Height in feet

- 4
- 5
- 6
- 7

Height in inches

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11

How much do you weigh in pounds?

APPENDIX E: GREEN EATING MODULE QUESTIONNAIRES

Module 1: Introduction to Green Eating

Intro Quiz:

How would you describe your diet?

- I eat mostly plants such as fruits, vegetables, beans, legumes, nuts and grains
- I eat all of the above including eggs and dairy
- I eat all of the above including poultry
- I eat all of the above including red meat
- I eat mostly answers b – d
- Choose not to answer

How well do you know about the environmental impact of food?

- I didn't know there was an environmental impact
- I know a little bit
- I have some knowledge on the topic
- I know quite a bit
- I think I know but I'd like to know more
- Choose not to answer

How often do you consider the environmental impact when making food choices?

- Never
- Rarely
- Sometimes
- Often
- Almost Always
- Choose not to answer

How important do you think sustainability is?

- Not at all important
- Somewhat important
- Neutral
- Very Important
- Extremely important
- Wait...what does sustainability mean?
- Choose not to answer

What does green eating mean?

- Eating foods that are the color green.
- Eating only expensive foods.
- Eating foods that are produced using sustainable environmental practices.
- Choose not to answer

SOC:

Are you a green eater?

- No, and I do not intend to start within the next 6 months
- No, but I am thinking about becoming a green eater within the next 6 months
- No, but I am planning on becoming a green eater within the next 30 days
- Yes, I am a green eater and have been for less than 6 months
- Yes, I am a green eater and have been doing so for 6 months or more
- I choose not to answer

Goal and Confidence:

Choose a goal for Intro to Green Eating:

- Assess what you're eating using the Green Eating calculator and make one healthy change to your diet.
- Visit URI East Farm on Route 108 and find out what's growing in your backyard!
- Join Slow Food URI – a group on campus dedicated to the sustainable food movement.
- Watch a documentary about the sustainable food movement such as *Food Fight*.
- Choose not to answer

How confident are you in achieving this goal?

- Not at all confident
- Not very confident
- Somewhat confident
- Very confident
- Extremely confident
- Choose not to answer

Knowledge:

Green eating means:

- Eating foods that are the color green
- Eating only expensive foods.
- Eating foods that are produced using sustainable environmental practices.

Sustainability refers to a process that degrades resources as to not leave any for future generations.

- TRUE
- FALSE

What best describes a food system?

- The way food is grown and produced
- The way food is manufactured
- The way food transported
- The way food is bought and eaten
- All of the above describe a food system

The Dead Zone in the Gulf of Mexico is caused by:

- Oil spills
- Overpopulation of fish
- Agricultural runoff
- Under-population of fish

What percentage of all fossil fuels is used to produce food?

- 10%
- 17%
- 32%
- 50%

Module 2: Eat Local

Intro Quiz:

When you purchase food, where do you go the most frequently?

- Grocery store/convenience store
- Farmer's market
- My own backyard
- I usually eat at the dining hall
- Other
- Choose not to answer

What would you consider as "eating local"?

- Within my backyard
- Within my town/county
- Within my state
- Within my country
- Anywhere!
- Choose not to answer

How often do you attend farmer's markets?

- Never
- Sometimes
- Only in the summertime
- Often
- All the time, even in winter!
- Choose not to answer

How well do you know where your food was grown?

- I only know whatever it says on the package.
- I know some details.
- I know the farm and the farmer!
- I don't know but I would like to know more.
- Choose not to answer

When purchasing food, what is the most important characteristic?

- Freshness/taste
- Cost
- Growing practices
- Local/origin
- I don't care as long as it's edible!

SOC:

Do you consider yourself a local eater?

- No, and do not intend to start within the next 6 months.
- No, but I am thinking about becoming a local eater within the next 6 months.
- No, but I am planning on becoming a local eater within the next 30 days.
- Yes, I am a local eater and have been for less than 6 months.
- Yes, I am a local eater and have been for 6 months or more.
- I choose not to answer.

Goal and Confidence:

Choose a goal for Eating Local:

- Check out this website to browse recipes by season and make one for your friends! Harvesteating.com
- Choose a food from farmfresh.org/learn/harvestcalendar.php that is in season and try it!
- Find one locally produced food on or off campus and try it.
- Watch a documentary about local food such as *Ingredients: The Local Food Movement Takes Root*.
- Choose not to answer

How confident are you in achieving this goal?

- Not at all confident
- Not very confident
- Somewhat confident
- Very confident
- Extremely confident
- Choose not to answer

Knowledge:

Which of the following is NOT a benefit of eating local?

- Supports local farmers
- Reduces "food miles"
- Supports Fair Trade
- All of the above are benefits of eating local

The average bite of food the American eats travels more than 1500 miles

- True
- False

What is a "locavore"?

- A person who runs a farmers' market
- A person who eats at local restaurants
- A person who only eats foods grown within a 100-mile radius
- A person who only eats local produce

As of 2012, how many farmers' markets existed in the United States?

- 8261
- 7864
- 5043
- 2604
- 4876

Which of these foods likely traveled the farthest to get to the grocery store in the middle of winter?

- Wheat Grass
- Mushrooms
- Peaches
- Sprouts
- Cauliflower

Module 3: Waste-less

Intro Quiz:

When you go up to the serving line at the dining hall do you...

