



Saudi FLW Baseline

Food Loss & Waste index In Kingdom of Saudi Arabia





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In Kingdom of Saudi Arabia

**National Program for
Reducing FLW in KSA**



المؤسسة العامة للحبوب
Saudi Grains Organization (SAGO)
المملكة العربية السعودية



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Foreword by The Governor of Saudi Grains Organization (SAGO)



The National Program for Reducing Food Loss & Waste is a cornerstone of the Food Security Strategy, overseen by Saudi Grains Organization (SAGO).

The organization succeeded in determining the baseline for the size of Food Loss and Waste (FLW), through applying universally recognized scientific methods and conducting a field survey, covering all regions of the Kingdom of Saudi Arabia.

One of the main objectives of the National Transformation Program 2020 (NTP2020) is to reduce FLW, and it is an integral part of the Kingdom's Food Security Strategy.

The baseline sets the foundation of a deliberate plan, focused initially on spreading awareness throughout the food supply chain to recognize and reduce FLW, this plan follows our Islamic values, which clearly call for minimizing FLW and preserving the grace of food.

The initiative also lies within the 2030 Vision of the Kingdom, which aims to maximise all economic and social resources.

Allah has blessed this country, with blessings of diversity and availability of food ,this necessitates an awareness of any overspending behaviors, and a call for everyone to reduce this.

Eng. Ahmed Bin Abdul-Aziz Alfares
Governor of Saudi Grain Organization (SAGO)



Preface by Director of the National Program for Reducing FLW

Thanks to Allah, this FLW baseline research is completed, and we can put before you the results for local and global review. This research will form a reliable cornerstone for research, awareness campaigns, for measuring the level of change in consumer awareness and behavior. It will allow measuring the effects of that change in the coming years.

The basis of making any plan for detailed studies should be provision of credible and clear data. Calculations of FLW from the baseline will be credible and clear because of this research and resulting data. This clarity is more critical in countries who lack resources, or who have higher rates of FLW.

Saudi Grains Organaization (SAGO) is entrusted with the implementation of the National Program to reduce FLW. We took into consideration the need for data based on reality, away from the influence or bais of the media's reports regardless of their source.

We relied on scientific criteria in the study to achieve international standars for a baseline, following the measurement and estimates of the size of both Loss and Waste of food. We analyzed both economic and social causes for the behavior to ensure that we can increase consumer awareness around FLW.

One of our Islamic values is to warn against extravagance and wasteful behavior.

Finally, we ask Allah to benefit the kingdom from this study, which represents a religious and patriotic obligation for the good of the Kingdom of Saudi Arabia and its inhabitants.

Mr. Zaid bin Abdullah Alshbanat
General Director of Prices at (SAGO) & Director
of the National Program for Reducing FLW
7 Jumada I 1440 AH

Introduction by General Supervisor & Head of Scientific Study Group



Attempts have been made to quantify global food waste over several decades, motivated partly by the need to highlight the scale of 'waste' in relation to global malnutrition. Such assessments are reliant on limited datasets collected across the food supply chain (FSC) at different times and extrapolated to the larger picture.

In the Kingdom of Saudi Arabia, ensuring food security remains a major challenge. This is true, especially against the background of scarcity of resources. Our main challenge during the coming decades is not to use more investment and greater physical inputs in order to increase food production but rather to pick up a great deal of slack that exists throughout our food system.

Issuing this baseline aims mainly to quantify Food Loss and Waste (FLW) in Saudi Arabia according to the international standard of (FLW). This field survey is the first of its kind, nationally and internationally, in terms of the number of food products surveyed, geographical scope, sample size, as well as the qualitative distribution of (FSC) sites. It was launched by the Saudi Grains Organization (SAGO) "Ministry of Environment, Water and Agriculture" in cooperation with AL-Imam Muhammad Bin Saud Islamic University. FAO's (CFW) expert, Dr. Claudia Giordano, did not hide her delight at the existence of such an important, large and detailed study, which is not available in many international studies in this field.

The team was keen to check the results of the field survey by carrying out a pilot study covering 35 cities in all regions of the kingdom, accompanied by a behavioral insights study, involving 20 associations of preservation of grace.

Dr. Abdulrahman Nasser Al-Khorayef
General Supervisor and
Head of Scientific Study Team

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البرنامج الوطني للحد من
الفقد والهدر في الغذاء
بالمملكة العربية السعودية

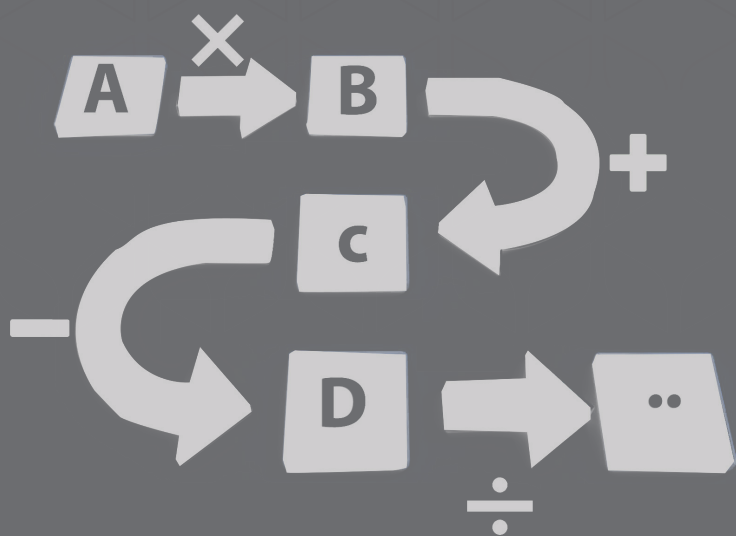


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لَا إِلَهَ إِلَّا اللَّهُ مُحَمَّدٌ رَسُولُ اللَّهِ





**National Program for
Reducing FLW in KSA**



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المملكة العربية السعودية





1st

Chapter

Methodology & Terminologies

Saudi FLW Baseline

**Food Loss & Waste index
In Kingdom of Saudi Arabia**

Field Survey Objectives

- 1 To estimate the amount of food loss and waste in Saudi Arabia in a scientific way according to international standards.
- 2 To measure the economic losses resulting from food loss and waste in Saudi Arabia.
- 3 To analyze the economic, social and cultural causes of FLW in Saudi Arabia.
- 4 To compare the amount of FLW in Saudi Arabia with some other countries.
- 5 To propose policies and plans to reduce food loss and waste FLW in Saudi Arabia.
- 6 To provide the Saudi Grains Organization (SAGO) with a performance index for FLW until the year 2020 in the national transformation program.

Concepts and Terminology

Food Loss

This means the quantities of food lost along the food supply chain (on farms, factories, transportation, etc.) that do not reach end consumer.

Food Waste

This explains what is wasted from food prepared for consumption after the stages of production and distribution in restaurants, hotels, houses .. and

Study Products

This study sought to determine the amount of loss and waste of 19 food products grouped into eight groups:

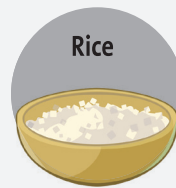
1. Wheat "Flour - Bread"
2. Rice
3. Dates
4. Vegetables "Eggplant – Cucumber – Tomato – Onion – Potato – Carrots"
5. Fruits "Orange – Melon – Mango"
6. Red meat "Camels – Lamb"
7. Poultry
8. Fish



Fruits
Orange – Melon – Mango



Dates



Rice



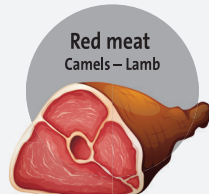
Flour - Bread



Fish



Poultry



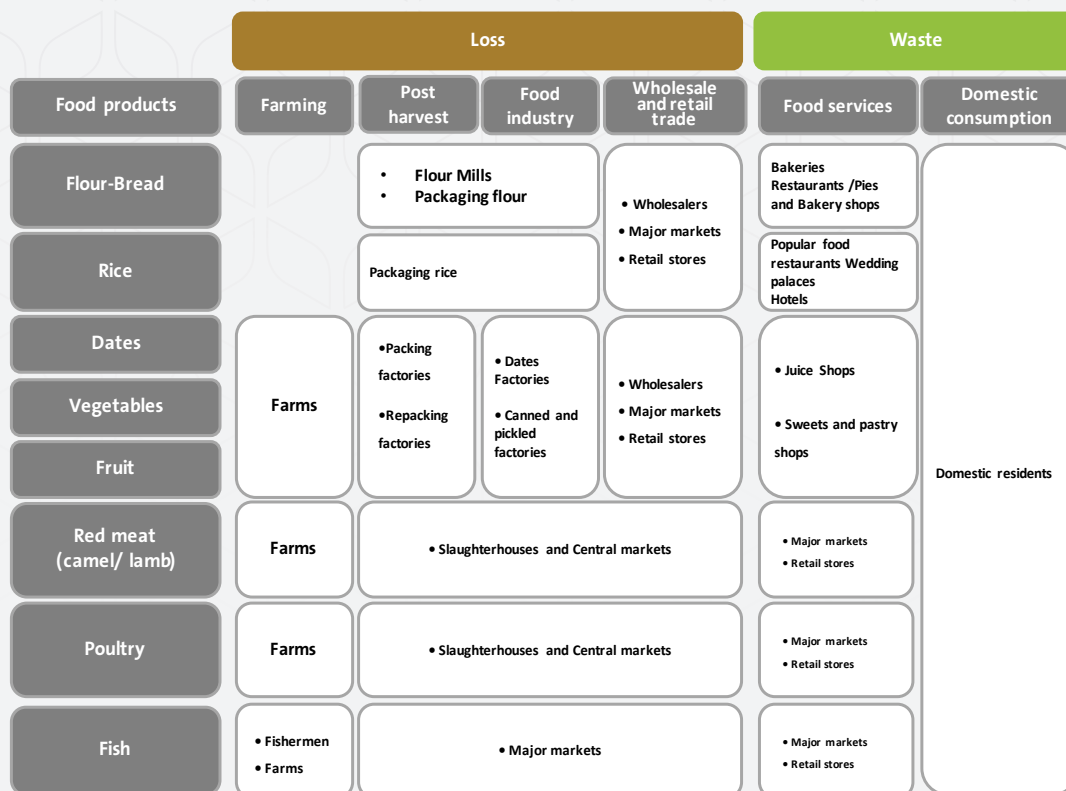
Red meat
Camels – Lamb



Vegetables
Eggplant – Cucumber – Tomato
– Onion – Potato – Carrots

Sites of the Food Supply Chain

The following diagram shows the main 33 sites of the food supply chain that were covered by this study (Pilot and Main Study).



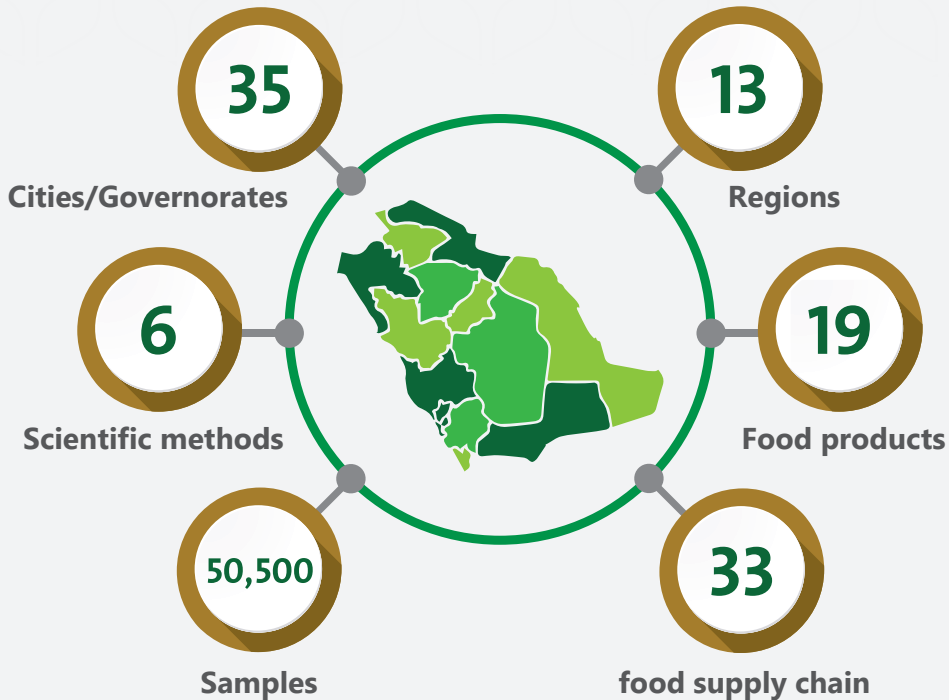
Main Features of the Field Survey

Study Products

حجم وتوزيع العينة

The field survey of the study sample includes the following:

1. The pilot study consists of 7210 Samples distributed among 13 administrative regions of the Kingdom [one city / province in each region].
2. Main study: consists of 41790 samples distributed over 35 cities of the Kingdom.
3. Behavioral qualitative study: composed of 1000 samples distributed in 27 cities of the Kingdom.
4. Quality assurance study: composed of 500 samples distributed across the Kingdom of Saudi Arabia.



Distribution of the Pilot Study Sample

Food products	Loss				Waste	
	Farming	Post harvest	Food Industry	Wholesale & retail trade	Food services	Domestic consumption
Flour-Bread		70		420	700	1,400
Rice		70			700	
Dates						
Vegetables	70	70	70	420	700	
Fruit						
Red meat (camel/ lamb)	70	70			700	
Poultry	70	70			700	
Fish	70	70			700	
Total= 7210	280	1,330			4,200	1,400

Distribution of the Main Study Sample

Food products	Loss				Waste	
	Farming	Post harvest	Food Industry	Wholesale & retail trade	Food services	Domestic consumption
Flour-Bread		700		700	2,100	20,090
Rice		700			2,100	
Dates						
Vegetables	700	700	700	700	2,100	
Fruit						
Red meat (camel/ lamb)	700	700			2,100	
Poultry	700	700			2,100	
Fish	700	700			2,100	
Total= 41,790	2,800	6,300			12,600	20,090

Distribution of Behavioral Qualitative Study Sample

Sector	Preparation of questionnaires
Families	(617) questionnaires
Restaurants	(383) questionnaires
Total	(1000) questionnaires

Distribution of Quality Assurance Study Sample

Food products	Loss				Waste	
	Farming	Post harvest	Food Industry	Wholesale & retail trade	Food services	Domestic consumption
Flour-Bread		12		12	12	152
Rice		12			12	
Dates						
Vegetables	36	36	36	36	36	
Fruit						
Red meat (camel/ lamb)	12	12			12	
Poultry	12	12			12	
Fish	12	12			12	
Total= 500	72	180			96	152

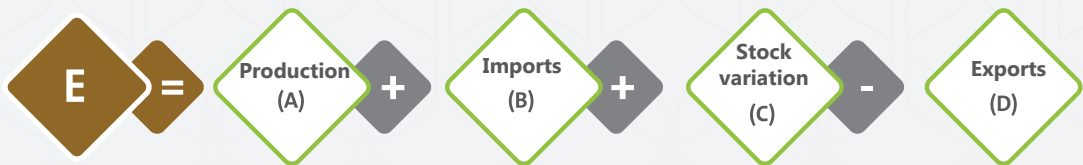
Calculation of Food Loss & Waste

Based on FAO study "Global Food Losses and Food Waste: Extent, causes and prevention, 2011."

