

Wasteful Food Consumption: Consumer Trends in Food and Packaging Waste

By Alexis Jade Levy

Graphic Communication Department
College of Liberal Arts

California Polytechnic State University, San Luis Obispo
Spring 2012

Wasteful Food Consumption: Trends in Food and Packaging Waste

Table of Contents

Chapter	Page
I Introduction.....	2
II. Literature Review.....	4
III. Research Methods & Procedures.....	11
IV. Results.....	14
V. Conclusion.....	17
References.....	19
Appendix.....	21

Chapter 1: Introduction

Statement of the problem

Food and packaging waste is an increasing problem throughout the United States. There have been changes over the years that have been implemented in order to alleviate this waste problem. However, waste is still accumulating in landfills and growing each year. Current research on food waste in the United State indicates that it has essentially not improved. The Environmental Protection Agency estimates that “the US generates more than 34 million tons of food waste each year” (EPA, 2010).

It is evident that there are many factors that contribute to this number. In addition to food waste, packaging waste also has a significant impact on landfills and the environment. The preservation of food and knowledge of how to reduce individual waste is vital in diminishing the amount of food America wastes. Another factor that contributes to this issue is the appeal and popularity of certain packages. Because the marketing of food packaging has had an increased impact on the consumer preference, the design and attractiveness of certain packages may correlate to the purchase of unnecessary items leading to waste. Even though this is a good strategy to sell items to consumers to make money, college students with limited income, should not be buying these unnecessary things. Also, buying in bulk is a new trend with consumers; however, it is not always the best thing, especially when purchasing as an individual. According to the United States Department of Agriculture (1995) about 18.9 billion pounds of edible fruits and vegetables were lost by retailers, food service and consumers. Therefore, the purpose of this study is to evaluate the correlation between food waste and food packaging on a household individual level by assessing the trends in each section and analyzing consumer trends when buying packaged food.

Significance of Research

This study is significant because while America wastes millions of tons of food, there are many people starving each day or fighting to eat something to survive. American consumers tend to buy in bulk and buy unnecessarily too much for individual needs. There are factors that contribute to buying in bulk which include price and packaging. If a larger package is priced lower, the current trend is to buy the bigger package. However, this may correlate to food spoilage due to not being able to finish the product in time. Also, many grocery markets tend to throw out food that has not been sold. For example, according to Jeremy Selfert, who filmed the documentary called “Dive!,” Trader Joe’s specifically will throw away much of their fresh produce because the expiration date is that day. Furthermore, Trader Joe’s sells tomatoes in plastic packages of four or five and the documentary showed people pulling out those packages from dumpsters where only one tomato was spoiled while the three or four others were perfectly edible. Because of the way the tomatoes were packaged, it was difficult to not waste. This is just one specific example of many others. While a solution would be brilliant, this research is not being performed to solve the issue of food waste, but rather to demonstrate a correlation between how food is packaged, consumer trends and food waste in America.

Interest in the Study

The researcher is interested in understanding if there is a correlation between the way fresh produce is packaged and food waste or spoilage. Additionally, the researcher is concerned with how consumer trends in America relate to wasted food in the household. Thus this study aims to collect data and survey in order to assess how food packaging correlates or does not correlate to food waste in America.

Chapter 2: Literature Review

Introduction

Food packaging has greatly improved throughout the years, but food waste continues to thrive. This literature review begins with the discussion of current statistics of food waste in America. Then, it discusses the current tactics food packagers use in order to preserve food longer. Additionally, this review examines the evolution of food packaging and how the packaging industry came to be where it is today. Finally, it will examine the trends of consumer purchasing through packaging.

Food waste in America

According to the Environmental Protection Agency (EPA 2010), the definition of Municipal Solid Waste (MSW) is “more commonly known as trash or garbage—consists of everyday items we use and then throw away, such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries” (EPA, 2012). In essence, it is the trash that is accumulated throughout households in America. Among municipal solid waste, “food waste now represents the single largest component of MSW reaching landfills and incinerators” (EPA). The definition of food waste “includes uneaten food and food preparation scraps from residences or households, commercial establishments like restaurants, grocery stores, cafeterias and industrial sources” (EPA). The Environmental Protection Agency estimates that “the US generates more than 34 million tons of food waste each year” (EPA). Despite the efforts that people take in order to reduce waste and recycle, there is still a significant amount of work that needs to be accomplished. Figure 1 shows the amount of food wasted compared to other materials, as well as the gradual increase of food wasted from 1960 to 2009.

