Towards Sustainable Food System in Qatar: Household Food Waste and Consumption Behavior

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Abstract It has been proofed that food wastage can be recognized at all level of food life cycle i.e. harvesting, manufacturing, distributing however, the largest contribution to food waste is the consumption stage by household. According to Parfitt et al, 2010; WRI, 2013 "household food waste" is define as the total losses that occur at the end of food lifecycle, which is final consumption, we consider the issue of waste of food as a deeply rooted issue of consumption behaviors, (Den 2008; Bowman 2007; Dogs 2002), and many commentators argue that domestic food waste is strongly influenced by consumer behaviors (Wharton, 2014). In the Arab countries, especially in the Gulf countries, high levels of food waste of recorded due to the social customs and traditions that control consumption patterns. Research efforts on the waste of food in the State of Qatar is very few and does not cover all Food waste, production and consumption chain, which start from production through delivery, storage, packaging, selling, and consumption. Through computer assisted telephone interview (CATI) with 1684 respondents This study covered the stage after purchase and consumption, aimed to understand the attitudes and behavior of individuals in Qatar towards food waste , and to identify types of food are often wasted and estimated the amount of waste as well. Survey respondents provided reason of food waste and Results indicate that people have an awareness regard food waste Furthermore; the study found out having more children was associated with reduced food waste perception and high-income households were strongly associated with increase in perception of food wastage as the income increases. Moreover, family give the persons a sense of responsibility towards food waste.

Keywords: environment, food waste, behavi

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1. Introduction

Recently food waste is gaining more attention worldwide because of its direct effect on all aspect of life. For instance, food wastes result in money loss and increase price of goods resulting from increased demand. It also limits the chance of improving malnutrition situation of poorer who cannot afford buying good quality food. Environmentally food waste effect is even worse since the food decomposition is releasing methane; the most hazardous greenhouse gas that lead to global warming by 34 times compared with carbon dioxide. This underscore the importance of food recycling for sustainable use in other useful purposes such as natural fertilizer, and rreducing the amount of wasted food is a key element in developing a sustainable food system. [1].

It has been proofed that food wastage can be recognized at all level of food life cycle i.e. harvesting, manufacturing, distributing however, the largest contribution to food waste is the consumption stage by household. According to Parfitt et al., 2010, WRI, 2013 [2] "household food waste" is define as the total losses that occur at the end of food lifecycle which is final consumption.

Studying food-wasting behavior is very important since it increases households' awareness and encourages them to change their consumption behavior and attitude and hence contribute in sustainable development. The study comes as a motive by September 2015 of the Sustainable Development Goals, which called in goal 12 to "ensure sustainable consumption and production patterns."

Though behavior and culture are difficult to change, the ethical effect of wasting, huge amount of food while poverty is spreading worldwide in a very horrible way has to be consider by each household.

It has been mentioned by ecoMENA, 2016 that about half of the dumbed waste in landfills in Qatar is food based [3]. Qatar also had the highest consumption food rate and lowest recycling rate with food waste amount to 25 percent of all prepared food during Ramadan. According to the International Diabetes Federation, 23% of adults in Qatar had diabetes in 2013, being third most affected country in the Middle East and North Africa.

There are differences in the various definitions applied to food waste. This is partly due to a lack of consensus [4]. In the basic form, 'food loss' and 'food waste' mean 'throwing uneaten food' away. The FAO defines food losses as a "change in the availability, edibility or quality of food that makes them unfit for human consumption" [5].

The aim of this paper is to identify determinants, the household perception of food, measurements of household food waste for this study include only waste that generated from homes (households), It concerns food and drink cooked or prepared at home but uneaten; Feed may be wasted at three points (strotmann, 2017) [6]:

1- Between coming into the home and preparation,
2- Between preparation and serving, and
3- After serving (plate waste or leftovers).

