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| **FOOD WASTE AND ITS ECONOMIC DIMENSION IN RETAIL AND HOUSEHOLD STAGE[[1]](#footnote-1)** |

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**Abstract**

This study takes into account the waste of food products, which is one of the wasted resources, and the food products included in the CPI, how much of a share of food waste is in Sakarya province and how much this share is in the economy of Sakarya, what are the effects on consumption and savings, and the effects of these effects on consumption and savings. It aims to determine how it is reflected in the social structure, how much wastage is in the goods in question, and whether it has any effects on the socio-economic structure. With this aspect, the study aims to both fill the gap in the literature and contribute to the socio-economic field.Mixed research method was used in the study. With the simple random sampling method, which is one of the quantitative research methods, a questionnaire was applied to the households residing in Adapazarı, Erenler Serdivan, the districts of Sakarya, and the data obtained were analyzed with the SPSS 26 program and frequency analysis was carried out to determine the demographic characteristics of the participants and the waste of food products. In this study, case study design, one of the qualitative research methods, was preferred. In this study, the direct (simple) observation method, which is a type of observation according to its structure, was used. The classification analysis method of the remaining wastes was used because the waste management system can be managed and planned with the obtained data and it gives information about the quantitative status of the remaining wastes. The research, which primarily aims to identify food waste in Sakarya, is based on the retail (market) and consumer food waste formulation in the "Food Waste Life Cycle Model" put forward by Venkat (2011). According to the results of the research, it has been determined that the monthly total amount of products purchased for consumption is 3 tons 708 kg, and 927 kg per week. Among the products that are not consumed and left behind, bulgur has the highest share with 13.22%. In addition, among the products left, dry beans have a share of approximately 10%, pears/quinces have a 12% share and peaches have a 10% share. The weekly food waste per person of the household participating in the research is 2.08 kg, and it is 99.84 kg annually. It has been determined that the annual food waste amount of the household is 567,107.88 TL, the monthly total food waste amount is 47,258.99 TL, and the weekly amount is 11,814.75 TL. In addition, it has been determined that the weekly food waste amount per person of the household is 26.5 TL. As a result of the observation and classification study carried out in the Wednesday market, 302 kg of vegetables and 381 bunches of greens (dill, green onion, parsley, etc.) were collected. The total value of the products obtained at the end of the study was determined to be 2.112.32 TL. The weekly average value of the products obtained is 192.02 TL. It has been observed that products such as peppers, salads, tomatoes and onions are wasted the most in the market.

Key Words: consumption, food waste, food supply chain, household, retail.

**Özet**

Bu çalışma israf edilen kaynaklardan bir tanesi olan gıda ürünlerinin israfını TÜFE’de yer alan gıda malları dikkate alarak gıda israfının Sakarya ili içerisinde ne kadarlık bir paya sahip olduğunu ve bu payın Sakarya ekonomisindeki yerinin ne kadar olduğunu, tüketim ve tasarrufa etkilerinin ne olduğunu, bu etkilerin sosyal yapıya yansımasının nasıl olduğunu, söz konusu mallarda israfın ne kadar olduğunu ve sosyo-ekonomik yapıya etkilerinin olup olmadığını tespit etmeyi hedeflemektedir. Bu yönüyle çalışma hem literatürdeki eksikliği giderecek hem de sosyo ekonomik alana katkı sağlamayı amaçlamaktadır.Çalışmada karma araştırma yöntemi kullanılmıştır. Nicel araştırma yöntemlerinden olan basit tesadüfi örnekleme yöntemi ile Sakarya’nın ilçeleri olan Adapazarı, Erenler Serdivan’da ikamet eden hanehalkına anket uygulanmış olup elde edilen veriler SPSS 26. programıyla analiz edilmiş ve katılımcıların demografik özellikleri ve gıda ürünlerinin israfını tespit etmek için frekans analizi yapılmıştır. Bu çalışmada nitel araştırma yöntemlerinden durum araştırması deseni tercih edilmiştir. Bu çalışmada yapısına göre gözlem çeşidi olan doğrudan doğruya (basit) gözlem yöntemi kullanılmıştır. Kalan atıkların tasnif analizi metodu, elde edilen verilerle atık yönetim sisteminin yönetilebilmesi ve planlanabilmesi ve kalan atıkların nicel durumları hakkında bilgi vermesi nedeniyle kullanılmıştır. Öncelikle Sakarya’daki gıda israfını tespit etmeyi amaçlayan araştırma, Venkat (2011)’ın ortaya koydukları “Gıda Atıkları Yaşam Döngü Modeli”ndeki perakende (pazar) ve tüketici gıda atıkları formülasyonuna dayandırılmaktadır. Yapılan araştıma sonuçlarına göre tüketmek amacıyla alınan ürünlerin tüketilmeden bırakılan aylık toplam ürün miktarı 3 ton 708 kg, haftalık olarak 927 kg olduğu tespit edilmiştir. Tüketilmeyip bırakılan ürünler içerisinde bulgur %13,22 en fazla paya sahip olmaktadır. Ayrıca bırakılan ürünler içerisinde kuru fasulye yaklaşık olarak %10, meyve olarak ise armut/ayva %12, şeftali %10’luk bir paya sahip olmaktadır. Araştırmaya katılan hanehalkının, kişi başı haftalık gıda israfı 2,08 kg, yıllık olarak ise 99,84 kgdır. Hanehalkının yıllık gıda israf tutarı 567.107,88 TL, aylık toplam gıda israf tutarı 47.258,99 TL, haftalık olarak ise 11.814,75 TL olduğu tespit edilmiştir. Ayrıca hane halkının kişi başı haftalık gıda israfı tutarı 26,5 TL olduğu belirlenmiştir. Çarşamba pazarında yapılan gözlem ve tasnif çalışması sonucunda 302 kg sebze ve 381 demet yeşillik(dereotu, yeşil soğan, maydanoz vb.) ürün toplanmıştır. Çalışma sonuncunda elde edilen ürünlerin toplam değeri 2.112,32 TL olduğu tespit edilmiştir. Elde edilen ürünlerin haftalık ortalama değeri ise 192,02 TLdir. Pazarda en fazla biber, salata, domates ve soğan gibi ürünlerin israf edildiği gözlemlenmiştir.

Anahtar kelimeler: tüketim, gıda israfı, gıda tedarik zinciri, hanehalkı, perakende.

**ENTRANCE**

Food loss across the entire food value chain represents a significant loss of resources devoted to food production, transportation and storage. Since resources (soil, energy, fresh water, agricultural inputs) are limited in nature, they should be used efficiently and sustainably (Erik, 2019). Other adverse externalities along the food supply chain include ecotoxicity from pesticides, eutrophication, soil erosion, organic matter loss and biodiversity loss (Pretty et al., 2005). Between 20% and 30% of the environmental impacts of products are due to food consumption (Tukker et al., 2006). Therefore, food loss can have significant environmental impacts. In addition, economically preventable food losses are of great importance in efforts to combat hunger and improve food security, not only in developing countries but also in developed countries (Aydın, 2007). Increasing the efficiency of the food value chain can help reduce the cost of food to the consumer, thereby increasing access to food for low-income households (Gustavsson et al.).

Reducing food waste offers multiple benefits for people and the planet, improving food security, addressing climate change, saving money and reducing pressures on land, water, biodiversity and waste management systems. Despite this, insufficient attention has been paid to reducing food waste (WRAP, 2021). On the contrary, excessive consumption is preferred, causing waste of resources and social, economic and psychological problems. It is important to carry out more studies to eliminate these social problems, to take the protection of the natural environment as a basis, and to reduce waste in order to deliver resources to future generations (Yazıcı & Yazıcı, 2017, p. 673). Reducing a food waste at the consumer level prevents environmental pollution and contributes to the improvement of the environment. Thus, a condition is derived that links the price transmission mechanism and the prevention of a food loss occurring in the supply chain with the environmental impact of this loss (Brown and Cameron, 2000).

In Europe, food waste collected from markets and businesses is donated to non-governmental organizations through food banks. In addition to the shopping culture in Europe, market places have an important place in the shopping culture in Turkey. In market places, food is presented to the consumer in a more open and uncontrolled way in terms of food safety compared to the markets. Especially in hot weather in summer, the products are directly exposed to heat without any cooling system. In this case, it can be predicted that food loss may be higher than in market and business environments. For this reason, losses can be reduced and less contamination of the food can be achieved by collecting the excess demand of the foods in the market quickly and systematically at the end of the sales period.

