Evaluation of The Problems Within The Food Supply Chain in Turkey in Terms of Food Losses and Food Waste

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Abstract: Nowadays, the sustainability of food security has become a more strategic issue than the energy sources. In this context, food losses and food waste issue is one of the most important problems for both present and future. Food losses and food waste, caused by different reasons, occur at all stages of the food supply chain. The aim of this study was to discuss problems of reducing food losses and food waste in the food supply chain in Turkey, and to suggest some solutions to these problems. Both individual and institutional efforts should be increased in order to reduce food losses and food waste that occur along the food supply chain in Turkey.

Keywords: Food Security, Food Losses, Food Waste, Food Supply Chain.

1. Introduction

The unequal distribution of food resources, as well as the energy sources, and some ecological factors are the reason why the world population does not have the access to sufficient amount of quality food. As a result of inappropriate implementations, which occur at various stages of the supply chain, both in amount and quality of food incur losses. Losses and wastage can occur at any stage from farm to fork- agricultural production, harvesting, post-harvest handling, transportation, storage, processing, packaging, distribution and the final consumption (Erbaş et al., 2012; Tatlıdil et al., 2013). According to the United Nations (UN), provision of food security and, in this context, food losses and food waste are the main problems for today and the future.

Factors which cause food losses in developing and developed countries may vary. 25 percent of the food produced in developing countries is lost and wasted (FAO, 2013). In these countries, food losses are caused by the lack of infrastructure at agricultural production, storage, processing, distribution and marketing stages. In Turkey, for instance, food losses occur at most at the agricultural production stage (Tatlıdil et al., 2013). In developed countries, food waste can be observed mostly at retail and consumption stages. In these countries, roughly one-third of purchased food is wasted as household waste (Gustavsson et al., 2011, Premanandh 2011; Prusky, 2011). On the other hand, 56 percent of food losses and waste emerge in developed countries, while the rest 44 percent can be observed in developing countries (EB 2014). For instance, 65 percent of the produced food is wasted every year in the United States (BSR, 2012). 63 percent of food waste in the UK is in households (DEFRA, 2013; Downing et al., 2015). On today's global scale, it is stated that 840 million starving people around the world could be fed with just one fourth of the total quantity of food losses and waste (FAO, 2013). The aim of this study was to reveal the problems in the food supply chain from the point of food losses and waste in Turkey and to discuss the some solutions.

2. Definition and the Scope of the Food Supply Chain

A supply chain is a network of units or organizations that procure raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through a distribution system (Lee and Billington, 1995, Chopra and Meindl, 2004). The food supply chain contains in itself farmers, manufacturers, distributors and retailers and is defined as an integrated process of transformation raw materials into specific final products and its delivery to retailers (Parfitt et al., 2010; Öcal 2012; Mert 2013; Timur et al. , 2013). In this system, thoughout the whole process from the producer to the consumer, all the partners (input owners) involved in relationship with the final product intend to communicate and coordinate in a certain format. Thus, food supply chain can be described as the management of relationships between companies (Altunlu, 2012).

3. Importance of Food Supply Chain in Terms of Food Loss and Waste

Food loss and waste particularly refers to the decrease in the supply chain of the food produced for human consumption.According to the UN Food and Agriculture Organization (FAO) report "Global Food Losses and Food Waste", 95 percent of food losses in developing countries occur "unintentionally" in the early stages of the supply chain (FAO, 2011). These losses are referred to financial, administrative and technical limitations in harvesting techniques, transportation, storage and cooling, public infrastructure, means of transport, packaging and distribution systems (Premanandh, 2011; Wang, 2013, TMO, 2013).

Like this, insufficient product processing in the supply chain might lead to an increase of food insecurity or risk of unhealthy food production (Keding at all, 2013). Losses rate in grain and legumes group are 15 percent of the total production, while losses in fruit and vegetable group can be up to 35 percent (Kader, 2005; Premanandh, 2011). In Turkey, total losses and wastage rate in fruit and vegetable group is 50 percent, in oilseeds and pulses group approximately 30 percent and 20 percent in milk group (Tatlıdil et al., 2013). This data shows that problems emerging in the food supply chain in Turkey might lead to severe food losses, and solution of these problems is of great significance.

4. Food Supply Chain Issues in terms of Food Loss and Waste

In this section, food losses and waste at different stages of the food supply chain, such as agricultural production, harvesting, transportation, packaging, storage and final comsumption, are assessed.