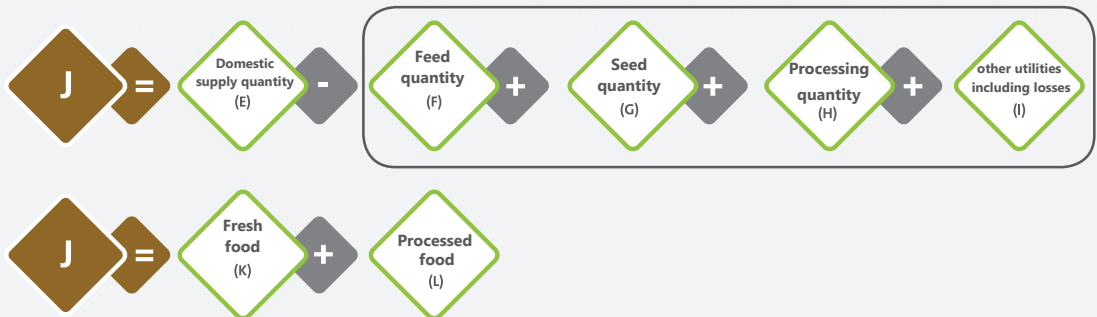
The methodology calculates food loss and waste quantities for each stage of the five stages of food supply chain (FSC):

- (1) Production
- (2) post-harvest handling and storage
- (3) Processing and packaging
- (4) distribution (fresh and processed)
- (5) Consumption (fresh and processed).

Domestic supply quantity (E) :



Available food (J) :



Definitions

1. Loss rate for production stage = LRP
2. Loss rate for post-harvest handling and storage stage = LRPH
3. Loss rate for processing and packaging stage = LRPK
4. Loss rate for distribution stage (fresh) = LRDF
5. Loss rate for distribution stage (Processed) = LRDP
6. Loss rate for consumption stage (fresh) = LRCF
7. Loss rate for consumption stage (Processed) = LRCP
8. Conversion factors:
 - Peeling by hand = X
 - Industrial peeling = Y
 - Mean = Z

Calculation of the Initial Equivalent of Loss & Waste at the Stages of the Food Supply Chain

1- Losses in the production stage:

$$L_p = A * LR_p / (1 - LR_p)$$

2- Losses in the post-harvest handling and storage stage:

$$L_{PH} = A * LR_{PH}$$

3- Losses in the processing and packaging stage:

$$L_{PK} = (H+L) * LR_{PK}$$

4- Losses in the distribution stage:

$$L_D = L_{DF} + L_{DP}$$

Diagram showing the calculation of distribution losses (L_D) as the sum of losses in fresh distribution (L_{DF}) and losses in processed distribution (L_{DP}).

A- Losses in fresh

$$L_{DF} = K * LR_{DF}$$

B- Losses in processed

$$L_{PF} = (H+L * L_{PK}) * LR_{DP}$$

5- Waste in the consumption stage:

$$W = W_{CF} + W_{CP}$$

Diagram showing the calculation of total waste (W) as the sum of fresh consumption waste (W_{CF}) and processed consumption waste (W_{CP}).

A- Fresh consumption

$$W_{CF} = (K - L_{DF}) * LR_{CF}$$

B- Processed consumption

$$W_{CP} = (L + H - L_{PK} - L_{DP}) * LR_{CP}$$

Loss & Waste at Every Stage of The Food Supply Chain

1- Losses in the production stage:

$$FL_p = L_p * Z$$

2- Losses in the post-harvest handling and storage stage:

$$FL_{PH} = L_{PH} * Z$$

3- Losses in the processing and packaging stage:

$$FL_{PK} = L_{PK} * Y$$

4- Losses in the distribution stage:

$$FL_D = \text{fresh distribution losses (FL}_{DF}) + \text{processed distribution losses (FL}_{DP})$$

A-Fresh distribution losses:

$$FL_{DF} = L_{DF} * X$$

B- Processed distribution

$$FL_{DP} = L_{DP} * X$$

5-Waste in the consumption stage:

$$FW = \text{fresh consumption waste (FW}_{CF}) + \text{processed consumption waste (FW}_{CP})$$

A- Fresh consumption

$$FW_{CF} = W_{CF} * X$$

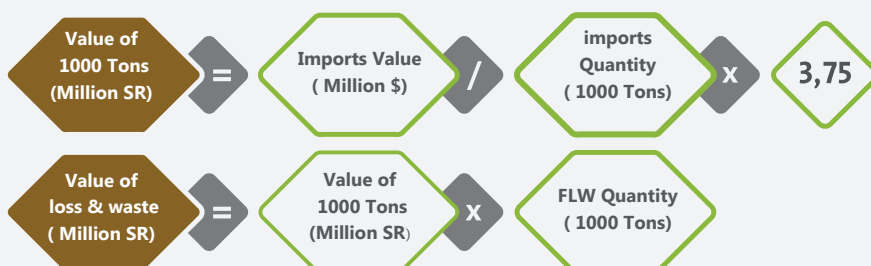
B- Processed consumption

$$FW_{CP} = W_{CP} * Y$$

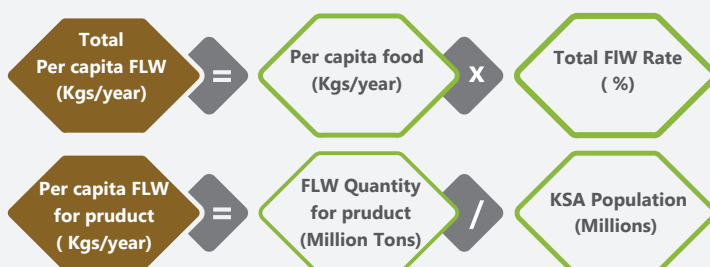
Total Calculations of Loss & Waste



Calculation of the value of loss & loss in Saudi Riyals



Per capita food loss & waste account



Per capita food according to the data of General Authority for Statistics ,2016, is (555 kg / year)



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2nd

Chapter

Data collection (statistics)

Saudi FLW Baseline

**Food Loss & Waste index
In Kingdom of Saudi Arabia**

Total of Loss & Waste Samples

Loss sample

6,162

Waste sample

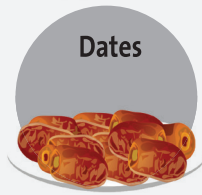
24,727

30,889*
Total Samples



Fruits
Orange – Melon – Mango

1.883



Dates

954



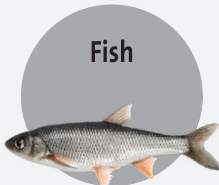
Rice **

12.933



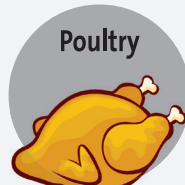
Flour - Bread

5.437



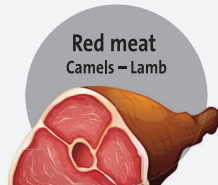
Fish

1.255



Poultry

3.698



Red meat
Camels – Lamb

1.514



Vegetables
Eggplant – Cucumber – Tomato
– Onion – Potato – Carrots

3.215

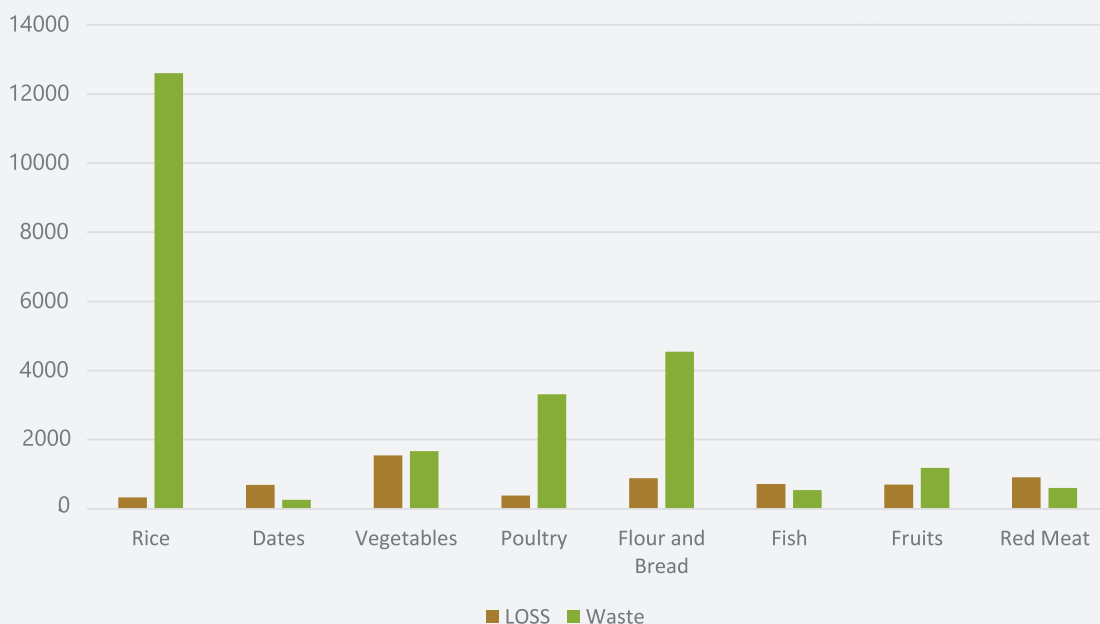
* Total samples is (52,720) , The incomplete and incorrect samples were excluded.

** The increase in rice samples because it's the main meal in most supply chain sites (houses, restaurants ,....).

Distribution of Loss - Waste Samples by the Supply Chain

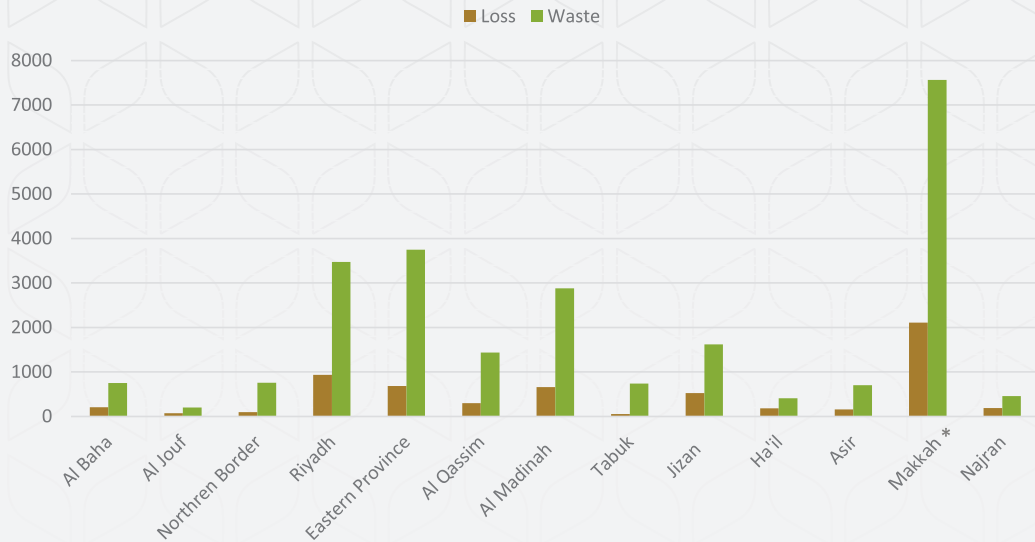


Distribution of Loss - Waste Samples by Products



* The increase in rice samples because it's the main meal in most supply chain sites (houses, restaurants ,....).

Distribution of Samples by Region



Region	Loss	Waste	Total
Al Baha	207	748	955
Al Jouf	71	199	270
Northren Border	99	758	857
Riyadh	932	3,472	4,404
Eastern Province	683	3,750	4,433
Al Qassim	297	1,433	1,730
Al Madinah	656	2,878	3,534
Tabuk	52	737	789
Jizan	527	1,622	2,149
Ha'il	181	407	588
Asir	159	700	859
Makkah *	2,111	7,563	9,674
Najran	187	460	647
Total	6,162	24,727	30,889

* The increase in the samples of Makkah region because it contains three major cities (Makkah, Jeddah and Taif)