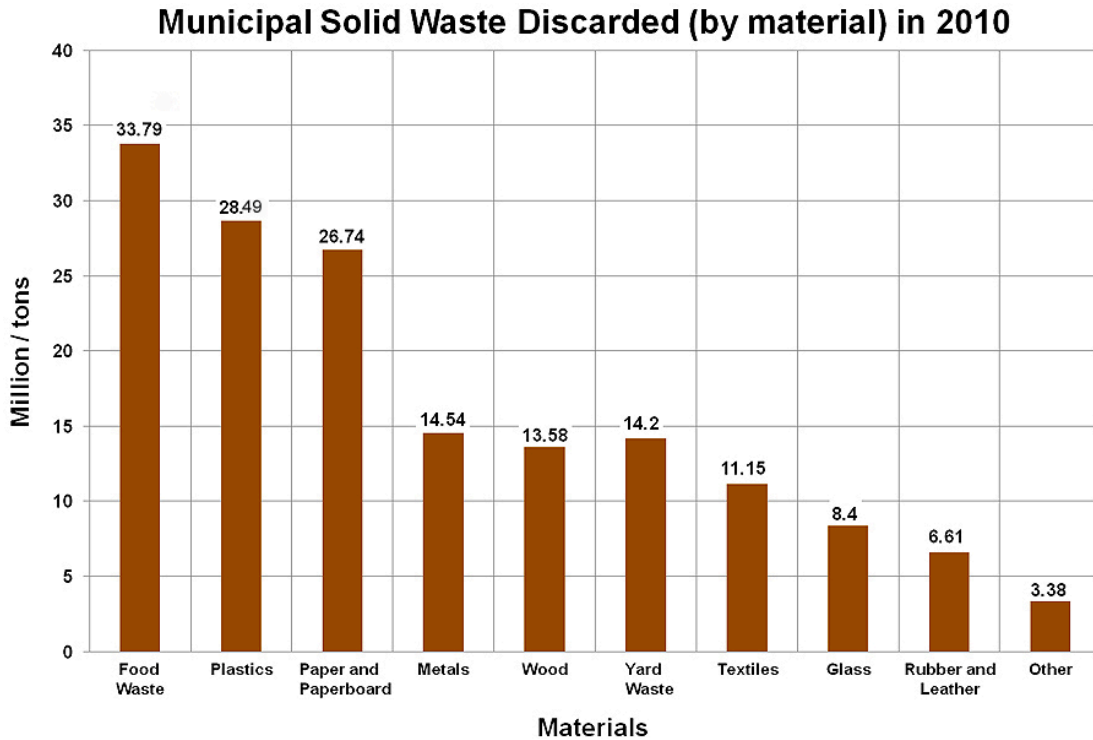


Figure 1. Materials Generated in Waste Stream 1960 to 2009

Source: EPA

Materials Generated in the Municipal Waste Stream 1960 to 2009
(in thousands and percent of total generation)

Materials	Thousands of Tons								
	1960	1970	1980	1990	2000	2005	2007	2008	2009
Food Scraps	12,200	12,800	13,000	23,860	29,810	31,990	32,610	33,340	34,290
Materials	Percent of Total Generation								
	13.8%	10.6%	8.6%	11.5%	12.3%	12.7%	12.8%	13.3%	14.1%

Source: Environmental Protection Agency.

Within these numbers there are different places that food is wasted. Specifically, households generate a good amount of food waste. According to Timothy Jones, “American households throw out 1.28 pounds of food a day in their refuse. Annually that is 467.2 lbs/year. This does not include food loss that goes down the garbage disposal, into compost piles, as food to family pets etc. Food

loss costs a family of four at least \$589.76 annually” (Jones, 2006).

