

Estimation of the Economic Losses of the Waste from the Most Important Vegetable and Fruit Crops in Egypt

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Abstract

Increasing the waste of agricultural crops in general and vegetable and fruit crops specially, consider one of the main problems which cause economic losses for Egyptian economy. The main objective of the research is estimating of the economic losses for the waste from the most important vegetable and fruit crops in Egypt. The research depends on two kinds of data, time serious data which collected from different sources local and foreign, and cross section data represent during using a random sample collected from AL- Behaira governorate.

The problem of waste considers one of the most important problems that face the agricultural crops, which hinder the performance of the agricultural sector, and the crops of vegetables and fruits of the most important agricultural crops are damaged due to their physical nature and impact of natural factors compared to other crops, causing significant losses of agricultural production and Egyptian food security. The agricultural production waste causing significant losses in national agricultural income and agricultural exports. The losses also cause waste in agricultural resources, specially land, irrigation water and capital and its limited resources in Egyptian agriculture. The results showed that the average annual quantity of Egyptian potato and orange wastes represented about 135.8% and about 55% of the average quantities of potato exported during the study period, which confirms the importance and necessity of reducing the quantity of waste in the important export potato crop, because if the conservation of this quantity of losses and re-evaluation at the prices of Egyptian exports of the potato and orange exported, the average value of this wastes are about \$ 419.4 million and \$ 118.75 million, respectively. The study showed that the economic losses represents a loss in the actual cultivated area of potato and orange crops a losses in potato and orange exports, a losses in farmers income, and losses in irrigation water.

In light of the results obtained from the research, it recommends the following: To reduce the production waste in potato and orange crops, attention should be paid to good pruning, pest control and fertilization. Exclude the damaged fruits when sorting so as not to damage others. Use of transport vehicles equipped to maintain goods. The speed of sorting goods by traders as soon as they reach the retail market. To improve the quality of the containers used and to be strong plastic for transporting and displaying the goods.

Key words: Production waste, marketing waste, potato and orangewastes, economic losses.

- Introduction:

It is known that the types of waste in agricultural crops include the following:-

1-Quantitative waste: The lack of supply of the crop is due to damage, damage or lack of weight due to dryness.

2-Economic waste: It is intended to decrease the monetary value of the crop due to low quality.

3-Qualitative waste: This refers to the deterioration that occurs in the standard specifications of the commodity and the consequent low quality.

4-Food waste: It is the low nutritional value of the commodity due to the lack of weight and quality together, and it is difficult to estimate this loss very accurately.

5-Natural waste: It is because of attacking birds, insects and rodents for part of the crop and it is difficult to estimate this loss very accurately.

It is well known that the agricultural sector has an important role to play in the economy of any country, especially in developing countries. In Egypt the agricultural sector remains the single most important economic sector, but its importance declined to 20% of the gross domestic production. The important role of the agricultural sector is to help financing the economic and social development (Nassar S, 1990).Egypt's agricultural income reached about \$ 29.4 billion in 2016, representing about 8.3% of the total Egyptian national income, which is about \$355.6 billion in the same year. The value of Egyptian agricultural exports is a major component of total Egyptian exports which reached about \$ 2.67 billion in 2016, representing about 12.07% of the total value of total Egyptian exports amounting to about \$ 22.12 billion in the same year (CAPMAS, 2016).

Vegetable and fruit crops are important agricultural crops for human health. It provides the body with vitamins, minerals, fibers and monounsaturated fats that prevent us from many diseases. This confirms the importance of vegetable and fruit exports as an important source of Egyptian agricultural income. Where the value of exports of vegetables and fruit in Egypt reached about \$ 1.09 billion in 2016, representing about 28.7% of the total value of Egyptian agricultural exports in the same year. Increasing the waste of agricultural crops in general and vegetable and fruit crops specially, consider one of the main problems which cause economic losses for Egyptian economy. The main objective of the research is estimating of the economic losses of the waste from the most important vegetable and fruit crops in Egypt. The fruits and vegetables waste in Egypt amounted to about 3.68 million tons in 2015(CAPMAS, 2016).

