**Food Waste and**

**Rescue in Israel**

***Economic, Social & Environmental Impacts***

***Second National Report***

***2016***

**Presented by Leket Israel**

**Prepared by BDO Ziv Haft**

***Nov. 15, 2016***

–Third draft–

## Introduction

This is the second National Food Waste and Rescue Report produced by Leket Israel and BDO. The previous report, produced in 2015, was the first of its type in Israel; a pioneering document that outlined, as never before, the significant extent of the problem of food waste in Israel. Estimates in the 2016 National Food Waste and Rescue Report, prepared by Leket Israel and BDO Ziv Haft, reveal that 2.4 million tons of food, worth NIS 19.5 billion, is wasted in Israel annually, constituting approximately 33% of domestic food production. Roughly 1.2 million tons of the waste, worth NIS 8 billion, is rescuable, meaning it is suitable for human consumption.

This year’s report again demonstrates that rescuing food is highly worthwhile, from economic, social, and environmental perspectives. Every shekel invested in food rescue produces food with a direct value of NIS 3.8. If we take account of the environmental impact of food rescue, the economic value of each shekel invested is increased, creating NIS 7.5 in value for the national economy.

The findings in this report indicate a slight decline in food waste in Israel, compared to the 2015 report, with 2.4 million tons wasted, rather than 2.5 tons in the previous report. The decline is primarily the result of a 0.2 million fewer tons wasted in agriculture and industry, partially balanced by expansion of the consumption model to include a separate analysis of institutional consumption. We will see that the decrease in waste during production is not necessarily the result of a reversal in the prevailing trend. Rather it is mostly the consequence of a one-time decrease of 6.5% in agricultural production caused by natural events and observance of the *Shemita* year. Conversely, the current findings show an increase in the value of food waste, from NIS 18 billion in 2015 to NIS 19.5 million in 2016. This increase is largely the result of the extending the consumption model to include food with higher market value than the fruits and vegetables that accounted for most of the waste reported in 2015.

New in this report is a detailed model for estimating food waste in the institutional sector (events, hotels, factories, IDF bases, etc.). Institutional consumption accounts for approximately 17% of total food consumption in Israel, but represents the highest potential for food rescue during the consumption stage. We estimate that approximately 1.8 million people in Israel eat away from home each day, consuming approximately 650 million meals annually, totaling approximately 720,000 tons of food (including meals that were not consumed), worth NIS 12.5 billion (in terms of food cost). Of this institutional consumption, 214,000 tons—worth approximately NIS 3.5 billion—is wasted. Roughly one-third of the food wasted at institutional meals is rescuable, meaning that approximately 70,000 tons of food with a total value of NIS 1 billion could be rescued annually. This equals approximately 64 million meals in an average year, or approximately 175,000 meals every day.

We hope that this report motivates Israel's decision makers to take action (instead of just making declarations) to develop a national policy that creates genuine change in the patterns of food rescue in Israel.

Joseph Gitler Gidi Kroch Chen Herzog

Founder and Chairman, Leket Israel CEO, Leket Israel Chief Economist, BDO

1. **Executive Summary**

## 1.1 **Food consumption and production in Israel**

In Israel, as elsewhere, food consumption is one of the most basic forms of consumption. Food is a unique commodity, not only in terms of its consumption, but also in terms of its production. The nutrients in food are derived almost entirely from agricultural produce: vegetables, fruit, legumes, dairy products, eggs, meat, fish, fats, etc.

Consuming food is a basic, existential necessity, and consumption of a balanced diet is essential to ensuring the health of the population, specifically the development of infants and children. Therefore, a shortage of food, or insufficient consumption of basic nutritional components, can cause potential health issues with a cost exceeding the food’s market value, which represents the cost of its production at each stage of the value chain.

In Israel, food consumption accounts for about 16% of an average household’s spending, and 22% of the consumer basket of households in the two lowest percentiles. Therefore, ensuring food security and food rescue are matters of the highest economic importance.

The cultivation and production of food inherently require the utilization of natural resources that are relatively rare or which have substantial economic costs: land and water. In a densely populated country like Israel, where land is an expensive and scarce resource (particularly in high demand areas), and which faces problems of both food insecurity and housing insecurity, using land for surplus agricultural production that is later lost or wasted incurs additional societal costs, beyond the direct economic costs.

The cultivation and production of food also has significant environmental impact. The use of land, fertilizers and pesticides may damage water sources, wildlife, plants, and the environment. Currently, 20% of greenhouse gas emissions in the world are generated during the various stages of food cultivation, production, and distribution.

This report also examines the issue of food waste and the economic viability of its rescue, based on quantifiable estimates and assessments, and includes updated data and methodological improvements, based on experience accumulated in the last year. Furthermore, it includes a new, detailed model for estimating food waste in the institutional sector, including but not limited to meals cooked on IDF bases, in factories, catering halls, hotels, and restaurants—any place where meals are served in an organized manner.[[1]](#endnote-1)

## 1.2 **Food rescue: Integrating economic, environmental, and social contributions**

Food waste is not unique to the Israeli economy, and is evident in similar volumes in all Western economies. According to UN Food and Agriculture Organization (FAO) estimates, roughly a third of all food produced in the world is wasted, translating to a quarter of produced caloric value.

In 2015, the US and Europe announced far-reaching goals for reducing food waste by 50% by 2030. France legislated strict laws prohibiting supermarkets from discarding food and Italy passed similar measures for restaurants. The United Nations promulgated international standards so food waste can be measured in a uniform manner in all countries (see section 1.9 of this Executive Summary).

In Israel, despite initial steps reflecting regulatory awareness of the issue (proposed legislation, establishing an inter-ministerial investigative committee, and declarations by cabinet ministers) there have yet to be any concrete results; two years after a State Comptroller's Report warned about the lack of a clear government policy on the issue, there is still no national program for food rescue.

The importance of rescuing food stems from three central benefits:

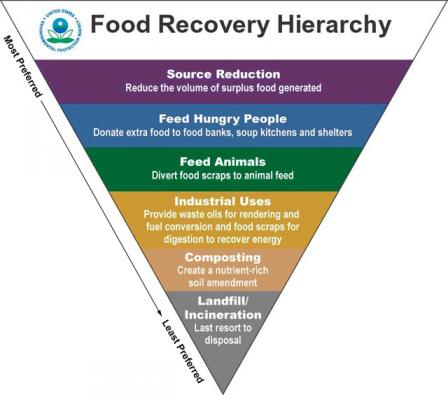
1. **Economic benefit** – Rescuing food means transforming zero or negative value waste to an economically valuable commodity, thus increasing the national product and productivity;
2. **Social benefit** – Waste reduction reduces social gaps and prevents food insecurity in weaker underprivileged populations; and
3. **Environmental benefit** – Waste reduction reduces pollutant levels, greenhouse emissions, and use of finite land and water resources.