Current Trends in Food Packaging and Food Preservation

There are many new trends in food packaging. One significant development is sustainable packaging or packaging that produces the least amount of waste and keeps food from perishing. The main purpose of food packaging is to protect the product from the environment. Another purpose is to maintain the quality of the food throughout the product's shelf life. Furthermore, packaging must address communication, legal, and commercial demands. Product shelf life is controlled by three factors: product characteristics, properties, and storage and distribution conditions of the individual package” (Harte & Gray, 1987). It is important to know the factors that contribute to food spoilage. Karina Petersen (1999) comments that:

“Deteriorative reactions in foods include enzymatic, chemical, physical, and microbiological changes. Additional problems include insects, pests, and rodents. In a packaging context enzymatic changes in foods are determined by temperature, water activity, and alteration of substrate (e.g. oxygen availability in oxygen-dependent reactions catalyzed by enzymes)” (p. 53).

Steps have been taken in order to significantly reduce the factors that contribute to food spoilage. For example, fruits and vegetables are highly perishable if not packaged or kept properly. There are ways to reduce the respiration and transpiration rates of fruits and vegetables, which will lengthen shelf life. Petersen (1999) said “this is done by controlling factors such as temperature, relative humidity, gas composition (ethylene (C₂H₂), O₂ and CO₂), light, mechanical/physical damage such as bruising, cutting, and puncturing and by applying food additives and treatments such as sorting, waxing, and irradiation”. Figure 2 illustrates the recommended atmosphere conditions for fruits

and vegetables.

Figure 2: Recommended controlled atmosphere/modified atmosphere conditions for fresh fruits and vegetables

Group	Commodity	CO ₂ (%)	O ₂ (%)
1	Potatoes	0	0
	Carrots	0	0
	Beets	0	0
2	Tomatoes	0	3-5
	Peppers	0	3-5
	Cucumbers	0	3-5
	Lettuce	0	2-5
	Celery	0	2-4
	Onions (dry)	0	1-2
3	Pears	0-5	1-3
	Lemons	0-5	5
	Apples	1-5	2-3
	Cauliflower	2-5	2-5
	Artichokes	3-5	2-3
	Peaches	5	1-2
4	Others	5-15	1-5

Percentages are volume of mole percentage; the remainder is nitrogen.

$$\text{Mole \%} = (\text{mol substance in a mixture}) / (\text{mol mixture}) * 100$$

Consumer Purchasing Trends Through Packaging

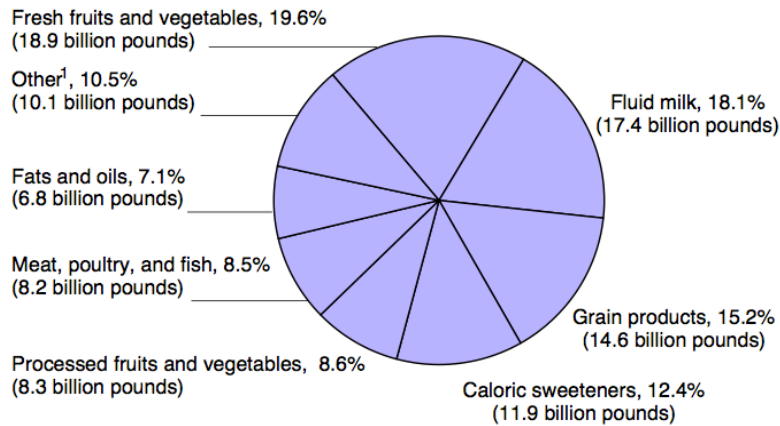
According to the United States Department of Agriculture (2011), “the United States, the European Union, and Japan account for over half of total global sales of packaged products” (USDA). This includes packaged food that is not just fresh produce. However, fresh produce packages have a wide variety of material and size in order to accommodate for shelf life, sale appeal and recyclability. M.D. Boyette states (1999)

“Buyers for grocery chains have different needs than buyers for food service. For grocery items normally sold in bulk, processors want largest size packages that they can handle efficiently - to minimize unpacking time and reduce the cost of handling or disposing of the used containers. Produce managers, on the other hand, want individualized, high quality graphics to entice retail buyers with in-store displays” (North Carolina State University).