In the national literature review, it is seen that the studies on waste are generally measuring consumer habits, the view of the conservatives towards waste, the concept of waste in the Qur'an and hadiths, consumer attitudes towards the prevention of food waste, and the economic impact of bread wastage. This study takes into account the waste of food products, which is one of the wasted resources, and the food products included in the CPI, how much of a share of food waste is in Sakarya province and how much this share is in the economy of Sakarya, what are the effects on consumption and savings, and the effects of these effects on consumption and savings. It aims to determine how it is reflected in the social structure, how much wastage is in the goods in question, and whether it has any effects on the socio-economic structure. With this aspect, the study aims to both fill the gap in the literature and contribute to the socio-economic field.

Mixed research method was used in the study. With the simple random sampling method, which is one of the quantitative research methods, a questionnaire was applied to the households residing in Adapazarı, Erenler Serdivan, the districts of Sakarya, and the data obtained were analyzed with the SPSS 26 program and frequency analysis was carried out to determine the demographic characteristics of the participants and the waste of food products. In this study, case study design, one of the qualitative research methods, was preferred. Case study is “a qualitative research approach in which the researcher examines one or more limited cases over time with data collection tools (observations, interviews, audio-visuals, documents, reports) that includes multiple sources, and defines situations and situation-related themes” (Creswell, 2019). ). Observation method; It is a method of collecting information by systematically and purposefully examining events that occur spontaneously or consciously while they are determined (İslamoğlu & Alnıçık, 2016). In this study, the direct (simple) observation method, which is a type of observation according to its structure, was used. The classification analysis method of the remaining wastes was used because the waste management system can be managed and planned with the obtained data and it gives information about the quantitative status of the remaining wastes. The research, which primarily aims to identify food waste in Sakarya, is based on the retail (market) and consumer food waste formulation in the "Food Waste Life Cycle Model" put forward by Venkat (2011).

It has been determined that the total income level of 446 households participating in the survey of the research is 1,812,830,00 TL. It has been determined that the average monthly income of 207 households participating in the research from Adapazarı district is 4.099.42 TL, the average monthly income of 176 households participating from Serdivan district is 4.206.82 TL and the average monthly income of 63 households participating from Erenler district is 3.553.17 TL. It is seen that the income level of the households participating from Serdivan district is higher. In addition, the minimum wage in 2021, when the research was conducted, is 2,825, 90 TL. In this context, it can be said that the average income level of the households participating in the research is higher than the minimum wage level.

It has been determined that the value of the total consumption of the participants is 605.680.00 TL. It has been determined that the total consumption level of the household participating from Adapazarı district is 272,429,00 TL, the consumption level of the household participating from Serdivan district is 250,687,00 TL and the consumption level of the household participating from the district of Erenler is 82,564.00 TL. The households participating in the research allocate 33% of their income to consumption. The household in Erenler district, which has the lowest average income level, allocates 37% of its income to consumption. Households participating from Serdivan allocate 34% of their income to consumption. The monthly average consumption level of the participants was determined as 1,358.03 TL. It has been determined that the monthly average consumption level of the households participating from Serdivan is 1,424.36 TL, the average monthly income level of the households participating from the Adapazarı district is 1,316.08 TL, and the households participating from Eren are 1,310.54 TL.

As a result of the observation and classification study carried out in the Wednesday market, 302 kg of vegetables and 381 bunches of greens (dill, green onion, parsley, etc.) were collected. The total value of the products obtained at the end of the study was determined to be 2.112.32 TL. The weekly average value of the products obtained is 192.02 TL. It has been observed that products such as peppers, salads, tomatoes and onions are wasted the most in the market.

As a result of the observations made in the Wednesday market for 11 weeks, it was observed that different groups regularly collect edible food products from discarded products. These different groups are made up of natives and immigrants. These groups collect edible products from the food products thrown with their spouses, children, alone or with their tricycles. It has been determined that each group collects products as much as their current capacities. These observations show that the amount and amount of food obtained throughout the study was at a minimum level. These experiences show that the amount and amount of food can be obtained many times more than the data obtained as a result of the research.

**1: DEFINITIONS AND TERMINOLOGY**

Food waste and food loss are considered as closely related concepts. Food waste is defined by FAO (2011) as the remaining edible loss at the consumer stage of the food supply chain. It defines the loss of usable products after harvest and during the production phase as food loss. Food loss, food waste defines the concepts as follows; According to Oral (2015), food waste is: "Food suitable for human consumption but discarded or left to spoil for whatever reason at the consumer level". "Food Loss: All waste that is planned for human consumption and occurs at all stages of the food chain, regardless of cause, before reaching the consumer level".

According to the Wrap (2021) report; Food losses are all quantities of human edible products and animals that are wholly removed, directly or indirectly, post-harvest/slaughtered, discarded from the production/supply chain, incinerated or otherwise, and not re-entered in any form. Therefore, all losses incurred during storage, transport and processing are included, including quantities imported. The damages include the goods as a whole with their inedible parts. For the purposes of the Food Waste Index, surplus food refers to food that is redistributed for human consumption, used for animal feed, or used for bio-based materials/biochemical processing.

Some of the main causes of food loss include the lack of infrastructure, markets, price mechanisms and even legal frameworks. Tomatoes that are crushed during transportation due to improper packaging are an example of food loss (FAO, 2013). Food waste refers to food waste, the disposal or alternative (non-food) use of food that is safe and nutritious for human consumption.

**Chart 1**: Estimated Ranking of Household Food Waste by Population Density (kg/capita/year)

**Source:** (Wrap, 2021).

According to the Wrap (2021) report, a total of 931 million tons of food is wasted every year around the world. In Turkey, 93 kilograms of food per person is thrown away every year. In total, 7.7 million tons of food is wasted every year. More than 800 million people in the world suffer from hunger. The monetary value of food losses is estimated at more than $400 million. Kantor et al. (1997), in their study, aimed to detect the food loss of America. In the study, food recovery projects to feed those on the border of hunger, recycling projects to conserve resources and reduce waste disposal costs, and educational campaigns and economic incentives to prevent food loss are discussed. The study refers to food "recovery" as the collection or recovery of healthy food from farmers' fields, retail stores or food service establishments for distribution to the poor and hungry. Barry (2004) At the University of North Texas, five dormitory cafeterias on campus were observed and classified to develop a food waste management system to leverage the shared resources of multiple participants and integrate academics into practical, local, and economic resource recovery opportunities. In their study, Lebersorger and Schneider (2011) aim to determine the ratio and composition of food waste in waste containers from private houses, to determine the effect of food packaging and to determine possible classification criteria by analyzing the selected impact factors.Önlenebilir . A photograph was taken of each product in the food waste category, the product was weighed, and the following information was entered into a spreadsheet in MS Excel: product name, brand, product ca. tegory (22 categories defined, e.g. vegetables, meat, bread...), life cycle stage, gross mass (for packaged products) and/or net mass (for loose products), estimate of current fill level and - if available and legible - also information about the best - before and expiry dates, packaging date, purchase price and original mass/amount of ingredients. The product packaging was separated from its contents and weighed individually with an accuracy of ±0.1 g unless time wasted or separation required significant effort. This database provides analysis of data according to different criteria. MS Excel 7.0 and SPSS 15.0 program packages were used for data analysis. In their study, Edwards and Mercer (2012) focus on the previous stage of the food life cycle and specifically examine the liberal practice of collecting and redistributing food discarded as 'worthless' by supermarket chains. This review is made from the perspective of Fregan, which expresses a choice, not a need, to protest overconsumption and waste issues. Erikson et al. (2012) analyzed fruit and vegetable flows in six retail stores in Sweden by analyzing both recorded data and physical measurements. The aim of this study is to obtain detailed information about the bulk flows of fresh fruit and vegetables, including waste streams, in a group of stores in order to facilitate waste prevention measures and to generate information on retail food waste in general. A positive correlation was found between unrecorded in-store waste and total waste. Giuseppe et al. (2014) in their study "Economic benefits from food recovery at the retail stage: an application to Italian food chains", deterministic for optimization of the supply chain created by retailers and potential buyers practicing food recovery, taking into account the benefits afforded to the donors and the management costs of food recovery. aimed to present a mathematical model. Silvennoinen et al. (2014), they aimed to determine the volume and quality of food waste in Finnish households and to discuss the causes of the waste produced. A total of 420 households participated in the study and of these 380 households (1,054 persons) completed the study in an acceptable manner. All solid food waste and liquid milk waste were weighed daily each time they discarded the food over a two-week period. The findings of the study are as follows: The amount of food waste in homes varies between 0 and 160 kg/year. The annual average food waste was 23 kg per capita, 63 kg per household and a total of approximately 120 million kg/year. Quantities and contributions of household food waste Over the two-week study period, households generated a total of 882 kg of avoidable food waste (0-23.4 kg per household). On average, households dropped 2.3 kg (837 g/p). In the study of Evans (2020), he tried to follow the grocery shopping of the households in a certain region and these purchases on a weekly basis and to determine which products and how much was left. In his study, he found that families buy more or less the same materials on a weekly basis, and if the same product is still in the cupboard, a new one is put in and the old one is thrown away. It has been emphasized that the way of shopping is a result of the conditions developed by modern life rather than being the choice of individuals. It has been stated that one of the reasons why the products are bought in excess is the perception that the product purchased in less quantity should be purchased by paying more. To summarize some of the implications of the study; It can be said that the reasons for people to buy more food than they can consume are more than one and complex. When examining grocery shopping, it is necessary to look at the daily habits at home, the wrong diet, the way of supplying the supermarkets. In the literature, it has been determined that the classification and observation method is frequently used for the detection of food waste and the determination of solutions. In studies conducted in Turkey, the classification and observation method was not preferred much. This study will contribute to the use of classification and observation method in studies to be carried out to detect food waste in Turkey. In addition, while it is similar to the studies in the literature in terms of method and method, it will also contribute to the literature in terms of detecting food waste in the neighborhood market (in the retail stage), which is important for Turkish culture.