In this study we add one more point, ppurchase stage some people have over estimate of their need as consumer, The food category that is considered in this study is the food and drink thrown away that was, at some point prior to disposal, edible (e.g. slice of bread, apples, meat), according to Household production theory Consumers choose foods for consumption within the context of their own and their household's preferences and available resources [1] (Becker,1965) [7], However in gulf countries consumers may overestimate their needs from goods and food (Suliman, 2000). [8]

The following section explained in details methods and survey of collected data section three presented results and finding of the study and discussion and section 4 concludes the paper.

2. Study Objective

The aim of this study is to identify determinants, the household perception of food waste, type of food waste usually wasted, cause of food waste according to respondents perspective, and test if there any perception different between respondents. The output of this study will help policy makers by providing policy options of how to reuse food waste in a sustainable way.

3. Methodology

The Qatar Semi-Annual Survey conducted by cellular phone in May 2017 to obtain a representative sample of respondents that included 744 Qataris, and 744 White-collar expatriates and 936 blue-collar expatriates. The distinction between White and Blue was determined by a cut-off of an income set at 4,000 QAR and over for White collar and under 4,000 QAR for Blue collar. This cut-off is based upon past research by SESRI showing this as a good predictor which aligns with income grouping, captured in SESRI's own face-to-face work as well as other demographic sources of information. The target population for the survey includes adults 18 years of age and older resident in Qatar. As the proportion of adult residents in Qatar (including both Qataris and expatriates) with a cellular phone is about 98 percent, a sample drawn from this type of frame is expected to have excellent coverage and representation of the target population. The phone numbers in the sample released for interviewing in batches to ensure that the complete call procedures followed for all numbers. The use of batches also improves the representativeness of the survey by balancing the distribution of phone numbers across respondent nationality and gender.

For every phone number in the sample, there are at least ten attempts to complete the interview. The phone calls made over different times during the day and different days of the week to maximize the changes of making contact with respondents. For phone numbers with break-off and soft refusal, dedicated interviewers would try to contact and convert them to completed interviews.

The raw response rate (RR2, the ratio between the number of completes or partials and total sample sizes after excluding ineligibles and all unreached numbers assumed to be eligible) was 48.1%.

3.1. Questionnaire Development and Survey Administration

With the numbers of completes and partials presented in table I-1, the maximum sampling error for a percentage is +/- 2.8 percentage points for the whole sample. The calculation of this sampling error takes into account the design effects (i.e., the effects from weighting and stratification). One possible interpretation of sampling errors is if the survey were conducted 100 times using the exact same procedure, the sampling errors would include the "true value" in 95 out of the 100 surveys. Note that the sampling errors can be calculated in this survey since the sample is based on a sampling scheme with known probabilities and that the sampling error for each specific question will vary.

The questions initially developed as omnibus questionnaire by researchers at SESRI. Questions initially written in English and then translated into Arabic and five other languages by professional translators. Researchers who are fluent in both English and Arabic carefully checked the translated version and modified the translation if necessary. Next, the questionnaires tested internally by SESRI. This allowed the project team to identify important concerns (such as comprehension) that affect quality of responses to the questions and the length of the interview.

During the data collection, 2,424 interviews completed in seven languages. The majority of these interviews were conducted in Arabic (51.8%), followed by 27.1% conducted in a South Asian language (Urdu, Hindi, Malayalam, Nepalese), 16.5% in English and the remaining interviews were conducted in Tagalog (4.6%). Of the respondents, 70.4% were male and 29.6% were female. These percentages are prior to weighting the data to reflect actual population proportions. The survey administered in CATI mode. CATI is a computer assisted phone-based data collection method usually conducted by phoning the home or business of the respondent. In this study, cellular phones rather than landlines called by SESRI's call center.

4. Result

4.1. Perceived Food Waste

Descriptive analysis explored the demographic characteristics of the sample and perceptions of food waste. perceptions of food waste within family with

respect to demographic variables were compared using the adjusted Wald test for samples with complex survey design the F-transformed version of the Pearson Chi-square statistic was used. Logistic regression was use to explore the association between perceptions of food waste within family and other demographic variables.

Table 1.