The losses are due to the decrease in the quality of the product, the low quantities offered by most commodities, the high prices inside, the shortage of exported quantities and the economic losses resulting from the use of natural resources which contributed to the production and the presence of large amounts of foodstuffs which are not exploited, which affects the level of food security. In this area, it is estimated that the percentage of losses exceeds 30% in vegetables and fruits, 20% of pulses and tubers, and about 10% for cereals. In total, agricultural losses account for 10-15% of agricultural income. To develop policies to improve the efficiency of marketing operations and increase manufacturing rates, with a view to gradually reducing this loss to half its current level (Bassyouni, 2013).

- Research objectives:

The main objective of this research is studying the economic losses of the waste from the most important vegetable and fruit crops in Egypt, like potato and orange, this objective can achieve by achieving the following objectives:

1- Estimating the economic impact of potato and orange waste.

2 – Studying causes of the waste and its solution in potato and orange crops according to the views of farmers interviewed in the random sample of the study during the agricultural season 2017/2018.

3 - Solving to reduce production and marketing wastes from the point of view of farmers interviewed by the random sample of AL- Behaira governorate.

- Research methodology and sources of data:

The research based on each of descriptive and quantitative analysis represented in the estimation of some models directivity of economic variables in question in its linear models and a semi logarithmic in the dependent variable for calculating the annual growth rates of these variables, as well as the use of

certain economic indicators to measure the economic losses related to agricultural waste of potato and orange crops.

The research depends on two kinds of data, first is secondary data published from different bulletin of agricultural economy issued by the Ministry of Agriculture and land reclamation, and the Central Agency for Public Mobilization and Statistics, as well as bulletins of the United Nations Food and Agriculture Organization (FAO) were used, also some research and scientific communications and some foreign references associated with the subject of the search, and the second primary data obtained from random sample data from the crop of the study, which was conducted through the forms questionnaire was compiled by interviewing the random sample data. The random sample of the study included three levels: producers, wholesalers and retailers of vegetables and fruits in Al-Beheira Governorate during the months of July, August, and November 2017 in the largest governorate centers according to the relative importance of the area and production for each crop of the study crops, namely the Damanhur and Kafr El-Dawar provinces. 60 investigated were taken, including 20 (10 orange, 10 potato), 20 wholesaler, 20 retailers of two crops.

- Research results and discussion:

- First: Evolution of quantity and value of potato and orange exports in Egypt during the period (2001-2016):

Table 1 in appendix shows that the average quantity of exports of potato crop fluctuated between a minimum of about 249.9 thousand tons during the period (2001-2005) and a maximum of about 435.8 thousand tons during the period (2011-2016) with an annual average of about 351.6 thousand tons during the study period. The annual growth rate of Egyptian potato exports, which amounted to about 5.3%. Table 1 in appendix also shows that the value of Egyptian potato exports fluctuated from a minimum of about \$42.2 million during the period (2001-2005) to a maximum of about \$193.6 million during the period (2011-2016) with an annual average of about \$ 121.7 million during the study period and with an annual growth rate of about 14.6%.

Data of the same table indicate that the quantity of potato waste crop fluctuated from a minimum of about 188.2 thousand tons during the period (2001-2005) to a maximum of about 777 thousand tons during the period (2011-2016) with an annual average of about 476 thousand tons. The annual growth rate amounted to about 13%. It should be noted that the average annual quantity of the losses of Egyptian potato waste represents about 135.8% of the average quantities of potatoes exported during the study period, which emphasizes the importance and need to reduce the amount of waste in the important potato export because if to maintain and re-evaluate this amount of Egyptian exports of potato exported, the average value of this waste of about \$ 419.4 million per year.