**2: Materials and methods**

**2.1. Importance and Purpose of the Research**

Overconsumption of natural resources is portrayed as a major threat to the sustainability of the world with its current resources (Commoner, 1990; Durning, 1992). Calls to reduce surplus consumption appear with increasing frequency in the popular press (Durning, 1991; Schmookler, 1991). Excessive consumption of resources is accepted by social scientists as a critical factor causing environmental damage (Brown and Cameron, 2000). The habit of excessive consumption causes the resources in the world to be wasted and the resources that can be reused are not included in the recycling. One of the sources that cannot be used effectively is food products (Durmus, 2022). According to the data obtained on food waste, tons of food products, bread and water go to waste. Brock (2018) treats food waste as a social justice issue, not an environmental or economic issue. A key element in making food systems more efficient is reducing food losses across the entire food value chain. Despite this, food losses are often neglected. In order to solve these social problems, to take the protection of the natural environment as a basis and to transfer the resources to future generations, researches to investigate the dimensions of waste and reduce waste are gaining more and more importance day by day. Because the imbalance between the supply and demand of all production factors causes problems such as social problems, economic crises and deterioration of the natural environment. For this reason, it is important to investigate food waste for the sustainability of socio-economic life.

The aim of the study is, considering the waste of food products, which is one of the wasted resources, the food goods included in the CPI, what share of food waste in Sakarya province and how much this share has in the economy of Sakarya, what are the effects on consumption and savings, It determines how these effects are reflected on the social structure, how much wastage is in the goods in question, and whether they have any effects on the socio-economic structure.

**2.2. Method and Method of Research**

Mixed research method was used in the study. With the simple random sampling method, which is one of the quantitative research methods, a questionnaire was applied to the households residing in Adapazarı, Erenler Serdivan, the districts of Sakarya, and the data obtained were analyzed with the SPSS 26 program and frequency analysis was performed to determine the demographic characteristics of the participants and the waste of food products. In this study, case study design, one of the qualitative research methods, was preferred. Case study is a qualitative research approach in which the researcher examines one or more limited cases over time with data collection tools (observations, interviews, audio-visuals, documents, reports) that includes multiple sources, and defines situations and situation-related themes (Creswell, 2019). method; It is a method of collecting information by systematically and purposefully examining events that occur spontaneously or consciously while they are determined (İslamoğlu & Alnıçık, 2016). In this study, the direct (simple) observation method, which is a type of observation according to its structure, was used. The method of waste classification analysis of residual wastes, these data were used to collect information on the quantitative status of residual waste, which is important for the management and planning of the waste management system. The research, which primarily aims to identify food waste in Sakarya, is based on the retail (market) and consumer food waste formulation in the "Food Waste Life Cycle Model" put forward by Venkat (2011). The "Food Waste Life Cycle Model" put forward by Venkat (2011) is as follows;

**Figure1: Food Waste Life Cycle Model**

**Product (P)**

**Avoidable waste from uneaten food (WC)**

**Retail**

**Distribution**

**Consumer**

**Inevitable Wastes from Edible Foods**

**Distribution Waste Retail Waste**

**(Wd) (Wr) (Wu)**

**Source:** (Venkat,2011).

Equation 31 below describes the basic mass balance of a food product in its life cycle. The difference shows the levels of total gross waste distribution (Wd), retail (Wr) and consumer (Wcg) generated from waste during distribution between production (P) and consumption (C). All quantities are product weights.

P-C= Wd+Wr+Wcg (31)

Gross consumer residue is the sum of the inevitable waste from eaten food and recoverable waste from uneaten food.

Wcg= Wc+Wu (32)

The weight and volume method, which is one of the data measurement methods required to determine the amount of food waste, introduced in the European Food Waste Level Estimation Report (2016), was used in the study.

In this study, which is based on the "Food Waste Life Cycle Model", retail wastes and consumer wastes are taken into account. In order to detect retail wastes, the weight and volume method of wastes left in the trash in the Wednesday market was preferredWhile creating the survey questions of the study, Ponis et al. (2017) survey questions in their studies were used. Permission was obtained from Researcher Stavros T. Ponis for the use of the survey questions. In order to determine the food waste, in order to establish the standard measures of kilo/kg/lt, the scales in dietitian scales (dietitian scale) and in Apps with athlete tracking applications (by examining many applications) used. Regarding the use of the wastes obtained from the fieldwork with the classification method, Dr. Felicitas Schneider was interviewed many times via e-mail and once online, which lasted about two hours. As a result of these interviews, the observation and classification method was matured.

A total of 22[[4]](#footnote-4) markets are established in Sakarya province, Serdivan, Adapazarı and Erenler districts. There are a total of 460 stalls and tradesmen in the Wednesday market, which is the fourth largest market in the Maramara region, which is the most developed and crowded region of Turkey. There are 217 tradesmen and stalls in the vegetable and fruit section of Çarşamba Pazar, which was established in 1980-1981. Wednesday bazaar is the biggest bazaar of Sakarya. Households from both the districts of Sakarya and the surrounding provinces come to the Çarşamba bazaar. This aspect of the Çarşamba market increases the impact power of the data to be obtained in the research.

**3. ANALYSIS AND FINDINGS**

In this section, where the findings are discussed, firstly, the findings obtained as a result of the survey conducted for the households residing in Adapazarı, Erenler and Serdivan districts in order to determine the income, consumption and waste levels of the consumers who constitute the last part of the supply chain are presented. In the next section, the findings of the research and observations made in the bazaar established on Wednesdays in the district of Erenler are presented.

**3.1. Findings of Research on Households.**

The unit of analysis of the questionnaire is the individual household. 482 people participated in the survey conducted between 28.07.2021 and 02.11.2021. The questionnaires of those who declared that they are responsible for any of the shopping, food preparation and disposal options of the participants and that they provided complete and accurate information were considered valid. The survey of 36 participants who did not comply with these conditions was deemed invalid and the survey results of 446 participants were analyzed. The Cronbach alpha reliability of the 34-item scale for detecting food waste was found to be 98.1%. This shows that the reliability value is quite sufficient

**3.1.1. Demographic Characteristics of the Household**

* The demographic characteristics of the households are shown in Table 1. Demographic characteristics of the participants are summarized as follows. 65.5% of the participants are female and 34.5% are male.

• The marital status of the participants; 65.9% of them are married and 34.1% of them are single.

• 40.6% of the participants are between the ages of 26-36.

• Approximately 50% of the participants have a bachelor's degree.

• Approximately 30% of the participants live in 4-person households.

• 28% of the participants are housewives.

