



WASTAGE OF FRESH FRUIT AND VEGETABLES AT RETAIL OUTLETS AND HOUSEHOLDS AT BANGALORE

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ABSTRACT:

Globally, the production of fruits and vegetables is about 675 million metric tons annually and out of which 1.3 billion ton wastage is produced. India alone produces 86.602 million metric tons of fruits and vegetables and constitute about 5.6 million ton of waste annually. Fruits and vegetables account for the largest portion of that wastage. 18% of India's fruit and vegetable production valued at Rs 13,300 crore is wasted annually. The study was conducted on the wastage of vegetables and fruits in retail outlets and in ten households for a period thirty days and also about the causes of wastage and calculation was done for the carbon foot print for fruits and vegetables. And also cost calculation was done for wastage.

KEY WORDS: Carbon foot print, House hold wastage, Retail outlets wastage.

I. INTRODUCTION:

In India, the household food waste estimate is 50 kg per capita per year, or 68,760,163 tonnes a year. The UN report 2021 noted that with 690 million people affected by hunger in 2019, an estimate that is expected to rise sharply due to the COVID-19 pandemic, and three billion people unable to afford a healthy diet, consumers need help to reduce food waste at home. Omre, P. et. al, reported globally, the production of fruits and vegetables is about 675 million metric tons annually and out of which 1.3 billion tons of waste is produced. India alone produces 86.602 million metric tons of fruits and vegetables and constitute about 5.6 million ton of waste annually. Presently, the wastes are disposed of by dumping them on the outskirts of cities. A large amount of waste of food material is because of a lack of control over food processing industries and agri- economy practices. Fruits and vegetables account for the largest portion of that wastage. 18% of India's fruit and vegetable production valued at Rs 13,300 crore is wasted annually," because of the country's lack of adequate cold storage facilities and refrigerated transport, a report said according to data compiled in a new report by Emerson Climate Technologies India, a business of the US-based manufacturing and technology company Emerson. The value of fruits, vegetables and grains wastage in India stands at Rs 44,000 crore annually [HT Correspondent, 2013]. Negi and Anand, 2015 reported in India fruits and vegetables are highly inefficient which is leading to huge losses and wastages and less income to the stakeholders in return. Apart from the loss of revenue to the farmers, it leads to increased additional costs in the supply chain which ultimately enforces the final consumers to pay high charges from their pocket. The Food and Agriculture Organization (FAO) estimated the worldwide cost of Food waste to be close to 2.6 trillion dollars of losses per year, considering the sustainability dimensions (about 700 billion dollars of environmental costs, a trillion in the economic scope, and 900 billion in the social scope) [Lins, M et al. 2021]. One-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year [Lukic, Radojko. 2020]. E. van Herpen et.al reported, food waste has become a global concern and a priority on political agendas, and especially household food waste is high in developed countries.

This waste is categorized differently based on where it occurs:

- Food “loss” occurs before the food reaches the consumer as a result of issues in the production, storage, processing, and distribution phases.
- Food “waste” refers to food that is fit for consumption but consciously discarded at the retail or consumption phases [Nutrition source].

Joardder, M.U.H, Masud, M.H, 2019 explained causes of food wastage in households:

- Purchasing food very early which is not prerequisite instantaneously.
- Discarding food owing to confusion over “best-before” and “expire” dates. Disposal of the food owing to the misconception between “best-before” and “expire” dates.
- Poor home food storage facility.

II. TYPES OF FOOD LOSSES/WASTE:

Gustavsson, J et al. 2011, explained five system boundaries distinguished food loss/ waste were estimated for each segment of the food supply chains.

2.1 Vegetable commodities and products.

2.2 Agricultural production: Losses due to mechanical damage and/or spillage during harvest operation (e.g. threshing or fruit picking), crops sorted out post-harvest, etc.

2.3 Processing: Including losses due to spillage and degradation during industrial or domestic processing, e.g. juice production, canning and bread baking. Losses may occur when crops are sorted out if not suitable to process or during washing, peeling, slicing and boiling or during process interruptions and accidental spillage.

2.4 Distribution: Including losses and waste in the market system, at e.g. wholesale markets, supermarkets, retailers and wet markets.