4.1. Agricultural Production and Harvesting Stage

One of the most significant problems of the world agriculture are losses that occur during production and harvesting (IFPRI 2012). The main reason for this is lack of knowledge about production and harvesting and technical deficiencies (Kader, 2005). To illustrate, more than 30 percent of agricultural production in starving sub-Saharan Africa is damaged during production and harvesting (IFPRI, 2012; WFP, 2013).

Turkey is the homeland and production center of many agricultural products. In particular, some fruits are in the front rank of the world production. Nevertheless, approximately 30-40 percent of the production is subjected to loss, particularly during production and harvesting. Considering that this ratio does not exceed 5 percent in developed countries, the importance of the losses in Turkey is obvious. Losses during primary production are caused by structural problems. They in turn induce major derivative problems, such as inability to fertilize the crops with the appropriate pesticide and failure in providing harvest time compliance.

Particularly, negligence during harvesting might lead to scratching, damaging and squeezing in the products. Food losses caused by these faults may reach high levels.This loss is caused by the disuse of the good seed by 3-9 percent; production faults by 15-20 percent; faults at harvesting stage by 35.5 percent and storage errors by 25.3 percent (Günay, 2008).

Large losses of some basic agricultural products may be experienced in Turkey due to unconscious production and harvesting. To illustrate, during 2010/2011 season 1 640 thousand tons of wheat and 605 375 tons of barley were lost during harvesting. Wheat loss figures in Turkey are higher than wheat production figures in other 86 wheat producing countries, and the amount of lost barley is greater than the production amount of 69 barley producing countries (out of 102). Losses from combine harvester in Turkey is approximately 3%. Unconscious plant protection causes great losses due to disease and pests (Bayraktar, 2012).

4.2. Transportation Stage

Food products are perishable items. Especially meat, dairy and fish products are more critical in terms of spoilage. Most food products should be stored at different temperature. Lack of this type of technical information and effective planning in Turkey causes failures in food preservation conditions, which subsequently leads to an increase of loss ratio (Tanyaş, 2013).

Another important concept in terms of reducing food losses is food logictics. In Turkey, the amount of logistic companies, which provide customer-specific solution in food sector, is insufficient. Product consolidation and co-operation between different producing companies is very low in this sector. Collaboration between logistic

service providers (networking) also cannot be formed. Errors caused by technical and information insufficiency may result in many food product losses (Tanyaş, 2013; Öcal, 2012). The greatest losses can be observed during fresh vegetables and fruit transportation. Analysis of the stages of the food supply chain detected that fresh fruit and vegetable losses during transportation stage vary between 6 and 10 percent (Özdemir ve ark., 2009).

4.3. Packaging Stage

The fourth article of the Turkish Food Codex Regulation defines packaging as "storing the food products covered with packaging material or placed into the containers with the aim of protection and providing information" (TGKY, 2011). Correct packaging may reduce losses to 50 percent. For instance, 2,1 billion loaves of bread are wasted per year in Turkey. The packaging of bread might extend its preservation (PÜB, 2014).

4.4. Storage Stage

The purpose of food storage is to reduce food losses as much as possible, and to minimize the factors which have negative impact on the quality of the food. Types and characteristics of the warehouse (dry, cold, freezing) must be selected so as to preserve physical, chemical and biological features of the food product. In terms of food losses, all types of sanitary and technical regulations must be paid attention to in order to control all factors which are detrimental to proper storage conditions (Mahmutoglu, 2011).

Lack of knowledge about some plant species and varieties of preservation regulations and lack of proper storage conditions are among the major causes of the losses observed in post-production. Any deficiency at storage stage might cause losses in terms of food quality and quantity (Kasım, 2007; Mahmutoglu, 2011). In Turkey, grain products have a priority among the basic food products. High rates of losses in grain group are caused by improper storage conditions, however, there is no statistical data about grain storage losses.

4.5. Final Consumption Stage

In Turkey, particularly bread waste has taken its place on the agenda in recent years. Thus, 95 million loaves of bread are consumed per day and 6 million are wasted. Turkey's annual economic loss due to wastage of bread is equivalent to the revenue obtained from the flour export by the biggest world's flour exporter (TMO, 2012).

According to the results of the survey conducted by the Department of Nutrition and Dietetics at Hacettepe University in 2005 and published by FAO, one Turkish household wastes 218.8 g at buying / preparation stage; 311.2 g during preparation / service stage; meal waste is 286.4 g; consequently, a total of 816.4 g of food is wasted daily (El, 2013). The energy amount of wasted food is 215.7 kcal, which means that wasted food could provide more than 10 percent of one person's daily energy (2000 kcal) needs. Most food waste can be observed in high-income households (Uysal, 2010).

