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STRENGTHENING INSTITUTIONAL CAPACITY OF MINISTRY OF TRANSPORT AND INFRASTRUCTURE ON THE TRANSPORT OF PERISHABLE FOODSTUFFS

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Cost Benefit Analysis Report for ATP Implementation in Turkish Legislation

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1. INTRODUCTION

1.1 PROJECT BACKGROUND

As an EU Candidate and as an important producer of food products, Turkey carefully follows and implements relevant regulations in order to secure the food industry and to improve food quality. 93% of freight is conducted by road in Turkey. In this freight, an important amount concerns animal products and agricultural products. Almost all domestic foodstuff distribution is made with land vehicles like trucks, trailers vans and minivans. As of June 2021, there are around 40.000 frigorific transportation vehicles in Turkey.

In the field of perishable foodstuff transportation, the improvement of refrigerating methods and equipment has permitted the transfer for greater distances and significantly increased the size of the global food market. The transportation of temperature-sensitive products in their original state of quality (and not degraded) to the final consumer is not only a matter of commerce but also a matter of public health.

The overall objective of the project is the Harmonization of Turkish legislation with the EU acquis in the field of ATP implementation through the harmonized practice of European ATP contracting parties, together with the progressive development of the institutional and administrative capacity. The main purpose of the project's activity is to strengthen the enforcement capacity of the Ministry of Transport and Infrastructure of the Republic of Turkey on perishable foodstuff transportation, assessment of the weaknesses and strengths in potential introduction of the ATP rules and standards to the local food transport market as well as the needs to apply ATP rules on the transport of fresh fruits and vegetables, that are not covered by the Agreement. In this respect on each of the stages, smooth transposition, implementation and enforcement schemes based on the best EU practices are to be ensured.

When food legislation is examined from an international perspective, the commission, which determines the minimum quality and safety criteria for foodstuffs and makes recommendations to the countries of the world, is the Codex Alimentarius Commission established by the United Nations Food and Agricultural Organization. The regulation on food codex was issued in Turkey in 1997. The aim of the regulation is to determine the standards of food production and good manufacturing practices to protect consumer health. The Regulation also sets the rules and procedures of appropriate technical and hygienic production, processing, storage, handling, packaging, marketing, sampling and analysis methods. More than 90 communiques have been issued within the framework of the regulation. One of them is the "Communique on Quick Frozen Food (no: 2204/46)" which regulates the production, storage, preservation and transportation of quick frozen food". There is also another communique, namely "Communiqué on sampling and analysis methods for temperature control of quick frozen foods (no: 2001/45)" which defines the sampling procedure and method of analysis for the official control of the temperatures of quick-frozen foods intended for human consumption. In addition, the By-law on Special Hygiene Rules for Animal-Origin Food (entry into force: 27.12.2011) has been issued on the basis of the By-Law of the European Parliament and Council on the Hygiene of Foodstuffs, dated 29.04.2004 and numbered EC No (852/2004). The By-Law contains the special hygiene requirements, responsibilities, and procedures and principles related to self-controls carried out, which processed and unprocessed animal food manager must comply with. These principles also include processes such as storing and transferring of animal food products.

Apart from adopting the EU legislation, Turkey has also its own law for Agricultural Goods Trade, published in the Official Gazette in 26.03.2010, and the subject is within the scope of the Ministry of Trade. It is intended to regulate buying and selling of any kind of agricultural goods; procedures and principles regarding the establishment, operation, management and supervision of the wholesale markets and local market places, the sanctions to be

applied by the ministries and municipalities. It covers the duties, powers and responsibilities of other administrations. This law has many legislations, communiques and circulars, yet the communique dated 29/06/2021 is important since it is regulating the transport of foodstuffs specifically. This communique describes the requirements applicable to the entire chain for fruits and vegetables and in particular the use of vehicles to carry these products. Although this communique is in force with the law 5957, no penalties are listed for disobeying the rules which means there is no enforcement. Law 5957 is binding for any kind of trade for agricultural goods and it is strictly controlled by authorities, however, no regulation has been made regarding penalties and roadside inspections within the scope of the communique.

Recently, two regulations relevant to the transportation of perishable foodstuff have been issued. One is the Regulation on Control of Transportation Services dated 03.06.2021 and the second one is the Regulation on the Special Equipment to be Used in the Transportation of Perishable Foodstuff dated 02.07.2021. The former regulation introduces the uniformization of inspections in the fields under the responsibility of the General Directorate of Transportation Services Regulation (UHDGM), including ATP inspections. The regulation defines the places, types and authorities of the inspections to be carried out within the framework of the transport and infrastructure legislation. The latter regulation makes a definition of special equipment, regulates supervision and testing obligations, imposes sanctions on those who do not comply with the rules, adopts roadside inspections and identifies public officials who will carry out these inspections. The mentioned Regulations have been in force starting from 01.01.2022.

1.2 NATURE OF THIS REPORT

There is no precise study on the losses or quality degradation of perishable food products due to improper transportation in Turkey. Studies are generally on fresh fruits and vegetables and examine the wastage beginning from the farm to the final retail point. It is difficult to estimate the impact of improper vehicle standards on the quality of final products. The perishable foodstuff within the scope of the ATP agreement, which should be carried by frigorific vehicles, are already transported within cold chain in the country but there may be various problems associated with the transport. These problems may be packaging related or there may be temperature fluctuations in the vehicles or delays in transport.

As mentioned above, to regulate the transport of perishable foodstuff, the Ministry of Transport and Infrastructure has issued the regulation on the Special Equipment to be Used in the Transportation of Perishable Foodstuff. This study will mainly focus on the impacts of the implementation of this regulation and will deal with the costs and benefits of vehicle certification and inspections.

This task is defined in Terms of Reference of the project under Activity 1.2 which states:

Activity 1.2: Explore the possibility to implement rules and standards specified in ATP Agreement in domestic transport operations for perishable foodstuffs and analyse the possible additional financial burden for the transport sector and positive externalities for mitigating negative effects of unsafe perishables for public health.

- Estimate the financial impact incurred on hauliers of possible inclusion of ATP rules into the domestic transport operations (impact of transportation costs for hauliers, the transportation fleet, etc.),
- Estimate the effects on retailers and perishable producers (the market) impacted by new rules to be applied in conformity with ATP requirements (weaknesses and strengths of implementation of ATP rules in Turkish legislation for the market).

The report is composed of 8 chapters. Chapter 2 gives information on the ATP convention and its implementation in Turkey. Chapter 3 explains the nature of the cold chain logistics in the country, provides information on the frigorific fleet and contains a section on the relationship between cold chain and climate change. Chapter 4 look at the market for perishable foodstuff, presents production statistics, calculates the value of products and the growth of the sector between 2013 – 2020. Chapter 4 also estimates the losses in the sector and makes a forecast about avoided losses due to implementation of ATP rules in the domestic market. Chapter 5 contains a SWOT analysis for the implementation of ATP rules in domestic market. Chapter 6 elaborates the costs and benefits of the proposed system for the public authority, the hauliers, the retailers and the producers. Chapter 7 provides a summary and conclusion.

2. ATP CONVENTION AND ITS IMPLEMENTATION IN TURKEY

2.1 ATP, ITS AIM AND SCOPE

The Agreement on the international carriage of perishable foodstuffs and on the special equipment to be used for such carriage (ATP) of 1970, is an international regulation prepared by European Governments for setting uniform criteria for the transportation of temperature-sensitive goods. The acronym “ATP” is the abbreviation of the French name of the Agreement (Accord relatif aux Transports internationaux de denrées Périssables et aux engins spéciaux à utiliser pour ces transports).

The ATP mandates that specific types of equipment should be used to transport perishable food internationally and that such equipment should be regularly tested. The ATP applies to transport by road and by rail and sea crossings of less than 150 km, but it does not necessarily apply to transport within the borders of a single country, unless a country declares its use in domestic transport as well. By regulating the technical specifications, the ATP creates a level playing field in the road haulage industry ensuring the quality and safety of the transported goods.