Most consumers feel the need to buy in bulk, however when it comes to fresh produce, buying in bulk can cause waste. There are multiple reasons that waste can occur this way including price, packaging size, shape and design, as well as members per family eating the food. The USDA states that “household food losses occur because of over preparation, preparation discard, plate waste, cooking losses, spoiled leftovers, and breakage, spillage, and package failure, either in the home or en route from the point of purchase. A variety of factors, including household size, income, and food-safety concerns, influence the type and quantity of foods lost at this level” (USDA, 1997). According to the USDA, “in recent years, growing concern about hunger, resource conservation, and the environmental and economic costs associated with food waste have raised public awareness of food loss. This in turn has accelerated public and private efforts to make better use of available food supplies by recovering safe and nutritious food that would otherwise be wasted”(1997). Figure 3 demonstrates the amount of food wasted by consumers and others in the year 1995.

Figure 3

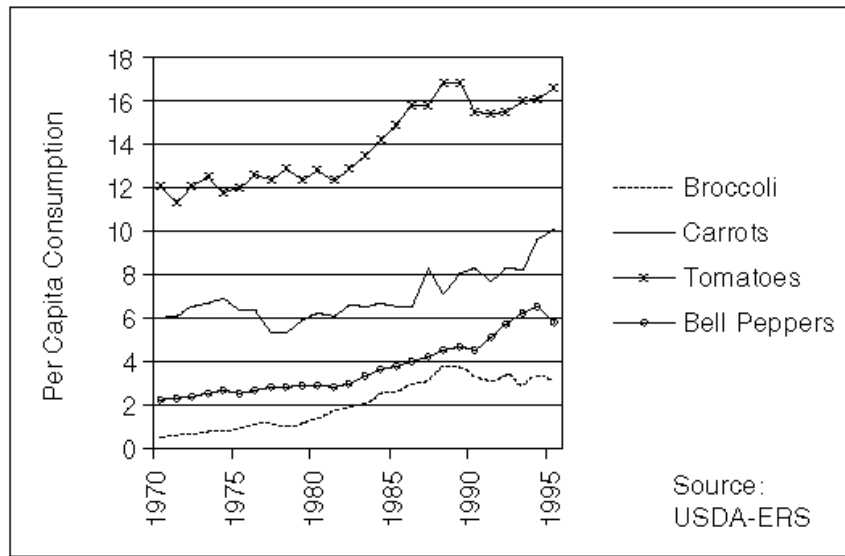
More Than 96 Billion Pounds of Edible Food Was Lost by Retailers, Foodservice, and Consumers in 1995



Note:¹ Includes eggs, peanuts, tree nuts, dry beans, peas, and lentils, and dairy products other than fluid milk. Source: Economic Research Service, U.S. Department of Agriculture.

Food waste can correlate with the amount that consumers purchase. Consumers have increased their consumption of vegetables over the last twenty-five years. According to the University of Kentucky, “health, taste, and convenience are the factors driving the increased consumption of vegetables, in particular more fresh and frozen vegetables. Consumers are eating more nutrient-dense vegetables, such as broccoli, bell peppers, carrots, and tomatoes. New convenience packaging has made consuming vegetables easier. Pre-packaged, peeled, baby carrots, mixed dark greens, and broccoli florets Figure 4 “highlights four fresh vegetables that have realized rapid gains in per capita consumption. Broccoli consumption increased 540 percent from 0.5 to 3.2 pounds, while bell pepper consumption increased 164 percent from 2.2 to 5.8 pounds from 1970 to 1995. Carrot consumption rose 68 percent from 6.0 to 10.1 pounds during the same period. After a 12-year plateau from 1970 to 1981, tomato consumption edged upward 37 percent, ending 1995 at 16.6 pounds” (King, Tietjen, and Vickner,1999).

Figure 4: Per Capita Consumption (Pounds), Disappearance Data: 1970-1995



(University of Kentucky, College of agriculture).

Chapter 3: Research Methods

This study encompasses two areas of research. The first area is a survey in which college students are the participants. This survey is used to help determine trends in fresh produce food waste with the college student population. The hypothesis is to hopefully see that most people do admit to wasting food, therefore wasting money spent and to determine trends that exist when purchasing and using fresh produce. The second area of research was expert research done in order to create a “how to” guide. This guide would provide detailed information on how to buy food while saving money and limiting waste. This guide is going to be geared toward college students so that people living on a budget and eating as an individual can learn how to minimize wasted fresh produce. The survey conducted could help reveal that buying larger packaging is contributing to food waste and the guide could help reduce it.