2.5 Consumption: Including losses and waste during consumption at the household level.

III. FOOD WASTE SOURCES:

Thi NB et al. 2015 explained food waste sources in the literature, have been classified into three categories: “(i) food losses: food products lost during the production phase; (ii) unavoidable food waste: referring to food products lost during the consumption phase (banana peels, fruit cores, etc); (iii) avoidable food waste: products that could have been eaten, but were lost during the consumption phase.”

IV. CARBON FOOT PRINT:

A carbon footprint is the total amount of greenhouse gases (including carbon dioxide and methane) that are generated by our actions. You will be surprised to know that the average carbon footprint for a person in the United States is 16 tonnes, while globally the average carbon footprint is closer to 4 tonnes [Geetanjali Mehra, 2022]. Al- obadi et al, 2021 explained about, food’s carbon footprint, or foot print, is the greenhouse gas emissions produced by growing, rearing, farming, processing, transporting, storing, cooking and disposing of the food you eat. Changing the foods that you eat can have a big impact on your carbon footprint. Lukic, Radojko. 2020, explained there as an average emission of carbon dioxide is higher in the processing of meat than vegetables. Carbon dioxide emissions in trade, in total and by sectors, vary by country. Scialabba et al. 2013, surveyed average carbon footprint of food wastage is about 500 kg CO₂ eq. per capita and per year. The carbon footprint is calculated as a multiplication of a food wastage amount and an impact factor.

Figure: 01: Measures to prevent and reduce food loss waste from harvest to distribution stages. [Nicastro, Rosalinda et al. 2021]



Figure:02: Measures to prevent and reduce food loss wastage at retail stage. [Nicastro, Rosalinda et al, 2021]



Figure:03: Measures to prevent and reduce food loss wastage at household consumption. [Nicastro, Rosalinda et al. 2021]

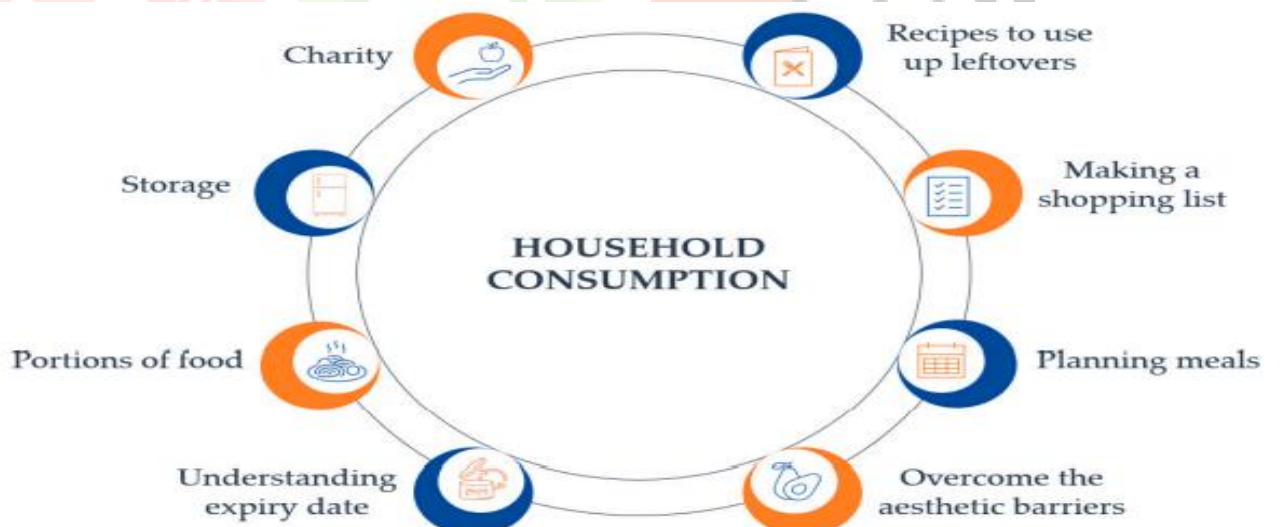
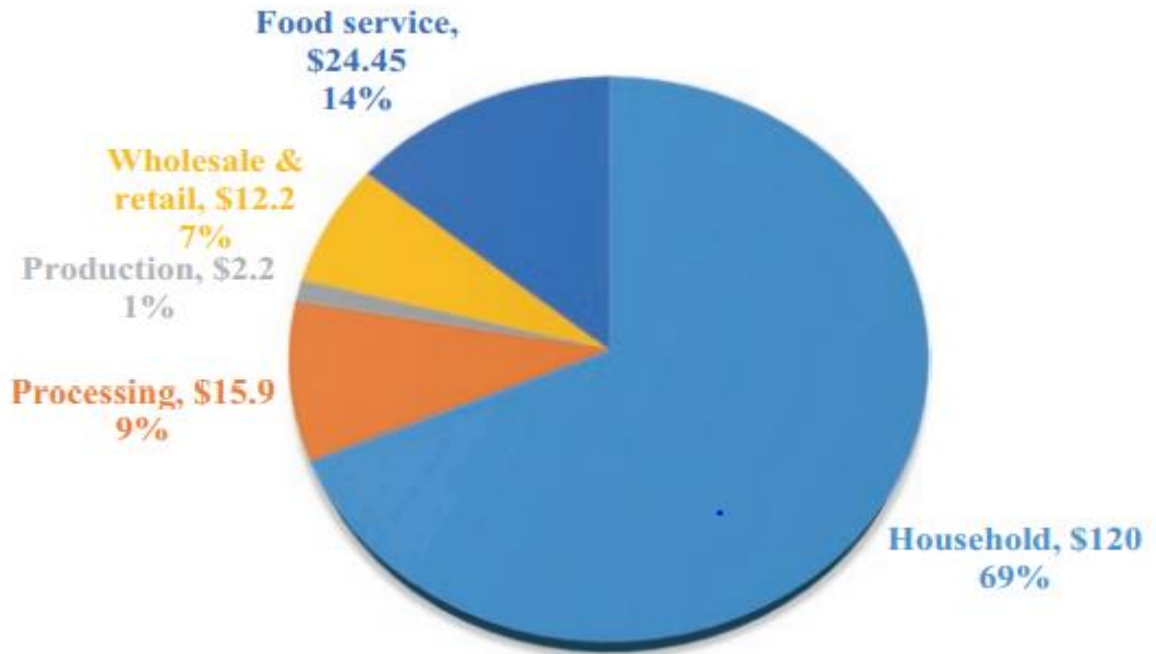