The combination of these three food rescue characteristics creates a unique opportunity that requires the formation of an appropriate policy to reflect such benefits.

**Food rescue is the economic endeavor of transforming food surplus, currently of zero or negative value, to food of economic value distributed to the underprivileged populace.**

In terms of the **Global Food Recovery Hierarchy,** the first priority is the prevention of food waste, and use of this surplus food to feed the poor.

**The Economic-Environmental Hierarchy of Food Recovery**

Source: EPA

Many policy measures exist to address the needs of the underprivileged population, and deal with the problem of food insecurity. The most commonly used methods in Israel are support through donations, subsidies, allocations and allowances. The uniqueness of food rescue stems from its ability to help the needy at a low economic and budgetary cost. Instead of financing the full cost of food, it is necessary to finance only the cost of its rescue.

In socioeconomic discourse, there is constant disagreement, both in Israel and abroad, between proponents of prioritizing growth (“increasing the pie”) and proponents of prioritizing reduction of inequality.

**Food rescue is a unique policy measure because it inherently incorporates both approaches. Rescuing food and transferring it to the underprivileged populace increases national productivity while concurrently reducing inequality.**

## 1.3 **Food rescue = Alternative to food production**

Throughout the growing, production, distribution and marketing of food in Israel, approximately 33% of domestically produced food is lost and becomes waste or surplus. Food rescue is an economic action that transforms such surplus, with a zero or negative value, into food that is then distributed to the underprivileged populace.

**Economically speaking, food rescue should be viewed as a comprehensive alternative to excess food production.** However, in contrast to the usual food production processes, the raw materials relied on for food rescue are surplus that would otherwise have been wasted.

Consequently, food rescue creates the availability of food without the utilization of resources and costs of production, while also preventing the majority of detrimental environmental impacts resulting from the production process. **Food rescue is a winning formula for producing food without substantive reliance on natural resources, land or water pollution, and use of fertilizers or pesticides.**

**Food Rescue Benefits**

|  |  |  |
| --- | --- | --- |
|  | Food Production | Food Rescue |
| Product | **Nutritional Foods** | **Aesthetically Flawed Nutritional Foods** |
| Nutritional Value | 100% | 100% |
| Land Use | Yes | Negligible |
| Water Use | Yes | Negligible |
| Greenhouse Gas Emissions During Production | Yes | None |
| Use of Fertilizers and Pesticides | Yes | None |
| Logistics, Distribution and Transportation Costs | Yes | Yes |

**According to our estimates, approximately 50% of food waste is rescuable, equivalent to the production of 1.2 million tons of food, valued at NIS 8 billion.**

Currently, the majority of food rescue in Israel and abroad is carried out by NPOs, supported by donations. However, even if funding for food rescue is derived from donations, such activity is not primarily philanthropic or charitable, but an alternative economic means for food production, one that is clearly beneficial to the national economy, and contributes to reducing inequality.

According to a study conducted in Australia, the multiplier for the value of rescued food relative to rescue costs is 5.7. In other words, for every dollar spent rescuing food, 5.7 dollars’ worth of food is rescued. There are additional environmental and societal benefits generated by food rescue as well.

Based on the experience of Leket Israel, the cost of food rescue is approximately NIS 1.3 for every kilogram of food. The value of the food is NIS 5.1 per kilogram, yielding a multiplier effect of 1:3.8.

Therefore, each NIS 1.0 invested by NPOs in food rescue provides NIS 3.8 worth of food for the needy clientele they serve. Although the field of food rescue in Israel is still in its infancy, there seems to be enormous potential for expansion, utilizing economies of scale to reduce the cost of food rescue, and/or raise the value of rescued products, which would in time enable the increase of the multiplier making it similar to that in Australia. However, to be conservative in our estimations, we have based our assessments on the current cost structure.

In terms of benefits to the national economy, it is also necessary to consider the positive environmental and societal contributions of food rescue. We did not assess such impact in the context of the Israeli economy, but assuming such environmental and societal benefits are similar to the average costs around the world, the multiplier would then increase to 7.5. As a result, a calculation that includes environmental influences would mean that every NIS 1.0 invested in food rescue generates NIS 7.5 to the national economy.

**Food Rescue Feasibility Assessment**

**Food Cost / Benefit NIS (per kg.)**

|  |  |  |
| --- | --- | --- |
|  | To National Economy – Excluding External Factors | To National Economy – Including External Factors |
| Rescued Food Value[[2]](#footnote-1) | 5.1 | 5.1 |
| Environmental-Social Contribution (FAO) |  | 5.0 |
| Total – National Economy Value | 5.1 | 10.1 |

Source: BDO estimates

## 1.4 **Food rescue: Feasibility to the national economy**

The rescue of 451,000 tons of food annually, constituting 37% of all food waste in Israel, would fully bridge the food consumption gap between the normative expenditure of the general population and those suffering from food insecurity. The cost of rescuing food is estimated at NIS 1.3/kg. An investment of NIS 840 million would therefore rescue NIS 3 billion worth of food, equivalent to the total gap of food consumption.

Food rescue is clearly preferable compared to the alternative of attempting to bridge this food insecurity gap by means of allocations, donations, subsidies or support for the needy. Without food rescue, it would require an annual cost of NIS 3 billion to fully finance this gap. Food rescue allows for reaching a similar social goal at a significantly lower cost – NIS 770 million annually. Specifically, **food rescue alleviates food insecurity while incurring a 74% cost savings, and also provides significant social and environmental benefits**.