The agreement details the following;

- Lays down standards for temperature controlled transport vehicles such as road vehicles, railway wagons and sea containers,
- Lists the foodstuffs to be carried in accordance with the ATP agreement and sets the warmest permissible temperatures for types of cargos,
- Specifies the tests to be carried out on equipment to ensure that they meet the required standards.
- Provides the system of certification for equipment that conforms to the standards
- Requires all contracting parties to recognize certificates issued in accordance with the agreement by the authorities of other signatory countries.

Perishable food transport by air is not included within the scope of the agreement.

The special equipment used for the carriage of perishable goods must comply with the appropriate requirements of insulation and refrigeration as defined in the Agreement. ATP stipulates that special equipment (insulated equipment, refrigerated equipment, mechanically refrigerated equipment, heated equipment, mechanically refrigerated and heated equipment) must be used for the transport of the said foodstuffs and that this equipment must comply with the criteria determined in the agreement. Among these equipment types, “mechanically cooled equipment” is widely used.

Many vehicles and trailers built for the carriage of perishable good are type approved to the required standards and come with certification. An ATP Certificate of Conformity is issued for each equipment produced in accordance with the approved type, without making an actual examination on the equipment, limited to a certain number based on the report prepared as a result of the type test on a reference equipment. This certification lasts for 6 years. After 6 years, it is possible to renew the certification for periods of 3 years by having an in-service K-coefficient test at an approved ATP Designated Station authorised by the signatory country. ATP Certificates of Conformity may also be issued by the specific approval authority for the equipment in question, provided that the report prepared as a result of the periodic/exceptional inspections of the equipment in use is appropriate.

It is acceptable to carry the ATP certificate on international journeys and to have an ATP plate showing the details of the certificate. This plate is permanently fixed on the bodywork of the vehicle and it is recognized by the signatory countries. It is also possible to display the relevant information permanently fixed to the bodywork according to the specifications in the Agreement.

The ATP agreement is widely accepted in Europe, in the USA and in other countries, and it is well known and has proven to be effective. However, it deals only with a limited number of perishable foodstuffs. The provisions of ATP only deal with food safety; this is the reason why the list of Annex 3 embraces only meat and meat offal, fish, milk and dairy products, butter, game, poultry and rabbit. However, there are many other foodstuffs whose quality and also safety could suffer from inadequate transport conditions. Among the food products which are not included in the Annex 3 of the ATP, there are some widespread foodstuffs like fruits and vegetables, minimally processed ready to use vegetables, ripened cheese, and a large number of prepared dishes (mainly pasta, sweets or creams) not containing meat or milk and normally stored and transported in controlled or modified atmosphere or under vacuum. Therefore, there may be an opportunity to extend the application of the ATP to other perishable foodstuffs or high value goods.

2.2 ATP CERTIFICATION IN TURKEY

Turkey has become a party to the ATP Agreement in 2012 and started the certifications on 01.05.2017. However, ATP certification of Turkish vehicles started years before Turkey's signing the treaty since the European countries were asking for this document. Mainly DNVGL (Germany), T.V S.D (Germany) and Cemafruid's (France) ATP certificates were used due to the imported trailers. Turkish trailer manufacturers were also using these companies to certify their own productions. First DNVGL opened a periodic testing station in Turkey in 2011 and later on T.V.S.D in 2011 and both were active in Turkey until TSE (Turkish Standards Institute) was authorized for certification.

TSE has been assigned as an Authority for approval, certification and type testing. The first national ATP Certificate was issued to a reefer semi-trailer registered in Turkey after 15 May 2017. Since then, approximately 4000 national ATP Certificates of Conformity have been issued (64% for new equipment), 3 type-testing stations were set up for Turkish body manufacturers and 9 periodical testing centres around the country were built for in-service equipment. The type testing centers are in Sakarya and Ankara while periodic testing centers are on the busiest routes of trucks, namely Mersin, Sakarya, Kocaeli, Balikesir, Izmir and Hatay. These periodical test centres are operated by TSE experts inside private companies' facilities. One expert is appointed to each center. The staff working in these facilities are periodically trained and assessed by TSE.

It has been reported to UNECE that Turkish Standards Institution (TSE) is authorized for type test/examination activities to be carried out within the scope of ATP in Turkey. In this respect, ATP Certificates of Conformity issued/approved by TSE, the authorized test/inspection/certification organization of a country party to ATP, are also accepted by all other ATP countries. From a technical point of view, TSE has fully completed the national setup for testing and certification of ATP, therefore Turkey is fully capable of certifying both new bodies and in-service bodies. TSE is also ready to increase the number of these testing facilities.

The service fees charged by the testing centers is given in the table below.

Table 1. ATP Certification fees (valid in 2021)

| Test type | Total Cost for Haulier or Vehicle Manufacturer |
|--|--|
| ATP Certificate of Conformity (New equipment, first issue) | 675 TL + VAT |
| ATP Certificate of Conformity (Renewal) | 1570 TL + VAT |
| Temperature Recorder Periodic Verification | 444 TL + VAT |
| Type Testing – 4 day long testing (For insulated equipment manufacturers) | 23.440 TL + VAT |
| Type Testing – 4 day long testing (For thermal unit manufacturers) | 40.350 TL + VAT |

According to the information provided from the testing centers, a typical periodic inspection lasts for 3 – 6 hours and the average number of vehicles to be checked in a day is 3. Assuming 250 working days, this corresponds to 750 vehicles per year per testing center. When it is considered that there are 9 centers all over Turkey, Turkey's current annual capacity to test is calculated as 6.750 vehicles. Currently 3000 vehicles have ATP certification, while the total number of frigorific vehicles that are potential candidates for certification to carry perishable foodstuff is 40.000 (details are explained in Section 6.2). This indicates a serious increase in work load for certification. In order to cope with the new work load, either the capacity of the existing testing centers will be increased or authorization will be given for the opening of new testing centers. The cost of new test-centers is not taken into account in the cost-benefit calculations, now that the investment will be done by the private sector and the centers will be earning a profit.

In any case, the number of ATP certification experts will need to be increased. This means that more technical staff need to be trained. The training can be provided by TSE experts who have experience in certification. Therefore, no cost is foreseen for increasing the number of certification experts.

2.3 ROAD – SIDE CHECKS

Each vehicle or container operating in used in perishable foodstuff transportation has to carry a certificate or plate to demonstrate that it meets the standards for thermal efficiency as mandated in the ATP. Checks on the certificate or plate can be made at border stations or in the country's territory, during road-side checks or at food-processing facilities.

The audit infrastructure of the ATP adaptation process, of which TSE completed the technical infrastructure by issuing the first national ATP Conformity Certificate on May 15, 2017, was established with the entry into force of the Regulation on the Special Equipment to be Used in the Transportation of Perishable Foodstuff dated 1.1.2022.

In the 2019-23 Strategic Plan of the Ministry of Transportation and Infrastructure, the budget allocated for the checks for both dangerous and perishable goods was 22 million TL for 5 years. However, no checks were done regarding the control of ATP certificates.

Inspections of vehicles carrying perishable food can be carried out by the personnel of public institutions who are authorized to conduct inspections on the highways according to Article 28 of the Decree Law No. 655. Currently, the Ministry has various stations which can be used for ATP inspections. The number of these stations may need to be increased and additional staff may be needed.

3. COLD CHAIN TRANSPORTATION IN TURKEY

3.1 COLD CHAIN LOGISTICS

The logistics sector in Turkey has experienced a rapid growth in recent years. With the increasing foreign trade figures every year and the increasing investments of the enterprises operating in the sector in parallel, this sector has the highest share in turnover within the service sector (TÜİK, 2020). Especially thanks to the increasing food exports, the cold chain investments of the enterprises are also increasing. In our country, the applications of cold chain logistics are concentrated in the food and pharmaceutical sectors. Rapid urbanization of the country is the main factor causing food to be transported long distances. High population growth and mega cities with millions of inhabitants mean that demand for food will continue to grow in the country. Cold chain logistics of agricultural products is an important issue in food supply and food safety as well as a factor that has positive effects on the prevention of food loss.