For orange crop, Table 1 in appendix shows that the quantity of orange exports fluctuated between a minimum of about 179.2 thousand tons during the period (2001-2005) and a maximum of about 799.2 thousand tons during the period (2011-2016) with an annual average of about 483.53 thousand tons during the study period. The annual average of Egyptian orange exports value fluctuated between a minimum of about \$42 million during the period (2001-2005) and a maximum of about \$95.4 million during the period (2011-2016) with an annual average of about \$ 236.49 million, the annual growth rate was about 22.8%.

Data of the same table indicate that the amount of orange waste fluctuated between a minimum of about 163.2 thousand tons during the period (2001-2005) and a maximum of about 367.5 thousand tons during the period (2011-2016) with an annual average of about 264 thousand tons. The annual growth rate was about 7.3%. It should be noted that the annual average of Egyptian oranges waste represents about 55% of the average quantities of orange exported during the study period, which emphasizes the importance and the need to reduce the amount of waste in important orange export because if to maintain and re-evaluate this amount of Egyptian exports of orange exported, the average value of this waste of about \$ 118.73 million / year.

Second: Estimation of economic losses average related to agricultural waste during the period (2012-2016):

It is clear from table (1) that the average of potato waste crop reached about 820.8 thousand tons. This waste represents a loss in the actual cultivated area of potato representing about 73.02 thousand feddans, which reduces the monetary value of potato production by about \$ 133.19 thousand. It is also evident that the amount of irrigation water lost due to the production of this waste of potato crop amounted to about 300.3 million cubic meters. It is worth mentioning that the water resource in Egyptian agriculture is one of the rare resources needed for horizontal development, and therefore could be used to cultivate other areas.

It was also found that there was a loss in the invested capital of cultivation potato crop in the total production costs that were spent in the production of this lost area of potato estimated at about \$ 85.99 million. This cost loss could have increased the incomes of farmers and improved their standard of living, as well as the possibility of targeting these costs to increase productivity through the use of modern technology in Egyptian agriculture.

It was also found that the amount of potato waste crop, estimated at about 820.8 thousand tons, could be directed to the local market, which works to balance the price of the market, or directing the lost quantity of potato to export, leading to increase the bulk of Egyptian agricultural exports, which reduces the deficit in the Egyptian agricultural trade balance.

Table 1. Estimated economic losses of potato and orange crops in Egypt during the period (2012-2016)

Crop	Total waste (10 ³ ton)	Wasted area 10 ³ feddan	% from cultivated area	Water waste 10 ⁶ m ³	Waste value as export 10 ³ \$	Prod. Cost (\$10 ³ / fed.)	Waste prod. cost (10 ⁶ \$)	Farmer loss (10 ⁶ \$)
Potato	820.8	73.02	17.9	300.3	373.3	1.18	85.99	133.19
Orange	393.6	39.09	10.78	160.7	162.5	2.49	97.33	3161.15

Source: compiled and calculated from:

(1) Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Annual Bulletin of the Balance Sheet, various numbers.

(2) Central Agency for Public Mobilization and Statistics, Bulletin of Foreign Trade, various editions

(3) FAO website www.fao.org

Note

Potato water requirement = 4112 thousand cubic meters

Orange water requirement = 5688 thousand cubic meters

Amount of lost water = lost area X¹ Water requirement

Loss of income farmer = quantity of loss per ton × farm price per ton

Lost production costs = lost area × production cost / feddan

Estimated value of the waste if exported = Quantity of loss in tons × Export price (\$/ton)

For orange crop, it is clear from table (1) that the amount of orangewaste crop amounted to about 393.6 thousand tons. This loss represents a loss in the actual cultivated area of orange representing with about 39.09 thousand feddans, which reduces the monetary value of orange production by about \$ 3.16 million. It is also evident that the amount of irrigation water lost due to the production of this loss of orange crop amounted to about 160.7 million cubic meters. It is worth mentioning that the water resource in Egyptian agriculture is one of the rare resources needed for horizontal development, and therefore could be used to cultivate other areas.