**Food Rescue: Summary of Estimated Feasibility to National Economy (in NIS Millions annually)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Percentage of Rescued Food from Food Waste | 2% (currently) | 10% | 19% | 25% |
| Rescued Food (in 1000 tons) | ‎24‎ | ‎119‎ | ‎238‎ | ‎451‎ |
| Part of Food Rescued from Food Insecurity Gap | ‎5%‎ | ‎26%‎ | ‎53%‎ | ‎100%‎ |
| Value of Rescued Food | ‎120‎ | ‎770‎ | ‎1,550‎ | ‎2,940‎ |
| Cost of Food Rescue | ‎30‎ | ‎200‎ | ‎400‎ | ‎770‎ |
| Benefit to National Economy (before external factors) | ‎90‎ | ‎570‎ | ‎1,150‎ | ‎2,170‎ |
| Environmental-Social Contribution (FAO) | ‎120‎ | ‎600‎ | ‎1,190‎ | ‎2,260‎ |
| Total Value of Food Rescue to National Economy | ‎210‎ | ‎1,170‎ | ‎2,340‎ | ‎4,430‎ |

Source: BDO estimates

The principles of economic theory dictate that revenue in goods is an inferior alternative to monetary revenues, as it deprives those receiving support of the freedom to allocate resources according to their full range of needs. Therefore, in principle, the general tendency is to choose the allocation of monetary support over the direct provision of products. However, **food rescue entails unique circumstances in which there is a clear economic preference for supporting the needy with products over money. This advantage stems from the specific characteristics involved in transforming waste into food, meaning that every shekel invested in food rescue generates a direct economic value 3.8 higher than the cost**. Moreover, taking into consideration the FAO estimates of external environmental and social impact, the increased benefit to the economy is 7.5 times that of the cost.

In this context, it should be noted that the food insecure also suffer from financial insecurity, evident in consumption gaps of other basic necessities (housing, health, education, etc.). It is reasonable to assume that food rescue would enable households to then choose to allocate some of the increased income to consume other goods. Socially speaking, these households view consumption of such products as prerequisites for ensuring their financial security. Therefore, beyond the direct value of the food distributed to them, they also benefit from now having additional resources to address other basic needs and services.

In September, 2015 the US government established a national food waste reduction goal of 50% within 15 years. Our analysis shows that rescuing 25% of food waste in Israel and its subsequent contribution to 450,000 households suffering from food insecurity, would fully cover the consumption gap relative to normative expenditure for these households. **For the national economy, such efforts would generate a value of NIS 2.2 billion annually, bridging the gap between the value of rescued food and food rescue costs**. This is even prior to considering the added benefits to the national economy in terms of poverty and inequality reduction, and before the external environmental impacts are factored.

**It should be emphasized that incremental implementation of a 50% national food waste reduction goal, spanning a 15-year period, is not expected to reduce the volume of agricultural production in Israel compared to current conditions, rather to reduce its growth from the natural rate of 1.8% to 0.6% annually.**

## 1.5 **Food Waste – How much food is wasted in Israel?**

Food waste estimates in Israel are based on a unique model of the value chain in domestic food production. Food waste in Israel is estimated at approximately 2.4 million tons annually, constituting 33% of overall domestic food production.[[3]](#footnote-2) In terms of quantities, roughly 73% of that food waste is in fruit and vegetables.

Findings of the 2016 Food Waste and Rescue Report indicate a decrease of 0.2 million tons in food waste, compared to the findings in the previous report. However, it seems that this decline does not indicate a change in trend; it is primarily the result of one time changes in Israeli agriculture, which experienced a 3.5% decrease in production that is mostly the result of a 6.3% decrease in crop production, due to natural conditions and residual effects of the *Shemitta* year. The drop during the production stage was partially balanced by the expansion of the consumption model used in the current report, which includes a separate analysis of food waste during institutional consumption (see section 1.7, below).

**Monthly Value (NIS) of Food Waste per Household in Israel**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Household Waste (monthly NIS) | Waste - Growing Stage | Waste - Packaging | Waste – Industry | Waste – Distribution | Waste – Consumption | Total |
| Fruit & Vegetables | ‎67‎ | ‎32‎ | ‎2‎ | ‎84‎ | ‎131‎ | ‎315‎ |
| Grains & Legumes | ‎3‎ | ‎2‎ | ‎1‎ | ‎13‎ | ‎134‎ | ‎152‎ |
| Meat, Fish & Eggs | ‎12‎ | ‎2‎ | ‎13‎ | ‎53‎ | ‎104‎ | ‎183‎ |
| Milk & Dairy | ‎4‎ | ‎1‎ | ‎1‎ | ‎2‎ | ‎17‎ | ‎24‎ |
| Total | **‎86‎** | **‎35‎** | **‎17‎** | **‎151‎** | **‎385‎** | **‎674‎** |

Food waste, up to and including the industrial stage

Food waste during distribution and consumption

Food waste, up to and including the industrial stage: NIS 4 billion

Food waste during distribution and consumption: NIS 15.5 billion

Food waste during distribution and consumption, out of food consumed (by value): 24%

Food waste out of GNP: 1.7%

Food waste up to and including the industrial stage, of the value produced by Israeli agriculture: 14%

**Food Value Chain in Israel (1000 tons) and Percentage of Food Waste in All Stages**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Fruits & vegetables** | **Grains & legumes** | **Meat, eggs & fish** | **Milk & dairy** | **Total** |
| **Agricultural production, quantity** | 4,278 | 523 | 690 | 1,493 | 6,985 |
| **Waste during agricultural production** | 542 | 24 | 29 | 52 | 648 |
| **Percent wasted** | 13% | 5% | 4% | 4% | 9% |
| **Quantity after harvesting and storage** | 3,736 | 500 | 661 | 1,441 | 6,338 |
| **Waste after harvesting and storage** | 286 | 20 | 4 | 7 | 318 |
| **Percent wasted** | 8% | 4% | 1% | 1% | 5% |
| **Industrial usage** | 587 | 476 | 546 | 1,422 | 3,032 |
| **Lost during industrial usage** | 20 | 9 | 27 | 17 | 74 |
| **Percent wasted** | 3% | 2% | 5% | 1% | 2% |
| **Net imports, minus other uses** | 25 | 887 | 130 | 133 | 1,176 |
| **Distribution and retail** | 3,303 | 1,347 | 759 | 1,550 | 6,958 |
| **Waste during distribution** | 349 | 25 | 39 | 8 | 421 |
| **Percent wasted** | 11% | 2% | 5% | 1% | 6% |
| **Consumption** | 2,953 | 1,322 | 719 | 1,542 | 6,537 |
| **Waste during consumption** | 522 | 245 | 75 | 80 | 923 |
| **Percent wasted** | 18% | 19% | 10% | 5% | 14% |
| **Total waste** | 1,720 | 323 | 176 | 165 | 2,384 |
| **Percent wasted, out of agriculture production** | 40% | 62% | 25% | 11% | 34% |

Source: BDO estimates. Percentages of waste are rounded to the nearest percentile to facilitate presentation.

In monetary value, some 20% of the value of waste, worth approximately NIS 4 billion, is during the production stages, and the remaining nearly 80% of the waste, worth approximately NIS 15.5 billion, is during distribution and consumption.