Agricultural products, animal products, meat and dairy products can suffer various losses at all stages of the chain. It is estimated that the value of these losses for Turkey is 214 billion liras per year (Dünya Newspaper, 2018). Only in fresh vegetables and fruits, there is a loss of 20 billion liras per year. Although most of the losses occur in the production and consumption stages, the studies show that 10% of these losses occur in the logistics processes (Eldener, 2019).

Especially in the field of food, cold chain management has many stakeholders. Producers, intermediaries, dealers, carriers, markets, restaurants and ultimately end consumers form the links of the chain. In recent years, the emergence of food safety awareness among consumers has paved the way for the supply of food from reliable sources. In particular, chain markets operating throughout the country prefer to obtain their products through the cold chain beginning from the very first stage of the distribution channels, in order to ensure food safety and to manage logistics costs correctly. Under these favorable conditions companies operating in the logistics sector, which have reached a certain financial maturity, have invested in warehouses and vehicles to operate in this field.

One of the major challenges in effective cold chain management is the different temperature range requirements that each of the perishable food product categories (milk, eggs, fruit and vegetables, fresh-cut fruit, fresh-cut vegetables, meat and meat products, seafood and fish) have. During the transportation of a single product group, it is sufficient to set the right temperature at the beginning of the process and keep it under control. However, the main problem experienced in transportation operations occurs in transportation where the products are combined and sent to a market or retail point. During the transportation of products in the cold chain, a mixture of different types of products is usually made. These combinations, which are made according to the delivery points of the products, contain more than one product type by nature. However, the heat regimes required for the products to be transported without deterioration are different from each other. It is an important issue how to decide or how to provide different temperatures in the vehicle.

There is no study in Turkey on the impacts of temperature fluctuations in the cold chain on product quality. When international studies are examined, there are striking findings: A study in the USA reported that temperature fluctuation for bagged salads is between -0.30°C and 7.7°C while in transport, whereas the temperature should be maintained between 0.17°C and 5°C (Zeng et al, 2014). A similar trend was observed by Brown et al., who found that 52.78%, 22.22%, 9.75%, and 15.28% of the time during transport in spring, summer, fall, and winter season, respectively, temperatures exceeded 5°C . In Japan, the temperature of refrigerated iceberg lettuce was found to fluctuate in the range of 3°C to 15°C during transport (Koseki & Isobe, 2005). On the other hand, Tigman

et al. found that the shelf life of products stored with temperature fluctuation in range of 2 0C had two months' shorter shelf life than products with a temperature fluctuation of less than 0.5 0C.

The economic and ecological effects of a cold chain that is not managed properly are more than is thought. In the US, it is estimated that about 12% of food loss occurs during distribution, mostly due to improper cooling (Gunders and Bloom, 2012).

Most probably, same temperature fluctuations occur in Turkey as well. The customer (the food manufacturer or retailer) usually sets the standards for transportation and controls whether the goods are transported at right temperature with the help of remote-sensing technology or temperature recorders. If any violations are detected, the goods are rejected. Therefore, it is quite unlikely that goods that have a risk of endangering human health end up in the shelves and are consumed. This is especially valid for well-known food producers and supermarket chains. However, there may be cases where such controls are not strict enough and goods that should ideally be eliminated from the food-chain are offered to human consumption. The implementation of ATP standards in the domestic market, will be a good tool to cope with such cases. Even if the inspections by official authorities are not sufficient, the food producers, retailers and insurance companies will require transport companies to meet the requirements for the transportation of perishable foodstuffs.

3.2 FRIGORIFIC VEHICLE FLEET

As of June 2021, there are approximately 40.000 frigorific vehicles in Turkey. According to the information obtained from the Ministry of Transport and Infrastructure, 3.000 of them have been ATP certified. The number of existing vehicles according to their license categories is provided in the table below.

The number of vehicles with a C2 type license (international transport) is around 11.400 while the number of licenses for domestic goods transport is around 25.000. Most of the vehicles used in domestic transport are trucks or pick-ups while the ones used in international transports are mostly tow truck/semi-trailer combinations.

The analysis of the ages of vehicles is presented in the figure below. Around 7.000 vehicles are older than 15 years.

Special transportation equipment used in perishable foodstuff transportation consists of insulated equipment and thermal unit. The thermal unit is selected according to the volume of the equipment and the thermal requirements. Therefore, the compatibility of the thermal unit and the insulated equipment is crucial. In Turkey, there are records and statistics on the number of frigorific vehicles, however, no record is kept for thermal units. According to the information obtained from companies producing and selling those units in Turkey, only 25% of the units are purchased first-hand from the producer companies, while most of these units are second-hand and bought from foreign countries. There is no restriction on the import of such units and they are not registered. In the certification process for carrying perishable foodstuff, the published regulation will greatly benefit from testing insulated equipment with thermal units and recording information on both.

Table 2. Frigorific Vehicles According to License Categories

| License | Number | Incity | Intercity | International | Explanation |
|--------------|---------------|---------------|---------------|---------------|--|
| K1 | 6.989 | + | + | | Domestic Commercial Goods Transportation |
| K2 | 18.022 | + | + | | Domestic Transport for own Goods |
| K3 | 65 | + | + | | Domestic home and office goods transportation |
| C1 | 210 | + | + | + | Domestic & International Own Goods Transportation |
| C2 | 11.171 | + | + | + | Domestic & International Commercial Goods Transportation |
| C3 | 3 | + | + | + | Domestic & International home and office goods transportation |
| L1 | 2.812 | + | + | | Domestic logistics management |
| L2 | 567 | + | + | + | Domestic and/or international logistics management |
| M1 | 0 | + | | | Cargo management on a domestic schedule for commercial purposes |
| M2 | 47 | + | + | + | Domestic and/or international scheduled cargo management for commercial purposes |
| N1 | 3 | + | | | Domestic shipping warehouse management for commercial purposes |
| N2 | 139 | + | + | | Domestic shipping warehouse management for commercial purposes |
| P1 | 1 | + | | | Commercial distribution management |
| P2 | 0 | + | + | | Domestic distribution management for commercial purposes |
| Total | 40.029 | 40.029 | 40.025 | 11.998 | |