	N	Percent% (95% CI)
Perceived food waste within family		
Yes	415	25.1(22.4-28)
No	976	74.9(72-77.6)
Perceived food waste in Qatar		
Yes	1,044	77.1(74.1-79.8)
No	295	22.9(20.2-25.9)
Demographics		
Gender		
Male	805	60.3(57-63.5)
Female	585	39.7(36.5-43)
Nationality		
Qatari	736	25.1(23-27.4)
Non-Qatari	655	74.9(72.6-77)
Marital status		
Married	1,006	79.3(76.9-81.6)
Separated, divorced or widowed	77	3.8(2.9-5.1)
Never married	304	16.8(14.8-19)
Age group		
Less than 24	283	7.2(6-8.5)
25-34	824	37.1(34.4-40)
35-44	635	30.8(28.1-33.5)
45-54	363	17.2(15.1-19.5)
55 or more	177	7.6(6.2-9.1)
Number of children		
Childless	123	10.7(8.8-12.7)
1-3	569	69.5(66.6-72.2)
4-6	291	16.6(14.5-19)
7 or more	91	3.2(2.4-4.2)
Level of education		
Less than Secondary school	212	11.7(9.9-13.8)
Secondary school	358	18.9(16.6-21.4)
Diploma	129	10(8.2-12.3)
University Graduate	583	49.2(45.8-52.5)
Master's Degree	90	9.2(7.2-11.5)
PH.D	9	1(0.5-1.9)
House hold Income		
Less than 15000	345	50.1(46.5-53.8)
15000-25000	149	20.6(17.6-24)
25000-50000	295	12.4(10.8-14.1)
50000-70000	151	6.6(5.5-7.9)
More than 70000	230	10.3(8.8-11.9)

Characteristics of the sample shown in Table 1. Approximately, 3 out of every 4 perceived there is a food wastage problem in Qatar whereas 1 out of every 4 perceived it within their own family. The sample consisted of 60% males and 40% females, 25% were Qataris and 75% were non-Qataris. In the sample 79% were married, 17% never married and 4% separated, divorced or widowed. The average age was 39 and the sample had a median of two children where 1 out of 10 had no children, 7 out of 10 had 1-3 children and 2 out of 10 had four or more children. Half of the sample were university graduates and 10% had master's degree or higher. Half had a household income of 15,000 or less 20% 15,000-25,000 and 30% more than 25,000.

There was no statistically significant difference between genders in food waste perception within the family where 24% of males considered there was food wastage within the family compared to 27% of females (P-value=0.26). Of those with no children, 17% perceived food wastage within the family compare to 25% who had 1-3 children, 22% with 4-6 children and 22% who had more than 7 children whoever the number of children was also not statistically significant with (P-value=0.41). Individual's education level also not statistically significant with (P-value=0.1) where 18% perceived food wastage had less than secondary education, 29% with secondary education, 15% with diploma, 27% with university degree, 28% with a master's degree and 26% with PH.D. Age was borderline significant with (P-vale=0.08) where 36% perceived food wastage where younger than 24, 23% between 25-34, 23% between 35-44, 28% between 45-54 and 21% were older than 55. Income was strongly associated with perceived food wastage within the family with (P-value<0.001) where 19% perceived food wastage had an income of less than 15,000, 17% with income between 15,000-25,000, 29% with income 25,000-50,000, 42% with income of 50,000-70,000 and 49% perceived food wastage had an income of 70,000 or more. There was a significant association between marital status and food waste perception where 23% of married individuals perceived food wastage, 31% who were separated or divorced or widowed and 33% of those never married perceived food wastage within the family (P-value=0.01).

The most common reason for wasting food shown in Table 2 was food going past the expiration date 36.5% and second reason was food going bad 27%. Of those that perceived food waste 41% thought it was after consumption, approximately 20% thought it was it was at purchasing or storing at home and 16% during processing or cooking.