A comprehensive value chain model for various food production and consumption stages was designed to assess food waste and the potential for food rescue in Israel. This model is based on a bottom-up approach, and includes analysis of data relevant to agricultural production, import, export, industry, distribution, and a sample of consumption patterns of 50 various foods.[[4]](#footnote-3)

Input and output analysis was conducted for each of the food groups in terms of quantity of gross agricultural production and rate of waste, in each of the four value chain stages. The overall food waste estimate, and estimates of specific foods, was based on the total waste incurred for each of the products and stages.

One of the major challenges of analyzing food waste and the potential for food rescue in Israel is the lack of any data-gathering mechanisms, or monitoring of relevant data. This absence of data was also extensively discussed in the 2014 State Comptroller's Report. The data regarding food waste presented in this report is based on estimates we conducted, weighing a wide range of information sources and statistics available, including conversations and interviews with experts in the field, study findings and results of previous reviews, international comparison studies and more.

The 2016 Food Waste and Rescue Report includes improvements in the database and methodology that were made possible by information received from the Ministry of Agriculture, the Israeli Central Bureau of Statistics, and the Volcani Institute.

**Food Waste Estimate in Israel (Thousands of Tons)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Thousands/Tons | Growing Stage | Processing & Packaging | Industry | Distribution | Consumption | | Total |
| Fruit & Vegetables | ‎542‎ | ‎286‎ | ‎20‎ | ‎349‎ | ‎522‎ | ‎1,720‎ | |
| Grains & Legumes | ‎24‎ | ‎20‎ | ‎9‎ | ‎25‎ | ‎245‎ | ‎323‎ | |
| Meat, Fish & Eggs | ‎29‎ | ‎4‎ | ‎27‎ | ‎39‎ | ‎75‎ | ‎176‎ | |
| Milk & Dairy | ‎52‎ | ‎7‎ | ‎17‎ | ‎8‎ | ‎80‎ | ‎165‎ | |
| Total | **‎648‎** | **‎318‎** | **‎74‎** | **‎421‎** | **‎923‎** | **‎2,384‎** | |

Source: BDO estimates

There is a great variance in food waste among the different foods reviewed, as well as in the stage in the value chain in which the waste occurs. The value of agricultural produce per ton increases as it progresses down the value chain of production and as additional inputs are invested—including those required by sorting, processing, transport and distribution. We assess the value of waste in the early stages of production (growing, packaging and manufacturing) on the basis of wholesale price paid to farmers. Waste during the later stages in the value chain is estimated based on retail food prices.

**We estimate the economic value of food waste in Israel at approximately NIS 19.5 billion, constituting 1.7% of domestic production.**

This estimate is approximately NIS 1.5 billion higher than our estimate for 2015 despite the quantitative decrease in the amount of waste. This is primarily because the expanded model now includes waste during institutional consumption, which has a higher monetary value than waste at the agricultural stage where values are relatively low.

Food waste can be divided into two stages of the food value chain:

1. From initial agricultural production to final stage of industrial food processing (food waste in production).
2. From distribution and retailing to final loss at the consumer level (food waste in consumption).

The value of food waste in initial stages, up until distribution, is estimated at approximately NIS 4 billion, constituting 14% of overall domestic agricultural produce in Israel. The total of food waste in the latter stage, from packing houses to final household or institutional consumers, is approximately NIS 15.5 billion, constituting about 21% of food retail revenues in Israel.

|  |  |
| --- | --- |
| Food waste (value) | NIS 19.5 billion |
| Food waste, out of GNP | 1.7% |
| Food Waste before distribution | NIS 4 billion |
| Food Waste before the manufacturing stage, from total agricultural production (%) | 14% |
| Food waste in the distribution and consumption stages | NIS 15.5 billion |
| Waste in distribution stage as percentage of retail revenue | 21% |

Source: BDO estimates

The large share of waste from fruits and vegetables in Israel stems both from their large share in domestic agricultural production, and from the high rate of waste (40%) during the value stages. A high waste rate of fruit and vegetables is not exclusive to the Israeli economy. Compared to international data, Israel’s waste rate in this category is similar to that in Europe. Israel has a lower overall waste rate than the US. Compared to the US, there is less waste during the production and consumption stages, but greater waste in the intermediary stages. **The 2016 report shows a decrease in the rate of waste, beyond the decline in the amount of produce. Among the reasons for excess production is the desire to ensure unbroken supply even during years when production suffers because of external factors (for example, weather, etc.)**. Reduction in the annual amount of rescuable waste in a year when production is lower indicates that excess food is indeed used, at least in part, as a reserve to ensure food suppliers even during difficult years.

**International Comparison of Fruit/Vegetable Waste (Loss)**

Source: FAO

**Food Waste Estimate in Israel - Select Products**

Source: BDO estimates

Total food waste in all value chain stages, translates to a loss of approximately NIS 647 per household in Israel per month, as the result of wasting approximately 82 kg of food per household per month. Quantitatively speaking, approximately 61% of this waste is incurred during production, manufacturing and distribution, prior to food reaching household or institutional consumers. In monetary values, roughly 57% is lost, or wasted, during consumption. Because of the decrease in production, the 2016 Food Waste and Rescue Report shows an increase in imports in order to meet demand, which increases each year because of population growth. Thus the estimate for waste in the field is smaller but there is an increase in the estimated amount of waste during consumption, and also an increase in the total monetary value of the waste (despite fewer tons were wasted).

## 1.6 **Food Waste – How Much Food Can Be Rescued?**

Roughly 33% of food produced in Israel is lost or wasted, during the production, distribution and consumption stages, totaling 2.4 million tons annually. This translates to food wasted valued at NIS 19.5 billion, equivalent to 1.7% of the GNP. About half of this waste is considered unworthy of human consumption due to natural deterioration, damage during the production processes, and the like, and is therefore not considered potentially rescuable.

In terms of food rescue, the most important component are edible foods (fit for consumption with nutritional and health benefits that do not reach consumers). There are various reasons for loss in each of the stages of the food value chain. The common denominator is lack of economic viability to food producers (i.e. farmers, industrialists, distributors, etc.) to invest additional resources in the more advanced stages of the production and distribution chain.

|  |  |
| --- | --- |
| Rescuable Food | Food Waste Unworthy  of Human Consumption |
| * Pre-harvested edible agricultural produce | * Sick livestock or carcasses |
| * Aesthetically flawed agricultural produce | * Diseased food |
| * Agricultural produce not sold in wholesale markets | * Damaged or contaminated food |
| * Unsold food surplus in supermarkets/stores | * Spoiled food |
| * Surplus prepared food from catering, industrial kitchens & restaurants | * Production leftovers (peels, seeds, skin, fat) |
| * Packaged food with damaged packaging or misshaped | * Food already served and left unconsumed |
| * Food nearing its sell-by date that will not be sold |  |

It is evidently clear that zero food waste is an impossible goal. However, reducing food waste, either by prevention or by rescuing surplus, should be a primary public objective.

