

RESEARCH ARTICLE

(Open Access)**An evaluation of apple production waste in the municipalities of Korça and Devoll and some related issues**ARBEN KAMBO¹, MYSLYM OSMANI²¹Agriculture University of Tirana, Department of Economy and Rural Development Policies, Tirane., Albania²Agriculture University of Tirana, Department of Economy and Rural Development Policies, Tirane, Albania

*Corresponding author, E-mail: akambo@ubt.edu.al

Abstract

The Korça district is an important agricultural area of Albania. The trend of apple production has been a strong result of new the plantings and the increase in yields. In this area apple production is one of the basic farmer's products and the main source of income. However, the increase of the surfaces, yields and apple production is accompanied by problems, difficulties and shortcomings in techniques and technologies of production, storage, handling post-harvest storage, product quality and sales. A significant part of the production is thrown due to the lack of markets, the low prices offered and the lack of storage capacities. There is a need to increase farmers cooperation in order to benefit from scale effects that are not only in production and sales but also in apple service. Special instruments designed for waste-reduction support methods are need for farmers who cultivate massively Gold and Starking, or in orienting new plantings to varieties that create less wastes.

Keywords: apple; production; waste; farm; yield.

1. Introduction

Apples are one of the main fruits of the Albanian tradition which located mainly in the Korca and Diber areas, but not only. After serious damage and reduction of surfaces and trees, production capacity, on the first period of transition apple planting and its production gained strong positive trends, especially in Korca region. These trends were firstly affected by benefits of production, but also by the direct financial government's support since 2006. The Korça district is an important agricultural area of Albania. It occupies about 11% of the country's land area and about 12% of the Albanian farms operate in this region. The weight of the apple production is about 60-70% of whole apple production in the country. According to agricultural statistics, apples in the Korça region are the main product in the fruits group. It occupied 69% of the total area planted with fruits and 83% of the total fruit production based on year 2016 statistics. The trend of apple production has been strong as a result of new plantings and the increase of yields. Thus compared to 1995, in 2016 the productions of apple rose about 15 times, while the yield about three times. In this area apple production is one of the basic farmer's product and the main source of income.

However, the increase of the surfaces, yields and apple production is accompanied by problems, difficulties and shortcomings in techniques and technologies of production, storage, post-harvest storage handling, product quality and sales. A significant part of this production is thrown due to the lack of markets, the low prices offered and the lack of storage capacities [10]. The waste during storage varies due to several factors: weather during the growing season, handling during harvest and putting into storage, whether the products were harvested mechanically or by hand, and the degree of infestation of fungi, bacteria and insects [3]. In addition, it is of course influenced by how long the products are stored [2].

There are many different market segments and all have their own requirements and tolerances, so a product that cannot be sold on one market can often find buyers somewhere else [5]. In Albania, the word "market" does not lead people think about the supermarkets of the main retail chains, since they are not dominant. There are many outlets besides. Some of them buy and sells apple products after having decided that they are not good enough for the supermarkets.

2. Material and Methods

There are many methods that could theoretically be used for the study of apple production waste such as: measuring, scanning (bar code), food waste diary, questionnaires, interviews, statistical data.

Our focus is the wastes of apples production at the farm level in the Korca area. We conducted a farm level research based on data obtained through direct interviews of 100 farmers in this area.

Objectives of the study are:

1. A general estimate of the waste level of apple production.
2. Identifying and estimating of the main causes of apple production waste.
3. Revealing eventual links between the level of wastes and the socio-demographic and economic characteristics of the farms.

The data was received through direct face to face interviews of about 100 farmers. 30% of which were from the municipality of Korca and 70% from the municipality of Devolli. About 25% of farmers were with low education, 60% with secondary education and the difference with higher education.

Of the total, about 70% were over 40 years old. Approximately 60% of the farmers cultivated up to 1.5 Ha apple orchards and 40% over 1.5 Ha. Almost all of them were male, as in general the head of the farm was a male person. The advantage of interviews is that they are flexible and allow for more detailed insight into issues such as reasons behind apple production wastes [7].

The method we use is mainly graphical presentation. Graphs are powerful data evaluation tools. They provide quick, visual summaries of essential data characteristics [8]. Graphical methods are typically used with quantitative statistical evaluations. Graphical methods provide information that may not be otherwise apparent from quantitative statistical evaluations, so it is a good practice to evaluate data using these methods prior to performing statistical evaluations [7]. The advantage shown by graphs over tables is consistent with the general view that complex relationships among data points are more easily assessed in graphical than in tabular format [1].