**Tablo 1:** Katılımcıların Demografik Özellikleri

|  |  |  |
| --- | --- | --- |
| **Gender** |  | **Number Percent(%)** |
| Man | 292 | 65,5 |
| Women | 154 | 34,5 |
| Total | 446 | 100,0 |
| **Age** | **Number** | **Percent(%)** |
| 18-25 | 125 | 28,0 |
| 26-36 | 181 | 40,6 |
| 37-45 | 87 | 19,5 |
| 46-59 | 48 | 10,8 |
| 60 and above | 5 | 1,1 |
| Total | 446 | 100,0 |
| **Marital status** | **Sayı** | **Yüzde(%)** |
| Single | 152 | 34,1 |
| Married | 294 | 65,9 |
| Total | 446 | 100,0 |
| **Department** | **Sayı** | **Yüzde(%)** |
| Primary school | 24 | 5,4 |
| Middle school | 33 | 7,4 |
| High school | 128 | 28,7 |
| Bechlor | 221 | 49,6 |
| Master | 40 | 9,0 |
| Total | 446 | 100,0 |
| **Occupation** | **Sayı** | **Yüzde(%)** |
| Officer | 59 | 13,2 |
| Employee | 71 | 15,9 |
| Self-employment | 22 | 4,9 |
| Housewife | 125 | 28,0 |
| Retired | 13 | 2,9 |
| Student | 75 | 16,8 |
| Chef | 4 | ,9 |
| Other | 77 | 17,3 |
| Total | 446 | 100,0 |
| **Number of house** | **Sayı** | **Yüzde(%)** |
| 1 | 27 | 6,1 |
| 2 | 62 | 13,9 |
| 3 | 118 | 26,5 |
| 4 | 130 | 29,1 |
| 5 | 66 | 14,8 |
| 6 | 28 | 6,3 |
| 7 ve üstü | 15 | 3,4 |
| **Total** | 446 | 100,0 |

**Source: Created by the author.**

### 3.1.2. Household Income, Consumption and Waste Levels

In order to determine the income and consumption levels of the participants, the income and consumption levels were asked in the form of open-ended questions. The participants were asked how much of the 33 food products they consumed and how much they could not consume, which were higher than their weight ratios in the CPI. The price levels of food products were determined according to the CPI price averages of the said products, shared by TÜİK, between 28.07.2021 and 02.11.2021, when the participants participated in the survey. The prices of the products that are not grown within the dates are determined according to the seasonal price averages of 2021.

Income and consumption levels of households are shown in Table 2. It has been determined that the average total income level of 446 households participating in the research is 1,812,830,00 TL. It has been determined that the average monthly income of 207 households participating in the research from Adapazarı district is 4.099.42 TL, the average monthly income of 176 households participating from Serdivan district is 4.206.82 TL and the average monthly income of 63 households participating from Erenler district is 3.553.17 TL. It is seen that the income level of the households participating from Serdivan district is higher. In addition, the minimum wage in 2021, when the research was conducted, is 2,825, 90 TL. According to the current minimum wage, the average total income of the participating households is estimated to be 5,946.86 TL. In this context, it can be said that the average income level of the households participating in the research is higher than the minimum wage level.

It has been determined that the value of the total consumption of the participants is 605.680.00 TL. The households participating in the research allocate 33% of their income to consumption. The monthly average consumption level of the participants was determined as 1,358.03 TL.

**Table 2:** Income and Consumption Levels of Participating Households

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **The number of participants** | **Total Revenue (₺)** | **Total Consumption**  **(₺)** | **Consumption Tendency (%)** | **Average Income (₺)** | **Average Consumption (₺)** |
| **Serdivan** | 176 | 740.400,00₺ | 250.687,00₺ | 34% | 4.206,82₺ | 1.424,36₺ |
| **Adapazarı** | 207 | 848.580,00₺ | 272.429,00₺ | 32% | 4.099,42₺ | 1.316,08₺ |
| **Erenler** | 63 | 223.850,00₺ | 82.564,00₺ | 37% | 3.553,17₺ | 1.310,54₺ |
| **Total** | 446 | 1.812.830,00₺ | 605.680,00₺ | 33% | 4.064,64₺ | 1.358,03₺ |

**Source:** **Created by the author**.

The level of household consumption of food products and the level of products that they cannot consume are shown in Table 3. The total consumption amount of the households participating in the research was determined as 75 tons and 375 kg. Maximum 45 tons of 715 kg dome from the products in the food basket of the household.

It was determined that ates consumed 5 thousand 261 pieces of bread (1368 kg), 2 tons of 173 kg of yogurt, 1 ton of 890 kg of cheese, 1 ton of 341 kg of pasta, 1 ton of 77 kg of potatoes and 1 ton of 93 kg of watermelon from fruits. It has been determined that the monthly total amount of products purchased for consumption left unconsumed is 3 tons 708 kg, and 927 kg per week.

Among the products that are not consumed and left behind, bulgur has the highest share with 13.22%. In addition, among the products left, dry beans have a share of approximately 10%, pears/quinces have a 12% share and peaches have a 10% share. The weekly food waste per person of the household participating in the research is 2.08 kg, and it is 99.84 kg annually. It has been determined that the annual food waste amount of the household is 567,107.88 TL, the monthly total food waste amount is 47,258.99 TL, and the weekly amount is 11,814.75 TL. In addition, it has been determined that the weekly food waste amount per person of the household is 26.5 TL.

**Table 3:** Household Food Consumption and Waste

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CPI Goods Basket** | **Consumption (KG)** | **non-consumable (KG)** | **Waste Percentage of Products** | **Waste Amount (TL)** | **Tuik Price**  **(Average)** |
| **Yogurt (Kg)** | 2173,1 | 18,7 | 0,86% | 161,94₺ | 8,66₺ |
| **Milk(Lt)** | 1756,6 | 22,367 | 1,27% | 154,82₺ | 6,92₺ |
| **Green beans (Kg)** | 407,2 | 17,55 | 4,31% | 184,73₺ | 10,53₺ |
| **Rice (Kg)** | 476,725 | 33,36 | 7,00% | 433,01₺ | 12,98₺ |
| **Bulgur wheat (Kg)** | 313 | 41,374 | 13,22% | 283,15₺ | 6,84₺ |
| **Makarna (Kg)** | 1341,35 | 25,72 | 1,92% | 183,55₺ | 7,14₺ |
| **Beans(Kg)** | 328,6 | 31,755 | 9,66% | 494,74₺ | 15,58₺ |
| **Chickpeas (Kg)** | 739,125 | 48,85 | 6,61% | 637,29₺ | 13,05₺ |
| **Vegetables(Spinach/Leek)(Kg)** | 587,1 | 32,75 | 5,58% | 233,90₺ | 7,14₺ |
| **Aubergine (Kg)** | 491,55 | 38 | 7,73% | 756,64₺ | 19,91₺ |
| **Pepper (Kg)** | 706,55 | 20,48 | 2,90% | 152,58₺ | 7,45₺ |
| **Tomatto (Kg)** | 1077,8 | 49,161 | 4,56% | 161,13₺ | 3,28₺ |
| **Onion (Kg)** | 769,35 | 13,38 | 1,74% | 30,25₺ | 2,26₺ |
| **Flour And Bakery Products(Kg)** | 717,61 | 59,072 | 8,23% | 343,80₺ | 5,82₺ |
| **Bread (1 Ekmek 260 )** | 1368,25 | 17,67 | 1,29% | 53,00₺ | 3,00₺ |
| **Cheese (Kg)** | 1890,729 | 10,11 | 0,53% | 485,79₺ | 48,05₺ |
| **Red meat (Kg)** | 494,3 | 15,825 | 3,20% | 1.091,93₺ | 69,00₺ |
| **Chicken meat (Kg)** | 1120,525 | 10,56 | 0,94% | 210,25₺ | 19,91₺ |
| **Fish (Kg)** | 340,9 | 29,42 | 8,63% | 1.337,06₺ | 45,45₺ |
| **Sausage / Salami / Sausage (Kg)** | 817,24 | 24,075 | 2,95% | 1.658,53₺ | 68,89₺ |
| **Egg Piece/Carton** | 6424,75 | 10,965 | 0,17% | 11,22₺ | 1,02₺ |
| **Tomatto (Kg)** | 45715,6 | 23,003 | 0,05% | 130,80₺ | 5,69₺ |
| **Orange/Mandarin (Kg)** | 824,6 | 61,84 | 7,50% | 384,06₺ | 6,21₺ |
| **Grape (Kg)** | 453 | 33,81 | 7,46% | 336,95₺ | 9,97₺ |
| **Apple (Kg)** | 562,45 | 26,65 | 4,74% | 155,37₺ | 5,83₺ |
| **Pear/Quince (Kg)** | 360,95 | 41,95 | 11,62% | 360,35₺ | 8,59₺ |
| **Strawberry (Kg)** | 273,85 | 21,774 | 7,95% | 314,63₺ | 14,45₺ |
| **Cherry (Kg)** | 286,7 | 17,176 | 5,99% | 103,06₺ | 6,00₺ |
| **Melon (Kg)** | 559,05 | 49,55 | 8,86% | 169,46₺ | 3,42₺ |
| **Watermelon (Kg)** | 1093,4 | 51,45 | 4,71% | 109,07₺ | 2,12₺ |
| **peach (Kg)** | 352,2 | 34,14 | 9,69% | 366,43₺ | 10,73₺ |
| **Banana(Kg)** | 550,9 | 22,085 | 4,01% | 325,28₺ | 14,73₺ |
| **Total** | 75375,05 | 927,60 | 1,23% | 11.814,75 ₺ |  |