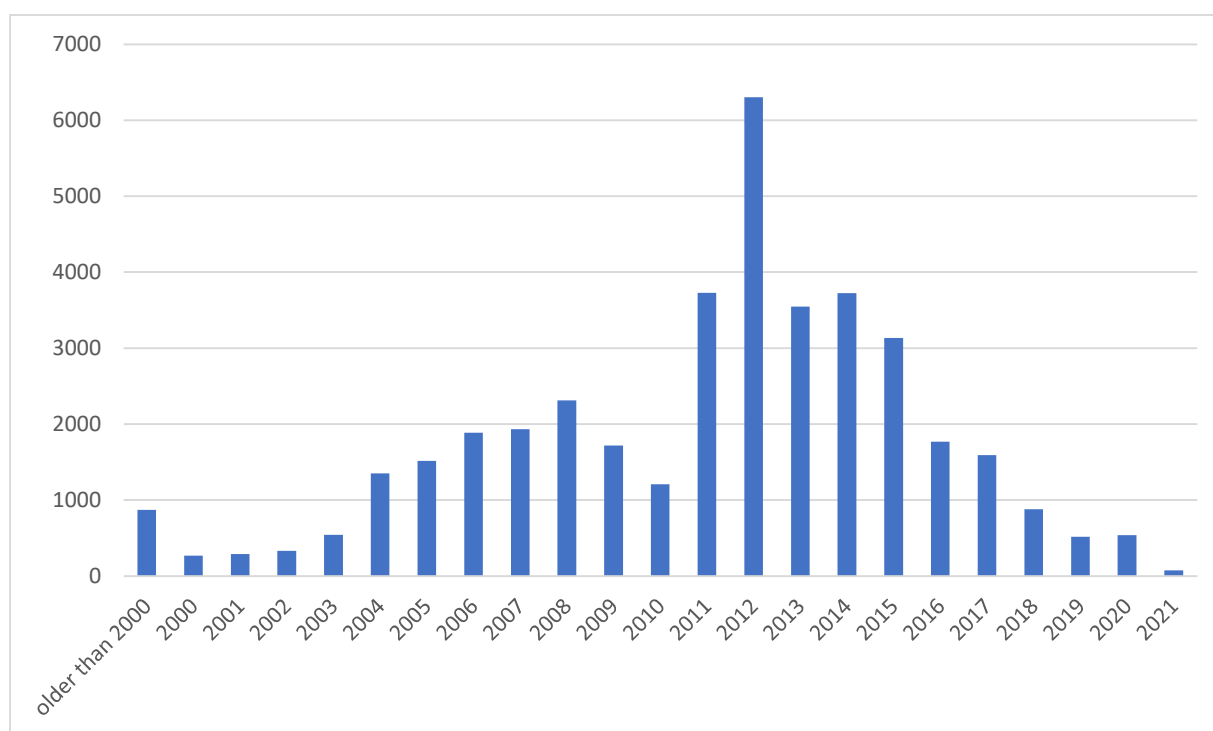


Figure 1. Model years of the Frigorific Vehicles

3.3 COLD CHAIN AND THE CLIMATE CHANGE

All regions of the world will ultimately suffer from the consequences of a warming climate. Agricultural production in northern latitudes may initially benefit. Countries in the southern hemisphere, on the other hand, and particularly those that are already agriculturally vulnerable are already beginning to suffer the negative consequences of a warmer, more volatile climate. They will not be able to grow as much, so the number of people at even greater risk of hunger will grow. There is therefore a strong moral case for countries to ensure that their farming sector is robust enough to grow enough food not just for their own populations, but also for people overseas (Garnett, 2008a, 2008b). Consequentially an effective and efficient cold-chain will be required to deliver this food around the world.

To provide safe food products of high organoleptic quality, attention must be paid to every aspect of the cold-chain from initial chilling or freezing of the raw ingredients, through storage and transport, to retail display. If climatic change results in a substantial rise in average ambient temperatures this will impose higher heat loads on all systems in the cold-chain. Warmer summer temperatures and humid conditions can enhance the survival of pathogens in the environment, leading to increased contamination of food, and increased risk of infection.

Refrigeration accounts for roughly 40% of the total energy requirement during distribution, making the distribution of frozen food around 1.7 times as energy-intensive as the distribution of groceries at ambient temperature (McKinnon & Campbell, 1998). A study by Nestlé demonstrated that transport generated roughly 15 kg of CO₂ emissions per tonne of product delivered. This represents approximately 10% of the total CO₂ generated during the manufacturing process (Carbon Disclosure Project, 2006).

Improvements in energy efficiency would not only cut distribution costs, but also reduce atmospheric emissions. Proper insulation of frigorific vehicles will contribute to the preservation of the appropriate temperature and will definitely save energy. Therefore, the implementation of ATP rules and standards in the domestic market is beneficial from energy saving and climate change perspective.

4. MARKET FOR PERISHABLE FOODSTUFF

4.1 THE SIZE OF THE MARKET

The ATP is limited to certain food products covered. Mainly they consist of meat, cheese, raw milk, dairy products, seafood and deep frozen food. Below Turkey's production of those goods is examined in order to give an idea about the size of the market. The below table is formed with information provided from the Institute of Statistics.

Table 3. Turkey's production of main perishable foods listed in the ATP Convention

| Year | Meat (Tons) | Chicken meat (Tons) | Turkey meat (tons) | Milk (tons) | Cheese (tons) | Milk cream (tons) |
|---------------------------|-------------|---------------------|--------------------|-------------|---------------|-------------------|
| 2013 | 996.125 | 1.758.363 | 39.627 | 1.323.942 | 598.915 | 29.445 |
| 2014 | 1.008.272 | 1.894.669 | 48.662 | 1.325.548 | 631.085 | 31.128 |
| 2015 | 1.149.262 | 1.909.276 | 52.722 | 1.378.524 | 665.580 | 32.097 |
| 2016 | 1.173.042 | 1.879.018 | 46.501 | 1.433.541 | 657.694 | 31.669 |
| 2017 | 1.126.403 | 2.136.734 | 52.363 | 1.547.844 | 687.206 | 32.458 |
| 2018 | 1.118.695 | 2.156.671 | 69.536 | 1.657.965 | 753.230 | 32.877 |
| 2019 | 1.201.469 | 2.138.451 | 59.640 | 1.490.321 | 696.804 | 39.006 |
| 2020 | N/A | 2 136 263 | 58 212 | 1.613.100 | 767.100 | 34.746 |
| 2013 – 2020 growth | 21% | 21% | 47% | 22% | 28% | 18% |
| Annual growth | 2,7% | 2,8% | 5,9% | 2,9% | 3,6% | 2,4% |

| Year | Butter (tons) | Butter milk (tons) | Yogurt (tons) | Seafood (tons) | Total tons |
|---------------------------|---------------|--------------------|---------------|----------------|------------|
| 2013 | 41.515 | 560.102 | 1.081.411 | 607.515 | 7.036.960 |
| 2014 | 45.818 | 598.876 | 1.101.261 | 537.345 | 7.222.664 |
| 2015 | 51.832 | 626.831 | 1.123.017 | 672.241 | 7.661.383 |
| 2016 | 57.610 | 684.527 | 1.173.577 | 588.715 | 7.725.893 |
| 2017 | 59.450 | 717.335 | 1.172.195 | 630.820 | 8.162.808 |
| 2018 | 65.857 | 730.708 | 1.198.796 | 628.631 | 8.412.965 |
| 2019 | 73.655 | 698.331 | 1.136.043 | 836.524 | 8.370.243 |
| 2020 | 78.610 | 587.830 | 1.113.782 | 785.811 | 8.376.923 |
| 2013 – 2020 growth | 89% | 5% | 3% | 29% | 19% |
| Annual growth | 9,5% | 0,7% | 0,4% | 3,7% | 2,5% |

Source: TURKSTAT and Consultant's calculations

The growth in production differs among types of products. While milk production grew 22% between 2013 and 2020, production of turkey meat grew by 47%. In total, production of the perishable goods listed above grew 19%, corresponding to an annual growth of 2.5% on the average in 7 years.