It was also found that there was a loss in the invested capital of cultivation orange crop in the total production costs that were spent in the production of this waste area of orange estimated at about \$ 97.33million. This cost loss could have increased the incomes of farmers and improved their standard of living, as well as the possibility of targeting these costs to increase productivity through the use of modern technology in Egyptian agriculture.

It was also found that the amount of waste orange crop, estimated at about 393.6 thousand tons, could be directed to the local market, which works to balance the price of the market, or directing the lost quantity of orange to export, leading to increase the bulk of Egyptian agricultural exports, which reduces the deficit in the Egyptian agricultural trade balance.

Third: Stages of postharvest waste of potato and orange crops during the marketing phase of the sample study in Al-Beheira Governorate

1. Farm level

The results of the questionnaire indicate that the most important reasons related to the waste of potato crop on the farm level were brown mold, mild mildew, bacterium, scratches and wounds during collection behind the plow, and inappropriate packaging. While the most important reasons related to the waste of orange crop were the incidence of diseases and insects crustaceous, specially fruit flies, deformation of fruits and small size because of various, and the fall of fruits due to poor harvesting.

Table 3. Relative importance of losses of potato and orange crops at the farm level by sample of Al-Beheira Governorate for the agricultural season (2017/2018)

Waste of potato crop	Freq.	(%)	Waste of orange crop	Freq.	(%)
1. mild mold injury	13	65	1. Distort the fruits and small size because of the nests	11	55
2. Scratches and wounds during collection behind the plow	11	55	2. The incidence of diseases and insects corticosteroids, especially fruit flies	13	65
3. The use of inappropriate packaging and filling is done in a wrong way	9	45	3. Fall of fruits due to poor harvesting	11	55
4. Infection of the structural mold.	10	50	4. - Lack of good screening (extortion) because there is no trained labor	11	55
5. The infection of bacterial diseases (scabies)	11	55	5. Infection with fungal diseases such as nave	6	30

Source: Collected and calculated from preliminary data in the sample of the study in Al-Beheira Governorate in the agricultural season (2017/2018.).

2. Wholesaler level

Wastes in wholesale markets are low compared to wastes at the farm or retailer level. This is because it is the link between the farm and the retailer in the sub-markets. The exchange takes place in a relatively short period of time. However, due to the nature of horticultural crops being perishable. For horticultural crops in the wholesale markets as a result of exposure to weather conditions and the delay in the sale or storage and other reasons, and the opinion of the wholesalers of the respondents on the causes of wastes as shown in table 3 and the most important the causes of waste for potato crop due to inadequate packing, poor sorting by farms, poor loading and unloading of the crop during transport, transfer of the crop at midday and increased heat, unscheduled roads, insufficient refrigerants in the market. For the causes of waste in orange crop due to transfer of the crop in the afternoon poor temperature, poor loading and unloading of the crop during transport, improper packaging and poor sorting by farms, and unscheduled roads, as the main causes of waste according to the opinions of wholesalers of orange crop.

Table 3. Relative importance of the causes of loss of potato and orange crops according to the views of wholesalers in the sample of the study in Al-Beheira Governorate for the agricultural season (2017/2018)

Causes of waste	Freq.	Potato (%)	Freq.	Orange (%)
1. transfer of the crop in the afternoon and the increase of heat	10	50	10	50
2. Packing in unsuitable containers and poor sorting by farmers	11	55	8	40
3. Roads are not paved	9	45	6	30
4. Poor loading and unloading of the crop during transportation	10	50	11	55

Source: Collected and calculated from preliminary data in the sample of the study in Al-Beheira Governorate in the agricultural season (2017/2018).

3. Retailer level

The respondents' opinions on the causes of the waste on the retailer level as shown in table 4. The most important reasons for the potato and orange crops are: consumer sorting of goods is done in the wrong way. Packing in unsuitable containers and poor sorting by farmers prevented merchants from setting up umbrellas in front of their shops to prevent and impose fines on the sun. Some of them ,improper commodity screening of commodities, and open exposure and exposure to weather conditions.