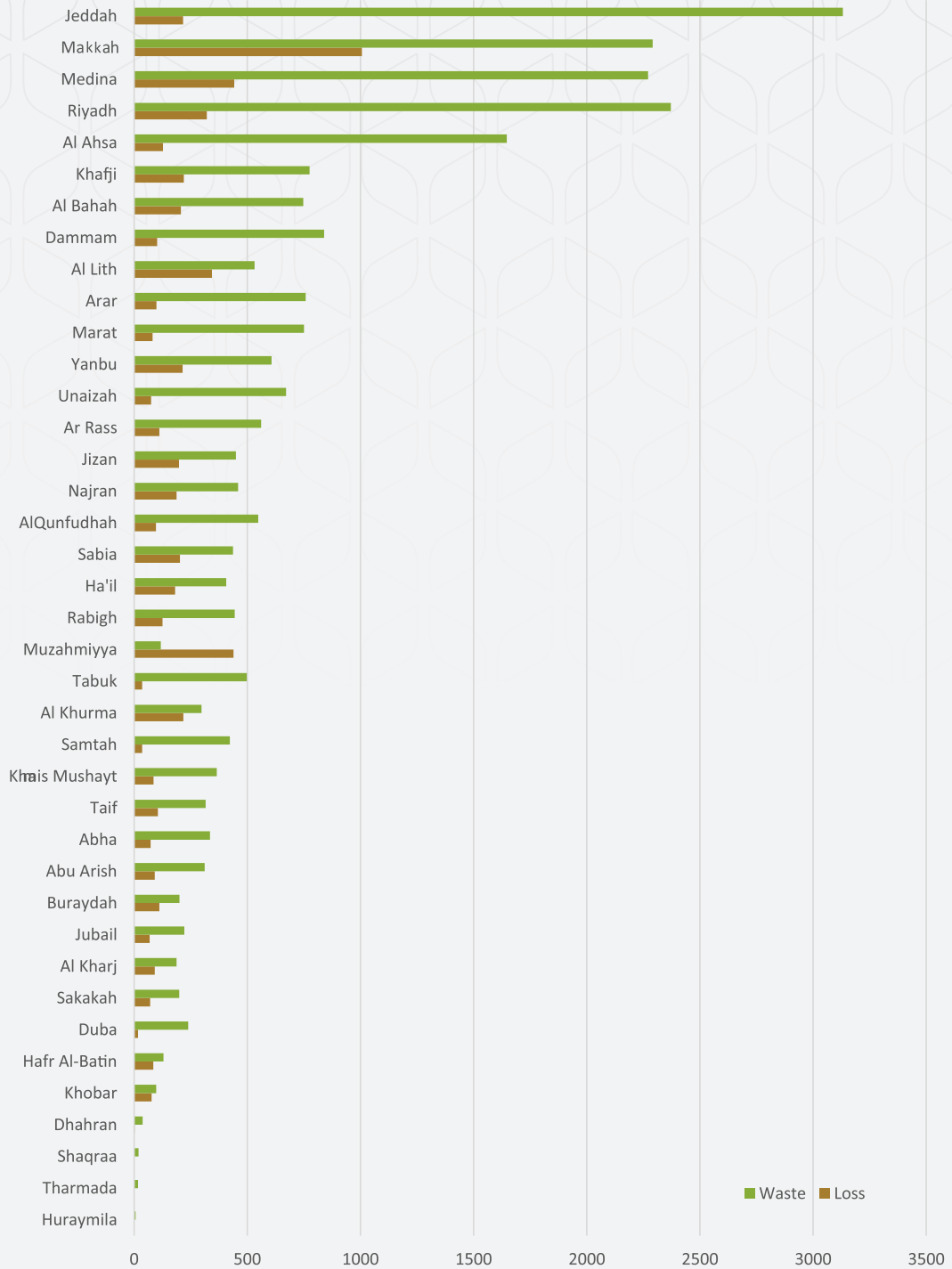
Distribution of Samples by Region



Min

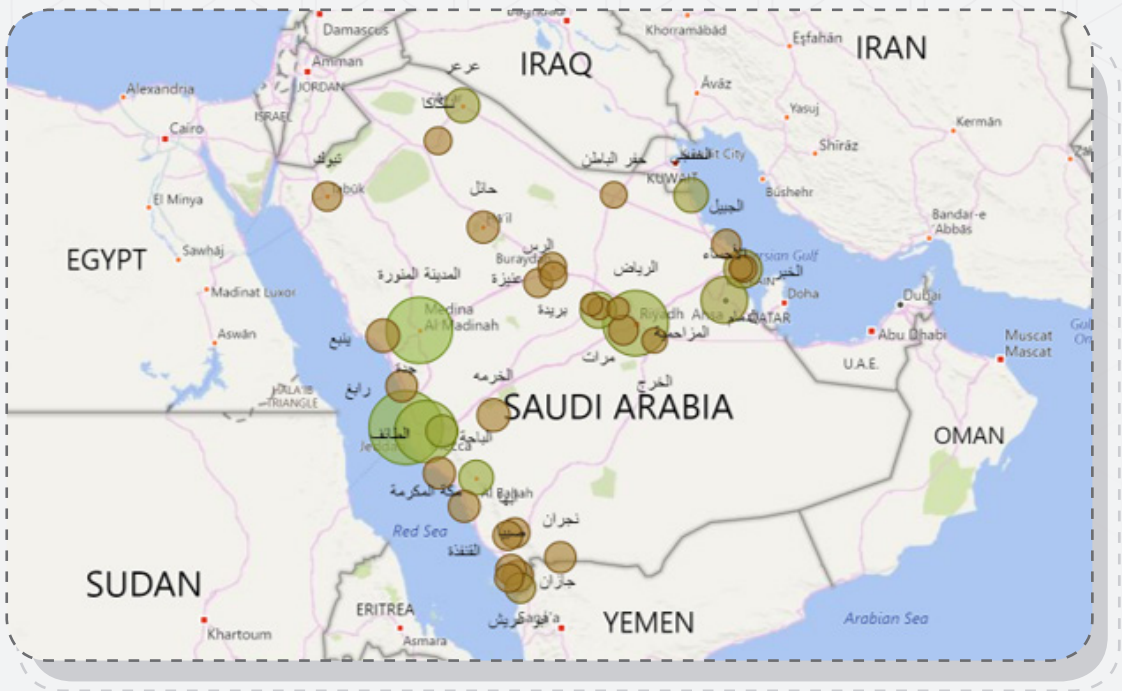
Max

Distribution of Samples by City

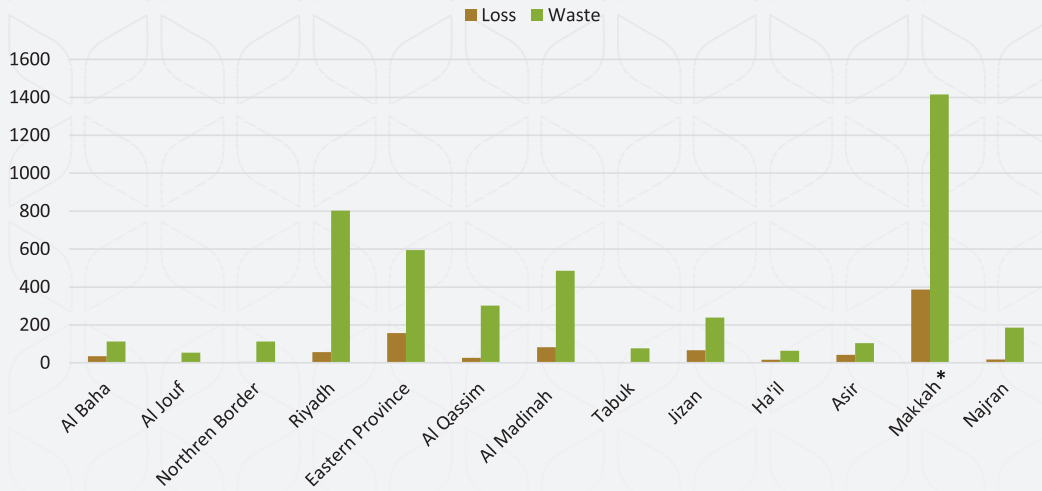


* (Dhahran - Shagraa - Tharmadha - Huraymila) didn't add to the total cities included in the survey because their pilot study & main study samples were incomplete (for 14 days) .

Distribution of Samples by City



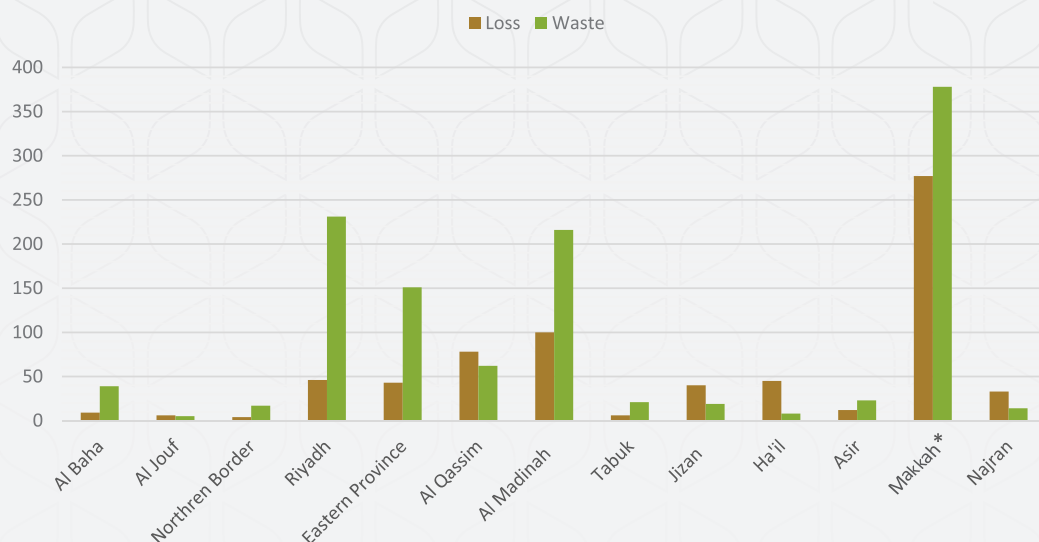
Distribution of Flour & Bread Sample by Region



Region	Loss	Waste	Total
Al Baha	35	113	148
Al Jouf	0	54	54
Northren Border	4	113	117
Riyadh	56	803	859
Eastern Province	157	594	751
Al Qassim	26	302	328
Al Madinah	82	486	568
Tabuk	0	77	77
Jizan	67	238	305
Ha'il	16	63	79
Asir	42	104	146
Makkah*	386	1,416	1,802
Najran	17	186	203
Total	888	4,549	5,437

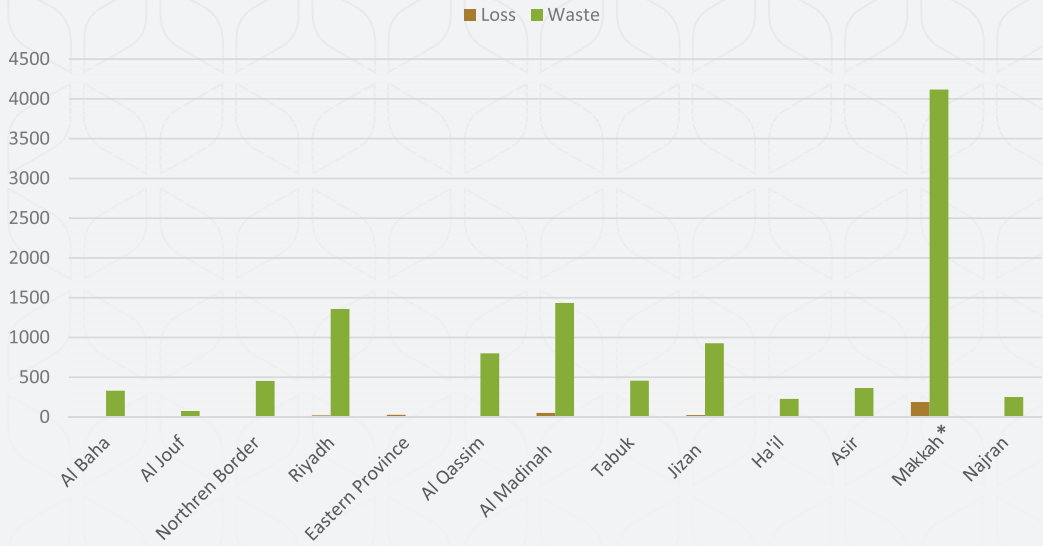
* The increase in the samples of Makkah region because it contains three major cities (Makkah, Jeddah and Taif)

Distribution of Fruits Sample by Region



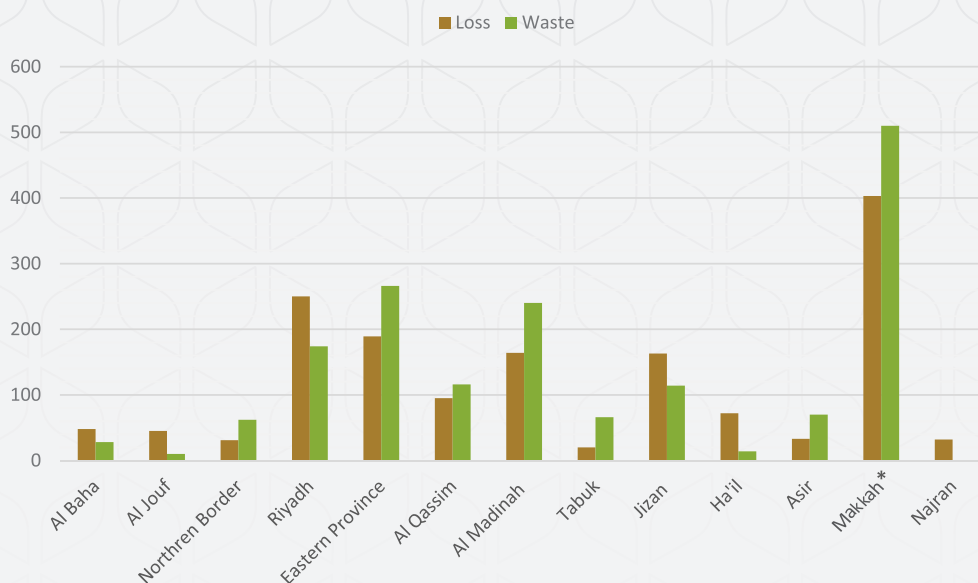
Region	Loss	Waste	Total
Al Baha	9	39	48
Al Jouf	6	5	11
Northren Border	4	17	21
Riyadh	46	231	277
Eastern Province	43	151	194
Al Qassim	78	62	140
Al Madinah	100	216	316
Tabuk	6	21	27
Jizan	40	19	59
Ha'il	45	8	53
Asir	12	23	35
Makkah*	277	378	655
Najran	33	14	47
Total	699	1,184	1,883

Distribution of Rice Sample by Region



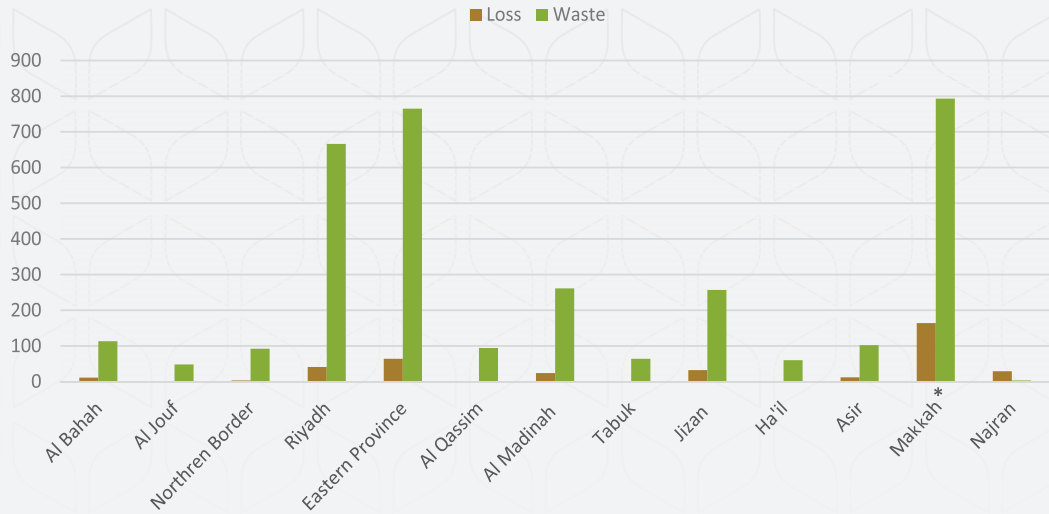
Region	Loss	Waste	Total
Al Baha	1	330	331
Al Jouf	6	75	81
Northren Border	0	453	453
Riyadh	19	1,357	1,376
Eastern Province	27	1,818	1,845
Al Qassim	1	799	800
Al Madinah	50	1,433	1,483
Tabuk	0	455	455
Jizan	23	926	949
Ha'il	6	226	232
Asir	8	363	371
Makkah*	188	4,116	4,304
Najran	3	250	253
Total	332	12,601	12,933

Distribution of Vegetables Sample by Region



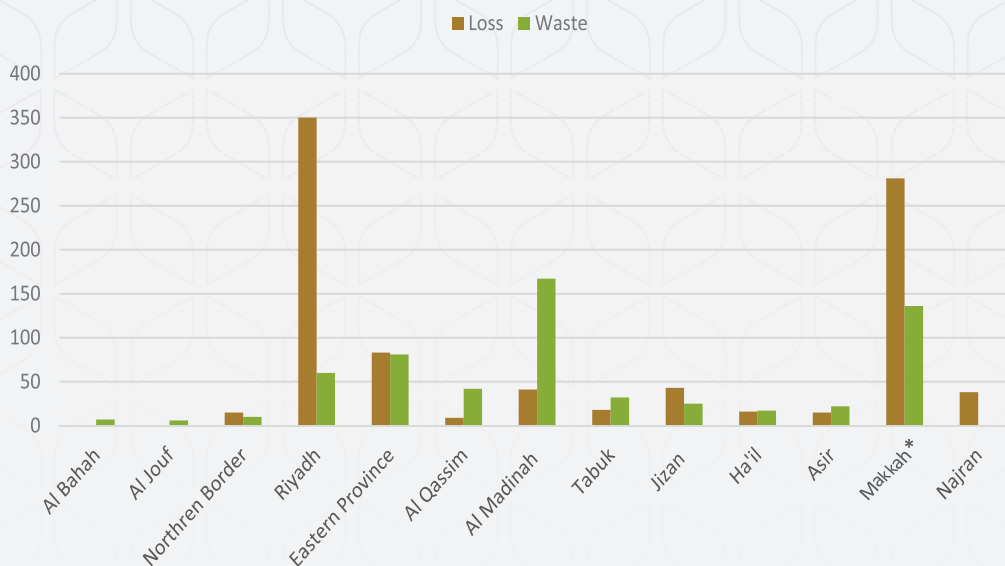
Region	Loss	Waste	Total
Al Baha	48	28	76
Al Jouf	45	10	55
Northren Border	31	62	93
Riyadh	250	174	424
Eastern Province	189	266	455
Al Qassim	95	116	211
Al Madinah	164	240	404
Tabuk	20	66	86
Jizan	163	114	277
Ha'il	72	14	86
Asir	33	70	103
Makkah*	403	510	913
Najran	32	0	32
Total	1,545	1,670	3,215