**Source: Created by the author.**

### 3.1.3. Household Perceptions and Attitudes towards Waste

Table 4 shows the answers to the question "What is the Main Cause of Food Waste in Households", to which the participants could give more than one answer. 350 participants stated that wastage in households is due to buying more products than needed

**Table 4:** Causes of Food Waste by Household

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Causes of Food Waste by Household** | | | | | | | | | | | |
|  | Buying More Product than Needed | Stale Decay | Meal Dropout | Having More Meals | Having Too Many Varieties | | Easy Obtaining of Products | I do not care | No idea | Total |
| **Serdivan** | 137 | 114 | 79 | 88 | 87 | 41 | | 3 | 11 | 176 |
|  | 39,10% | 38,40% | 38,00% | 39,10% | 36,10% | 41,00% | | 75,00% | 57,90% |  |
| **Adapazarı** | 159 | 144 | 97 | 105 | 113 | 43 | | 1 | 6 | 207 |
|  | 45,40% | 48,50% | 46,60% | 46,70% | 46,90% | 43,00% | | 25,00% | 31,60% |  |
| **Erenler** | 54 | 39 | 32 | 32 | 41 | 16 | | 0 | 2 | 63 |
|  | 15,40% | 13,10% | 15,40% | 14,20% | 17,00% | 16,00% | | 0,00% | 10,50% |  |
| **Toplam** | 350 | 297 | 208 | 225 | 241 | 100 | | 4 | 19 | 446 |
|  | 78,5% | 66,6% | 46,6% | 50,4% | 54% | 22,4% | | 0,9% | 4,3% | 100% |

**Source: Created by the author.**

Table 5 shows the answers to the question "In Which Situations Does Food Waste More Occurring", to which the participants could give more than one answer. 316 respondents (70.9%) state that waste occurs mostly when it is partially consumed and left. 276 participants state that waste occurs mostly in food left on the plate.

**Table 5:** Situations where the Most Waste Occurs by Household (By Districts)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Situations where the Most Waste Occurs by Household** | | | | | | | |
|  | Food left over during meal preparation | Leftover food during serving | Partially consumed food | Untouched food | Food left on the plate | Food left in the bottom of the pot | Total |
| **Serdivan** | 31 | 43 | 115 | 69 | 108 | 69 | 176 |
|  | 33,30% | 35,00% | 36,40% | 39,00% | 39,10% | 41,10% |  |
| **Adapazarı** | 44 | 59 | 155 | 79 | 128 | 73 | 207 |
|  | 47,30% | 48,00% | 49,10% | 44,60% | 46,40% | 43,50% |  |
| **Erenler** | 18 | 21 | 46 | 29 | 40 | 26 | 63 |
|  | 19,40% | 17,10% | 14,60% | 16,40% | 14,50% | 15,50% |  |
| **Toplam** | 93 | 123 | 316 | 177 | 276 | 168 | 446 |
|  | 20,9% | 27,6% | 70,9% | 39,7% | 61,9% | 37,7% | 100,0% |

**Source: Created by the author.**

In order to determine the attitudes and tendencies of the participants to consume the food and side dishes they eat in restaurants efficiently, "How much of the food you eat at the restaurant can't you consume?" was asked to the participants. and “How much of the side dishes do you consume at the restaurant?” questions were asked. The answers to these questions are shown in Table 6. “How much of the food you eat at the restaurant can't you consume?” 82.5% of the participants stated that they consumed all of the meals. “How much of the garnishes that come to your table in the restaurant do you consume?” 55% of the participants stated that they could not consume all of the side dishes. 21% of the 244 participants who stated that they left the garnishes leave half of the garnishes. 202 participants consume all of the garnishes.

**Table 6:** Attitudes of Households to Products in Restaurants

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **How much of the food you eat at the restaurant can't you consume?** | | | | | | |
|  | All remains | stays for half | Remains more than a tablespoon | One tablespoon remains | I Consume All | Total |
| **Serdivan** | 2 | 5 | 11 | 12 | 146 | 176 |
|  | 66,70% | 45,50% | 36,70% | 35,30% | 39,70% | 39,50% |
| **Adapazarı** | 1 | 4 | 16 | 17 | 169 | 207 |
|  | 33,30% | 36,40% | 53,30% | 50,00% | 45,90% | 46,40% |
| **Erenler** | 0 | 2 | 3 | 5 | 53 | 63 |
|  | 0,00% | 18,20% | 10,00% | 14,70% | 14,40% | 14,10% |
| **Toplam** | 3 | 11 | 30 | 34 | 368 | 446 |
|  | 0,70% | 2,50% | 6,70% | 7,60% | 82,50% | 100,00% |
| **How much of the garnishes that come to your table in the restaurant do you consume?** | | | | | | |
|  | All remains | stays for half | Remains more than a tablespoon | One tablespoon remains | I Consume All | Total |
| **Serdivan** | 4 | 30 | 30 | 31 | 81 | 176 |
|  | 33,30% | 32,60% | 50,00% | 38,80% | 40,10% | 39,50% |
| **Adapazarı** | 8 | 45 | 23 | 37 | 94 | 207 |
|  | 66,70% | 48,90% | 38,30% | 46,30% | 46,50% | 46,40% |
| **Erenler** | 0 | 17 | 7 | 12 | 27 | 63 |
|  | 0,00% | 18,50% | 11,70% | 15,00% | 13,40% | 14,10% |
| **Toplam** | 12 | 92 | 60 | 80 | 202 | 446 |
|  | 2,70% | 20,60% | 13,50% | 17,90% | 45,30% | 100,00% |

**Source: Created by the author.**

In order to determine the perceptions of the waste effects of excessive consumption and saving, the households participating in the research were asked, "Do you think that excessive consumption increases food waste?" and “Do you think increased waste reduces savings?” questions were asked. The answers to the questions are shown in Table 7. “Do you think overconsumption increases food waste?” 85.4% of the participants answered yes to the question. In this context, it can be said that the participants have a perception that there is a relationship between excessive consumption and waste.

**“**Do you think that excessive consumption increases food waste?” was asked to determine the perceptions of the participants towards savings and waste. About 87% of the participants answered yes to the question. Based on these data, it can be said that the participants have perceptions that as waste increases, savings will decrease.

**Table 7:** Perceptions of Households on the Effects of Over-Consumption and Saving on Waste

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Do you think excessive consumption increases food waste?** | | | | |
|  | Yes | No idea | No | Total |
| **Serdivan** | 149 | 14 | 13 | 176 |
|  | 39,10% | 37,80% | 46,40% | 39,50% |
| **Adapazarı** | 177 | 17 | 13 | 207 |
|  | 46,50% | 45,90% | 46,40% | 46,40% |
| **Erenler** | 55 | 6 | 2 | 63 |
|  | 14,40% | 16,20% | 7,10% | 14,10% |
| **Total** | 381 | 37 | 28 | 446 |
|  | 85,4% | 8,3% | 6,3% | 100,0% |
| **Do you think that increased waste reduces savings?** | | | | |
|  | Yes | No idea | No | Total |
| **Serdivan** | 147 | 10 | 19 | 176 |
|  | 38,00% | 43,50% | 52,80% | 39,50% |
| **Adapazarı** | 181 | 12 | 14 | 207 |
|  | 40,60% | 2,70% | 3,10% | 46,40% |
| **Erenler** | 59 | 1 | 3 | 63 |
|  | 15,20% | 4,30% | 8,30% | 14,10% |
| **Total** | 387 | 23 | 36 | 446 |
|  | 86,80% | 5,20% | 8,10% | 100,00% |

**Source: Created by the author.**

## 3.2. Wednesday Bazaar Food Waste Observation and Classification

Wednesday Bazaar, established in Erenler district, is the biggest market of Sakarya province. Buyers and sellers come to Çarşamba Bazaar from all districts of Sakarya and from many cities in the vicinity. The Wednesday market has an important place among the households residing in Erenler, Adapazarı and Serdivan districts. Wednesday Bazaar is the largest common shopping place for the households of these three districts, which are the central districts of Sakarya. For this reason, Çarşamba Pazar was chosen as a place for observation and classification because it represents the food waste in the retail chain and because it is a common place for the households in the mentioned districts. In the Wednesday market, observation and classification were made every Wednesday for 11 weeks between 11.08.2021 and 22.10.2021. The classification method is to separate the usable products from the wastes. The value of the total convertible food was determined by multiplying the separated products with the unit prices (PXQ) shared by TÜİK. In order to classify the products thrown as garbage by the marketers, tools such as gloves, large hazelnut bags, large garbage bags, pull-off bags used in the markets, sensitive scales were used. Marketers start to collect the stalls when it starts to get dark. The products left as waste after the evening call to prayer are quickly collected by the municipal cleaning works with scoops and taken to the landfills in about an hour or two. For this reason, there is very limited time to collect and sort the products.