Packaging can contribute to food waste in many ways. For example, the size of the packaging, resealable packaging or not, packages that help advertise it than protect it and packages that do not preserve the food from spoilage all contribute to how food gets wasted. To help determine consumer trends, a survey will be conducted. There are different sections to the survey. The first section will determine age and gender. The next section will determine how many times the consumer grocery shops per month, and what type of food they waste the most. The consumers will also be asked to estimate about how much fresh produce they waste each month. Although this question will be an estimate, it helps to demonstrate food waste with consumer trends. The last section is a set of questions that ask the consumer if they are willing to spend a little more to not waste food as well as if they would consider using a free guide to help minimize waste. The survey participants will also be asked what they think will help them minimize their food waste. This

open-ended question can help determine a main reason for college student food waste. Here are the survey questions that college students will be asked:

Part I

1. How old are you?

- A. 18
- B. 19
- C. 20
- D. 21
- E. 22 or above

2. What is your gender?

- A. Male
- B. Female

Part II

3. How many times per month do you grocery shop for yourself?

- A. 1-2
- B. 3-4
- C. 5 or more
- D. Other

4. What prompts you to purchase items?

Range from most important to least important

- A. Price
- B. Sell-by date
- C. Packaging
- D. How much product is in the package.

(1= least important, 4= most important)

5. How much on average do you think you waste or throw out of the fresh produce you purchase per month?

- A. 0-10%
- B. 10-15%
- C. 16-25%
- D. 26-40%
- E. 50% or above

6. Which produce do you think you throw out the most?

- A. Vegetables
- B. Fruit

- C. Both equally
- D. Other

Part III

7. If packages of fresh produce were smaller, but slightly more expensive, how much more would you be willing to spend? (you may be saving food instead of wasting it per month)
- A. Not Willing
 - B. 5%
 - C. 10%
 - D. 15%
8. Why do you think you waste food?
- A. Bought too much for yourself
 - B. Forgot about it
 - C. Other
- Please provide a simple answer:
9. What do you think would help you limit or minimize your food waste?
- Please provide a simple answer:
10. If there was a Free guide created on how to purchase food for individual use, do you think you would utilize it to save money and food?
- A. Yes
 - B. No
 - C. Maybe

The data that will be collected are valued answers from a group of people that are representative of the American college student consumer population living on their own. The data collected from the sample survey will be tangible data, meaning that it would merely discover possible reasons a college student consumer wastes food and will be used to make inferences about the population. (Levenson, 2001). These answers will be analyzed in order to determine how packaging contributes and correlates to food waste in the college individual environment. This survey will provide information about consumer trends when purchasing fresh produce. The information will be used to determine just how significantly packaging correlates to food waste.

Chapter 4: Results

This study aims to collect data from a survey in order to assess how food packaging correlates to food waste. The purpose is to create a guide for college students on how to minimize food waste and money spent on food. I conducted an online survey that consisted of 100 college students. The data was collected and analyzed with the help of [surveymonkey.com](https://www.surveymonkey.com). The survey conducted was multiple choice, as specified in the previous chapter, with two questions containing areas that the participant could answer in their own words. Participants were required to select one answer and each answer was given a percentage based on how many people selected it. The following paragraphs contain further detail about the survey results.

After creating and performing the online survey through survey monkey, the results were slightly skewed. The survey assessed 100 participants and 80 percent were female and only 20 percent were male. This however is accepted because this survey was created based on college students and not based on gender. A majority of the participants were between the ages of 20 and 22; only 19 percent were 18 or 19 years old. This result actually helped in that most younger college students are required to have meal plans through their selected university while older students usually shop and provide food for themselves.

The members of the survey were then asked to average how many times they grocery shop per month and the majority (81%) answered between one and four times per month.

The fourth question was not a multiple-choice question, but rather a ranking question. The respondent was asked to rank in order from most important to least important the reasons listed that prompt them to purchase an item. The reasons given were price, sell-by-date, packaging and how much product is in the package. Price was the overall winner for most important. There was a

close call between how much product is in the package and sell-by-date for the important section and packaging was considered the least important for most respondents.

The survey members were then asked to estimate how much fresh produce they believe that they throw out per month and which product they tend to throw out the most. The questions resulted in most respondents throwing away up to 25% of the fresh produce they purchase while vegetables are the most common form of waste (57%).