In addition to household waste, high rates of food waste in public catering establishments, such as restaurants, hotels, schools, factories, hospitals, is a serious subject as well. Resort hotels in Turkey in 2009 were supplied with 538 thousand tons of food, however, only about 200 thousand tons were consumed while the rest of food became plate and counter waste. This amount of food is said to be enough to fully cover food needs of Switzerland or Istanbul for 15 days (El, 2013). Fruits, vegetables, beverages, bread, meat and dairy products are the most wasted food products.

5. Suggestions for Problems

Attempts to reduce food losses must be implemented by various transnational, international and national organizations. Food losses have become a high profile public issue. In order to reduce food losses and food waste, some measures should be taken throughout the food supply chain, and they should be dealt with on both individual and institutional basis. Whereas dealing with food losses needs a more systematic approach to integrated solutions, waste issue is largely related to creating self-awareness. The main measure to be taken in this direction, in order to estimate the amount of food losses, detect the reasons of the food supply chain losses and identify the tested methods to reduce losses, is creating a virtual information network about losses and waste(Sinaceur,2013).

Actions such as providing training and technical support to farmers and improving rural infrastructure and communication technologies should be carried out with the direct participation of governments. Public sector must take part in supporting local initiatives to improve access to information and new technologies and their application in the field (Food Drink Europe, 2013). Food products management in public places at the consumption stage is among the suggested solutions to reduce food losses (IFAD, 2013).

The large part of the agricultural and food produced in Turkey is lost and wasted at harvesting, storage, packaging, transportation and household stages. Unhealthy and improper conditions during transportation, storage, packaging and selling cause food losses; concerned people should be given training on the importance of " Supply Chain Management for Agricultural Products " concept, and awareness should be created (Altunlu, 2012). These efforts must be carried out by cooperation of universities, the Ministry of Agriculture and NGOs. This educational organization must integrate the food security issue into the food loss and waste problem.

In order to minimize storage losses, manufacturers and farmers throughout the country should be induced to implement deposit purchase procedure, which is put into practice by warehouse receipt system and Soil Products Office (Bayraktar, 2012).

New packaging systems, such as active packaging and smart packaging, should be expanded to reduce losses caused by packaging. Smart packages can monitore situation of the products and conditions both in storage and transportation (PÜB, 2014). Although the cost of the smart packaging, which is also used in Turkey for some food products, is high, it is leadingly recommended for usage in large scale enterprises.

In order to reduce food losses and waste during transportation stage e-logistics system should be expanded. E-logistics, which provides more information and services, is a more advanced form of traditional logistics. Implementation of e-logistics into the transportation system might increase delivery relialibity and significantly reduce losses throughout the food supply chain (Gülenç et al., 2008).

Current food banking system in Turkey must be activated with the aim of reducing losses. Food bank is a non-profit organization made up of associations and foundations which directly or through various charities distributes donated and excess production, which meets all health requirements, to those in need (Arpacı, 2005). By means of this system, the amount of food losses might be reduced considerably.

Among the main suggestions for solving the problems at household are increasing awareness about home economics by using public service announcement in media and improving knowledge level of the children about saving food in the primary and secondary schools.

6. Conclusion

Food losses derive from insufficiency and malfunction in the supply chain. Important studies on prevention losses and waste in the food supply chain have been initiated in recent years in the world and in Turkey. World “Save Food” and Turkish “Do not waste bread” campaigns are the most important initiatives.

In order to prevent food losses in the food supply chain in Turkey, various solutions should be developed for the problems at different stages, such as agricultural production, harvesting, transportation, storage, packaging and household.

The main suggestions;

- for agricultural production and harvesting stages: training farmers about proper fertilizers and pesticides usage and harvesting techniques,
- for transportation and packaging stages: e-logistics and appropriate technology application, such as smart packaging systems,
- for storage stage: implementation of deposit purchase procedure put into practice by Soil Products Office and warehouse receipt system, and
- for household stage: increasing awareness about home economics in the society.

All things considered, to ensure and maintain food security, in order to reduce food losses and waste that create negative economic and social impacts, problems emerging throughout the food supply chain should be approached within a whole system, and urgent measures should be taken to solve the problems. As a result, it is significant that agriculture and food policies are related to food security, and it’s sustainability should include

some specific purpose and implementation to reduce food losses and waste in Turkey for the future as well as for today.

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