### 3.2.1. Wednesday Market Sorting And Food Waste Data (11 Weeks Every Wednesday)

The data and images obtained as a result of the 11-week observations and classifications made in the Çarşımpa market are presented in this section. The 11-week observation and classification data are as follows:

**Table 8 :**Wednesday Market Observation And Classification (Total 11 Week Data)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period | Date | Products | Volume | unit price | Total Price | Total Product Value |
| 11 HAFTA | 11.08.2021-22.10.2021 | PEAR | 0,212 kg | 12,500 | ₺2,65 | 2.112,32₺ |
| QUINCE | 4,19 kg | 6,387 | ₺26,76 |
| PEPPER | 47,06 kg | 5,829 | ₺274,30 |
| RIVER GRASS | 89 demet | 2,000 | ₺178,00 |
| TOMATOES | 28,765 kg | 4,333 | ₺124,63 |
| APPLE | 7,844 kg | 6,335 | ₺49,69 |
| PLUM | 1,17kg | 5,250 | ₺6,14 |
| CARROT | 3,26 kg | 5,665 | ₺18,47 |
| COURGETTE | 19,87 kg | 5,659 | ₺112,44 |
| WATERMELON | 18,987 kg | 1,709 | ₺32,45 |
| LEMON | 38,5 kese | 2,500 | ₺96,28 |
| MANDARIN | 2,79 kg | 8,000 | ₺22,32 |
| PARSLEY | 117 demet | 1,463 | ₺171,13 |
| MINT | 15 demet | 1,815 | ₺27,23 |
| OMER Plum | 0,664 kg | 5,250 | ₺3,49 |
| POTATES | 18,118 kg | 2,746 | ₺49,75 |
| AUBERGINE | 5,8 kg | 4,173 | ₺24,20 |
| ROCKET | 18 demet | 2,900 | ₺52,20 |
| SALAD | 78,61 kg | 5,283 | ₺415,28 |
| PEPPER WITH PASTE | 2,875kg | 6,900 | ₺19,84 |
| GARLIC | 0,29kg | 21,273 | ₺6,17 |
| PURSLANE | 8 demet | 5,000 | ₺40,00 |
| ONİON | 35,337 kg | 2,327 | ₺82,22 |
| MILK CORN | 95 adet | 0,500 | ₺47,50 |
| PEACH | 4,41 kg | 11,596 | ₺51,14 |
| GREEN BEANS | 2,535kg | 10,768 | ₺27,30 |
| RADISH | 5,535 kg | 3,500 | ₺19,37 |
| GRAPE | 4,2 kg | 8,426 | ₺35,39 |
| SCALLION | 48 demet | 2,000 | ₺96,00 |

**Source: Created by the author.**

The first observation and classification study of the research was carried out on 11.08.2021 between 20:00-22:00 hours. In the 1st week, six items were obtained. 16 kg watermelon, 3 kg pepper, 2,613 kg tomato were classified. The products obtained in the 1st week observation and classification results are 25,813 kg and the weekly total value of these products is 76,65 TL. During the observation in the 1st week, information was obtained about the order and functioning of the market. The first observation and classification study of the research was carried out on 11.08.2021 between 20:00-22:00 hours. In the 1st week, six items were obtained. 16 kg watermelon, 3 kg pepper, 2,613 kg tomato were classified. The products obtained in the 1st week observation and classification results are 25.813 kg and the weekly total value of these products is 76.65 TL. During the observation in the 1st week, information was obtained about the order and functioning of the market.

The second observation and classification study of the research was carried out on 18.08.2021 between 19:30-23:00. In the 2nd week, ten items were obtained. The products obtained in the observation and classification results this week are 19.93 kg and the weekly total value of these products is 125,284 TL. While more food was collected as a product item in the 2nd week of the observation compared to the 1st week, less product was obtained in total kg. The value of the collected products increased by approximately 49 TL compared to the first week.2 . The most important experience obtained at the end of the week is that the products collected can be the sustenance of another household. For this reason, the foods collected from the 2nd week were quickly sorted and left in places where food can be accessed.

The third observation and classification study of the research was carried out on 23.08.2021 between 19:10-22:30 hours. In the 3rd week, six items of food were collected. The products obtained in the 3rd week observation and classification results are 85.21 kg and the weekly total value of these products is 302.77 TL. In the 3rd week of the observation, both kg and total values ​​were obtained more than the previous 2 weeks. As a result of the observation of the Wednesday market in the 3rd week, a large amount of salad waste was detected. Since the salad is in season, it can be said that there is plenty of salad in the market and there is an oversupply. In addition, it was observed that product surpluses occurred in this week, when the observation was made, due to the excess of tomato paste and pickles. The researcher was able to collect a small portion of the food wastes that emerged in the 3rd week due to the collection of food products alone. Salad and parsley are among these products. A portable sack was collected from the parsley thrown in heaps. But multiple sacks were left due to manpower and insufficient equipment.

**Photograph 1:** Observation and Classification Images from the Wednesday Marketfarklı, birkaç içeren bir resim

Açıklama otomatik olarak oluşturuldu

**Source: Created by the author.**

The 4th week observation and classification data are shown in Table 15. The fourth observation and classification study of the research was carried out on 01.09.2021 between 19:10-22:30 hours. In the 4th week, six items of food were collected. The products obtained in the 4th week observation and classification results are 18.66 kg and the weekly total value of these products is 95.90 TL. In the 4th week of the observation, it was determined that there was a 56.2% increase in salad prices compared to the previous week. It can be said that the decrease in the salad supply due to the beginning of the transition to the autumn season is one of the reasons for this price increase. As a result of the observations made this week, it is seen that the products thrown in the market are taken by the family and put in the stroller. It is seen that the wastes left in the market place are randomly left in the garbage containers. However, it was observed that these wastes were collected by families with low income levels by mixing the wastes and collecting the edible ones throughout the market. For this reason, opportunities can be created where the waste can be left by placing boxes, crates or even bags under it in a way that does not take the time of the market tradesmen.

**Photograph 2:** Observation and Classification Images from the Wednesday Market

**Source: Created by the author.**

The fifth observation and classification study of the research was carried out on 08.09.2021 between 19:10-22:25 hours. In the 5th week, six items of food were collected. The products obtained in the 5th week observation and classification results are 16 kg and the weekly total value of these products is 105.79 TL. As a result of the observations and classifications of the 5th week, it was observed that the tomato paste tomatoes started to decrease in the market place and in parallel, the tomato paste wastes decreased. It has been observed that starting from this week, peppers with tomato paste have started to be sold. The 6th observation and classification study of the research was carried out on 15.09.2021 between 19:00-22:00 hours. In the 6th week, seven items of food were collected. The products obtained in the 6th week observation and classification results are 21.30 kg and the weekly total value of these products is 131.75 TL. As a result of the 6th week observations and classifications, it was observed that there were more pepper paste wastes in the market place.

**Photograph 3:** Observation and Classification Images from the Wednesday Marketfarklı, öğeler, çeşitli, çeşitler içeren bir resim

Açıklama otomatik olarak oluşturuldu

**Source: Created by the author.**

The 7th observation and classification study of the research was carried out on 22.09.2021 between 19:00-22:00. In the 7th week, seven items of food were collected. The products obtained in the 7th week observation and classification results are 14.78 kg and the weekly total value of these products is 68.92 TL. As a result of the 7th week observation and classification, it was observed that pepper waste piles were formed in different parts of the market place. The 8th observation and classification study of the research was carried out on 29.09.2021 between 18:45-21:40 hours. In the 8th week, ten items of food were collected. The products obtained in the 8th week observation and classification results are 30 kg and the weekly total value of these products is 213.5 TL. Continuous consultations were held with researchers at İSEFAM, Sakarya University Islamic Economics and Finance Research Center, on market experience and observations. In these consultations, it was concluded that the discarded edible foods could be left by the marketers for people to buy. However, it was stated that the researcher marketers who made the observation and classification left the products in the garbage and separated them from the garbage by the food of the people. One of the researchers of the center participated in the 8th week observation and classification study in order to observe the market experience and the attitudes of the marketers. As a result of the 8th week observation and classification, when the food products were collected by two researchers, it was seen that more than two sacks of food were collected.8 The products obtained as a result of the observation and classification studies carried out during the week were given to the families who came to collect the food. The products collected from the 8th week were exhibited on the benches created on the pavement. These stalls have been set up for families to buy the products they need.