Question seven asked the respondents how much more they would be willing to pay if fresh produce was made in smaller packages for individual use. Most of the respondents were either not willing to pay more or were willing to pay up to five percent more. This question was asked to see if individuals would want smaller packaging of fresh produce to save food rather than waste it, but the study demonstrated a college student's attempt to buy the most food for cheaper.

The following two questions were opinion-based questions. The first one asked the respondent why they believe they waste food. The question gave the respondent two answers (bought too much or forgot about it) as well as an option for "other" and an area where the respondent could write their answer in. The results for this question were that most people said that they bought too much food for themselves and as a result could not finish the food in time before it went bad. The second question asked respondents what they thought would help limit or minimize their food waste. This was solely opinion-based meaning the respondent had to write in an answer. A few of the most frequent answers were: buying less more often, smaller packages for individual use, keeping track of what is in the refrigerator, better planning for usage and better packaging to keep food from spoiling. One response that was interesting was by a Male who was 21 years old and his response was to not eat out as often. This was interesting because this is definitely a factor for college students as to why the food they buy goes to waste and not many people thought of this.

The last question of the survey was asking the respondents if they would use a free guide on how to purchase food for individual use. 86% of the respondents said yes or maybe.

Chapter 5: Conclusion

Food and packaging waste is an increasing problem throughout the United States, however everything is a matter of perspective. As this study continued, and research was performed, the answers about food waste and packaging were not black and white. If food packages are produced smaller to satisfy individual use, the price goes up, but if the packaging is larger, individuals are more likely to waste food because they cannot finish it. The cycle continues and this study aims to help college students minimize food waste without paying more for their food by refraining from purchasing in bulk. The overall goal is to create a how-to guide for college students to help decrease the amount of food they waste.

After conducting this survey, targeted towards college individuals, it can be concluded that food packaging of fresh produce correlates to food waste. There are other factors that contribute to food waste and spoilage among other population, however this study focuses on specific reasons for food waste among college students. Some of these reasons include individuals buying too much for themselves, forgetting about the produce therefore leading to spoilage and waste, eating out too often, and not eating the food already bought from the grocery store.

This guide will give tips and instructions on how to eliminate food waste based on the study's findings. If simple steps are taken, then food waste can definitely be reduced and these tips will guide consumers towards achieving that. For example, one of the tips for individual consumers is to purchase only what is needed and refrain from purchasing in bulk- even if it is a "better deal"; buying in bulk does not always lead to saving money since one is often unable to finish all the food anyway.

While there is not simply one solution to the problem of excessive food waste, one thing is certain: the consumer has to put forth the effort to change their habits- even if that means passing up a trip to Costco.

Work Sited

- Alter, H. (1989). *The origins of municipal solid waste: The relations between residues from packaging materials and food*. Waste Management and Research. Retrieved February 3, 2012 from <https://illiad.lib.calpoly.edu/cas/illiad.dll?SessionID=Y142639095U&Action=10&Form=75&Value=173098>.
- Berger, K., R., & Welt, B. (2002, December). *A brief history of food packaging*. Agricultural and Biological Engineering Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Retrieved February 15, 2012 from <http://edis.ifas.ufl.edu/pdf/FILES/AE/AE20600.pdf>.
- Bertelsen, G., Lawther, M., Mortensen, G., Nielsen, P.V., Nilsson, N.H., & Petersen, K. (1999). *Potential of Biobased Materials for Food Packaging*. Trends in Food Science & Technology. Retrieved February 16, 2012, from http://blogs.unpad.ac.id/souvia/files/2010/03/tfst10_521.pdf.
- Boyette, M.D., Rutledge, G.A. & Sanders, D.C. *Packaging Requirements for Fresh Fruits and Vegetables*. Maintaining the Quality of North Carolina Fresh Produce. Retrieved February 12, 2012 from <http://www.bae.ncsu.edu/programs/extension/publicat/postharv/ag-414-8/index.html>.
- Kantor, L.S., Lipton, K., Manchester, A., & Oliveira, V. (1997). *Estimating and Addressing America's Food Losses*. United States Department of Agriculture. Retrieved February 16, 2012 from <http://www.ers.usda.gov/publications/foodreview/jan1997/jan97a.pdf>.
- King, B.S., Tietyen, J.L. & Vickner, S.S. (1995) *Food and Agriculture: Consumer Trends and Opportunities*. Cooperative Extension Service, University of Kentucky, College of Agriculture. Retrieved February 23, 2012, from <http://www.ca.uky.edu/agc/pubs/ip/ip58c/IP58C.pdf>
- Levenson, H. (2001). *Some Ideas About Doing Research in Graphic Communication*. The Good Neighbor Press & Services.
- Mcintyre, D. (2011, April). *U.S. Companies Shrink Packages as food Prices Rise*. Daily Finance. Retrieved January 24, 2012 from <http://www.dailyfinance.com/2011/04/04/u-s-companies-shrink-packages-as-food-prices-rise/>.
- Porter, R.C. (2002). *The Economics of Waste*. Washington, DC: Resources for the Future Publishers.
- Selfert, J. (Jeremy Selfert). (2011). *Dive!*. [Documentary]. Los Angeles, California. <http://www.divethefilm.com/default.aspx>.