To date, there are no commonly agreed definitions of “food waste”, or “food loss”. The lack of harmonisation on definitions or on methodologies for food waste data collection and measurement, such as value, weight or caloric equivalent poses significant problems for the collection and comparison of data necessary for the development of targeted measures to address waste. [9] According to FAO’s definition [14], food loss refers to a decrease in mass (dry matter) or nutritional value (quality) of food that was originally intended for human consumption. These losses are mainly caused by inefficiencies in the food supply chains, such as poor infrastructure, logistics lack of technology, insufficient skills, knowledge and management capacity of supply chain actors and lack of access to markets. In addition, natural disasters also play a role.

Food waste refers to food appropriate for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil. According to FUSIONS [13], “Food waste is any food and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)”.

According to Regulation EC 178/2002 [11] plants before harvest are not included in the definition of production, unless they have been treated in order to be released onto the market as food. This means that apple waste includes plants and parts of plants after harvest. We use the term waste to include apple products that are grown into a product ready for sale but that are not used as food. This means that products that cannot be sold to the fresh market but that are delivered to the food industry or used as food for animals do not count as waste.

3. Results and Discussion

The biggest apple waste occurred in the Devoll area with about 14% and less in Korca by about 6%. On average every farm waste was about 140,500 leke production (1000 Euros).

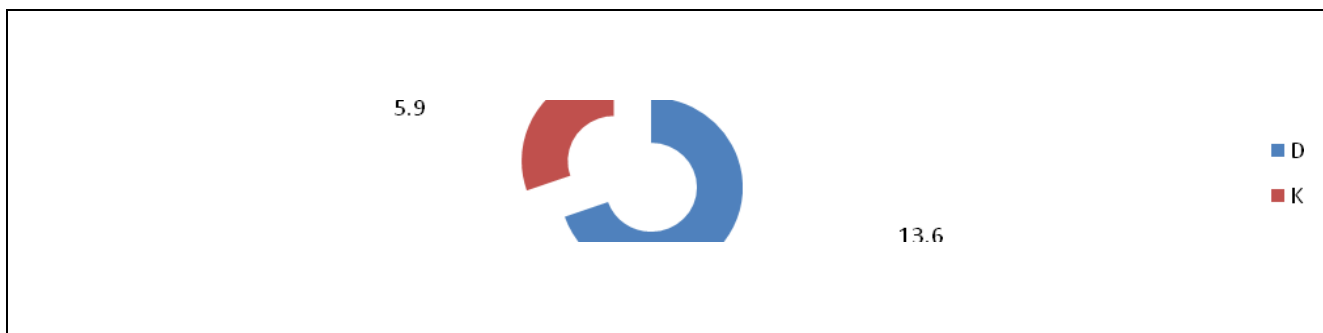


Figure 1. Apple production wastes in percents by municipalities

According to the size of the farm the wastes are as in Figure. 2 below. Generally, the smaller farms throw more production, but they differ in size of them from 1.3 Ha to 3, 3 Ha. As it is noticed, the bigger farms throw less even though the production is higher.