Distribution of Poultry Sample by Region



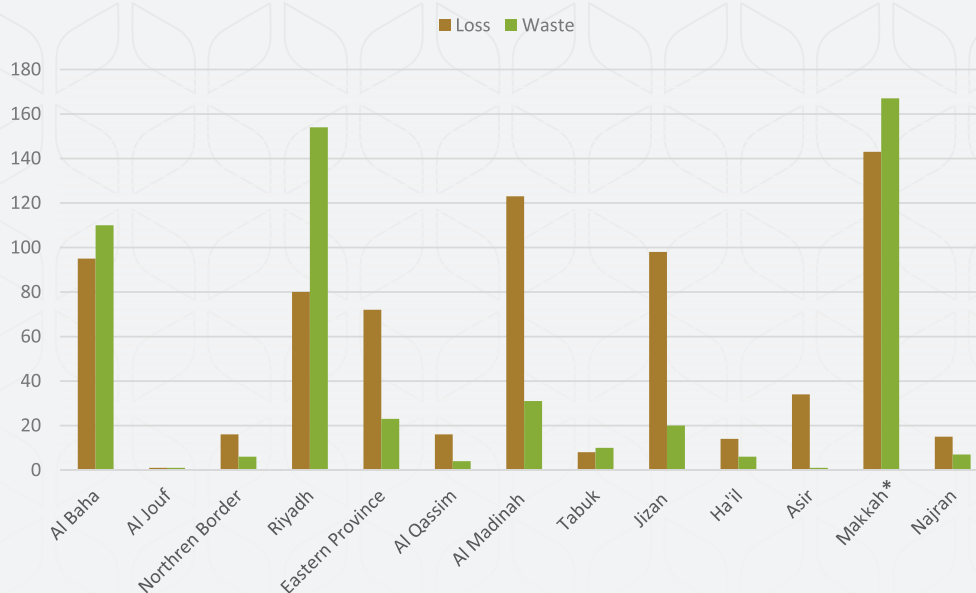
Region	Loss	Waste	Total
Al Bahah	11	113	124
Al Jouf	0	48	48
Northren Border	3	92	95
Riyadh	41	666	707
Eastern Province	64	765	829
Al Qassim	0	94	94
Al Madinah	24	261	285
Tabuk	0	64	64
Jizan	32	257	289
Ha'il	0	60	60
Asir	12	102	114
Makkah*	164	793	957
Najran	29	3	32
Total	380	3,318	3,698

Distribution of Red Meat Sample by Region



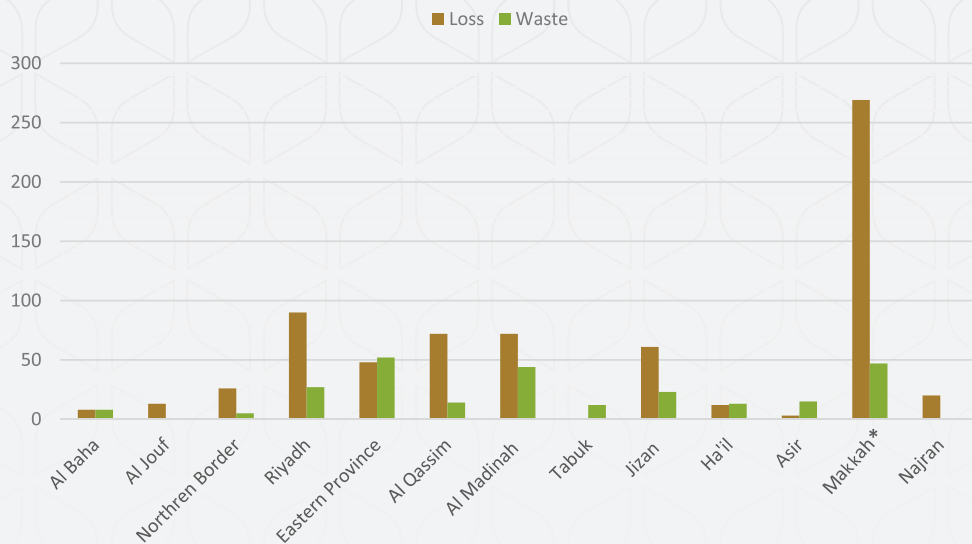
Region	Loss	Waste	Total
Al Bahah	0	7	7
Al Jouf	0	6	6
Northren Border	15	10	25
Riyadh	350	60	410
Eastern Province	83	81	164
Al Qassim	9	42	51
Al Madinah	41	167	208
Tabuk	18	32	50
Jizan	43	25	68
Ha'il	16	17	33
Asir	15	22	37
Makkah*	281	136	417
Najran	38	0	38
Total	909	605	1,514

Distribution of Fish Sample by Region



Region	Loss	Waste	Total
Al Baha	95	110	205
Al Jouf	1	1	2
Northren Border	16	6	22
Riyadh	80	154	234
Eastern Province	72	23	95
Al Qassim	16	4	20
Al Madinah	123	31	154
Tabuk	8	10	18
Jizan	98	20	118
Ha'il	14	6	20
Asir	34	1	35
Makkah*	143	167	310
Najran	15	7	22
Total	715	540	1,255

Distribution of Dates Sample by Region



Region	Loss	Waste	Total
Al Baha	8	8	16
Al Jouf	13	0	13
Northren Border	26	5	31
Riyadh	90	27	117
Eastern Province	48	52	100
Al Qassim	72	14	86
Al Madinah	72	44	116
Tabuk	0	12	12
Jizan	61	23	84
Ha'il	12	13	25
Asir	3	15	18
Makkah*	269	47	316
Najran	20	0	20
Total	694	260	954

البرنامج الوطني للحد من
الفقد والهدر في الغذاء
بالمملكة العربية السعودية



المؤسسة العامة للحبوب
Saudi Grains Organization (SAGO)
المملكة العربية السعودية



لا إله إلا الله محمد رسول الله





**National Program for
Reducing FLW in KSA**



المؤسسة العامة للحبوب
Saudi Grains Organization (SAGO)
المملكة العربية السعودية



3rd

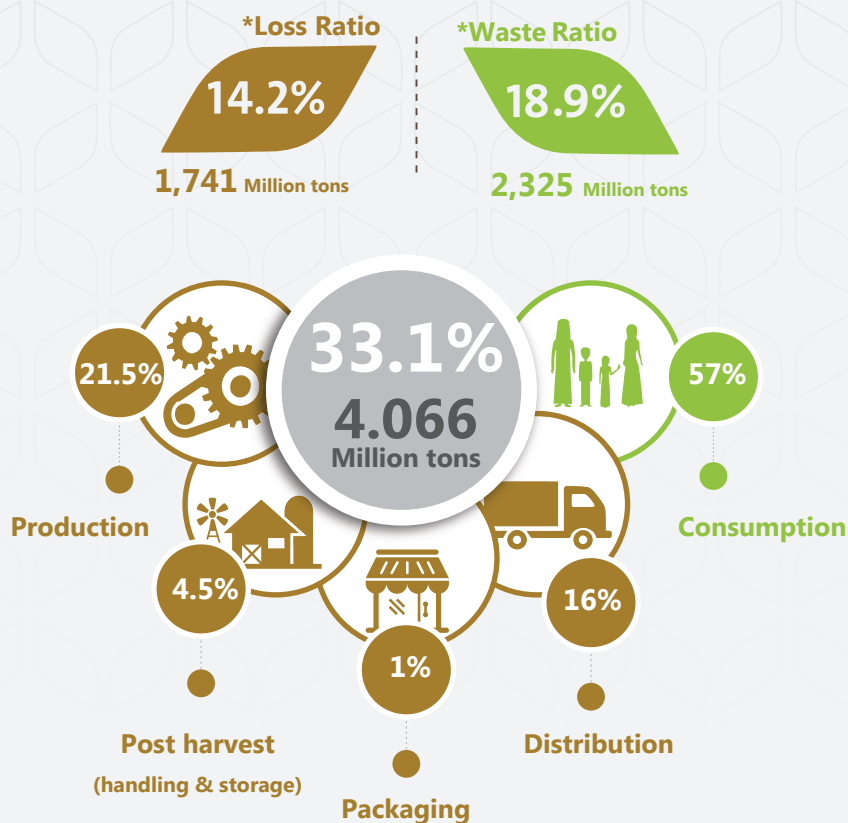
Chapter

Results of Food Loss & waste index "Saudi FLW-Baseline"

Saudi FLW Baseline

**Food Loss & Waste index
In Kingdom of Saudi Arabia**

Total FLW ratios for Study Products



*** The total FLW per capita **184** Kgs/year ****

79
Loss Size

105
Waste Size

** The total value of FLW

12,980 Million SR/year

*FLW ratios is calculated according to international FLW protocol, 2016, pages (16-19).

**The value of FLW was calculated according to the data from General Authority for Statistics,2016,page (65).

***The total per capita in FLW was calculated according to the formula on page (19) based on the population of KSA , 2018, reached (33 million) according to General Authority for Statistics website.

****The total per capita in FLW includes all the food products in the KSA that was included in the study and not included (e.g. dairy products, eggs, sugar, milk, tea and spices) according to the international FLW protocol.

The estimated waste value of all food products According to consumer spending in ksa



Food Waste Ratio

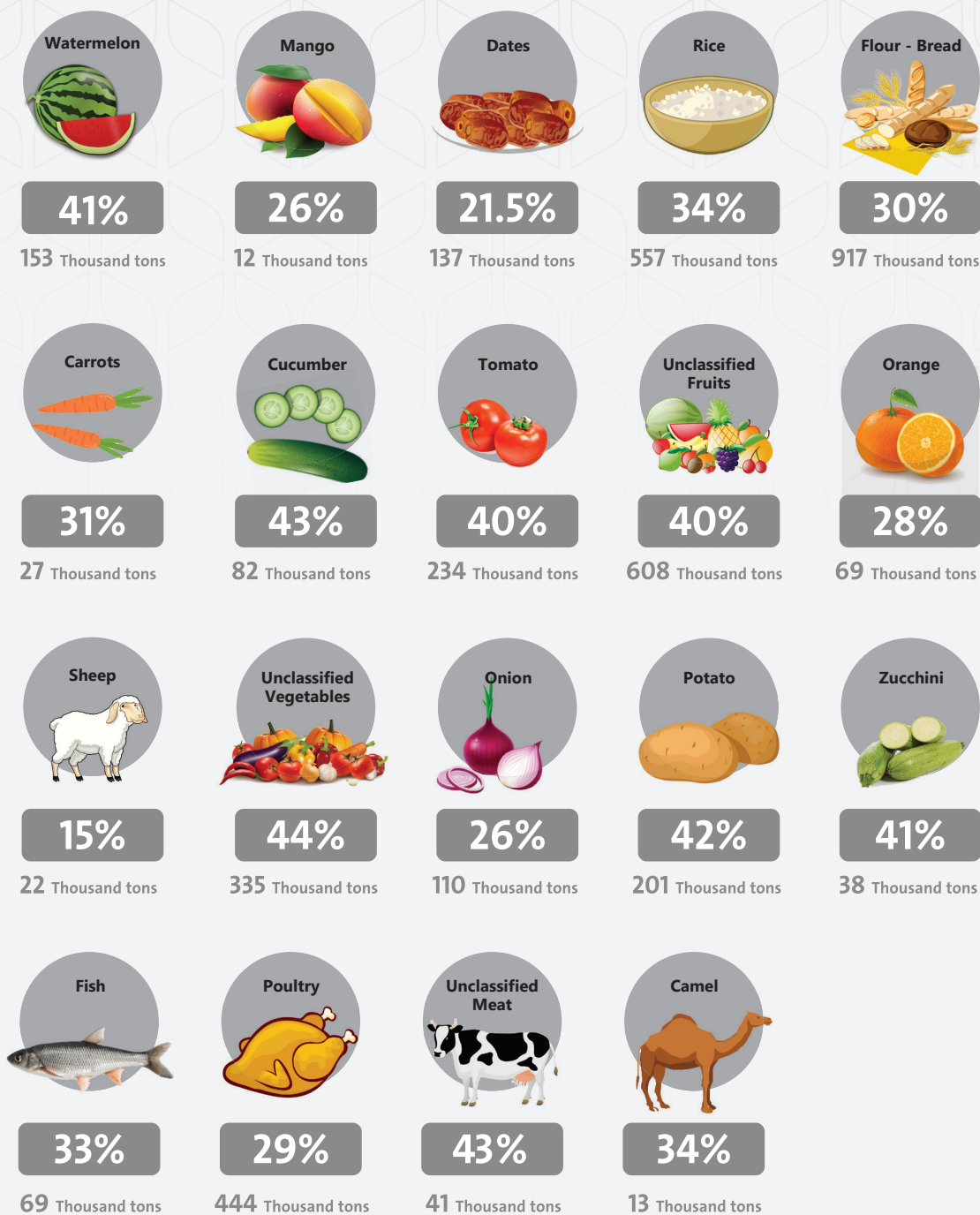
18.9%

The total value of waste according to consumer spending

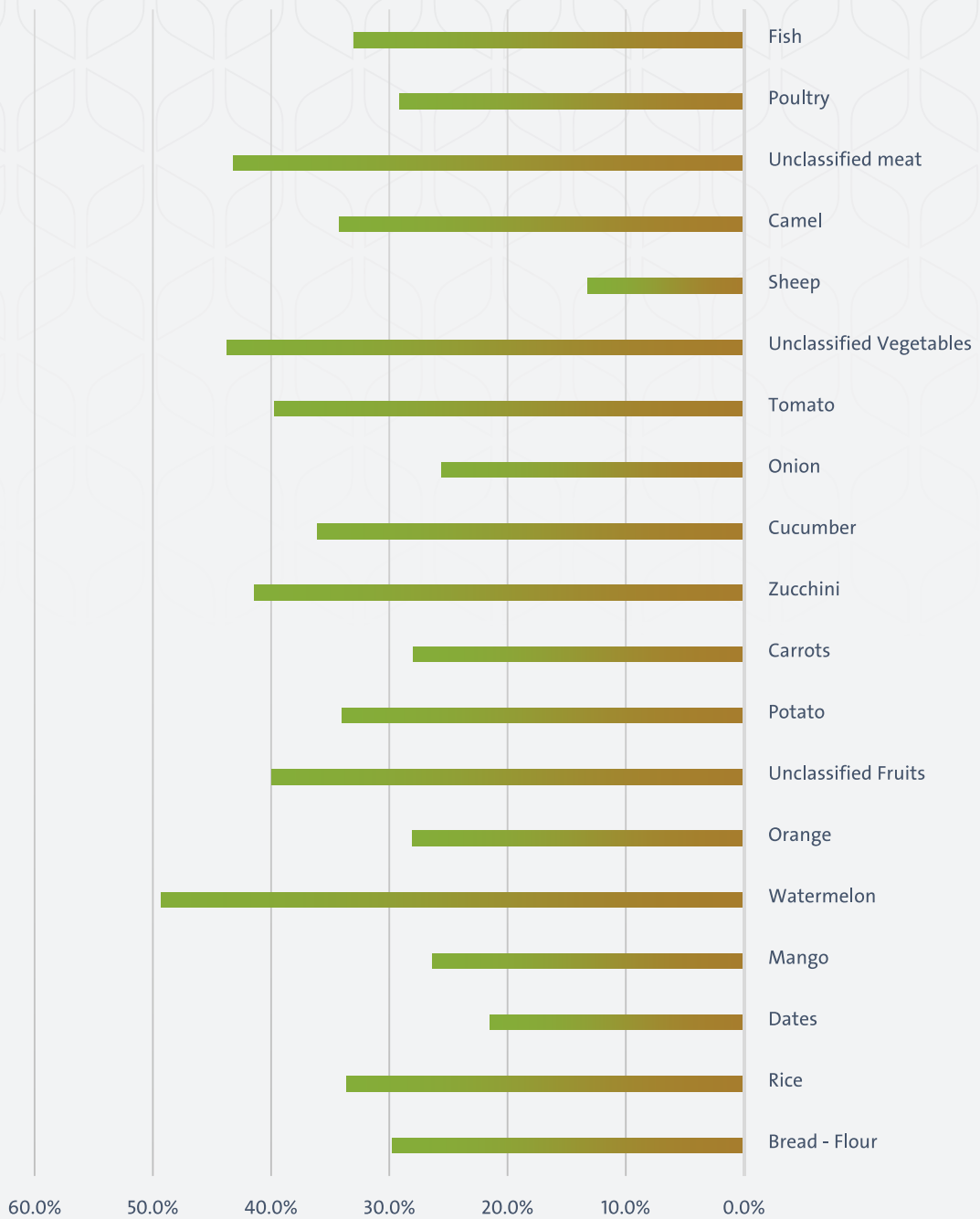
40.480 Million SR/year

* General Authority for Statistics,(GDP & consumer spending, 2016).