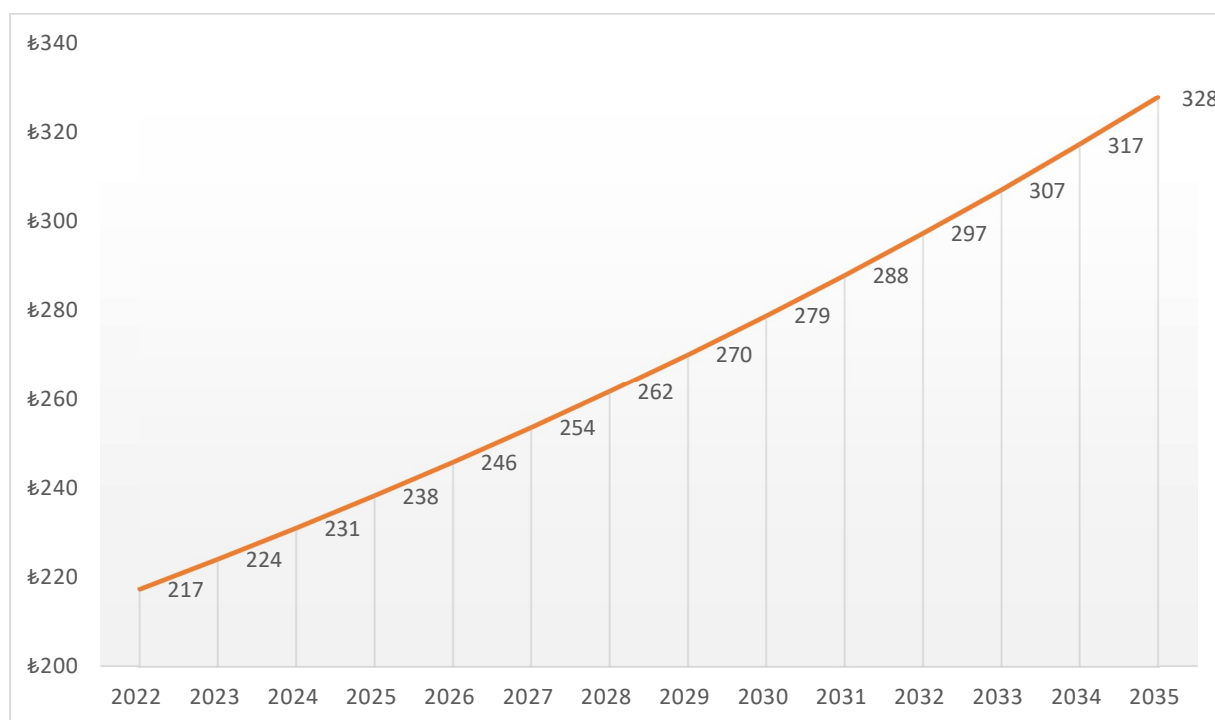


Figure 2. Forecasted Growth of the Perishable Foodstuff Sector in Turkey (Billion TL)

With 2021 retail prices, the value of the goods produced in 2020 sums up to 203 billion TL. The value of frozen food produced in Turkey is 1.2 billion TL according to sectoral reports. So, the size of the market for perishable foodstuff is around 205 billion TL. In 2030, the value of perishable foodstuff is estimated to reach 280 billion TL.

4.2 LOSSES DUE TO IMPROPER TRANSPORT

In a study prepared by TUBITAK (Turkish Institute for Scientific and Technical Research) for Metro Wholesale Market in 2012, the losses in the traditional food supply chain have been determined. The losses for the perishable foods are presented in the Table below:

Table 4. Percentage of Losses in the Food Supply Chain

| Product Group | Agricultural products | Post-harvest Loading and Storage | Processing and Packaging | Distribution | Household Consumption | Total |
|------------------|-----------------------|----------------------------------|--------------------------|--------------|-----------------------|-------|
| Meat | 10 | 0,2 | 5 | 0,5 | 1 | 16,7 |
| Fish and seafood | 10 | 0,02 | 0,04 | 0,01 | 2 | 12,07 |
| Milk products | 10 | 1 | 1,5 | 6 | 1,5 | 20 |

Source: TUSIAD Report (Improvements in Agriculture and Food logistics)

Food and Agricultural Organization also issues statistics on losses in the food supply chain. FAO statistics are on a regional basis. Turkey is located in the North Africa, West and Central Asia region. According to the recent statistics for this region (2012), the losses during distribution are 5% for meat, 10% for fish and 8% for milk. The figures of the Tubitak study proves that Turkey performs better than the countries in her region.

The reasons of the losses during transport are various. The master’s thesis titled “Analysis of Criteria Effecting Food Carriage Sector in Turkey and Identification of These criteria’s Significance Level” by Melih Gündüz, investigates the problems experienced in food transport sector and examines the positive and negative effects of the ATP agreement on the sector. As a part of the thesis, a survey is conducted with 8 companies based in the Ankara Logistics Base. The aim of the survey was to examine the role of training, vehicle and staff security, ATP convention, IT systems, fast delivery, on-line integration among institutions, staff training, cost, unplanned road maintenance, public inspection and politics on food transport. The respondents were asked to prioritize the problems of the sector. Priorities with degrees of importance associated to them are provided below:

Table 5. Prioritisation of Problems Stated by the Sector Officials

| CRITERIA | Degree of importance |
|---|----------------------|
| 1. Vehicle and staff security | 0,314 |
| 2. ATP convention (unfair competition between those adopting to the standards of the convention and the rest of the companies) | 0,195 |
| 3. Transportation IT system | 0,129 |
| 4. Fast delivery | 0,092 |
| 5. On-line integration among institutions | 0,083 |
| 6. Staff training | 0,067 |
| 7. Costs | 0,047 |
| 8. Un-planned road maintenance | 0,029 |
| 9. Public Inspections | 0,028 |
| 10. Politics | 0,015 |

Source: Master’s Thesis by Melih Gündüz (Çankaya University)

The ATP convention and public inspections have 22% share in the problems stated by the transport sector. The new regulation that addresses the ATP requirements in a way that covers the domestic transportation sector will address two items listed above, namely item 2 and 9 which have 22% weight on the 100 percent scale.

4.3 FORECASTED BENEFITS

A forecast is made for the size and production value of the perishable foods from 2022 until 2031 based on existing data and sector growth rates during the last 7 years. The deep-frozen products are excluded because losses in this category are not known and they have a small share in the perishable foodstuff. As stated in the previous section, it is assumed that the losses during distribution are 0.5% for meat, 0.01% for sea products and 6% for milk. Avoided losses are 22% of all transport losses.

Table 6. Sample Calculation for Avoided Losses for the Year 2025

| Product | Forecasted Production (Tons) | Value of product (TL) | Forecasted Loss during Transport (TL) | Avoided Losses (TL) |
|-----------------------|------------------------------|------------------------|---------------------------------------|----------------------|
| Red meat | 1.372.666 | 82.359.943.137 | 411.799.716 | 90.595.937 |
| Chicken meat | 2.452.564 | 49.051.273.529 | 245.256.368 | 53.956.401 |
| Turkey meat | 77.534 | 2.326.020.703 | 11.630.104 | 2.558.623 |
| Milk | 1.860.965 | 14.887.718.621 | 893.263.117 | 196.517.886 |
| Cheese | 915.484 | 54.929.040.164 | 3.295.742.410 | 725.063.330 |
| Milk cream | 39.121 | 2.347.231.090 | 140.833.865 | 30.983.450 |
| Butter | 123.751 | 7.425.054.445 | 445.503.267 | 98.010.719 |
| Butter milk | 608.694 | 2.130.429.385 | 127.825.763 | 28.121.668 |
| Yoghurt | 1.136.237 | 7.385.537.636 | 443.132.258 | 97.489.097 |
| Fish and sea products | 942.349 | 14.135.238.639 | 1.413.524 | 310.975 |
| Total | 9.529.364 | 236.977.487.349 | 6.016.400.391 | 1.323.608.086 |

The above table shows that the size of the perishable foods market reaches 9.5 million tons in 2025 with a total value of approximately 240 billion TL. Value of prevented losses are expected to reach 1.3 billion TL.

The avoided losses (benefits of the new system) for all years are presented in Section 6.6.