Table 2. Reason for wasting food

Reasons	N	Percent
Food past expiration date	521	36.5
Bought more than needed	95	7.2
Food gone bad	305	27
Didn't like the taste	39	4
Prepared too much food	129	8.8
Other	71	6.1
Don' waste food	164	10.5

According to the respondents statement data shows that there are four main stages of food waste at home, we found that 4 out of 10 respondents agreed that they wasted the food after eating (consumption), while 2 out of 10 said that they wasted food at purchase stage (over estimate of their need), other distribution of stages see Figure 1.
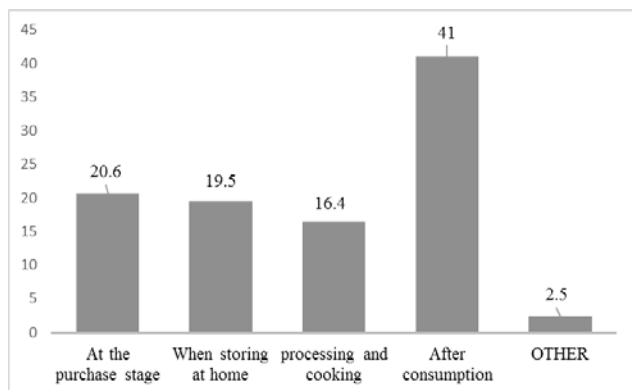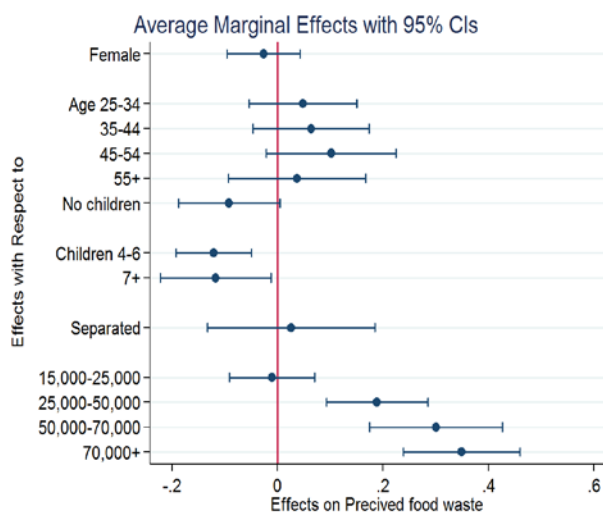
Figure 1. Stage of food wastage %

Figure 2. Average Marginal Effect

Table 3. Logistic regression analysis of perceived food waste and demographics

	Model 1			Model 2*		
	Odds Ratio	95% CI	P-value	Odds Ratio	95% CI	P-value
Gender						
Female	0.84	0.54-1.32	0.46	0.91	0.62-1.33	0.63
Age						
25-34	1.42	0.64-3.11	0.39	1.06	0.63-1.78	0.83
35-44	1.57	0.68-3.6	0.29	1.12	0.60-2.06	0.72
45-54	1.96	0.82-4.7	0.13	1.62	0.8-3.26	0.18
55+	1.32	0.5-3.5	0.58	0.95	0.43-2.1	0.91
Number of children						
None	0.56	0.28-1.1	0.09	0.66	0.32-1.36	0.26
4-6	0.44	0.26-0.74	0.002	0.48	0.29-0.78	0.003
7+	0.46	0.20-1.04	0.06	0.5	0.23-1.09	0.08
Marital status						
Separated	1.17	0.46-2.98	0.74	1.17	0.48-2.82	0.74
Never married				1.65	0.80-3.4	0.17
Household Income						
15000-25000	0.93	0.49-1.73	0.81	0.92	0.52-1.62	0.77
25000-50000	2.87	1.69-4.87	<0.001	2.26	1.43-3.57	0.001
50000-70000	4.65	2.52-8.57	<0.001	3.79	2.27-6.33	<0.001
More than 70000	5.7	3.26-9.96	<0.001	4.93	3.12-7.78	<0.001

Model 1 excludes Never married group
Model 2 includes never married by assigning number of children=0 if never married

Table 3 shows logistic regression of perceived food waste and covariates after adjustment for all demographic variables age and marital status were no longer significant, however having more children was significantly associated with reduced food waste perception and high-income households with income of 25,000 or more were strongly associated with increase in perception of food wastage as the income increases. Figure 1 and Figure 2 display marginal plots for the two models.