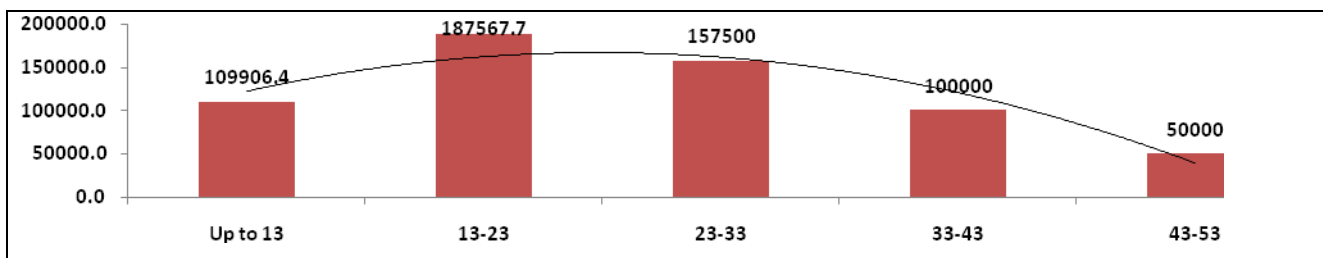


Figure 2. Average of apple production thrown by the farm sizes

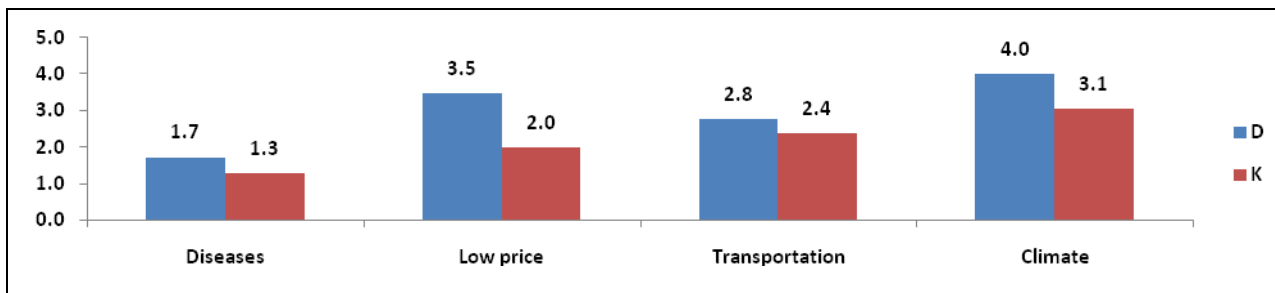


Figure 3. Apple production thrown in % according to areas and causes

Despite the causes, a higher percentage of production is wasted in Devoll compared to Korça. Referred to the causes, most of the production was wasted due to the low price, so there were no interest to be sold, with about 4% in Devoll and 3.1% in Korca. The second factors are the climatic factors, with 5.5% wastes for both areas and again more in Devoll. The third cause were damage during the time of storage and finally wastes caused by the pests. In Figure 4 are shown in percents wastes of production according to farmer's experiences. Generally, farmers with an average experience throw more; apparently experience is not a factor that clearly helps many farmers to reduce wastes.

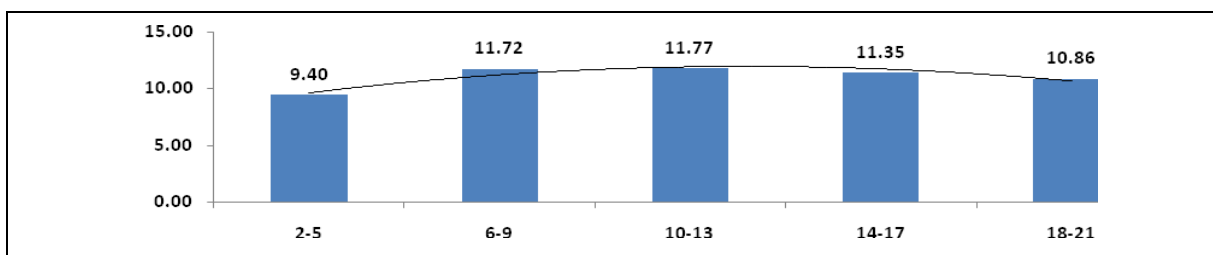


Figure 4. Wastes according to the experience in the apple planting

In the figure 5, we shows losses in percents according to a factor like education. Generally farmers with low education are more "penalized" because of low prices, also due to climatic factors and for reasons related to storage and transport. It seems a bit paradoxical how low-educated farmers can better counteract the negative effects of pests. High-education farmers seem to suffer less wastes due to price, storage or transportation and due to climate factors.

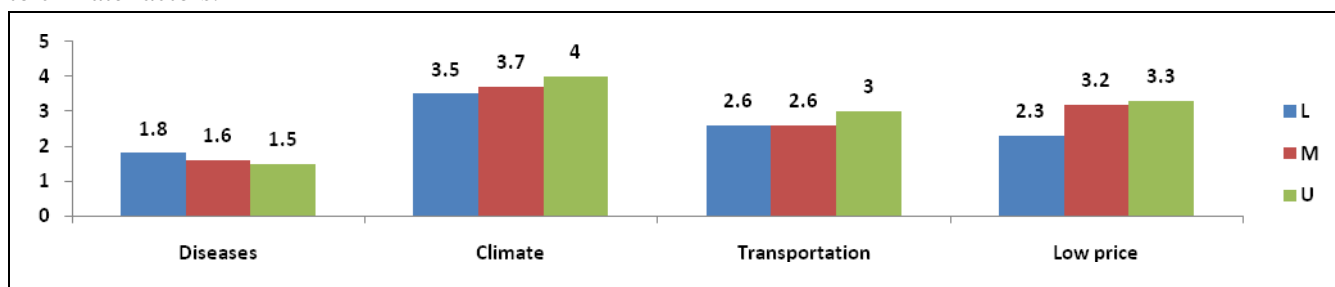


Figure 5. wastes in percents classified by the reason and education

In the figure 6, we have shown how the quantity of apple wastes in percents is associated with the quality and the frequency of the contacts that the farmers have with the private or state advisory service.