Estimates of food fit for rescue is derived from the food value chain model designed specifically for the food industry. Classification into rescuable (worthy of consumption) vs. unrescuable food were analyzed according to each food type, and their loss rates, in each of the value chain stages.

It is important to note that classification of rescuable foods does not address economic viability of rescue, but rather the technical ability to use this food waste to feed people. According to our estimate, roughly 50% of food waste is rescuable and can, given appropriate resources and economic viability, serve to feed needy populations suffering from food insecurity.

**Estimate Amounts of Rescuable Food in Israel (thousands of tons)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Total Consumption | Total Local Production | Loss | Percentage of Loss | Recoverable Loss[[5]](#footnote-4) |
| Fruit | 939 | 1,548 | 549 | 247 | 35% |
| Vegetables | 1,245 | 1,990 | 989 | 660 | 50% |
| Potatoes & Starch | 318 | 740 | 267 | 176 | 36% |
| Grains & Legumes | 855 | 523 | 317 | 49 | 60% |
| Meat, Fish & Eggs | 654 | 690 | 181 | 66 | 26% |
| Milk & Dairy | 1,473 | 1,493 | 169 | 35 | 11% |
| Total | **5,485** | **6,985** | **2,472** | **1,232** | **35%** |

For analytical purposes, we did not classify food waste during household consumption as rescuable. There are various approaches to the issue of food waste in household consumption. Western culture is based on the notion of consumerism and prosperity, and it seems that consumers extract benefit (and enjoyment) not only from food consumption, but also from a range of selections and even excess. Economically, as long as consumers pay the full amount for purchased products, no restrictions should be placed on their consumption. The problem in food rescue is that, while food production entails using natural resources and the exacting of environmental impact, its external costs are not calculated in the price paid by consumers for food - aspects that were not reviewed in our study. However, these circumstances may justify actions to reduce waste, such as by raising public awareness regarding the external repercussions of producing food that is left unconsumed.

Conversely, institutional consumption creates a substantial amount waste that can also be attributed, in part, to the culture of prosperity. However, in the case of institutional consumption there is potential for significant rescue, due to the logistical advantages of having the excess food found concentrated in a relatively small number of locations.

## 1.7 **Food waste and rescue in institutional consumption**

Approximately 20% of the food consumed in Israel is served institutional contexts: meals served at factories, workplaces, IDF bases, police stations, hotels, catering halls, restaurants, schools, hospitals and elsewhere.[[6]](#footnote-5)

Household consumption has a low economic feasibility of food rescue because of the high logistical costs resulting from the wide physical distribution of the excess meals. In institutional settings, where many people are served food together in one place, there is greater potential for food rescue. Therefore, we consider it paramount to analyze the amount of food wasted in the institutional sector.

According to the BDO estimates, on an average day in 2016 approximately 1.8 million people ate one meal away from home, for a total of some 640 million meals each year. Approximately 722,000 tons of food are used to prepare these meals. The value of food component in meals eaten away from home is estimated to be NIS 12.5 billion annually, equivalent to approximately 17% of the total expenditure for food in Israel, and approximately 11% of the food consumed in quantitative terms.

According to the 2016 Food Waste and Rescue Report, the total amount of food wasted in the institutional sector totals 214,000 tons annually, which are 30% of institutional food consumption. In monetary terms, the cost of the food (alone) in these meals totals approximately NIS 3.5 billion annually.

**Estimated Food Waste in Institutional Consumption**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Relevant population [[7]](#footnote-6) | Daily meals/ person | Meals served (yearly) | Food consumed (yearly) | Annual waste | Rate of waste | Rescuable waste | Rescuable waste as share of consumption | Rescuable Meals |
|  | 1000 people | Meals | Million meals | 1000  tons | 1000  tons | % | 1000  tons | % | Million meals |
| Events | ‏125‏ | ‏1.1‏ | ‏51‏ | ‏103‏ | ‏44‏ | ‏43%‏ | ‏19‏ | ‏18%‏ | 13 |
| Hotels | ‏91‏ | ‏1.5‏ | ‏48‏ | ‏83‏ | ‏31‏ | ‏37%‏ | ‏7‏ | ‏8%‏ | 5 |
| Hospitals | ‏190‏ | ‏1.4‏ | ‏94‏ | ‏75‏ | ‏24‏ | ‏32%‏ | ‏7‏ | ‏10%‏ | 10.5 |
| IDF | ‏186‏ | ‏1.7‏ | ‏98‏ | ‏122‏ | ‏38‏ | ‏31%‏ | ‏15‏ | ‏12%‏ | 14.5 |
| Police | ‏29‏ | ‏0.8‏ | ‏8‏ | ‏10‏ | ‏3‏ | ‏29%‏ | ‏1‏ | ‏9%‏ | 1 |
| Workplaces | ‏400‏ | ‏0.7‏ | ‏101‏ | ‏169‏ | ‏49‏ | ‏29%‏ | ‏17‏ | ‏10%‏ | 12 |
| Prisons | ‏29‏ | ‏2.5‏ | ‏26‏ | ‏18‏ | ‏4‏ | ‏25%‏ | ‏1‏ | ‏5%‏ | 1.5 |
| Educational institutions | ‏360‏ | ‏0.5‏ | ‏65‏ | ‏32‏ | ‏5‏ | ‏16%‏ | ‏1‏ | ‏3%‏ | 2 |
| Restaurants | ‏403‏ | ‏1.0‏ | ‏147‏ | ‏110‏ | ‏16‏ | ‏14%‏ | ‏3‏ | ‏3%‏ | 4.5 |
| Total | ‏1,813‏ | ‏1.0‏ | ‏638‏ | ‏722‏ | ‏214‏ | ‏30%‏ | ‏71‏ | ‏10%‏ | 13 |

In our estimate, approximately one-third of the institutional meals now wasted are rescuable, meaning that it would be possible to save approximately 70,000 tons of food, equivalent to approximately 60 million meals, with a total value of approximately NIS 1 billion each year on average.

Food waste in institutional kitchens is an inevitable part of the economic planning of meals for a large number of diners, while guaranteeing that the supply and variety meet the requirements of many diverse diners, and while taking account of the inherent elements of uncertainty.

Institutional kitchens in workplaces, the IDF, catering halls and hotels need to ensure a varied supply of food in sufficient quantity under conditions of uncertainty. This uncertainty is inherent because it is difficult to fully anticipate how many people will attend an event, how many workers will be absent on a given day, or how many soldiers will decide not to eat in the dining room on their base.