- Scoop whatever you want onto your plate - "If it looks good, I'm gonna try it!"
- Take what you can eat, but usually end up with some leftover
- Eat everything on your plate and only discard napkins, peels, etc.
- Take less than you think you can consume and go up for seconds if you're still hungry
- Choose not to answer

When you buy food do you...

- Buy whatever is cheapest, especially prepackaged products in bulk
- Usually eat at the dining hall but occasionally purchase prepackaged items at the convenience store
- Only buy what you can use in the next few weeks
- Buy raw ingredients in bulk at places such as Whole Foods
- Choose not to answer

How often do you opt for reusable items?

- I double bag my groceries and keep my iced double venti mochachino latte cold with a styrofoam jacket - brrr!
- Disposable coffee cups and plastic grocery bags is how I roll.
- Plastic shopping bags are okay if I repurpose or recycle them. How else do you expect me to line my garbage cans and make homemade parachutes?
- I religiously bring my own travel mug and shopping bag wherever I go.
- Choose not to answer

What is compost?

- What the heck is compost? Isn't that some hippie thing..?
- I've heard of it - think it has to do with food scraps? I know plenty of dorms with old food!
- I know people who compost and I would if I could.
- I'm a composting nut! I have my own bin in my room!
- Choose not to answer

SOC:

Do you make a conscious effort to reduce food waste?

- No, and do not intend to start within the next 6 months.
- No, but I am thinking about reducing my food waste within the next 6 months.
- No, but I am planning on reducing my food waste within the next 30 days.
- Yes, I reduce my food waste and have been for less than 6 months.
- Yes, I reduce my food waste and have been for 6 months or more.
- Choose not to answer

Goal and Confidence:

Choose a goal for Waste Less:

- Take less food at one meal every day (if you're still hungry, you can always get seconds)
- Keep a journal about food waste for 3 days – how much food doesn't make it into your mouth?
- Talk to someone about food waste and tell them what you learned.
- Watch a documentary about food waste such as *Dive*.
- Choose not to answer

How confident are you in achieving this goal?

- Not at all confident
- Not very confident
- Somewhat confident
- Very confident
- Extremely confident
- Choose not to answer

Knowledge:

What is the largest source of food waste in the US?

- Waste on-farm
- Waste from grocery stores
- Leftovers
- Take-out food

Of the food produced in the US:

- 5-10% is wasted each year
- 10-20% is wasted each year
- 20-30% is wasted each year
- 30-40% is wasted each year

On average, how many Calories are wasted per person per day?

- 800
- 1250
- 1400
- 2000

How much food in landfills is actually edible?

- 10%
- 25%
- 30%
- 50%

Module 4: Got Protein?

Intro Quiz:

How often do you think about the impact of meat consumption of the environment?

- Meat consumption doesn't effect the environment
- Once in awhile
- Every time I eat meat
- I don't eat meat because I know the impact it has on the environment
- I don't eat meat for other reasons
- Choose not to answer

On average per week, how many days do you consume some form of animal protein?

- 0 days
- 1-3 days
- 4-6 days
- All 7 days, I'll take extra bacon on that cheeseburger
- Choose not to answer

How many times do you eat red meat per week?

- 0 – 1 times
- 2 – 4 times
- 5 – 7 times
- It's not really a meal unless steak is involved
- Choose not to answer

Do you think it is possible to eat a healthy, nutritious diet consuming mostly plant-based foods?

- Yes, it is very possible
- Maybe, but I don't know enough about how to do that
- No, you need to eat meat for a balanced diet
- Choose not to answer

How often do you choose what you eat based on long-term impacts to your health?

- Never
- Occasionally
- Always
- I don't think about the future. Carpe diem!
- Choose not to answer

SOC:

Do you make a conscious effort to choose more environmentally friendly protein?

- No, and do not intend to start within the next 6 months.
- No, but I am thinking about choosing more environmentally friendly proteins within the next 6 months.
- No, but I am planning on choosing more environmentally friendly proteins within the next 30 days.
- Yes, I already choose more environmentally friendly proteins and have been for less than 6 months.
- Yes, I already choose more environmentally friendly proteins and have been for 6 months or more.
- Choose not to answer

Goal and Confidence:

Choose a goal for Got Protein?:

- If you eat red meat every day, replace beef with chicken or instead of chicken on your salad, try chickpeas, kidney beans or edamame.
- At breakfast, load up with colorful veggies instead of ham or bacon.
- If you already take part in Meatless Mondays try Meatless Tuesdays through Sundays as well or share a meatless meal with a friend this week.
- Watch a documentary about animal production such as *Meat The Truth*.

How confident are you in achieving this goal?

- Not at all confident
- Not very confident
- Somewhat confident
- Very confident
- Extremely confident
- Choose not to answer

Knowledge:

Animal production has roughly the same "cost" to the environment as plant production.

- True
- False

Of the choices below, what causes the most pollution?

- Uneaten meat in landfills
- Runoff from factory farms
- Methane gas from pigs
- Transportation to grocery stores only

The Amazon Rainforest is being cleared to:

- Plant crops that will be used as animal feed
- Reduce greenhouse gas emissions
- Increase biodiversity
- Allow farm animals more land for grazing

It takes how many gallons of water to produce one pound of beef?

- 1200
- 1600
- 2000
- 2400