Figure: 04: Costs associated with food waste by sector (in billions of dollars). [Joardder, M.U.H., Masud, M.H. 2019].



V. METHODOLOGY:

The design of the study is an important component of research to realize the various objectives of the study, an appropriate methodology describing location of study area, data collection and tools of analysis for the conduct of the study are inevitable. In this chapter the methodology adopted for the present study, including the selection of the study area, sampling design, collection of data are presented under the following heads.

Location of the Study Area.

Collection of Data.

5.1 Household analysis

Location of the study area

The present study was conducted at Amruthahalli, Bengaluru-560092

Collection of Data

The detailed schedule was formulated to Elicit the information on basic knowledge of expenditure of all food groups for the per month of thirty days and also purchasing pattern and storage of food, kitchen gardening, salad consumption. The data was collected by giving Close ended questionnaire which had two. The details of various aspects of questionnaire included in each part are discussed below.

Demographic Profile

Data on Name, Gender, Age, Occupation, Income, Marital status, Type of family.

Age and Gender

The subject selected wearing the Range of 25-60 years old comprising only female adults who were all housewife.

Occupation

The occupation of the subject was recorded using questionnaire and it was categorized as

- A) Private Sector.
- B) Government sector.
- C) Business.
- D) Other.

Practice Habits

Practice of food consumption of ten samples for thirty days correlated with expenditure and wastage of foods for thirty days.

The Data so Collected were transferred on worktables and excel sheets were prepared. The data were further processed, tabulated, classified for this Purpose tabular presentation with frequency and percentage was employed. The appropriate tables were prepared, and the data were interpreted in light of the objective of the study.