For several years now, most institutional kitchens have been operated by external companies with a high level of expertise in the field. They strive for maximal economic efficiency and reduction of waste. Despite this, catering cannot be planned on the basis of averages alone. Rather, it is necessary to provide appropriate food even on non-average days. Therefore, food preparation must allow for sufficient margins to accommodate the risk of variance, rather than relying solely on statistical averages.

Our analysis shows that, as a rule, a kitchen characterized with a higher level of uncertainty regarding the number of diners can be expected to produce a higher level of waste. For example, on open army bases and workplaces, where there are accessible alternatives, the food waste will be higher than in schools and prisons, where there is less uncertainty about the number of meals to be served.

In addition, the more varied the menu, the greater the amount of waste that can be expected because of uncertainty regarding which choices diners will prefer. Accordingly, a higher level of waste can be expected at events and in hotels, where a wide variety of choices is offered, than in workplaces, the IDF and police.

The style of service and payment can also influence the amount of waste. In restaurants where food is prepared only after it is ordered, less waste is expected than at a buffet where food must be prepared in advance. In situations where the consumer pays only for what is eaten, the amount of waste will be lower than it is restaurants that charge an inclusive price.

The table below presents a summary, in quantitative terms, of the BDO model for estimating food wastage in the institutional sector.

The highest amount of waste in the institutional sector is at events, including both weddings and other family occasions, and business events. The amount of waste at these events is approximately 43%, of which 18% is rescuable. The high rate of waste in this sector is caused by the need to offer a diverse menu, and is an inescapable component of the Western culture of prosperity. In the culture of plenty prevalent in Israel, creating a surplus of food is a rational economic act on the part of event operators and hosts. Despite the high rate of waste, our results show that the cost of wasted food accounts for approximately 4% of the price of an entire event. On the assumption that the waste is created is the consequence of the desire to give guests a feeling of plenty, it seems that hosts will continue to pay for this extra cost in order to ensure variety and abundance.

The rate of waste in hotels is slightly lower, approximately 37%, of which 8% is rescuable. Our analysis shows that although hotels offer a wide variety of foods, they achieve a significant decrease in rescuable waste because of the continuous nature of their activity that enables them to serve surplus, rescuable food to employees. This kind of reuse is not possible in catering halls where, by definition the event ends after the meal is served, and the staff is not employed around the clock, as it is in hotels.

**Rate of Food Waste by Category of Institutional Consumption**

Rescuable and Non-rescuable waste

Restaurants, Educational institutions, Prisons, Workplaces, Police, IDF, Hospitals, Hotels, Events

Rescuable waste; Non-rescuable waste

Catering halls, hotels, workplaces and hospitals produce the highest level of non-rescuable food waste. At events and in hotels, the high percentage of non-rescuable waste is mostly food that remains on diners’ plates because of the generous servings and variety. In hospitals, the percentage of waste is similar but there food more often remains uneaten because of patients’ health and lack of appetite. However, the value of the food wasted at hospitals is lower because value of an average meal is lower, also because the calculation includes three meals a day, not only the main meal.

The value of the wasted food in the IDF is estimated at approximately NIS 300 million annually, which is 0.5% of the IDF’s budget for 2016, and approximately 8% of the food wasted in the institutional sector. Of this, approximately 40% of the wasted food in the IDF is rescuable.

The lowest levels of food waste in the institutional sector are found in educational institutions and restaurants. There is less waste in educational institutions because the consumers of the catered food there do not have an alternative for eating elsewhere. Moreover, the reporting system facilitates good predictive abilities, and there is very little variation from one day to the next, making it easier to supply each school with the appropriate number of meals for the actual number students in attendance.

In restaurants, the amount of food waste is reduced because of the style of service: most of the food is prepared in real-time, in response to consumers’ preferences and the orders they place. This also reduces the amount of non-rescuable waste that has been served on plates. Conversely, this process increases costs. Therefore, it is generally inappropriate for large-scale institutional service and hotels.

The total amount of food rescuable from the institutional sector is valued at approximately NIS 1.1 billion. Approximately half of this amount is from events, from which we believe it is possible to rescue approximately 18,000 tons of food, with a monetary value of NIS 0.5 billion, annually. Hotels, IDF bases and workplaces are other important focal points for food rescue, and it should be possible to rescue food worth NIS 110-180 million annually from each of these sources. The value of rescuable food from restaurants is similar, approximately NIS 108 million, but it seems that the broader geographical distribution and the lack of a critical mass in any single location generally reduces the economic feasibility of rescuing food from restaurants.

**Annual summary: Rescuable Food from the Institutional Sector**

**in NIS millions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Meals/year | Market size | Total waste in NIS | Rescuable waste in NIS |
|  |  |  |  |  |
| Events | 51 | 2,732 | 1,167 | 493 |
| Hotels | 48 | 1,758 | 665 | 147 |
| Hospitals | 94 | 583 | 187 | 57 |
| IDF | 98 | 970 | 300 | 107 |
| Police | 7 | 92 | 27 | 9 |
| Workplaces | 97 | 1,779 | 514 | 178 |
| Prisons | 26 | 125 | 31 | 7 |
| Educational institutions | 65 | 487 | 80 | 14 |
| Restaurants | 147 | 3,984 | 567 | 108 |
| Total | 633 | 12,510 | 3,538 | 1,120 |

**The yield on the investment for rescuing food in the institutional sector is significantly higher than elsewhere**. According to data from Leket Israel, a meal worth NIS 15 can be rescued for an investment of only NIS 1.3. Therefore, the value multiplier for the value of food rescue from the institutional sector is 11. This high multiplier is the result of the relatively high value of the rescued product, and the relatively low logistical costs per quantity of meals, because the food is usually collected from kitchens at central locations, either in city centers or in industrial areas.

## 1.8 **Food security – How much food is required to close the food consumption gap in Israel?**

One of the greatest challenges facing the Israeli economy is the problem of inequality in distribution of income. The inequality level in Israel, measured by the Gini (Inequality) Index, is one of the highest of developed economies, excluding the US, Turkey, Chile, and Mexico. Food insecurity is one of the consequences of income inequality.

**Israel's Ranking in Inequality and Food Security**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Israel | OECD Average | OECD Index  Israel ranks 34 of member states. High rank = High inequality |
| Gini Index (inequality) | 0.37 | 0.32 | 5 |
| Poverty Rate | 18.8% | 11% | 1 |
| Food Security Index | 79 | 78 | 13 |
| (%) Food Expenditure to PCE | 16% | 14% | 8 |

\* Israel’s rank among 34 countries.