Table 4. Logistic regression analysis of perceived food waste and type of wasted food

	Odds Ratio	95% CI	P-value
Cereals or baked goods	1.87	1.24-2.82	0.003
Roots and tubers (potatoes)	1.51	0.74-3.07	0.26
Pulses and oilseeds	2.2	1.05-4.6	0.04
Fruits	1.76	1.15-2.69	0.009
Vegetables	2.05	1.33-3.15	0.001
Meat and meat products	1.6	0.78-3.26	0.2
Fish and seafood	9	1.85-43.74	0.006
Dairy and dairy products	1.78	1.11-2.85	0.02
Other	0.57	0.37-0.88	0.011

Table 4 shows the association between perceived food waste and type of food wasted. Logistic regression shows that those that perceived food waste believed that the foods they overbought and end up wasting the most were Cereals or baked goods, pulses or oilseed, fruits, vegetables, fish and dairy compared to those that did not perceived food wastage within their families. Figure 3 illustrates marginal plot.
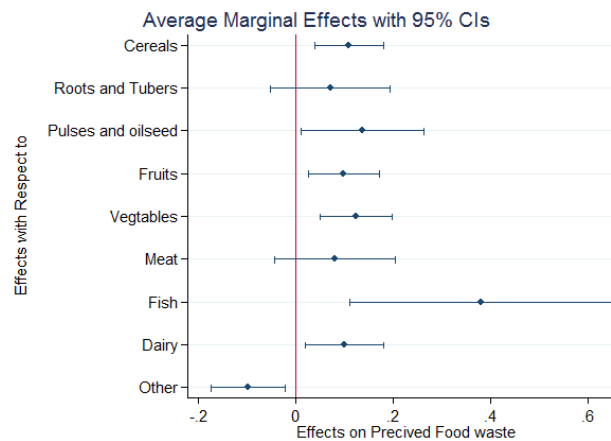

Figure 3. Average Marginal Effect-perceived food waste

5. Conclusion

Data shows that oonly 29.7% of all respondents agree that there is food waste problem at their household level, while that three quarter of respondent (75%) agree with the exist of the problem in Qatar, this result is consistent with the social desirable, where Social desirability bias refers to the tendency of research subjects to give socially desirable responses instead of choosing responses that are reflective of their true feelings, the bias in responses due to this personality trait becomes a major issue when the scope of the study involves socially sensitive issues such

as politics, religion, and environment or personal issues (Grimm, 2010) [9].

Data shows that there are four main causes for food waste at home, include bought more than needed and prepare more food, changing consumption habits requires persistent educational and public awareness efforts. This would include a combination of government policies and business strategies.

Data shows there is no statistically significant difference between genders in food waste perception within the family and also age is no statistically significant, however, there was a significant association between marital status and food waste perception, it have been approved that Social responsibility values decreased in young ages (Lake, 2016) [10] according to this study family give the persons a sense of responsibility towards food waste.

The study found out having more children was associated with reduced food waste perception and high-income households were strongly associated with increase in perception of food wastage as the income increases.

Data shows also, there are four main stage of food waste at home after consumption, at the purchase stage, when storing at home, processing and cooking.

Many considerations related to pollution, water scarcity, energy, waste, food insecurity and climate change materialize. Not surprisingly, most of these issues are human induced; human activity and unsustainable development practices have been some of the strongest driving forces behind the degradation of the finite world we live in [11].

To change behavior we need not only low but also we have to encourage individual and societal actions and the involvement of civil society and Academia, together with the media. Individuals need to change their consumption habits and lifestyles towards more sustainable behavior. (Arab environment sustainable consumption 2011).

We need to going forward, improved strategies for tackling consumption waste will need to be a priority for research and innovation for the global community dedicated to reducing food loss and waste. (WRI, 2013) [12].

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