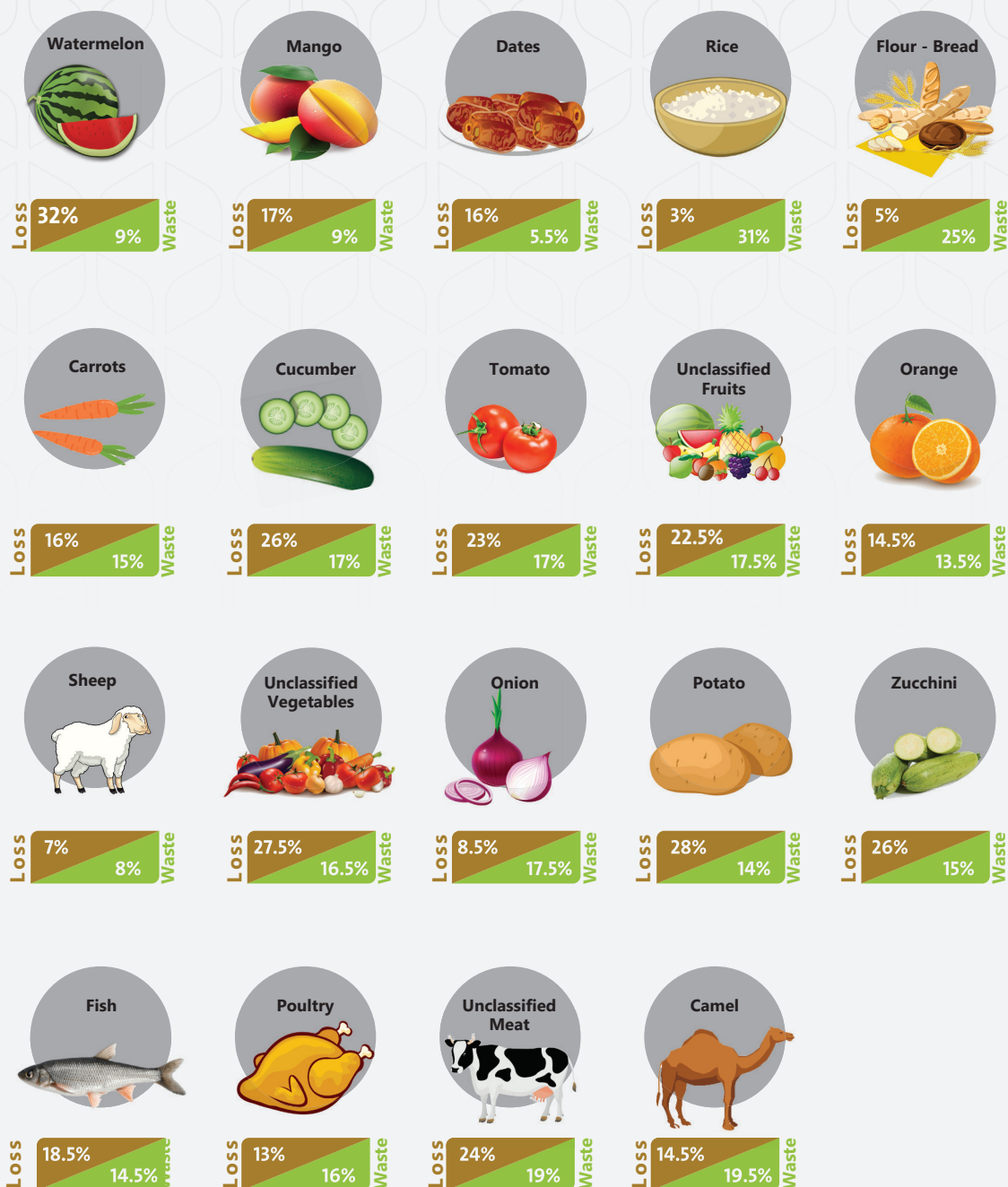
FLW Ratio For Each Product



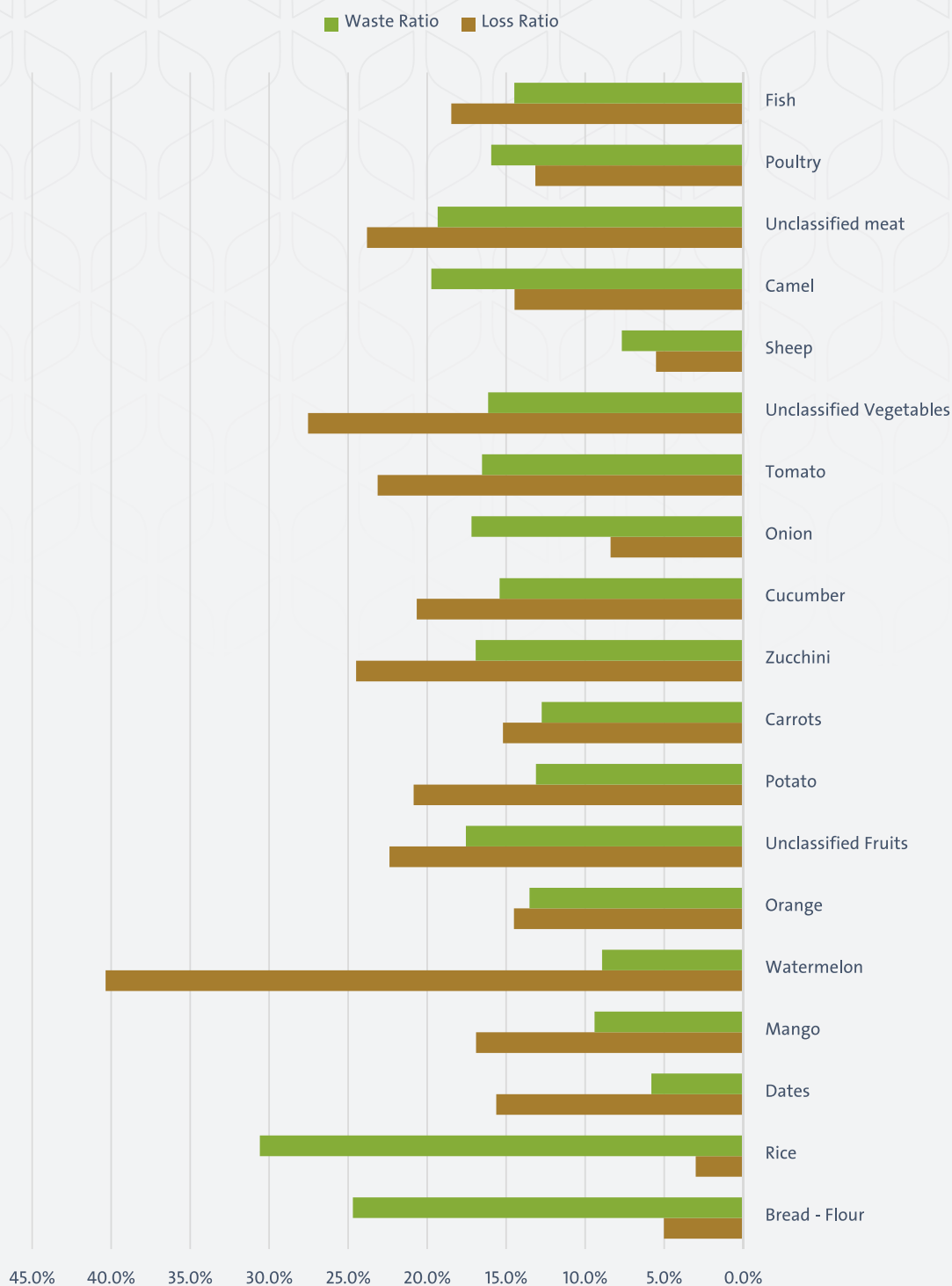
FLW Ratio For Each Product



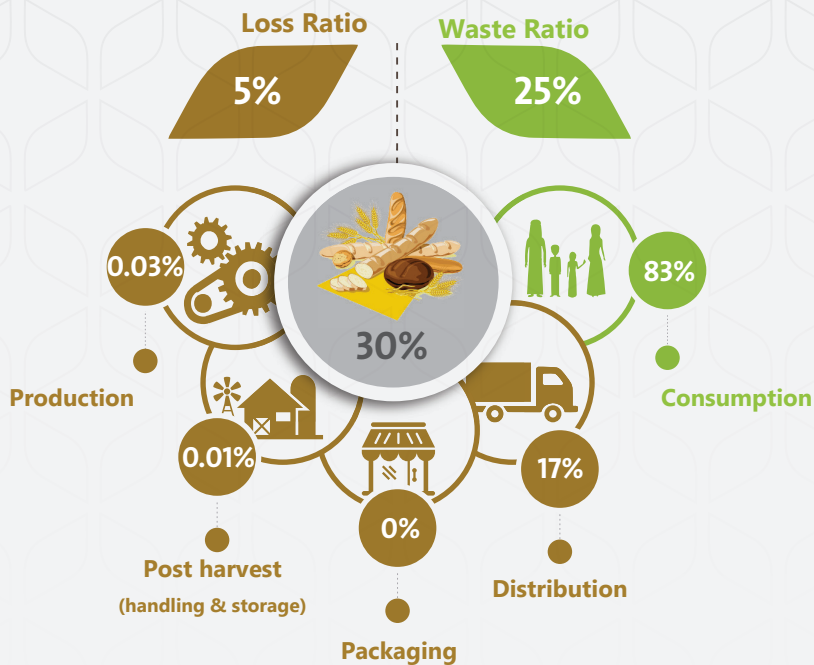
Food loss - Waste Ratio For Each Product



Food loss - Waste Ratio For Each Product



Loss - Waste Ratios for (Flour - Bread)



Food Supply chain	FLW Ratio*	FLW amount (Thousand tons)
Production	0.03%	0.319
Post harvest (handling & storage)	0.01%	0.103
Packaging	0%	0.000
Distribution	17%	154.265
Consumption	83%	762.071

The total FLW per capita **28** Kgs/year

5
Loss Size

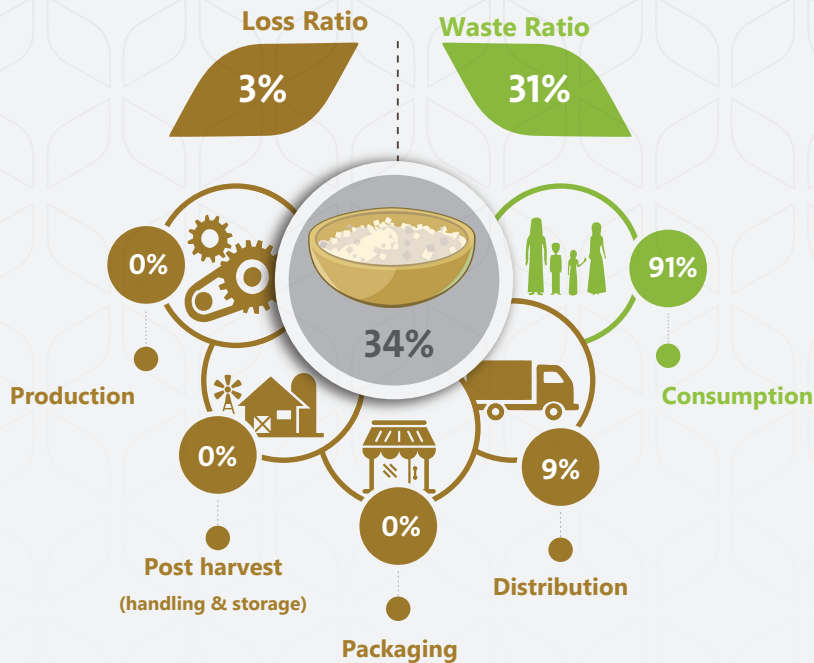
23
Waste Size

The total value of FLW for product

913 Million SR/year

* FLW Ratio represents from the total Food Loss & waste of the product.