5. SWOT ANALYSIS FOR IMPLEMENTATION OF ATP RULES IN THE DOMESTIC MARKET

The Consultant presents a SWOT analysis of Turkey's decision to implement ATP rules and standards within the country. The results of the analysis is presented below:

5.1 STRENGTHS

- The continuous growth of the total turnover in the logistics sector and increasing investments: The logistic sector in Turkey is quite strong and has grown more than 300% between 2010 and 2019. Although the sector is less developed than in Europe, it is growing rapidly which means that there is a potential to adapt to the new regulations in domestic transportation of perishable foodstuff.
- Turkey's intensive traffic in perishable food: Turkey is an important producer and exporter of perishable foods and has extensive experience in transportation of those products. The perishable foods within the scope of the ATP convention is already being transported in cold chain to a major extend.
- Wide transportation network spread across the country: A good transportation network is vital in cold chain transportation because hauliers compete with time. In recent years, Turkey has invested extensively in highways and the length of split roads has reached 28.000 km.
- Food transportation is carried out with vehicles harmonized with international standards: The trucks, trailers and cooling units used in frigorific transportation in Turkey are world-known brands. Most of them are foreign brands or Turkish products that have proven their quality world-wide.
- Turkey is already a signatory of ATP: Many transportation companies that carry products to foreign countries have already adapted their fleet to ATP requirements now that it is obligatory to have an ATP Certificate of Conformity in order to carry goods to countries that are signatory of the ATP convention.
- National regulations for food transportation: Two important regulations relevant to the transportation of perishable foodstuff have been issued recently. One is the Regulation on Control of Transportation Services dated 03.06.2021 and the second one is the Regulation on the Special Equipment to be Used in the Transportation of Perishable Foodstuff dated 02.07.2021. The former regulation introduces the uniformization of inspections in the fields under the responsibility of the General Directorate of Transportation Services Regulation (UHDM), including ATP inspections. The regulation defines the places, types and authorities of the inspections to be carried out within the framework of the duty and jurisdiction of UHDM. The latter regulation makes a definition of special equipment, regulates supervision and testing obligations, imposes sanctions on those who do not comply with the rules, adopts roadside inspections and identifies public officials who will carry out these inspections. The mentioned regulations has been in force starting from 01.01.2022.

5.2 WEAKNESSES

- High cost of energy required for cold chain: It is a fact that cold chain logistics is more expensive when compared to other modes of transport. Hauliers may tend to operate the cooling units more economically (above ideal cooling temperatures) to save energy and reduce operational costs.

- Failure to fully implement existing regulations: There are gaps especially in the enforcement of legislation. For example, although Turkey is a signatory of the ATP agreement, there are no road-side checks to control the compliance of transportation companies. With the new regulation on Control of Transportation Services, the Ministry has taken the necessary steps in this direction and it is expected that the situation will be improved starting from 01.01.2022

5.3 OPPORTUNITIES

- The reducing effect of a properly managed cold chain process on food inflation: Proper transportation of food under ideal conditions ensures the preservation of food quality and is important in reducing food loss. More food to be offered for consumption will reflect positively on the control of inflation in this sector with the decrease in food loss.
- Well insulated vehicles to reduce energy costs: Vehicles with weak insulation that are currently used in food transportation use more energy than vehicles that are heavily insulated. If the transportation sector is required to switch to heavily insulated vehicles, the energy cost will be reduced.
- Thermal units to be registered during certification: As explained in chapter 3, the thermal units that are the most essential parts of special transport equipment, are not registered and no record is kept on the compatibility of thermal units with insulated equipment. The certification process will be an opportunity to register thermal units.

5.4 THREATS

- High investment costs for hauliers to cope with the new regulation: Transporters whose fleet is not in full compliance with the requirements of ATP will have to replace vehicles that meet ATP requirements which will mean high investment costs.
- Hauliers to reflect the increase in investment and operational expenditures on food prices: If hauliers face high investment and operational expenditures, they will reflect the cost on to the products they carry, which may result in higher food prices in the short term.

6. COSTS AND BENEFITS OF IMPLEMENTATION OF THE ATP REGULATION IN THE DOMESTIC MARKET

6.1 IMPACTS ON THE PUBLIC AUTHORITY

As discussed previously, the Ministry of Transport and Infrastructure, as the main authority in charge of implementing and supervising the certification of vehicles and transport of perishable foodstuff, will need to increase the number of test centers and experts to be employed in those centers through TSE. While the testing capacity of Turkey is estimated as 6.750 per annum, the number of vehicles that are in use currently and expected to apply for a document between 2022-2024 with the implementation of the new regulation is around 29.000 (see section 6.2 for details). The Ministry has the experience and capacity to authorize additional companies for this purpose and train additional staff.

In addition, the Ministry will start to implement road-side inspections. The establishment of mobile or stationary inspection points and the training of staff to be employed in inspection are the main tasks to be fulfilled in the near future.

The fees collected in return for tests and certification of vehicles will be shared between the Ministry and TSE by 35% and 65% respectively, which means the Ministry will receive 56 million TL in 10 years and the TSE will receive 104 million TL.

6.2 IMPACTS ON HAULIERS

The hauliers will be widely affected by the new regulation on the transport of perishable foods. Although the transport companies that give service in international transport have already complied with the requirements of ATP and have certified their vehicles, majority of hauliers will need to adapt themselves to the new rules. Firstly, they will have to get their vehicles tested and certified. It is a significant work load to have thousands of vehicles certified and it requires time. Therefore, the Regulation has allowed a 3-year transition period for certification of existing vehicles. The results regarding the estimated cost of certification are presented in Table 4 below. It is believed that the certification cost is negligible and will not have a major impact on the companies.

According to the new Regulation on the Special Equipment to be Used in the Transport of Perishable Foodstuff, the vehicles older than 15 years will not be certified. Considering that 3.000 vehicles out of 40.000 are already certified and 7.000 will not be certified due to age restrictions, the total number of vehicles that can be certified is approximately 30.000. These vehicles are indicated at row 1 in the Table 7. Each year, the number of vehicles decline due to aging and they are replaced with new vehicles (row 2).

Row 3 shows the number of vehicles to be added to the fleet due to the growth in the market for perishable foodstuff which is assumed to be 2.5% per annum as explained in Chapter 4. The cost of certification for new vehicles has been calculated (row 2 and 3) in row 6. Certification fee is 675 TL. The cost of certificate renewal after 6 years is calculated in row 7 of the table. The renewal fee is 1.570 TL.

For the existing vehicles in the fleet, a transition period of 3 years is allowed to be certified to carry perishable foodstuff. The calculation of fees for those vehicles is provided in row 5 of the table. Again certification fee for old vehicles is assumed to be 1570 TL. Each year, transport companies will spend more than 15 million TL for certification and the total cost will reach 167 million TL in 10 years.

Table 7. Annual Cost of Frigorific Vehicle Certification to Carry Perishable Foodstuff (for selected years) – in fixed 2021 prices

| 2022 | 2023 | 2024 | 2025 | 2028 | 2030 |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|
| NO OF VEHICLES | | | | | |
| (1) Existing number of vehicles with no ATP Certificate of Conformity as of 2021 under 15 years of age: numbers decrease in years as more vehicles become older than 15 years | | | | | |
| 29.009 | 27.853 | 26.995 | 26.390 | 19.603 | 16.173 |
| (2) Number of old vehicles replaced: The number of vehicles over the age of 15 in the current fleet is 7.000. They should be replaced in 2022. Then, each year, the vehicles reaching the age of 15 will be replaced. | | | | | |
| 7.967 | 1.157 | 858 | 605 | 1.774 | 1.568 |
| (3) Number of vehicles to be added to the fleet each year: It is assumed that the fleet will grow 3% parallel to the growth of perishable food production | | | | | |
| 1.200 | 1.235 | 1.307 | 1.372 | 1.671 | 1.883 |
| (4) Cumulative number of frigorific vehicles | | | | | |
| 41.176 | 43.568 | 45.733 | 47.709 | 59.128 | 66.215 |
| COST CALCULATION (TL) | | | | | |
| (5) Fee for existing vehicles to apply for certificate (for vehicles in row 1) fee is 1.570 TL/vehicle : It is assumed that 1/3 of the vehicles in row 1 (1/3 of 29.000 vehicles) are tested in 2022 due to 3 year transition period. Same is valid for 2023 and 2024. Now that the certificate will be valid for 3 years, the renewal process will start in 2025. | | | | | |
| 15.181.377 | 14.576.142 | 14.127.122 | 13.810.767 | 10.258.903 | 8.463.870 |
| (6) ATP new certification fee for vehicles in row 2 and 3 – fee is 675 TL/vehicle | | | | | |
| 6.187.725 | 1.614.452 | 1.461.398 | 1.334.127 | 2.324.717 | 2.329.045 |
| (7) Renewal of ATP certificates for vehicles in row 2 and 3 after 6 years - fee is 1.570 TL/vehicle | | | | | |
| | | | | 14.392.190 | 3.399.102 |
| ANNUAL COST OF CERTIFICATION FOR HAULIERS (TL) – 10 years total 167 million TL | | | | | |
| 21.369.102 | 16.190.593 | 15.588.519 | 15.144.894 | 26.975.811 | 14.192.017 |