Clearly, farmers with limited access to the extension were contacting less compared to their closest colleagues who have better contacts. Apparently, access to extension was not a relevant factor for apple waste production. That might happen, perhaps, for the reason that in the contacts between farmers and extension agents issue of production waste were not discussion object .

The same thing is shown in figure7 where apple production waste are not in percents but in value, as it seems clear that farmers with more access to the advisory service throw more production.

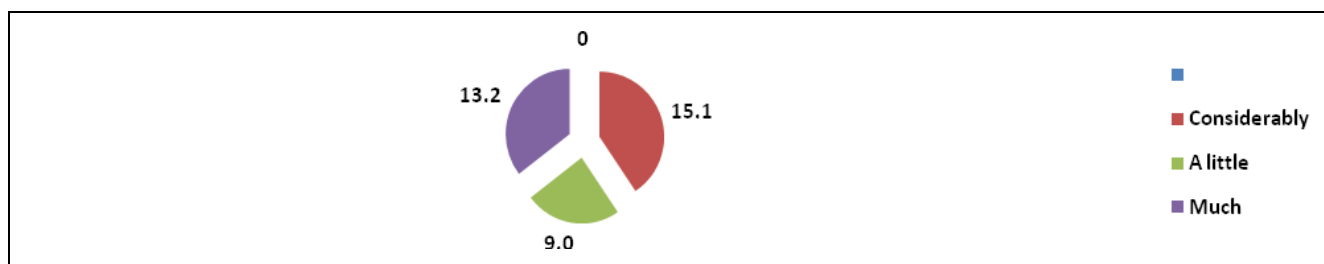


Figure 6. Percent of apple production wastes by extension contacts

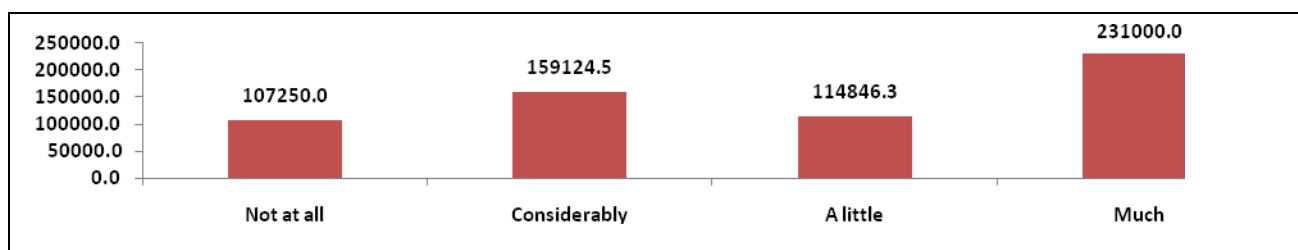


Figure 7. Average value of apple production thrown according to extension

Figure 8, shows the quantity thrown by volume of farm production. We expected that the bigger the output, the greater the amount of waste. This expectation is verified up to the production quantity 884 kv; the more productive farms are compared to this level the less it is expected to throw. This can be explained by the fact that larger farms have better contact with the market, so with less difficulty they can have better storage or transportation capacities, better contacts with relevant private actors and can also better manage the climate factors and pests.