Loss - Waste Ratios for (Rice)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	0%	0.000
Post harvest (handling & storage)	0%	0.000
Packaging	0%	0.000
Distribution	9%	49.740
Consumption	91%	507.117

The total FLW per capita **17** Kgs/year

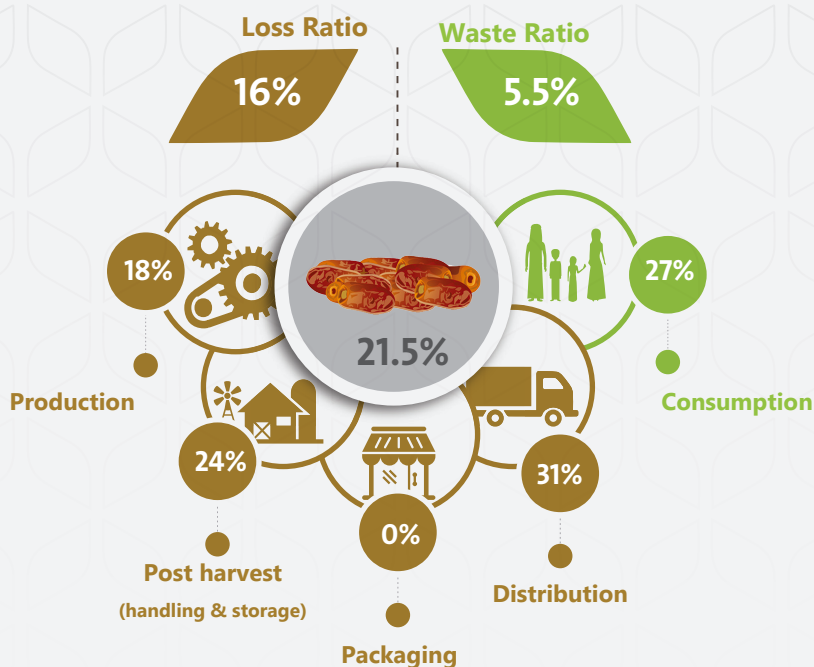
2
Loss Size

15
Waste Size

The total value of FLW for product

1.682 Million SR/year

Loss - Waste Ratios for (Dates)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	18%	24.873
Post harvest (handling & storage)	24%	32.235
Packaging	0%	0.000
Distribution	31%	42.550
Consumption	27%	36.972

The total FLW per
capita

5

Kgs/year

The total value
of FLW for product

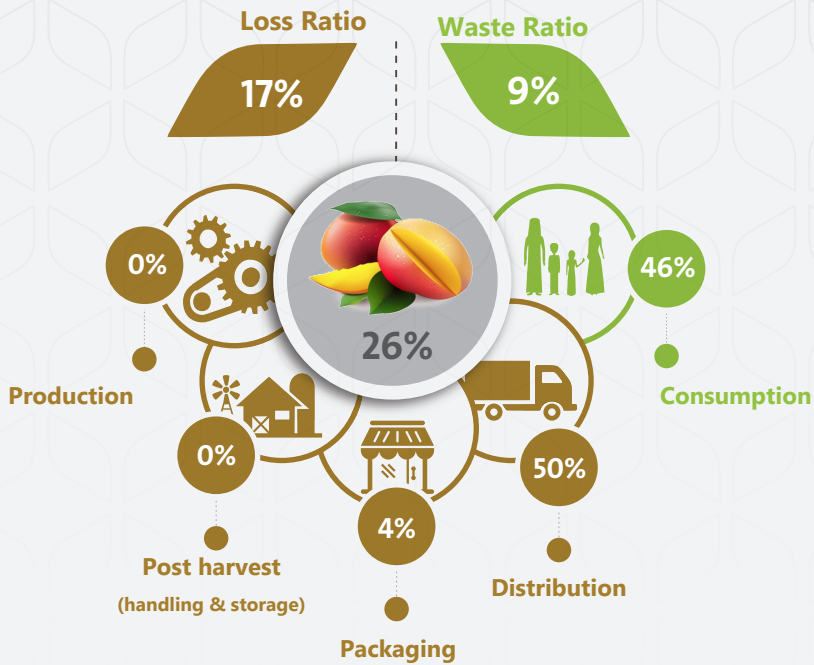
588

Million SR/year

4
Loss Size

1
Waste Size

Loss - Waste Ratios for (Mango)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	0%	0.000
Post harvest (handling & storage)	0%	0.000
Packaging	4%	0.500
Distribution	50%	5.910
Consumption	46%	5.420

The total FLW per capita **0.4** Kgs/year

0.2
Loss Size

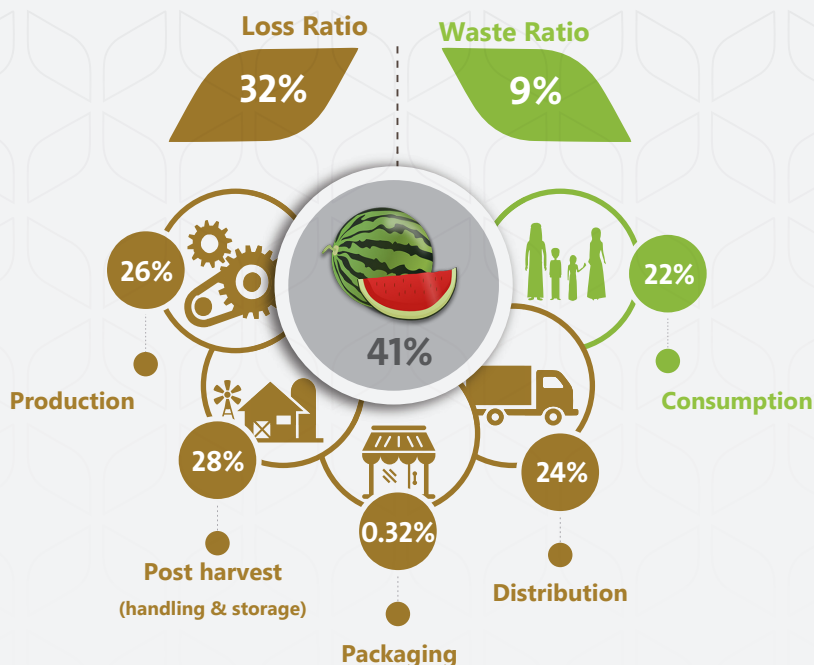
0.2
Waste Size

The total value of FLW for product

42

Million SR/year

Loss - Waste Ratios for (Watermelon)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	26%	39.116
Post harvest (handling & storage)	28%	42.603
Packaging	0.32%	0.487
Distribution	24%	37.369
Consumption	22%	33.706

The total FLW per
capita

5
Kgs/year

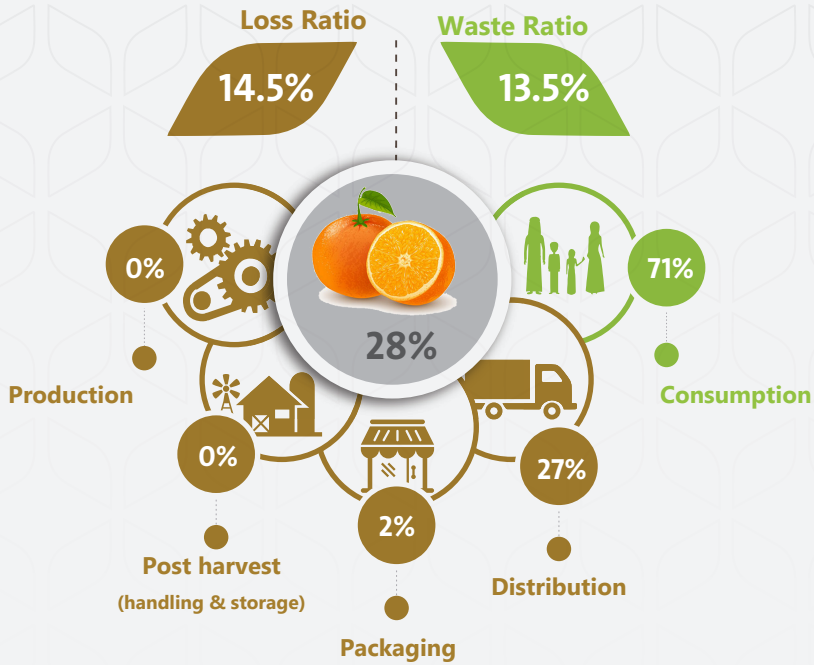
The total value
of FLW for product

254
Million SR/year

4
Loss Size

1
Waste Size

Loss - Waste Ratios for (Orange)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	0%	0.000
Post harvest (handling & storage)	0%	0.000
Packaging	2%	1.347
Distribution	27%	18.332
Consumption	71%	49.088

The total FLW per
capita

3

Kgs/year

The total value
of FLW for product

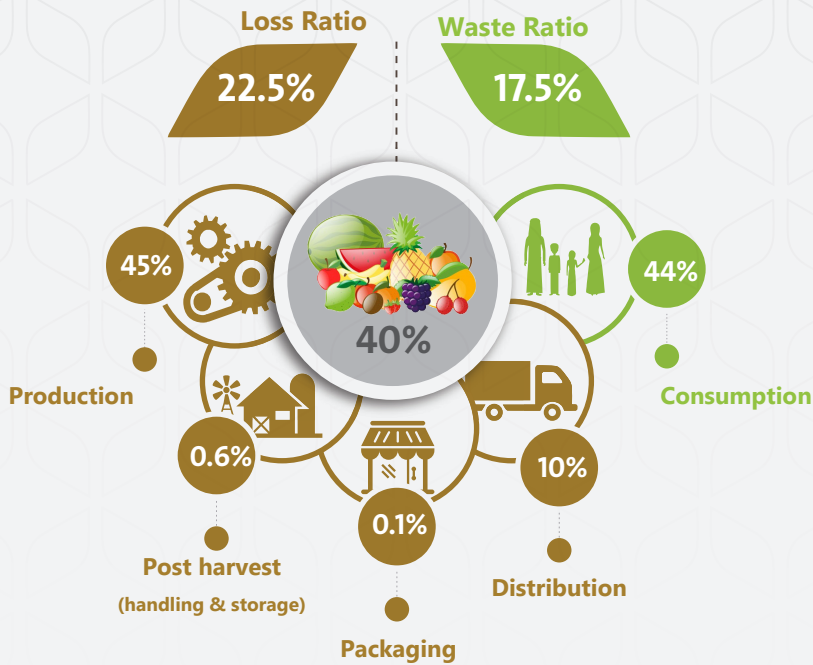
181

Million SR/year

1
Loss Size

2
Waste Size

Loss - Waste Ratios for (Unclassified Fruits)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	45%	275.302
Post harvest (handling & storage)	0.6%	3.450
Packaging	0.4%	2.584
Distribution	10%	59.334
Consumption	44%	267.010

The total FLW per capita **18** Kgs/year

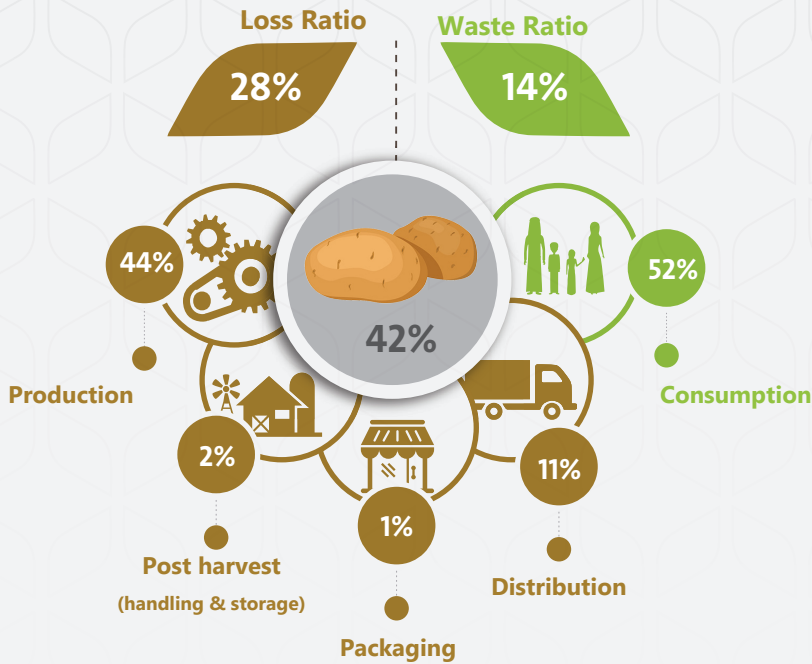
The total value of FLW for product

10
Loss Size

8
Waste Size

2,257 Million SR/year

Loss - Waste Ratios for (Potato)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	52%	104.136
Post harvest (handling & storage)	2%	4.165
Packaging	1%	2.337
Distribution	11%	22.690
Consumption	34%	67.376

The total FLW per
capita

6

Kgs/year

4

Loss Size

2

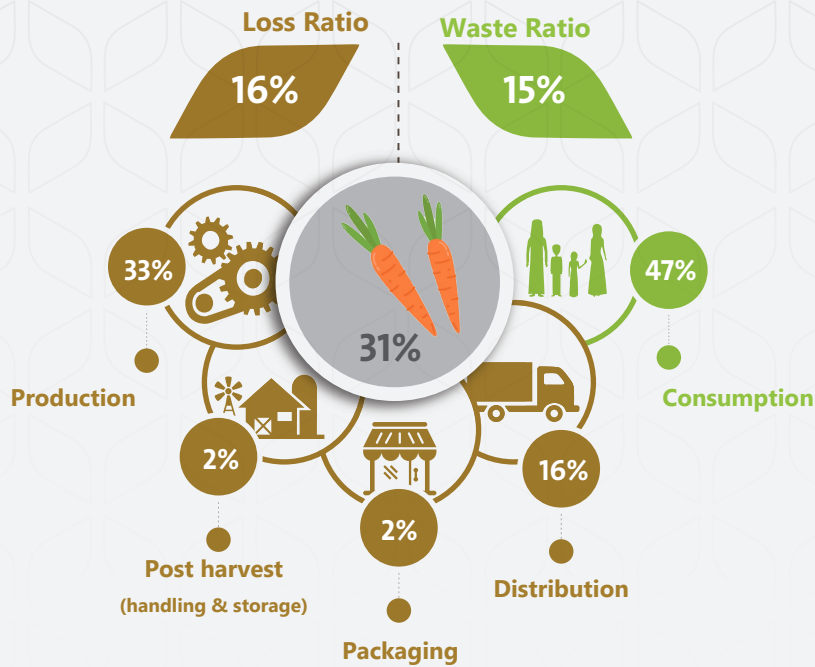
Waste Size

The total value
of FLW for product

372

Million SR/year

Loss - Waste Ratios for (Carrots)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	33%	8.794
Post harvest (handling & storage)	2%	0.440
Packaging	2%	0.514
Distribution	16%	4.362
Consumption	47%	12.674

The total FLW per capita **0.8** Kgs/year

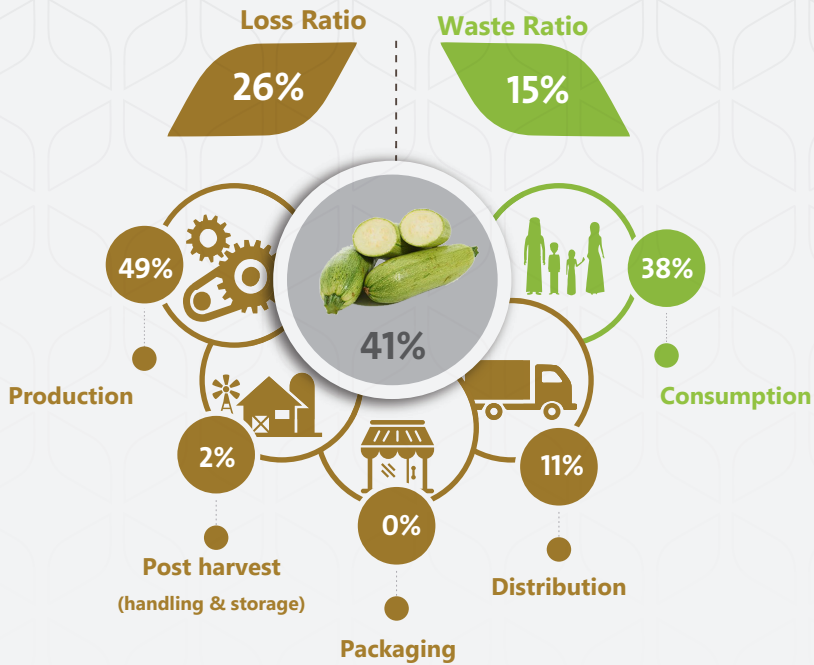
The total value of FLW for product

0.4
Loss Size

0.4
Waste Size

47 Million SR/year

Loss - Waste Ratios for (Zucchini)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	49%	18.461
Post harvest (handling & storage)	2%	0.923
Packaging	0%	0.000
Distribution	11%	4.155
Consumption	38%	14.196