Source: Consultant's calculations

It is assumed that, hauliers who do not have an ATP Certificate of Conformity will replace their old vehicles (those older than 15 years) in order to obtain a Perishable Food Transport Certificate or ATP Certificate of Conformity. Most of the frigorific vehicles used in domestic transport are trucks or panelvans. The sizes vary (5 meter – 7.5 meter long rigid trucks or 5 – 15 m³ panelvans) and so do prices, but the average price of a new vehicle is taken as: 100.000 TL. The total cost of replacing the vehicles older than 15 years will be close to 2.2 billion TL in 10 years. So the total cost of the regulation to the hauliers will be approximately 2.3 billion TL in 10 years.

On the other hand, the new regulation will make improvements in the transport sector. Although there are companies working at international standards with very modern equipment in the sector, there are also others that don't comply with the standards and therefore gain comparative cost advantage in transport tenders, where usually the lowest bidder is awarded the contract. With the certification requirement for vehicles that are used in the transport of perishable foodstuff, the vehicles to be used for this purpose will have a uniform standard and unfair competition will be terminated.

6.3 IMPACTS ON RETAILERS

Retailers are the ones who brings perishable foods directly to the final consumer. As they are responsible for offering the products in best condition, they make sure that the products are transported under ideal conditions. The retailers that own a frigorific fleet, will be directly affected from the new regulation. They will have to get ATP

Certificate of Conformity or Certification of Compliance on Transportation of Perishable Food. Vehicles older than 15 years will required to be renewed.

For retailers that have outsourced the transportation services, the new regulation will bring benefits. The presence of a perishable foodstuff transportation certificate will reduce the incidences of degradation in food quality due to improper vehicle insulation. They will be selling better quality products.

6.4 IMPACTS ON PRODUCERS

The producers of perishable foodstuff are responsible for the quality of their goods from farm to fork. Degradation in quality due to improper transport will harm the producer's reputation, therefore should be given great care. The impacts of the regulation on producers will be similar to that of retailers. Some big food companies transporting their goods with their own vehicles will have certification and vehicle replacement costs. In case they have outsourced the transportation services, the existence of an authority to check the compatibility of frigorific vehicles of the transportation companies will be an advantage for them.

6.5 IMPACTS ON CONSUMERS

Consumers of the perishable foodstuff are expected to benefit from the consequences of the new regulation. Public health issues due to food poisoning will definitely be reduced. Control and certification of vehicles cannot eradicate alone public health problems because there are many other rings of the chain from farm to fork but food quality degradation due to improper transportation will be minimized.

Food that is transported at right temperature has a longer shelf life and lasts longer in the consumer's fridge. Therefore, the foodstuff transported properly will be of better quality and better in terms of "value for money".

One concern for the consumer can be the possible increase in food prices due to the rising costs in transport however, the reduction of food loss and cost savings in that respect should be taken into consideration. It will be logical to expect that savings due to avoided loss will offset the costs associated with the increase in operational expenditures of transportation companies.

6.6 NET BENEFIT CALCULATION FOR TURKISH ECONOMY

The costs that are associated with vehicle certification and vehicle replacement and benefits arising from reduced losses are calculated on an annual basis and presented in the table below.

Table 8. Net Benefit Calculation

| Year | Benefits due to avoided losses | Cost of certification | Cost of new vehicles | Net Benefit |
|------|--------------------------------|-----------------------|----------------------|---------------|
| 2022 | 1.195.550.386 | 21.369.102 | 796.700.000 | 377.481.284 |
| 2023 | 1.236.404.345 | 16.190.593 | 115.650.000 | 1.104.563.752 |
| 2024 | 1.279.056.101 | 15.588.519 | 85.800.000 | 1.177.667.582 |
| 2025 | 1.323.608.086 | 15.144.894 | 60.450.000 | 1.248.013.192 |
| 2026 | 1.370.170.148 | 15.059.435 | 186.300.000 | 1.168.810.713 |

| | | | | |
|---|-----------------------|--------------------|----------------------|-----------------------|
| 2027 | 1.418.860.173 | 14.346.445 | 315.050.000 | 1.089.463.728 |
| 2028 | 1.469.804.768 | 26.975.811 | 177.350.000 | 1.265.478.958 |
| 2029 | 1.523.140.002 | 15.493.823 | 186.250.000 | 1.321.396.179 |
| 2030 | 1.579.012.219 | 14.192.017 | 156.750.000 | 1.408.070.202 |
| 2031 | 1.637.578.919 | 13.041.953 | 88.450.000 | 1.536.086.966 |
| TOTAL | 14.033.185.148 | 167.402.592 | 2.168.750.000 | 11.697.032.556 |
| NPV (Net Present Value) of Net Benefits | | | | 6.789.168.774 |

As shown in the above table, the benefits of the system surpass the costs and the value of net benefits are close to 12 billion TL in 10 years. The current value of net benefits is TL 6.8 billion.

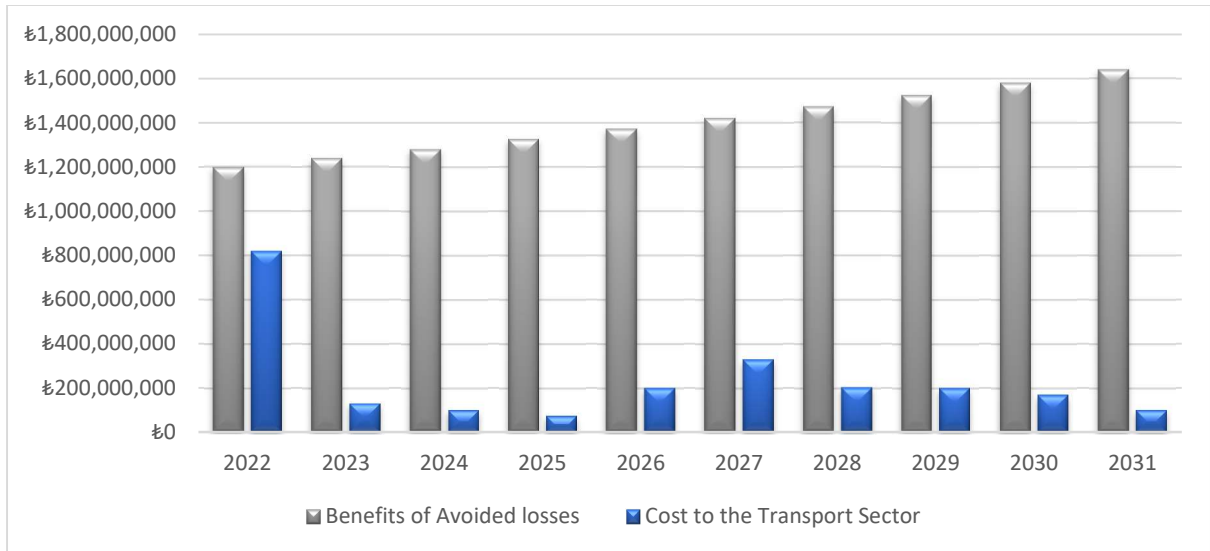


Figure 3. Costs and Benefits for the Turkish Economy (TL)