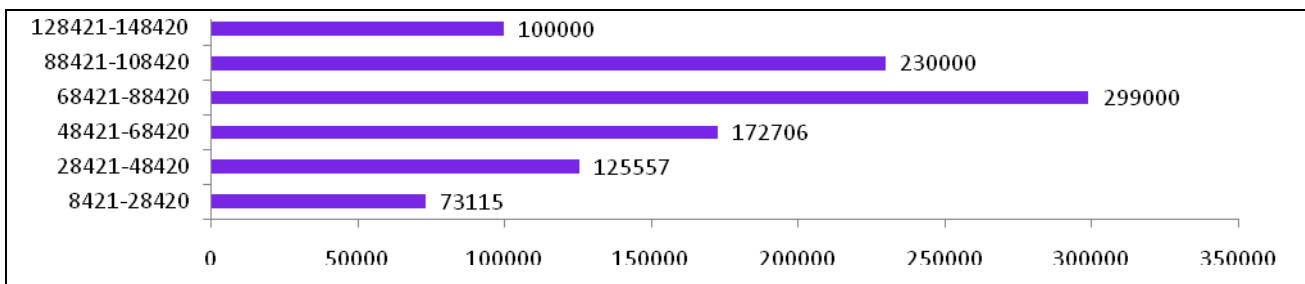


Figure 8. Value of wasted production according to the production volume

Figure 9 shows the value of apple production wastes according to the yield in the apple farm. It was known that increases in productivity significantly reflect to the growth of production, increases of the yield are accompanied by increases of the quantity of waste but up to the limit of 70 kv / dyn. Upper-yield farms throw less. Comments and inferences that can be made here are similar to those in the case of production.

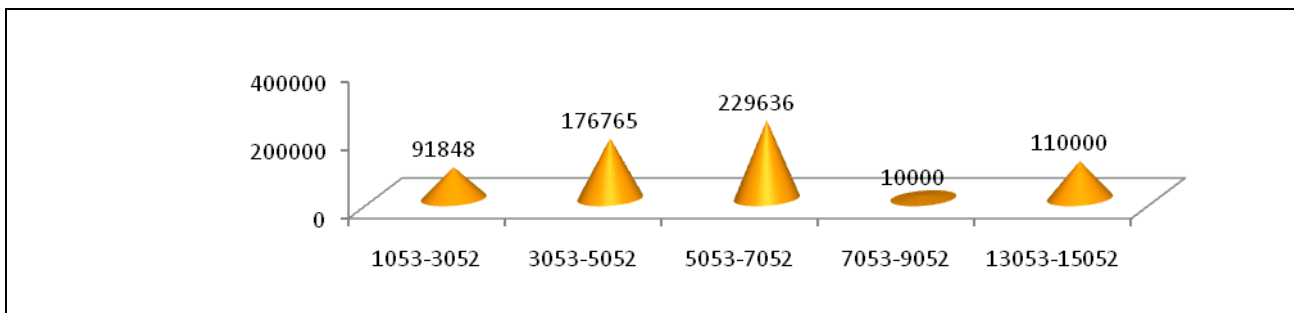


Figure 9. Value of apple production wastes by yield

From this graph we can see how the amount of production wasted varies with the increase of the weight of apple varieties' Gold and Starking in the whole variety structure. It is clear that in farms where their weight is inferior (less than 50%), the losses and wastes are smaller and generally, the increasing tendency of the waste quantity is accompanied by increases of Gold and Starking cultivars in the apples structure.

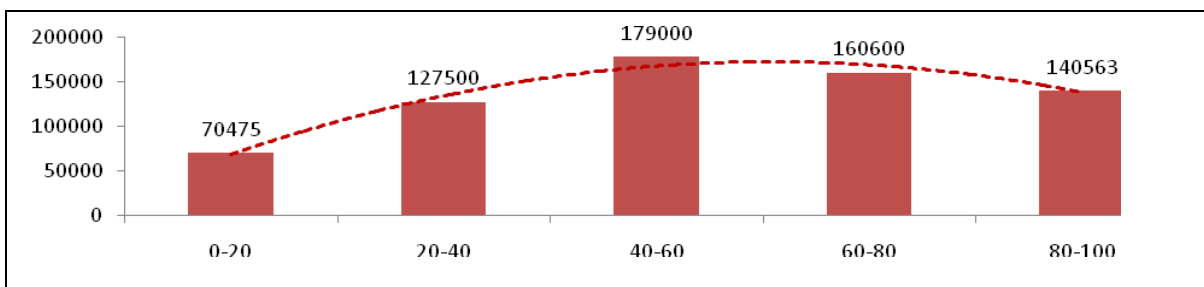


Figure 10. Value of wasted apple production by weight of gold and starring cultivars in the apple structure

Even the percentage of the thrown apple product manifests itself in the same behavior as in the case of the quantity thrown (Figure 11). It was unknown why the maximum thrown happens in farms with 50 to 70% variety structure of golden and starring cultivars.