Household analysis:

- Survey was conducted in local area in ten households.
- Contacted the household.
- Consent was taken from the each household.
- Basic information was collected from ten households.
- From each household purchasing practices and eating habits data was collected.
- And provided a log book to maintain the record for thirty days.
- In the log book, requested each household to note down purchasing quantity for one day for period of thirty days and also waste was also noted each day for period of thirty days. And daily the data noted was checked by daily visiting the place.

5.2 Retail shop analysis:

- Survey was done in a local area.
- Selected three retail outlets for fruits and three outlets for vegetables to collect the data.
- Consent was taken from the proprietor from all retail shops.
- And provided a log book to maintain the record for thirty days.
- In the log book, requested proprietor to note down the amount of purchase of fruits and vegetables per day for a period of thirty days, wastage of fruits and vegetables in each retail outlets for a period of thirty days.
- Daily the data noted down was checked and also did survey about the causes of food wastage by asking the concern proprietor.

VI. Results and Discussion:

Table:6.1: Calculation of wastage of fruits and vegetables of households for thirty days and for one year.

Wastage Calculation & cost of waste of fruits and vegetable per month and for one year				
Household	Waste of Fruits per month	Cost of Purchase of fruits/month	Wastage of Vegetables per month	Cost of Purchase of Vegetables/month
1st Household	1/2Kg	18.8	1/2Kg	42.5
2nd Household	1/2Kg	36.6	1Kg	61.4
3rd Household	1/4Kg	23.2	1/2Kg	17.9
4th Household	1/2Kg	14.8	1/2Kg	14.9
5th Household	-	-	1.2Kg	70.5
6th Household	1/2Kg	57.1	1.5Kg	68
7th Household	-	-	1Kg	48.19
8th Household	1/2Kg	41.2	1Kg	79.2
9th Household	-	-	0.8Kg	73.3
10th Household	1/2Kg	54.05	-	-
Total	3.25Kg	245.75/-	8Kg	475.89/-

Table 6.1 depicts calculation of wastage of fruits and vegetables for thirty whole days and one year and cost of wastage was calculated for thirty days and one year 3.25 kg waste of fruits per month and for one year from ten households and the cost of waste of fruits was Rs. 245.75/- and 8 kg waste of vegetables per month and one year from ten households and the cost of waste of vegetables was Rs. 475.89/-. In a study UNEP Food waste Index report published in the year 2021 found that the average food wastage in high income countries households waste was 79 (kg/capita/year), upper middle-income countries households waste was 76 (kg/capita/year) and in lower middle-income countries households average wastage was 91 (kg/capita/year).

Table :6.2: Total vegetable purchased and wastage of three retail shops for period thirty days and one year.

Dates	Vegetable purchased			Wastage of vegetables		
	Retail outlet 1	Retail outlet 2	Retail outlet 3	Retail outlet 1	Retail outlet 2	Retail outlet 3
From 08/06/2022 - 08/07/2022						
Total	6350 kg	6300 kg	5950 kg	1135 kg	995 kg	990 kg

Table 6.2 depicts survey carried on six retail vegetable shops locally, survey was conducted on each retail shop separately about vegetable purchased and wastage of vegetables, and survey was done continuously for period of thirty days and one year, and total vegetables purchased for ten days in retail shop 1 was 6350 kg and the total wastage of vegetables for ten days in retail shop 1 was 1135 kg, retail shop 2 vegetable purchased was 6300 kg and wastage of vegetable was 995 kg and retail shop three vegetable purchased was 1135 kg and wastage of vegetable was 990 kg. Survey conducted by Mattsson et al. in the year 2013, listed some twenty vegetables, list represents which vegetable is more wasted and also it represents economic cost, waste quota was highest from fresh herbs and also highest economic cost was from lettuce. And the report by Mattsson et al was published in the year 2018.

Table :6.3: Total Fruits purchased and wastage of three retail shops for period thirty days and for one year.