**Photograph 4:** Observation and Classification Images from the Wednesday Market

farklı, birkaç içeren bir resim

Açıklama otomatik olarak oluşturuldu

**Source: Created by the author.**

The 9th observation and classification study of the research was carried out on 06.10.2021 between 18:45-21:40 hours. In the 9th week, eight items of food were collected. The products obtained in the 9th week observation and classification results are 10.47 kg and 90 greens and the weekly total value of these products is 213.31 TL. As a result of the observations and classifications of the 9th week, it was observed that heaps of greenery were formed in different parts of the market place with the effect of winter. The 10th observation and classification study of the research was carried out on 13.10.2021 between 18:45-22:40 hours. In the 10th week, eight items of food were collected. The products obtained in the 10th week observation and classification results are 34 kg and the weekly total value of these products is 214.66 TL. In the 10th week, the collected products were weighed and sorted, then arranged and delivered to low-income groups.

**Photograph 5:** Observation and Classification Images from the Wednesday Market metin içeren bir resim

Açıklama otomatik olarak oluşturuldu

**Source: Created by the author.**

The 11th observation and classification study of the research was carried out on 20.10.2021 between 18:45-23:40 hours. In the 11th week, twelve items of food were collected. The products obtained in the 11th week observation and classification results were 25.8 kg and 276 bunches of greens and lemons were collected and the weekly total value of these products was 541.9 TL. During the fieldwork, the week with the highest amount of food collected was the 11th week. This week, the products were sorted and weighed and laid on the pavement. There were households who wanted to ask for prices and buy these products. This shows that edible, robust products can be of value by reintroducing them after they are identified. However, the products in question were immediately distributed to low-income households in the market place without expecting any compensation.

As a result of the observation and classification study carried out in the Wednesday market, 302 kg of vegetables and 381 bunches of greens (dill, green onion, parsley, etc.) were collected. The total value of the products obtained at the end of the study was determined to be 2.112.32 TL. The weekly average value of the products obtained is 192.02 TL. It has been observed that products such as peppers, salads, tomatoes and onions are wasted the most in the market. As a result of the observations made in the Wednesday market for 11 weeks, it was observed that different groups regularly collect edible food products from discarded products. These different groups are made up of natives and immigrants. These groups collect edible products from the food products thrown with their spouses, children, alone or with their tricycles. It has been determined that each group collects products as much as their current capacities. These observations show that the amount and amount of food obtained by me throughout the research was at a minimum level. These experiences show that the amount and amount of food can be obtained many times more than the data obtained as a result of the research.

As a result of the observations, it has been determined that the products thrown by the tradesmen in the market create unhealthy environments in general. With the contributions of Sakarya Metropolitan Municipality and Erenler Municipality, efforts should be made to ensure that the tradesmen leave the products they plan to throw in healthier conditions. It is necessary to increase the sensitivity of tradesmen about leaving these products in healthy conditions. It is recommended to create alternative places instead of establishing the market place on the streets, to ensure that the equipment of the marketers is more modern, and to ensure the order of the market place. For this reason, it is recommended that municipalities reconsider their regulations on the establishment and gathering of markets.

CONCLUSION

The expanding consumption culture with the effects of advertisements, borrowing opportunities, mobile applications and social media causes the economic and ecological environment to be negatively affected. The understanding of excessive consumption, which is a result of the consumption culture, leads to the extinction of species, environmental disasters and the rapid consumption and waste of resources. In addition, it can be said that the inefficient use and waste of resources cause an increase in negative externalities. In order to solve these problems, it is necessary to regain the lost moral values, to raise the awareness of the new generation about consumption and to be more social benefit-based. It should be reminded that it has at least one goal by restructuring the definition of need in minds.

Today, waste is a global problem. In order to prevent this problem, duties fall not only individually, but also socially. Instead of using resources wastefully and inconsistently, resources should be used efficiently and transferred to future generations. In order for this transfer to take place, societies need to put values ​​such as trust, righteousness, middle-class life style, contentment, trust, gratitude, abundance and donations at the center of their lives. In addition, they should stay away from immoral behaviors such as stinginess, extremism, lying and bribery.

Based on the data obtained from the participants residing in Sakarya's Adapazarı, Erenler and Serdivan districts and the observations made in the Wednesday market, which is Sakarya's largest market, it can be said that the resources are not used efficiently. Particularly, the collection of wastes left in the Wednesday market by low-income groups shows that waste can be recycled. The majority of the households participating in the survey state that excessive consumption brings with it waste, and as waste increases, savings decrease. It can be said that excessive consumption and resulting waste should be reduced in order to increase savings in households.

The findings and recommendations to reduce food waste are summarized as follows:

Provide public/employee education on excess food prepared but not consumed (including crockery), proper food preparation, portion sizes, and the importance of ordering flexibility to get people to enjoy the food served.

Food that causes waste, such as wrong (burning) or poorly prepared (non-tasting food); Training can be given to public/employee/housewives on proper food preparation and reuse for wasted food due to the inability to reuse excess food or incorporate leftovers into a new meal. Added value can be generated through discarded food, logistics improvements (for example, improved transportation that reduces food damage) and redistribution policies due to defective qualities of food (such as rots) or damaged food packaging (including grading).

Since excess food purchased but not consumed/sold (at the consumer or retail level) is wasted, trainings on food purchasing and planning can be organized at the consumer and retail level. For example, Sellers should plan supply and demand according to market and seasonal conditions. In order for this planning to be applicable, trainings on economy, marketing, market analysis and stock management improvement and reduction in bulk discounts can be organized for retailers. Based on personal preferences, date labels or food safety concepts, trainings on food storage, food safety and food planning can be provided for foods that are allowed to deteriorate before being consumed/sold or are believed to be insufficient for consumption. In addition, easy-to-understand food labeling systems can be used. The product packaging system can be improved.

Lack of awareness or concerns about food waste Training can be given to the public about the cause of food waste and its environmental, economic and social concern. Education to reduce waste can be given in primary and secondary school classrooms. Application projects in which students are at the center can be realized.

It should be ensured that saving is a priority rather than limiting advertisements and/or focusing on consumption. Food redistribution policies can be established for edible retail and commercial foods. As seen in the examples given in the literature, the products remaining in the retail sector in many countries are delivered to consumers by producing added value by different methods. Market, market, bakery, patisserie, etc. Products that are edible but remain on the counter are sold to consumers through mobile applications and e-commerce activities. In addition, public, private and non-governmental organizations that can ensure the evaluation of the products left on the counters should be established and supported.

In market places, food is presented to the consumer in a more open and uncontrolled way in terms of food safety compared to the markets. Especially in hot weather in summer, the products are directly exposed to heat without any cooling system. In this case, it can be predicted that food loss may be higher than in market and business environments. For this reason, losses can be reduced and less contamination of the food can be achieved by collecting the excess demand of the foods in the market quickly and systematically at the end of the sales period.

Food wastage throughout the supply chain, products are exposed to the sun after collection, products are transported in airless closed vehicles, products rot before reaching the consumer due to lack of knowledge of the manufacturer, inability of sellers to plan demand, products that cannot be sold because their expiration date has passed, between the expiration date and the recommended use date. It arises due to the fact that consumable products are not used due to the inability to make a distinction, the market and shopping planning is not made in advance in the households, the food is not used efficiently during preparation and service, the food remains on the plates due to the large meal plates.

Within the retail sector, the sale of SKT and TETT (Recommended Consumption Date) products in a certain aisle by informing the buyers should be expanded. Such practices are slowly developing in our country. However, rotten products should not be put in the products sold by this method. According to the conditions of use of the products, after the products are kept in the aisle for a certain period of time, they can be sold to the buyers at a lower price in the recycling aisles. Households prefer to buy more products, considering that the cost decreases when they buy more in terms of weight. This causes wastage. Households should purchase the amount of products they can use. Financial literacy training can be given to households.

One of the areas where waste is experienced is the ready-made food sector. Businesses such as restaurants, restaurants, cafeterias and cafes should reconsider their portions. When asked how much of the side dish you consume in restaurants, the majority of the participants stated that they had leftovers. One of the reasons for this is that businesses put more products on the table than necessary in order to meet the desire of the buyers to make the tables and plates look rich and stylish. Both sellers and buyers should be encouraged to act in a simple and middle way. In order to achieve this, programs can be organized for people to adopt a simpler and sharing lifestyle instead of a visual, status and materialistic lifestyle.