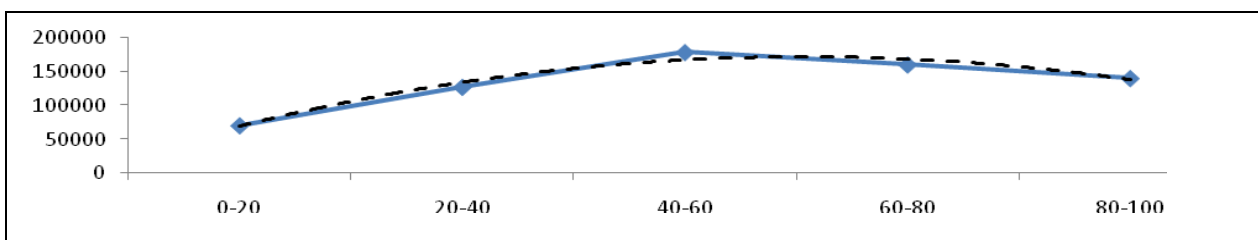


Figure 11. The value of apple production wasted by the weight of the gold and starking cultivar in the apple structure.

4. Conclusions

There are a lot of difficulties in sales and lack of storage capacities. This shows serious flaws in market functioning and investment in post-harvest capacity at and outside the farm.

The negative impact of climatic factors tells the need for support of farmers to be able to manage the situations they create, especially for improving investments relevant to infrastructure.

The difficulties in the market, transportation, storage and climatic reasons, seem to penalize more farmers with low education. Apparently, this category must be in a special focus for support and empowerment.

Larger farms throw less, because they may have better contact with the market, or a better climate and pests events management. This evidences the need to increase farmer's cooperation in order to benefit from scale effects that are not only in production and sales but also in apple service.

The structure variety seems to have an impact on the increment of apple waste production. This can be taken into consideration for the special instruments designed for waste-reduction support methods for farmers who cultivate massively Gold and Starking, or in orienting new plantings to varieties that create less wastes.

In current situation, farmers, wholesalers and retailers must take certain concrete steps to reduce waste. One of the ways is to increase quality during cultivation in general or to reduce quality losses post-harvest. This would reduce wastes both during cultivation and later in the distribution chain. Other measures seek to find alternative markets for products that do not meet the quality requirements of the main buyer.

5. References

1. Braithwaite DW, Goldstone RL: **Benefits of Graphical and Symbolic Representations for Learning and Transfer of Statistical Concepts.** Department of Psychological and Brain Sciences, 1101 E. 10th Street Bloomington, IN 47405 USA; 2013: 1928-1933.
2. Na W, Wolf J, Fu-suo Zh: **Towards sustainable intensification of apple production in China. Yield gaps and nutrient use efficiency in apple farming systems.** Journal of Integrative Agriculture 2016, **15**(4): 716–725
3. Olujenyo F: **The determinants of agricultural production and profitability in akoko land, Ondo State, Nigeria** 2008, Journal of Social Sciences, **4**(1), 37-41.
4. Ntakyo PR, Mugishag J, Elepu G: **Socio economic factors affecting apple production in southwestern Uganda,** African Crop Science Journal 2013, **21**(4): 311 – 321.
5. Topcu Y, Uzundumlu A, Celep S, Hun S: **Analysis of the factors affecting apple farming: The case of Isparta province.** Turkey Scientific Research and Essays 2010, **5**(14), 1881-1889.
6. Moreno R, Mayer R: **Cognitive Principles of Multimedia Learning: The Role of Modality and Contiguity.** Journal of Educational Psychology 1999, **91**(2) 358-368
7. Gujarati D: **Basic Econometrics:** 4th edition, McGrawHill; 2003.
8. Osmani M: **Statistical Methods:** Pegi, Tirana; 2015.
9. Mattsson K: **Division for Trade and Markets Sweden.** Author Kristina Mattsson National Rapport: 5 EN Title: "Why do we throw away edible fruit and vegetables?"; 2014.
10. Waarts Y, Eppink MM, Oosterkamp EB, Hiller S., van der Sluis AA, Timmermans AJM.: **LEI, Reducing food waste.** LEI report 2011-059. 2011.
11. EU - Commission. **Agricultural product quality policy: Impact Assessment.** Annex A (II): 2009.
12. Marketing standards. **Regulation (ec) no 178/2002 of the european parliament and of the council** of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

13. **FAO. Food losses and waste in the context of sustainable food systems** A report by The High Level Panel on food losses and waste in the context of sustainable food systems A report by The High Level Panel. 2014.