Dates	Fruits purchased			Wastage of Fruit		
	Retail outlet 1	Retail outlet 2	Retail outlet 3	Retail outlet 1	Retail outlet 2	Retail outlet 3
From 08/06/2022 - 08/07/2022						
Total	11,200 kg	11,300 kg	11,100 kg	4810 kg	4930 kg	4820 kg

Table 6.3 represents survey carried on six retail fruits shops locally, survey was conducted on each retail shop separately about fruits purchased and wastage of fruits, and survey was done continuously for period of thirty days, and total fruits purchased for thirty days in retail shop 1 was 11,200 kg and the total wastage of fruits for thirty days and for one year in retail shop 1 was 4810 kg, retail shop 2 fruits purchased was 11,300 kg and wastage of fruits was 4930 kg and retail shop 3 vegetable purchased was 11,100 kg and wastage of fruits was 4820 kg. Survey conducted by Mattsson et al. in the year 2013, listed some twenty fruits, list represents which fruits is more wasted and also represents economic cost, waste quota was highest from mango and also highest economic cost was from apple. And the report by Mattsson et al was published in the year 2018. In the present study also wastage was more from mango. In a study UNEP Food waste Index report published in the year 2021 found that Average food wastage in high income countries retail waste was 13 (kg/capita/year).

Table:6.4: Calculated carbon food print of Vegetables and Fruits.

Vegetable	Cost /kg	Carbon Foot Print Value (100 gm)	Very Low (Co2)	Medium (Co2)	High (Co2)
Carrot	40	1133	Very low Co2	-	-
Potato	40	1273	Very low Co2	-	-
Tomato	10	2905	-	Medium Co2	-
Onion	20	1051	Very low Co2	-	-
Beetroot	60	1136	Very low Co2	-	-
Green capsicum	60	2019	Low Co2	-	-
Cauliflower	30	1928	Very low Co2	-	-
Peas	80	4228	-	-	High Co2
Turnip	40	678	Very low Co2	-	-
Garlic	80	452	Very low Co2	-	-
Cabbage	40	622	Very low Co2	-	-
Spinach	10	1457	Very low Co2	-	-

Fruits	Cost /kg	Carbon Foot Print Value (100 gm)	Very Low (Co2)	Medium (Co2)	High (Co2)
Mango	100	4400	-	-	High Co2
Apple	100	900	Very low Co2	-	-
Banana	50	1300	Very low Co2	-	-
Orange	150	1900	Very low Co2	-	-
Papaya	30	4400	-	-	High Co2
Kiwi	150	621	Very low Co2	-	-
Watermelon	20	900	Very low Co2	-	-
Muskmelon	30	900	Very low Co2	-	-
Grapes (Black)	50	2300	Low Co2	-	-
Grapes (Green)	40	800	Low Co2	-	-
Pineapple	30	1700	Low Co2	-	-
Strawberry	30	2243	Low Co2	-	-
Butter fruit	250	2400	Low Co2	-	-
Pear	100	1028	Very low Co2	-	-
Black berry	250	2860	-	Medium Co2	-
Blue berry	500	2860	-	Medium Co2	-

Table 6.4 depicts Food's carbon footprint, or foot print, is the greenhouse gas emissions produced by growing, rearing, farming, processing, transporting, storing, cooking and disposing of the food you eat. Changing the foods that you eat can have a big impact on your carbon footprint. Calculation of carbon food print of fruits and vegetables was done only for 100 gm but if carbon foot print is calculated is for the nation or world it will be more. Calculation of carbon foot print was done by using Food carbon foot print calculator- My emissions. Carbon foot print was calculated for each vegetable and fruit, some vegetables have low carbon footprint like green leafy vegetables and some vegetable like tomato have medium carbon foot print and vegetable like peas have high carbon foot print, fruits almost all have low carbon foot print, some fruits like black berry and blue berry have medium carbon foot print and some vegetables like mango and papaya have high carbon foot print. Survey was conducted by

Lukic, Radojko 2020 listed some food groups and their carbon dioxide content of particular food group like processed meats have 0.59 median (kgCO₂-eq/kg) and also like processed vegetables have 0.06 median (kgCO₂-eq/kg).

VII. CONCLUSION:

The study was conducted on three retail outlets for fruits and three outlets for vegetables and for a period of thirty days. Data was collected about how much of fruits and vegetables purchased and also to find out how much fruits and vegetables wastage. And the carbon footprint was calculated by using Food carbon footprint calculator- My emissions. And also survey was done on ten households for a period of thirty days, their purchasing pattern and how much they are purchasing and how much was the wastage done for a period of thirty days and also cost was calculated for the wastage of the fruits and vegetables in the households.

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