7. FINAL EVALUATION OF THE PROPOSED SYSTEM

The Consultant has evaluated the costs and benefits of implementing new Regulation on the Special Equipment to be Used in the Transportation of Perishable Foodstuff from various perspectives. Due to insufficient data, it is not possible to quantify many impacts. The costs and benefits are summarised in the table below:

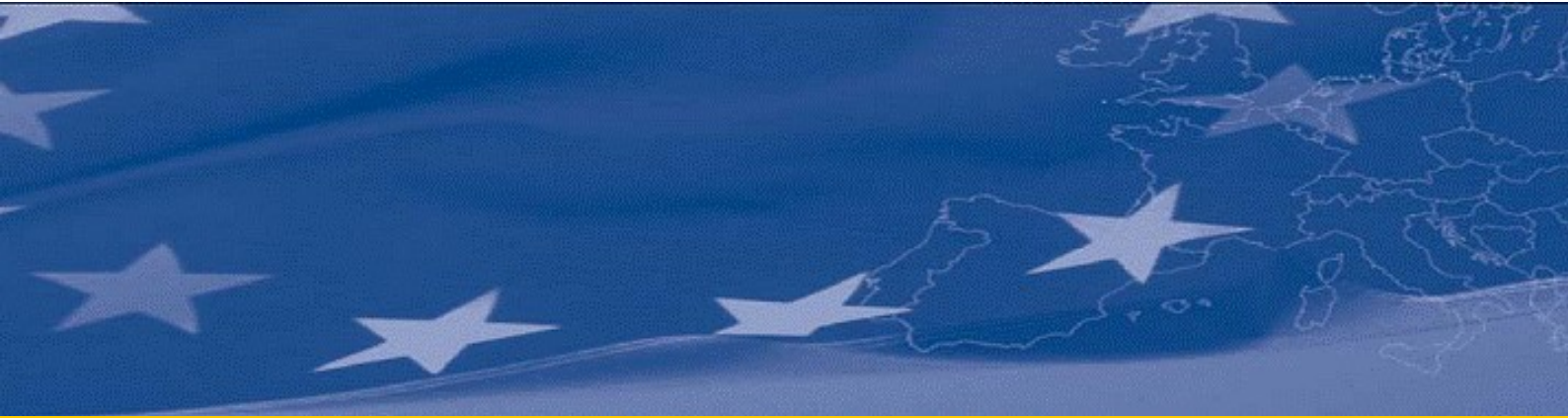
Table 9. A Summary of Costs and Benefits of Implementing ATP rules in the Domestic Market

| | COSTS | BENEFITS |
|-----------------------------------|---|--|
| Public Authority | <ul style="list-style-type: none"> • Cost of training additional staff • Cost of establishing road-side control stations <p><i>Monetary value: Cost is uncalculated.</i></p> | <ul style="list-style-type: none"> • Revenue from certification of vehicles <p><i>Monetary value: Ministry will receive 56 million TL and TSE 104 million TL in 10 years.</i></p> |
| Hauliers | <ul style="list-style-type: none"> • Extra certification cost • Investment in vehicle renewal <p><i>Monetary value: Estimated as 2.3 billion TL between 2022-2031.</i></p> | <ul style="list-style-type: none"> • Unfair competition due to uneven standards in the sector will be terminated (as explained in section 6.2) <p><i>Monetary value: Not calculated</i></p> |
| Retailers | <p>In case of owning frigorific vehicle fleet;</p> <ul style="list-style-type: none"> • Extra certification cost • Investment in vehicle renewal <p>Otherwise no cost</p> <p><i>Monetary value: Not calculated for retailers but included in the total cost calculated for hauliers</i></p> | <ul style="list-style-type: none"> • Benefits of selling better quality products with long shelf life <p><i>Monetary value: Not calculated due to lack of data</i></p> |
| Producers | <p>Same as retailers</p> <p><i>Monetary value: Not calculated due to lack of data</i></p> | <ul style="list-style-type: none"> • Benefits of improved product quality <p><i>Monetary value: Not calculated due to lack of data</i></p> |
| Consumers | <p>Possible price increase in foodstuffs if additional costs of transportation are added to the prices (0,02 TL per kg)</p> | <ul style="list-style-type: none"> • Reduced incidences of food poisoning • Improved quality of food, more fresh food <p><i>Monetary value: Not calculated due to lack of data</i></p> |
| Perishable Food Market in general | <p>Costs undertaken by the transport sector</p> | <ul style="list-style-type: none"> • Reduced food losses <p><i>Monetary value: total value 12 billion TL in 10 years</i></p> |

As a conclusion, the implementation of ATP rules in the domestic market will have many benefits for all parties and for the country's economy. Each year, 1-1.5 billion TL worth of foodstuff will be saved from loss as a result of improved vehicles and inspections in the transport sector. The total value of avoided food loss will reach 14 billion TL. The net benefits after deduction of costs to the transport sector will reach 12 billion TL in 10 years. Also considering the potential public health benefits that could not be calculated due to lack of data, it is concluded that the new regulation is beneficial and should be implemented.

8. REFERENCES

- Bentham, G. (2002). Food poisoning and climate change. Health effects of climate change in the UK – 2001/2002. London: Department of Health [Section 4.2, pp. 81–84].
- Brown, W., Ryser, E., Gorman, L., Steinmaus, S., Vorst, K., 2016b. Transit temperatures experienced by fresh-cut leafy greens during cross-country shipment. *Food Control* 61, 146–155.
- Carbon Disclosure Project (2006). Carbon disclosure project report global FT500. <http://www.cdproject.net/CDPResults/CDP5_FT500_Report.pdf>. London: Carbon Disclosure Project.
- Department of Climate Change (2009). Climate change – Potential impacts and costs. Australian Government, Department of Climate Change Fact Sheet. <<http://www.climatechange.gov.au/impacts/publications/pubs/fs-national.pdf>>.
- Dünya Gazetesi, (2018), “Her yıl 214 milyar liralık gıda çöpe gidiyor” (<https://www.dunya.com/iyilik-saglik/her-yil-214-milyar-liralik-gida-cope-gidiyor-haberi-431220/>)
- “Draft road map for accession to and implementation of the ATP”, Economic and Social Council, Economic Commission for Europe, Inland Transport Committee Working Party on the Transport of Perishable Foodstuffs, 2015
- Garnett, T. (2008a). Food and climate change – The world on a plate. CoolLogistics conference, city conference centre, London, 1–2 July 2008.
- Garnett, T. (2008b). Cooking up a storm – Food, greenhouse gas emissions and our changing climate. UK: Food Climate Research Network, University of Surrey.
- Koseki, S., Isobe, S., 2005. Prediction of pathogen growth on iceberg lettuce under real temperature history during distribution from farm to table. *International Journal of Food Microbiology* 104, 239–248.
- McKinnon, A., & Campbell, J. (1998). Quick-response in the frozen food supply chain: The manufacturers’ perspective. Christian Salvesen logistics research paper no. 2, Heriot-Watt University, UK.
- Melih Gündüz, 2018, Türkiye’de Gıda Taşımacılığı Sektörünü Etkileyen Kriterlerin Analiz Edilmesi ve Önem Derecelerinin Belirlenmesi, Yüksek Lisans Tezi, Çankaya Üniversitesi Sosyal Bilimler Enstitüsü Uluslararası Ticaret ve Lojistik Anabilim Dalı
- Tektaş, A., Tanyaş, M., Tarım ve Gıda lojistiğinde İyileştirmeler, TÜSİAD 2020.
- Zeng, W., Vorst, K., Brown, W., Marks, B.P., Jeong, S., P.rez-Rodr.guez, F., et al., 2014. Growth of *Escherichia coli* O157:H7 and *Listeria monocytogenes* in packaged fresh-cut romaine mix at fluctuating temperatures during commercial transport, retail storage, and display. *Journal of Food Protection* 77, 197–206.



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