Source: USDA and Global Food Security Index

Relying on World Health Organization definitions, also used by the National Insurance Institute of Israel (NII), food security is based on three key pillars:

1. **Food Availability**: Sufficient quantities of food available on a consistent basis;
2. **Food Access**: Sufficient resources to obtain appropriate foods for a nutritious diet; and
3. **Food Use**: Awareness to proper use of food as well as adequate water and sanitation.

Using these criteria, which are primarily subjective, the NII estimates that approximately 18% of Israel's population suffers from food insecurity; of this number, 10% are in severe food insecurity, and an additional 8% in moderate or mild food insecurity.

According to The Economist 2015 Global Food Security Index, Israel is ranked 13th in food insecurity among member states of the Organization of Economic Cooperation and Development (OECD). Among OECD countries, Israel is ranked 8th in household expenditure on food.

**Food Security Index - International Comparison 2015**

**Percent (%) Food Expenditure to PCE 2015**

Source: Economist 2015 Global Food Security Index

Comparison of inequality and food insecurity data indicates that the US and Israel have similarly high inequality and poverty levels, however paradoxically food security in the US is among the highest in the developed world. It seems that the high US measure of food security, despite high general inequality, is the result of many years of public awareness to the problem of food insecurity, evident among other things by the American reliance on food stamp programs to ensure food provision to the needy. Furthermore, the US is a pioneer in instating food banks to save surplus and distribute it to underprivileged populations, and is a world leader in establishing policies to remove obstacles for food waste and reuse. As early as 1996, the US passed the Good Samaritan Food Donation Act to protect those involved in food rescue from litigation.

**Despite similar inequality and poverty rates in Israel and the US, food expenses as part of the Personal Consumption Expenditure (PCE) in Israel is among the highest in the world, measured at 16% - a number 2.5 times that of the US. Therefore, a policy of food rescue and distribution to the underprivileged populace is an effective welfare policy particularly applicable to Israel, where a significant portion of household expenditure is allocated to food.**

The definition of food security is subjective. In order to examine food rescue effectiveness as a policy measure to increase food security in Israel, we relied on the methodology of Chernichovsky and Regev[[8]](#footnote-7) to define normative food expenditure as a measure of expenditure that remains constant even with an increase to household income.

To examine normative food expenditure[[9]](#footnote-8), we reviewed expenditure on food of the lowest percentiles relative to normative levels. Our analysis demonstrates that in the three lowest percentiles (in terms of standard per capita consumption), food expenditure was roughly half that of the normative level.

**Per Capita Food Expenditure in Israel to Normative Expenditure (percentile distribution)**

Food Insecurity

x Axis: Household Percentile (Consumption)

y Axis: Standard Per Capita Monthly Expenditure

According to our estimates, the volume of food required to bridge the gap between actual food consumption of food insecure populations and normative consumption level (average levels of second-to-fifth percentiles), is valued at NIS 3.2 billion. The cost of eliminating this food expenditure gap relative to normative level for the severely nutrition-deprived population (10% of Israeli households) is estimated at NIS 2.2 billion, with an additional 1.0 billion NIS required to assist populations experiencing moderate nutritional insecurity.

**Food Expenditure Gap Relative to Normative Consumption Expenditure**

**for Nutritionally Insecure Populations (in millions NIS)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Value of Food Required to Bridge the Gap for Severe Food Insecurity | Value of Food Required to Bridge the Gap for Moderate Food Insecurity | Total Gap in Food Expenditure |
| Fruit & Vegetables | ‎550‎ | ‎202‎ | 753 |
| Bread & Grains | ‎305‎ | ‎106‎ | 411 |
| Meat, Fish & Eggs | ‎583‎ | ‎229‎ | 812 |
| Milk & Dairy | ‎308‎ | ‎124‎ | 432 |
| Other Foods | ‎398‎ | ‎137‎ | 535 |
| Total | ‎2145‎ | ‎797‎ | **2,943** |

Source: BDO estimates

The rescue of 451,000 tons of wasted food each year, constituting 37% of overall food waste in Israel, will enable the closing of the food gap in Israel. According to our estimate, NIS 770 million would enable the rescue NIS 3 billion in food, equivalent to the gap between food expenditure of food insecure populations and normative expenditure levels.

## 1.9 **Developments in food rescue, in Israel and globally**

This year, the trend towards rescuing more food continued in Israel. Based on data provided by Leket Israel, BDO estimates that food rescue in Israel increased by approximately 20%. Leket Israel is the largest food rescue organization in Israel and responsible for most food rescue in the country. With the assistance of approximately 52,000 volunteers, Leket Israel rescues food worth approximately NIS 72.4 million each year. In 2015, Leket Israel increased the amount of cooked food it rescues by 18%, and the amount of rescued harvest by 21%. During the year, Leket Israel rescued approximately 14,000 tons of food.

The rescue of cooked meals, which is unique on the global scene, grew substantially this year, for the third consecutive year. Projects for collecting food from hotels in Eilat and IDF bases continued for second year and grew substantially. Significant activities in the past year include:

1. Expansion of the program for collecting cooked meals in Eilat: The Isrotel and Dan hotel chains joined the project that began with the Fattal chain last year. This enabled a larger amount of food to be collected while streamlining the collection routes, and improving the support provided by the organizational infrastructure in Be’er Sheva.
2. Expansion of activity with the IDF. There was a significant increase in the number of IDF bases, around the country, that donate food. More efficient collection of meals from bases, by either NPOs or Leket Israel’s professional teams and specially designed vehicles, made it possible to transport more nourishing, quality meals to soup kitchens throughout Israel.

During 2016, due to growing international awareness, international institutions and countries around the globe instituted measures to reduce food waste. A consortium of leading international organizations, including the United Nations, announced the first-ever international standard for measuring food waste.

The UN itself, and the Food and Agriculture Organization of the United Nations (FAO) are working towards implementing a uniform international standard for estimating the extent of food waste worldwide. This effort is expected to facilitate compliance with the goal set by the UN last year: reducing the amount of food waste by 50% by 2030.

In February 2016, **France** became the first country in the world to prohibit supermarkets from discarding food. The law passed unanimously in the French Senate, and effectively forces all supermarkets and groceries with a selling area exceeding 400 m² to contribute any excess food to food banks rather than discarding it. In other EU countries there have been calls to adopt the French legislation, and Italy has begun the process of adopting similar legislation.

On January 1, 2016, **France** increased the supervision of restaurants and caterers. Restaurants that serve 150 or more people per day must now recycle food if it adds up to more than 10 tons annually. Restaurants that do not comply are liable to a fine of €75,000.