The total FLW per capita **1.1** Kgs/year

The total value of FLW for product

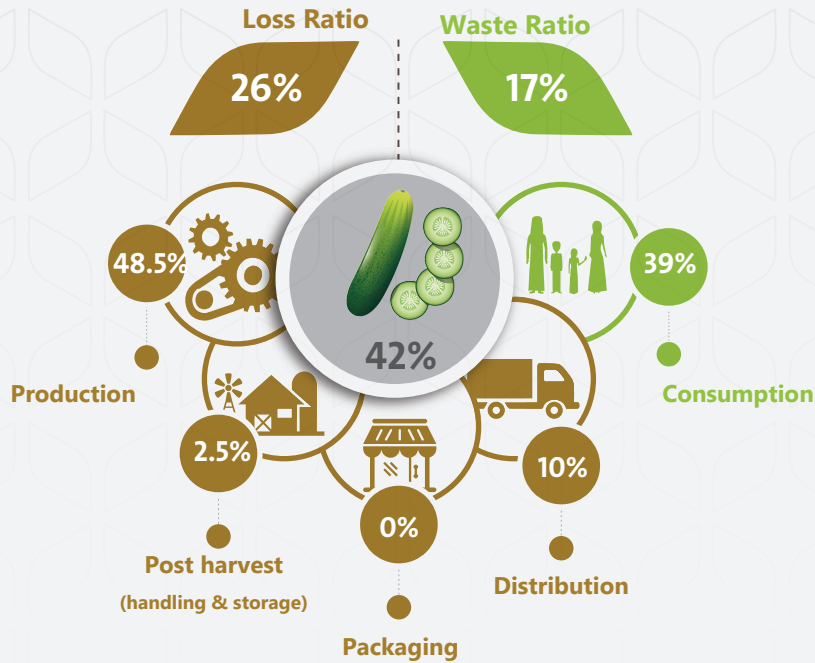
0.7
Loss Size

0.4
Waste Size

74

Million SR/year

Loss - Waste Ratios for (Cucumber)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	48.5%	39.433
Post harvest (handling & storage)	2.5%	1.972
Packaging	0%	0.000
Distribution	10%	8.130
Consumption	39%	31.972

The total FLW per capita

2 Kgs/year

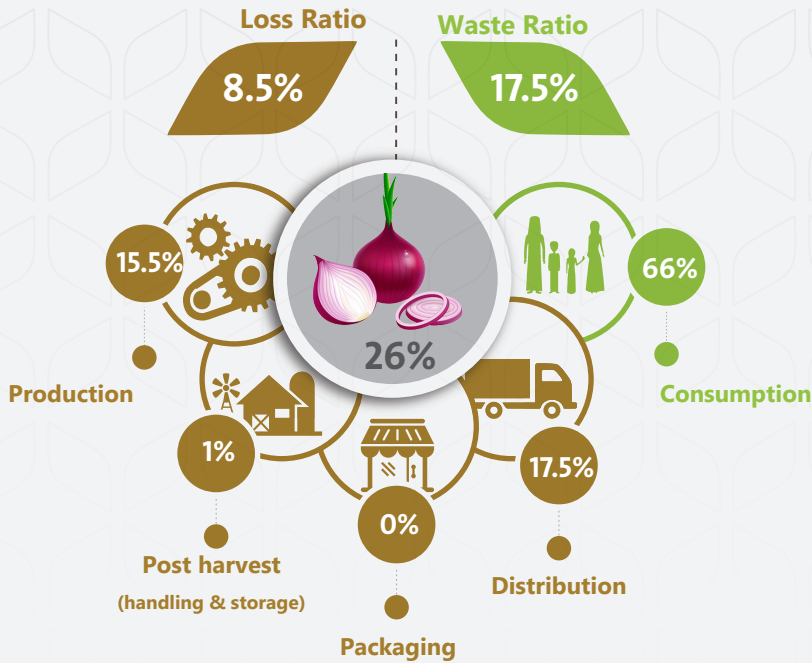
The total value of FLW for product

260 Million SR/year

1
Loss Size

1
Waste Size

Loss - Waste Ratios for (Onion)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	15.5%	17.083
Post harvest (handling & storage)	1%	0.854
Packaging	0%	0.000
Distribution	17.5%	19.281
Consumption	66%	72.376

The total FLW per capita **3.5** Kgs/year

1.1
Loss Size

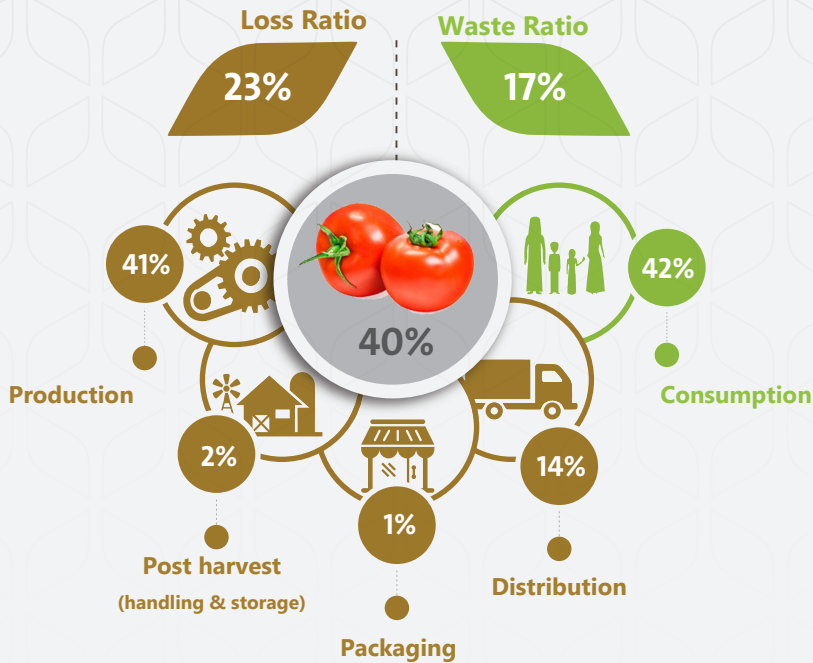
2.4
Waste Size

The total value of FLW for product

167

Million SR/year

Loss - Waste Ratios for (Tomato)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	41%	96.869
Post harvest (handling & storage)	2%	4.843
Packaging	1%	2.380
Distribution	14%	31.642
Consumption	42%	97.776

The total FLW per
capita

8

Kgs/year

The total value
of FLW for product

428

Million SR/year

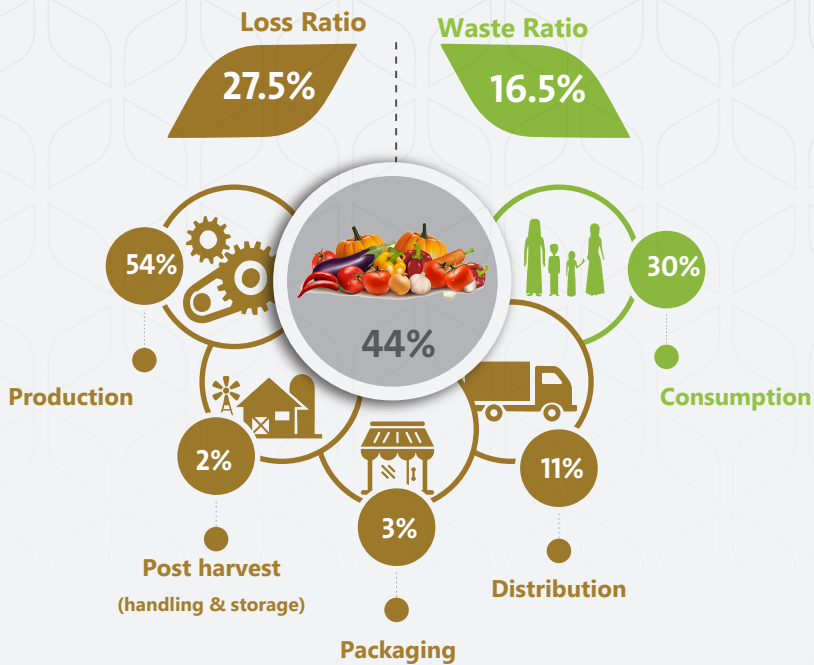
5

Loss Size

3

Waste Size

Loss - Waste Ratios for (Unclassified Vegetables)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	54%	181.881
Post harvest (handling & storage)	2%	5.469
Packaging	3%	8.295
Distribution	11%	37.390
Consumption	30%	101.882

The total FLW per capita **10** Kgs/year

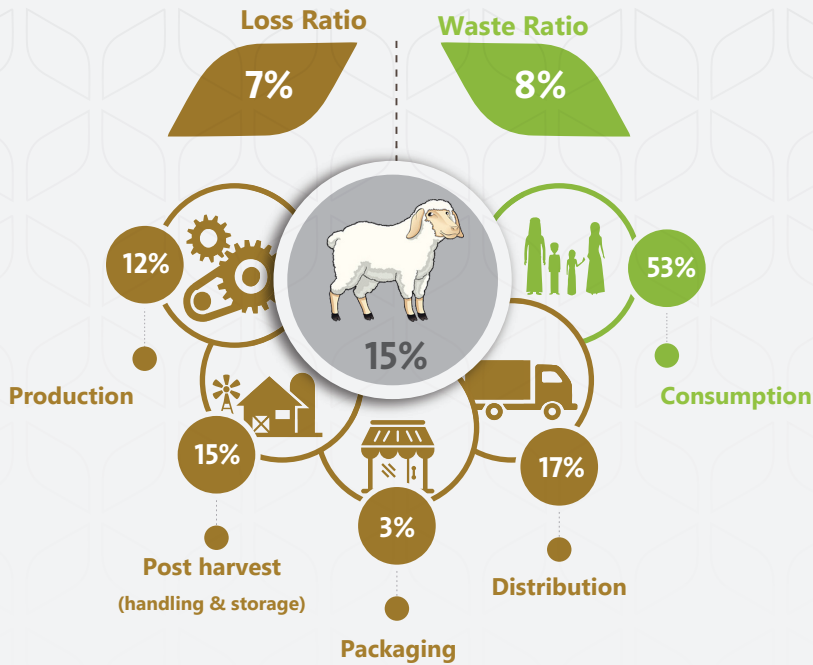
7
Loss Size

3
Waste Size

The total value of FLW for product

1,252 Million SR/year

Loss - Waste Ratios for (Sheep)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	12%	2.660
Post harvest (handling & storage)	15%	3.334
Packaging	3%	0.609
Distribution	17%	3.627
Consumption	53%	11.493

The total FLW per capita **0.7** Kgs/year

The total value of FLW for product

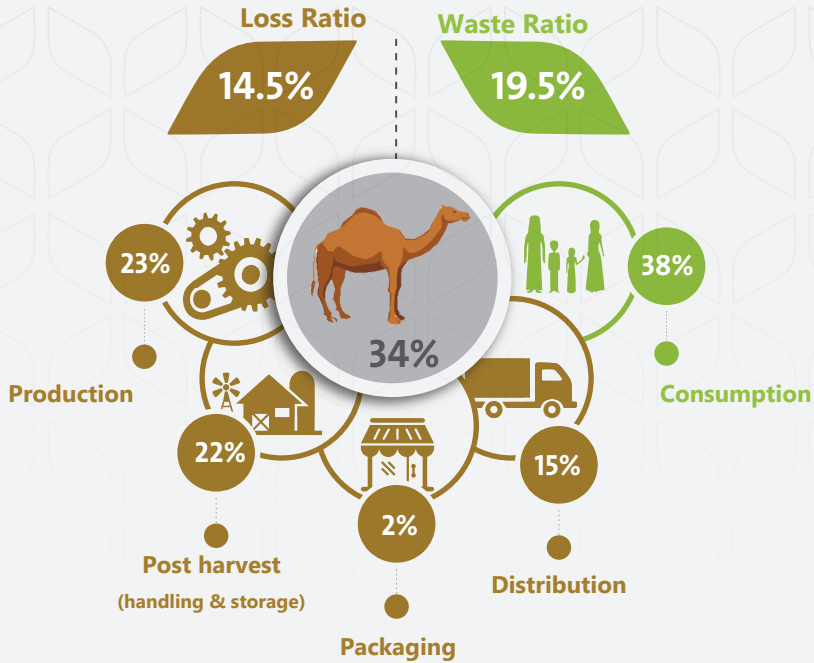
0.3
Loss Size

0.4
Waste Size

401

Million SR/year

Loss - Waste Ratios for (Camel)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	23%	3.031
Post harvest (handling & storage)	22%	2.909
Packaging	2%	0.220
Distribution	15%	1.924
Consumption	38%	4.976

The total FLW per capita

0.4 Kgs/year

The total value of FLW for product

150

Million SR/year

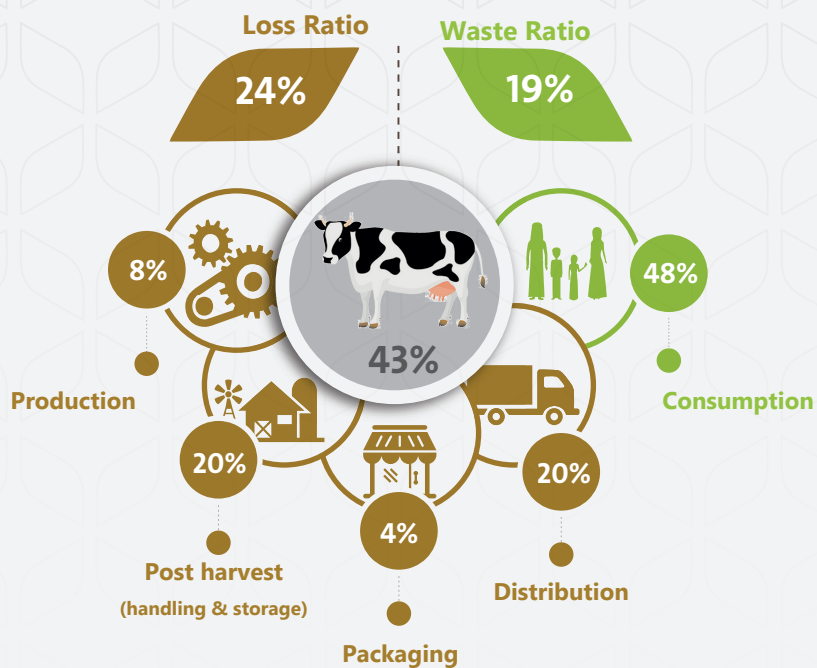
0.25

Loss Size

0.15

Waste Size

Loss - Waste Ratios for (Unclassified meat)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	8%	3.132
Post harvest (handling & storage)	20%	8.353
Packaging	4%	1.638
Distribution	20%	8.120
Consumption	48%	19.568

The total FLW per capita **1.2** Kgs/year

0.6
Loss Size

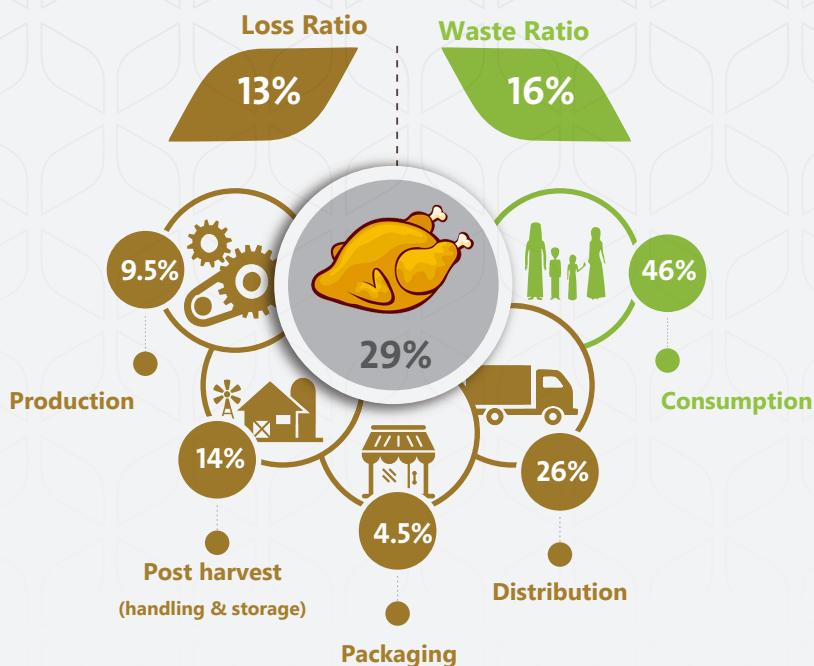
0.6
Waste Size

The total value of FLW for product

619

Million SR/year

Loss - Waste Ratios for (Poultry)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	9.5%	41.876
Post harvest (handling & storage)	14%	63.652
Packaging	4.5%	19.458
Distribution	26%	115.709
Consumption	46%	203.722