United States Department of Agriculture. (2011). *Global Food Markets: International Consumer and Retail Trends*. United States Department of Agriculture, Economic Research Service, Economics of Food , Farming, Natural Resources and Rural America. Retrieved February 14, 2012, from <http://www.ers.usda.gov/briefing/globalfoodmarkets/consumer.htm>.

United States Environmental Protection Agency. (2011). *Wastes- Non-Hazardous Waste- Municipal Solid Waste*. U.S. Environmental Protection Agency. Retrieved February 5, 2012 from <http://www.epa.gov/osw/nonhaz/municipal/>.

United States Environmental Protection Agency. (2011). *Wastes- Non-Hazardous Waste- Municipal Solid Waste*. U.S. Environmental Protection Agency. Retrieved February 5, 2012 from <http://www.epa.gov/osw/nonhaz/municipal/>.

How to Minimize food waste: The college edition.

10 Tips and recommendations on how to minimize your food waste and save money.

1. **Use your time**

It takes effort to minimize your food waste. If you put in a little time and effort, you could drastically reduce what you waste and save money. Invest time in each day to check your refrigerator and decide how you are going to use the food you have.

2. **Make a list**

Make a list of all the food that is in your refrigerator and the date it expires. This will help you remember what you have in your fridge. Place it on the outside of the fridge doors and cross it off as you use it.

3. **Quantity you can handle.**

“Buy in quantities that you realistically need and will use. If you buy in bulk, make sure to have a way to keep the food from spoiling before you use it. An entire head of lettuce may be cheaper than bagged or the salad bar pound for pound, but if you end up throwing most of it out because you didn’t use it all, you may have just thrown away those savings.” (EPA).

4. **Utilize your Freezer**

Put leftovers and fruit or veggies that are going to go bad soon directly in the freezer. The fruit can be used for smoothies and the vegetables can be made into soup. The leftovers can easily be heated up for a yummy meal, instead of forgetting about it before it went bad or used to create a whole new recipe.

5. **Eat before you shop**

Do not go grocery shopping when you are hungry. This may cause you to purchase unnecessary items, which in turn can result in more money spent. Make a list of the food you already have before you shop as well so you do not purchase double items.

6. **Organize your fridge**

Arrange the items in your fridge by placing the things that will go bad first in the front. This will help you see it and remember to use it.

7. **Individual packages**

Take advantage of the fact that you can purchase fruits and vegetables as single items. As an individual, it is best to buy what you need instead of purchasing through pre-packaged items. Buying individually instead of in bulk will help you minimize your waste.

8. **Buying in bulk.**

If you chose to purchase fruits and vegetables in bulk, again, utilize the freezer. Chop up the

vegetables right after purchase; bag them and stick them in the freezer. This way you can grab a handful when you need them.

9. **Think**

“Think ‘what do we have to eat’ instead of ‘what do I want to eat.’ Use up the food you already bought and have in the house instead of buying more. You already paid for it – so use it.” (EPA). Going off of that, reduce the amount of times you go out to eat. This will force you to use the food you have already purchased.

10. **Donate**

There are plenty of hungry people in the world. Search online for your nearest food bank and donate the food that you cannot eat to those in need. Don't let it go to waste because it is too much for you to eat alone.