**Italy** has begun the legislative process for a measure similar to the French law prohibiting supermarkets from discarding food, and requiring them to work with food rescue organizations. This proposal, which passed in the lower house of parliament, is currently being debated in the Italian Senate. The main difference between proposed Italian legislation and the French law is that France fines violators, while the Italian law offers incentives, in the form of tax breaks, for those who rescue food.

**Great Britain** adopted a multiyear plan to reduce food waste by 20% during the coming decade. The program will be managed by the governmental Food Standards Agency (FSA) in cooperation with the food rescue organization WRAP. The program will be implemented in cooperation with private sector organizations along the food-manufacturing chain, and be accompanied by a campaign entitled, “Love Food – Hate Waste.” According to FSA, the campaign will save approximately ₤20 billion during the coming decade.

In 2016, increasing awareness of the issue of food waste was also observed across the United States. After the government declared, in September 2015, a national goal to halve the amount of food waste by 2030, large food manufacturers including Unilever, Kellogg’s and Nestlé, expressed their support for the program. These large manufacturers announced a series of measures to reduce food waste, and the adoption of technologies for measuring and reducing waste. Kellogg’s set a target of reducing the amount of food sent to landfill to zero by 2020. Furthermore, the corporations declared that they would support campaigns to increase awareness, and educate about the issue of preventing food waste.

**It seems that international awareness of food waste is increasing and becoming stronger. Therefore, we expect that during the coming year more governments, NGOs and corporations will adopt measures for reducing food waste around the world. Similarly, the accessibility of innovative technologies will be utilized for the benefit of this global effort. Israel will no longer be able to ignore the need to act consistently with the international effort to fight food waste. Local decision-makers must decide to implement a comprehensive national plan to reduce food waste in Israel**.

## 1.10 **Obstacles and Policies to Encourage Food Rescue**

A special report of Israel State Comptroller in 2015 concluded that Israel should adopt a comprehensive food rescue policy. This issue is on the agenda around the world, and many countries have begun to undertake significant measures to reduce food loss along the production chain, and during consumption by final consumers. The steps taken in Israel today are insufficient and a comprehensive, budgeted inter-ministerial effort is necessary to create significant change on the ground.

The 2016 National Food Waste and Rescue Report, similar to its predecessor in 2015, outlines the high feasibility of food rescue, from economic, social and environmental perspectives.

**Economic**: This is a clear instance of market failure. At market prices, it is not economically viable to rescue food, but if one considers food’s true ‎economic value, reflecting its alternative and nutritional value, food rescue is indeed very worthwhile.‎

**Social**: Rescued food donated to the underprivileged populace reduces inequality and improves food security for residents of the country.

**Environmental**: Food rescue saves many resources including energy, water, soil and chemicals. In addition, it will reduce the emission of greenhouse gases.

From our perspective, the initial policy measures needed to encourage food rescue in Israel are:

1. **Finalizing legislation to encourage food surplus rescue,** similar to the USGood Samaritan Food Donation Act. Proposed legislation passed the preliminary reading in the Knesset plenum. It is now necessary to complete the debates in the Health and Welfare Committee of the Knesset, in order to submit the bill for first, second, and third readings.

A law encouraging donations of surplus food should limit the civil or criminal liability of NPOs that distribute food that meets standards and guidelines, while exempting food donors from liability. Similar laws already exist in several countries. In 1996, the US passed a federal law exempting any person, corporation or government authority from civil or criminal liability for damage caused by the food donated in good faith to an NPO for redistribution to the needy, on the condition that the food meets necessary standards for quality and labeling (Bill Emerson Good Samaritan Food Donation Act).

1. **Requirement of food rescue of all governmental and government-financed institutions.** Requiring state-funded organizations with kitchens catering to 1,000 or more patrons daily (either directly or through subcontractors) to collaborate with registered food rescue NPOs as a condition for government support (including defense agencies, school catering programs, government companies, etc.). In addition, these organizations will be required to include a section requiring donations of surplus food to their contracts with food suppliers.
2. **Determining national food rescue goals,** to reduce food waste by 50% by the year 2030, as specified by the UN.

Setting a national goal carries more significance than merely raising awareness about an issue; it is a governmental commitment to act towards achieving the goal. Furthermore, it also necessary to establish ongoing measurement and monitoring tools to review progress and implementation.

1. Expand the Ministry of Welfare tender: In 2016 a tender was issued for supplying food, fruit and vegetable coupons for rescued food to 10,000 families, with a total value of NIS 36 billion (with half of the funding coming from the Ministry, and the other half from the company granted the tender). This tender should be expanded to include more families, with a significant increase in budget allocations for 2017-18.
2. An inter-ministerial program to reduce food rescue, and allocate resources in the two-year budget.

1. We are grateful to the Ministry of Agriculture, particularly Ori-Tzuk Bar, Zippi Freidkin and Yael Kachal. The Central Bureau of Statistics (Prof. \_\_\_), the staff of Volcani Institute (Prof. Ron Porath and his team) for the fruitful cooperation that made it possible for us to improve our database and technology. We are also grateful to the Restaurant Association, Dan Hotels, ISS catering, the Ministry of Health, the Organization of Catering Hall Owners and R2M restaurants for their cooperation in providing data on institutional consumption. [↑](#endnote-ref-1)
2. Market price of alternative product with similar nutritional value. [↑](#footnote-ref-1)
3. The value chain model does not include beverages, energy boosters, sugar, honey and candy. [↑](#footnote-ref-2)
4. We are aware such estimates may include deviations or inaccuracies that are inevitable in view of lacking any official data. Additionally, the volume of annual food waste also depends on random variables, such as weather conditions, natural events and pests, deviations in demand, etc. The data presented here is based on an annual analysis and average weather conditions. It does not include impact of singular events or deviations from the norm. This data is indicative and intended to serve as the basis for public debate, and further research and study. [↑](#footnote-ref-3)
5. Waste of grains and legumes was calculated as a percentage of consumption because few grains are produced in Israel. [↑](#footnote-ref-4)
6. In the model, each of these branches is weighted according to the characteristics of the meal it serves. [↑](#footnote-ref-5)
7. This figure is based on the number of workdays relevant to each category. The estimate also distinguishes between different populations within each category. [↑](#footnote-ref-6)
8. **Patterns of Expenditure on Food in Israel, Taub Center, 2014.**  [↑](#footnote-ref-7)
9. **Excluding "dining out", alcoholic beverages and carbonated beverages.** [↑](#footnote-ref-8)