Serving trays and plate sizes are things that may need to be reconsidered in the restaurant and cafeteria system. Half-empty serving trays will not look appealing and at the same time, an always-full serving tray can result in food wastage as demand dwindles. Creative chefs will maintain the look of a full serving tray without filling it completely. There is a great debate for customers about the transition from tray to trayless service and how this can help reduce food waste. Trayless service means customers will have to go to the buffet multiple times. In order to reduce the number of trips, customers will be more careful in their choices and what they put on their plates.

Behavioral values ​​and skills of the society should be developed in order to prevent food waste;

Educational campaigns can be organized focusing on behavioral changes for the society to reduce waste. These campaigns can target a variety of audiences. These considerations may include proper food preparation, portion sizes, food reuse, order flexibility in restaurants, food purchasing, food storage, food safety, and meal planning.

Educational programs can be organized to address the moral issues of food waste and its potential to save money by preventing food waste.

It can promote the redistribution of edible foods for human consumption. Recovery policies, tax incentives for donors, limited liability arrangements for donors, programs that facilitate the connection between donors and those in need, or logistics of collection and transportation can be facilitated. By explaining the difference between the consumption date and expiration date of foodstuffs, it should be cleared that the usable foods that have not expired but passed the expiration date should be subject to food banking. Returned products in the markets constitute a great burden. For this, the VAT incurred in the production and purchase of the items subject to donation and the burden incurred in the delivery of donations may be exempt from VAT.

It can promote the redistribution of waste food for animal consumption. These policies can make it easier to divert waste food from the retail and consumer sectors into animal feed, for example food rejected due to packaging errors or defects. Also, education at the household level can encourage people to feed their pets instead of throwing away excess food.

Incentives to Prevent Food Waste Can Be Provided; Policies can be enacted to encourage prevention, such as rewarding companies that can significantly prevent food waste. Incentives can be financial, such as tax credits, or require higher costs for waste disposal (thus promoting reduction).

Policies that support research and development can be implemented. These policies can contribute to innovations that can reduce food waste. These could include improved packaging that extends shelf life, improvements in food storage, or better tracking systems for stock management. Policies may include funding or tax incentives for research organizations.

Policies can be implemented to improve Food Packaging. These policies may encourage product packaging restructuring to avoid waste, such as packaging to extend shelf life or protect products. Policies may include financial incentives to businesses using preferred packaging. Policies can be implemented to eliminate ambiguous food labeling. This policy includes well-defined, clear, scientifically sound date labeling systems for food.

The waste aggregate system can be reviewed;

Policies to change the design of municipal waste collection systems can help prevent food waste. These include volume-based systems for garbage or reducing the number of days garbage is collected. It can also separate wastes in order to classify and recycle wastes in households. food waste in household waste bins; It can be separated into other wastes such as crusty, watery.

Waste garbage applications, which have examples in Europe, can be realized. For example, Green can of vegetables, Yellow can of food, etc. It is possible to collect the wastes and provide the necessary transformation more easily by performing this separation in the garbage containers on the streets. For this, it may be necessary to review the existing capacities of legal regulations and local governments. There are many direct and indirect benefits of preventing and reducing the dumping of food waste in landfills. It will help reduce the various resource use associated with food production, reduce greenhouse gas (GHG) emissions, recover useful resources from food waste, reduce the social cost of handling and processing food waste, and better use storage and waste capacity.

Scientific studies to identify food waste can be encouraged;

To solve the current problem, a measurement system must first be found to understand where waste is occurring and how to stop it. The system must be able to accurately measure the food waste and its monetary value, which includes the full cost of materials and labor. In addition, monitoring and separate collection of food waste flow will raise awareness of food waste for both staff and customers. Staff should be involved in the costing of food waste and trained about the environmental issues that may arise from their actions. It can reduce food waste by determining how to treat it. An example is legislation that prohibits the dumping of organics. Financial incentives such as taxes, fees or subsidies can also determine treatment modalities.

Reporting food waste statistics necessitates the achievement of waste prevention targets. Consistent, comprehensive data collection and indicator monitoring will provide future guidance on effective and ineffective policies.

Data on the availability and losses of food obtained throughout the supply chain are shared each year by the US Department of Agriculture. In order to share such data, it is important to benefit from technological developments in both production and consumption markets. It should be ensured that sample applications are examined and applied according to the conditions and conditions of our country.

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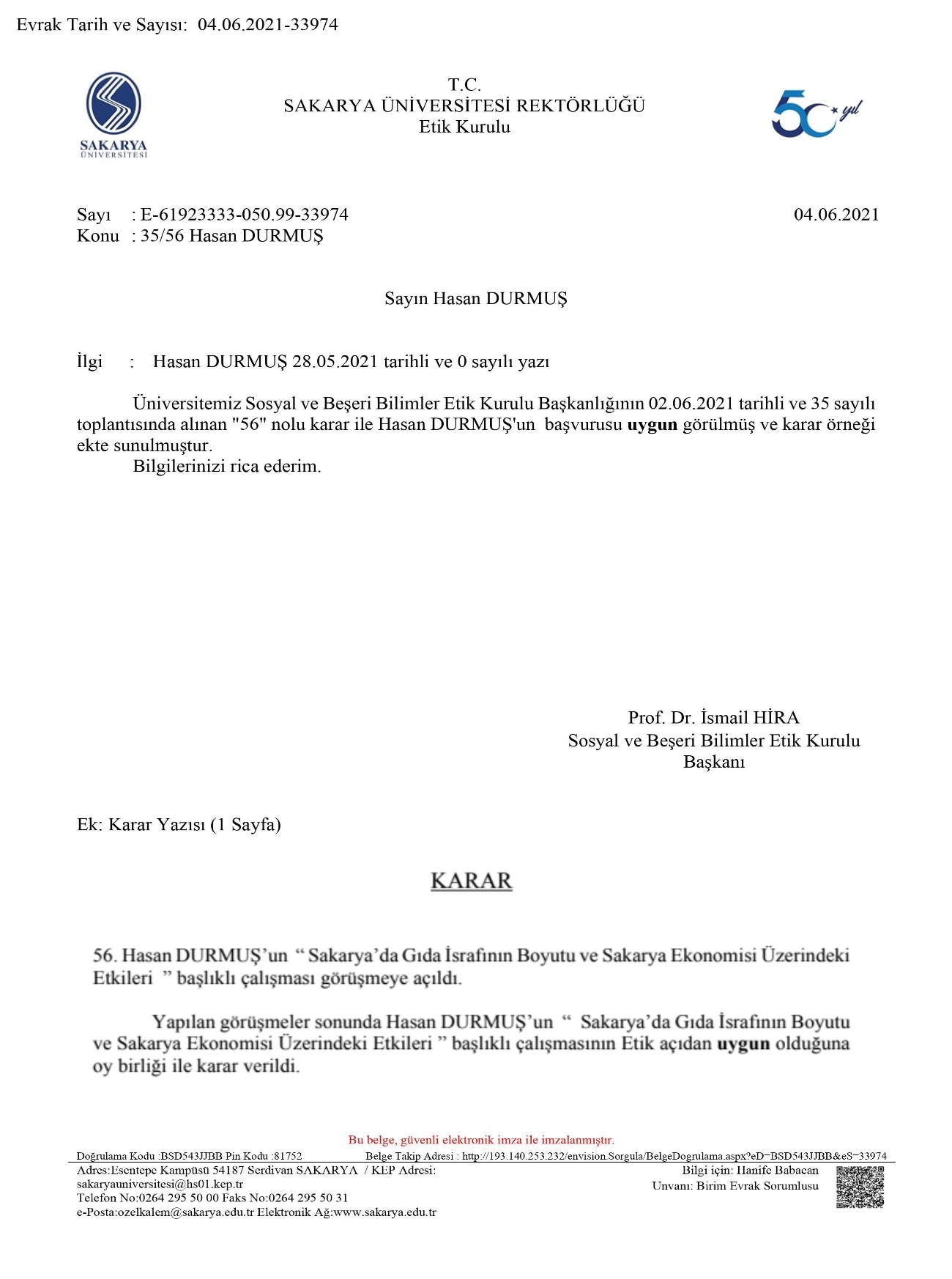
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ATTACHMENTS

**EK 1:** Etik Kurul Raporu 

1. This study was prepared based on the doctoral thesis titled "A Research on the Size of Food Waste and Determination of Its Economic Effects: The Case of Sakarya Province". [↑](#footnote-ref-1)
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4. Information about Wednesday market was obtained from Erenler Municipality and Sakarya Chamber of Vegetables. [↑](#footnote-ref-4)