The total FLW per capita **13** Kgs/year

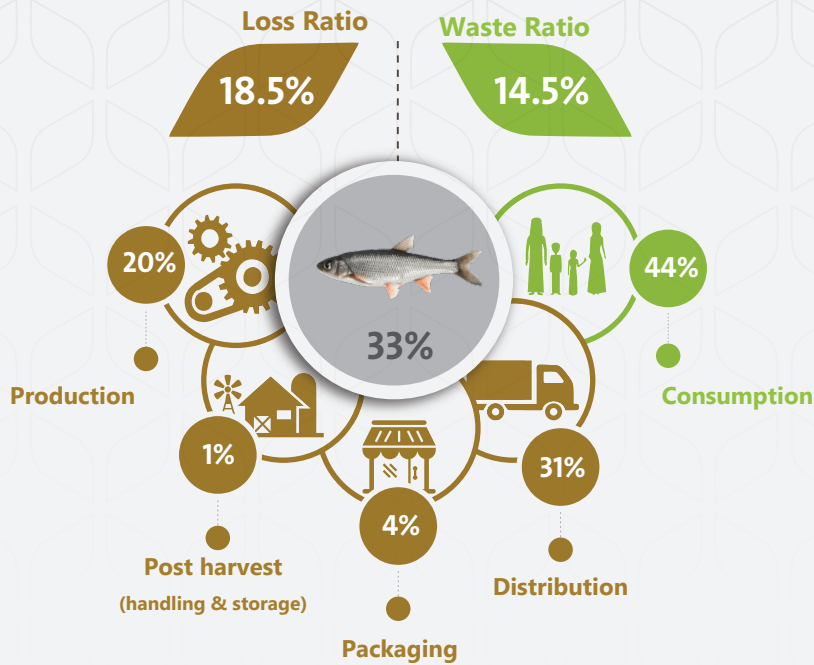
7
Loss Size

6
Waste Size

The total value of FLW for product

2,799 Million SR/year

Loss - Waste Ratios for (Fish)



Food Supply chain	FLW Ratio	FLW amount (Thousand tons)
Production	20%	13.903
Post harvest (handling & storage)	1%	0.670
Packaging	4%	2.846
Distribution	31%	21.482
Consumption	44%	30.506

The total FLW per capita **2.4** Kgs/year

The total value of FLW for product

1.4
Loss Size

1
Waste Size

494

Million SR/year

Data and information sources

s	Data / Information	Source	publish date
1	Production quantity of study products (2016)	General Authority for Statistics	(2017)
2	Exports quantity of study products (2016)	General Authority for Statistics	(2017)
3	Imports quantity of study products (2016)	General Authority for Statistics	(2017)
4	Quantity of Wheat Imports (2016)	Saudi Grain Organization (SAGO) website	(2017)
5	Production quantity of study products in detail (2016)	Arab Organization for Agricultural Development	(2018)
6	Exports quantity of study products in detail (2016)	General Authority for Statistics	(2018)
7	Imports quantity of study products in detail (2016)	General Authority for Statistics	(2018)
8	Value of imports in dollars (2016)	General Authority for Statistics	(2017)
9	Production of red and white meat in tons (2016)	Food and Agriculture Organization of the United Nations (FAO)	(2017)
10	Quantity of food loss & waste of in KSA (2018)	Field survey	(2018)
11	Food loss & waste data for four major retail markets (retail sector) for 14 days (2018)	A local retail company owning a chain of major commercial markets (more than 200 branches) in Saudi Arabia	(2018)
12	International Standard for the Calculation Food Loss and Waste of	Gustavsson, J., Cederberg, C., Sonesson U., Global food losses and food waste: Extent, causes and prevention. Rome: Food and Agriculture Organization of the United Nations (FAO).	(2011)

Exports & Imports of Food Products

s	Product	Production quantity (1000 tons)	Imports quantity (1000 tons)	Imports Value (Million SR)	Exports quantity (1000 tons)	Exports Value (Million SR)
1	Bread	-	6.10	58.13	8.06	32.57
2	Flour	10.00	3,004.00	2,990.28	0.33	0.89
3	Rice	-	1,300.00	3,927.76	11.83	39.79
4	Dates	964.54	0.44	2.57	135.88	584.21
5	Zucchini	95.90	1.24	2.43	5.15	5.39
6	Tomato	503.22	202.71	371.95	17.61	24.12
7	Cucumber	204.85	1.51	4.80	14.53	15.27
8	Onion	88.74	366.25	558.08	-	-
9	Potato	432.77	53.68	99.61	0.02	0.02
10	Carrots	45.68	49.94	75.70	6.53	7.17
11	Unclassified Vegetables	568.19	446.29	2,014.44	225.34	145.26
12	Orange	-	418.45	742.83	19.27	28.02
13	Mango	-	41.89	149.65	1.97	4.54
14	Watermelon	394.93	9.66	57.02	0.18	0.16
15	Unclassified Fruits	1,259.79	1,258.49	2,274.01	232.26	783.26
16	Sheep	127.75	46.55	860.11	2.52	9.72
17	Camel	63.01	23.14	265.24	0.09	1.23
18	Unclassified meat	43.99	102.17	1,428.10	42.20	427.72
19	Poultry	755.86	899.01	5,661.21	33.40	553.72
20	Fish	121.40	163.41	1,105.50	21.50	84.33
Vegetables (total)		1,939.40	1,125.17	2,855.61	197.10	257.82
Fruits (total)		1,654.71	1731.32	5624.13	253.79	848.51
Meat (total)		234.76	171.86	1169.85	44.81	438.67

* Source:

Statistical Book of Arab Cultures, Vol 37, 2016, Arab Organization for Agricultural Development. Imports and Exports (2016), General Authority for Statistics, KSA.

United States Department of Agriculture (Foreign Agriculture Service)

Scientific & Administrative Study Team

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Business Partners



International Consultants

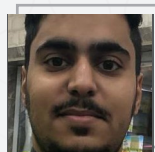
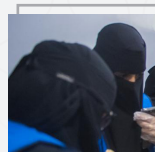
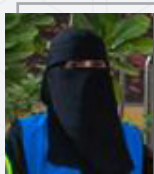
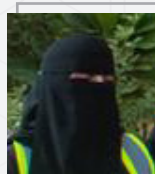
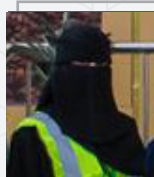
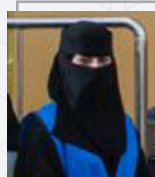
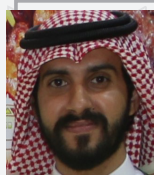
منظمة الأغذية والزراعة
للأمم المتحدة



Food
Loss + Waste
PROTOCOL



WORLD
RESOURCES
INSTITUTE



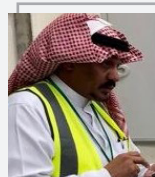
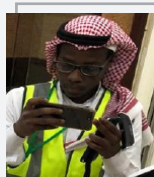
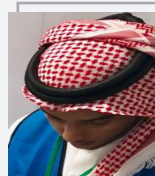
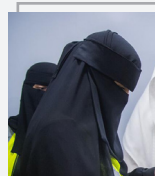
FOCUS
GROUPS

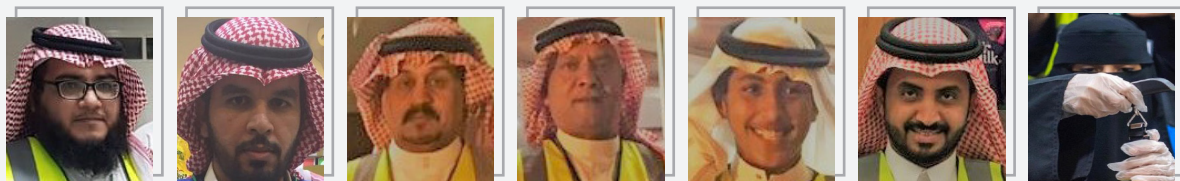
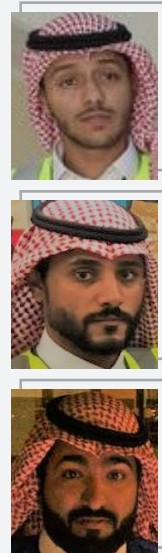
Workshop Meeting Team & Events

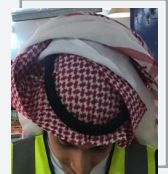
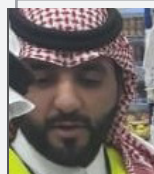
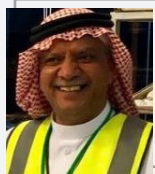
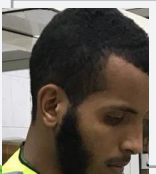
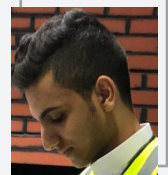
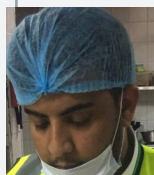
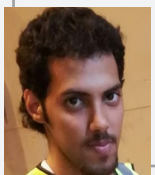
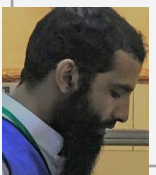
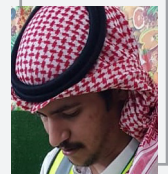
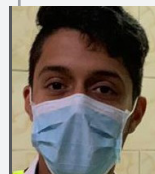
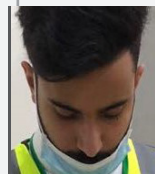
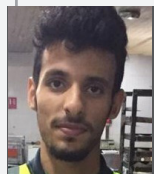
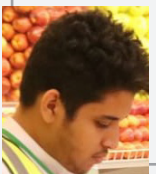
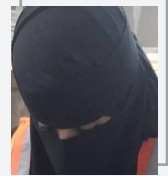
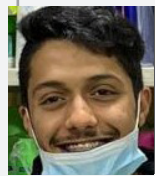
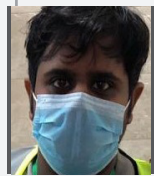
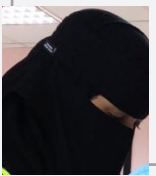
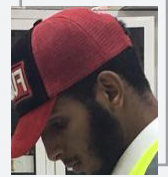
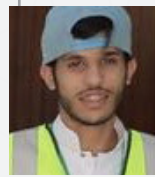
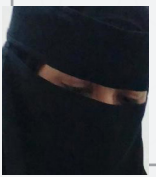
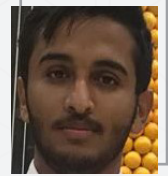
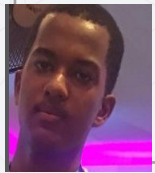
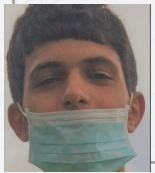
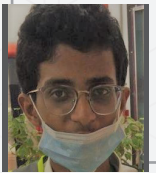
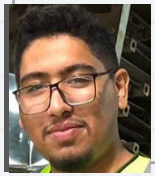
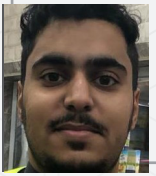
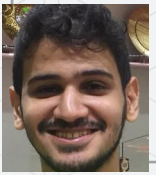
Field Survey Interviews

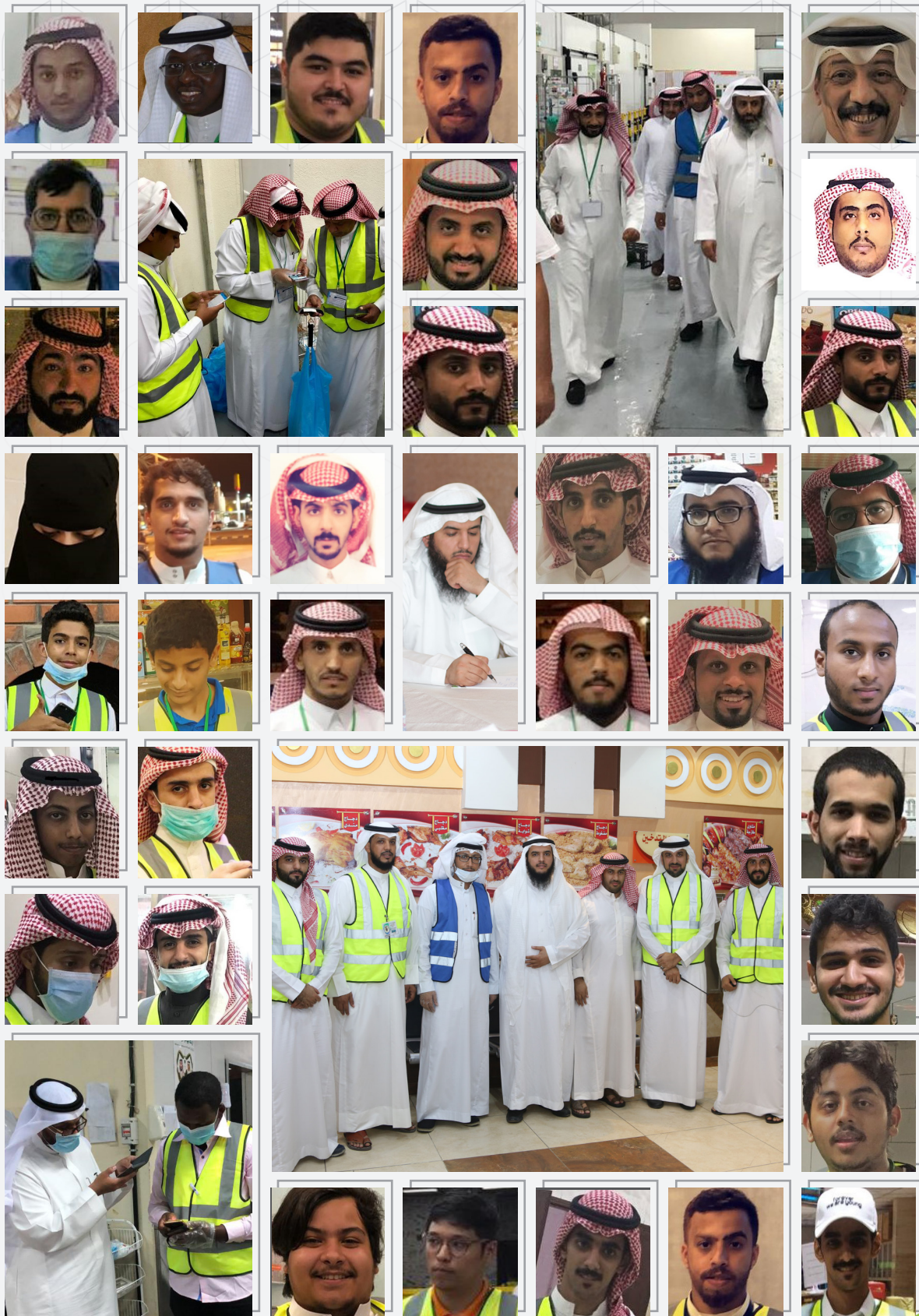
Training Inspection Visits

SOCIAL
MEDIA











National Program for
Reducing FLW in KSA



المؤسسة العامة للحبوب
Saudi Grains Organization (SAGO)
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