Table 4. Relative importance of losses from potato and orange crops according to the opinion of the retailers in the sample of the study in Al-Beheira Governorate for the agricultural season (2017/2018)

Causes of waste	Freq.	Potato (%)	Freq.	Orange (%)
1- Consumer sorting of goods is done in the wrong way	5	25	7	35

2. The time and tools used in the supply and sale of goods are not appropriate	4	20	5	25
3 - The narrowness of the place where the goods are displayed and the items on top of each other	4	20	3	15
4. Packing in unsuitable containers and poor sorting by farmers	3	15	5	25
5. Exposed exposure and exposure to weather conditions	3	15	5	25

Source: Collected and calculated from preliminary data in the sample of the study in Al-Beheira Governorate in the agricultural season (2017/2018).

Fourth: Proposals and means of reducing the wastes of potato and orange harvesters

The views of farmers, wholesalers and retailers on the proposals and means of reducing wastes as shown in Table 5. The most important of these proposals were as follows:

1. Farmers level

As it is evident from table 5, with regard to the potato crop, the importance of seeding and good spreading was excluded, so that the damaged fruit would not be damaged, depending on the trained workers in Jenin and the collection for the absence of wounds or scratches and improvement of the quality of the crops used. As for orange crop it is concerned with the sorting and the good sorting (extension), excluding the damaged fruits so as not to damage others, and this comes from the good sorting of fruits, Used in agriculture, planting of varieties carrying transport operations, carrying out agricultural operations according to an agricultural program.

2. Wholesalers level

The views of wholesalers regarding proposals to reduce potato waste were the proximity of the wholesale markets to the retail markets, the improvement of the quality of the used containers, the transportation of goods at night or the morning, the provision of refrigerated transport, the use of transport vehicles equipped to maintain the goods, and improving the road network to reduce transport time. As for orange crop losses indicate that close to wholesale markets from retail market locations, transportation of goods at night or early morning and provision of refrigerated transport means improving the quality of used containers, use of transport vehicles equipped to maintain goods, building umbrellas in front of shops, and improving the road network to reduce transport time.

3. Retailers level

The views of retailers regarding to reduce the waste of the potato crop, they were to prevent consumers from sorting the wrong goods, improving the quality of the containers used and being strong plastic for transporting and displaying the goods, the speed of sorting the goods by traders once they reach the retail market, Places to sell with good ventilation As for the proposals to reduce the waste of orange were found to prevent consumers from spoiled goods, improving the quality of containers used, and being a strong plastic for transporting and displaying goods, quickly sorting goods by traders as soon as they reach the retail market, and selling places are suitable for displaying goods.

Table5. The relative importance of the proposals of farmers, wholesalers and retailers to reduce the wastes in potato and orange crops in the sample of the study in Al-Beheira Governorate for the agricultural season 2017/2018

Solving	Freq.	Potato (%)	Ferq.	Orange (%)
Farmers' solving				
1 - the exclusion of damaged fruits so as not to damage others	7	35	6	30
2 - Cultivation of varieties that bear the transport operations	6	30	5	25
3. Conducting agricultural operations according to an extension program	6	30	5	25
4 - attention to sorting and good gradation (extension)	4	20	4	20
Wholesalers' solving				
1- Improve the road network to reduce transport time	8	40	7	35
2 - Near the wholesale markets of retail markets	7	35	7	35
3 - The transport of goods at night or early morning and the provision of refrigerated transport	5	25	6	30
4 - Use of transport vehicles equipped to maintain goods	4	20	4	20
Retailers' solving				
1 - The places of sale suitable for the display of goods	3	15	3	15
2 - Prevent consumers from sorting the wrong goods	6	30	6	30
3 - the speed of sorting goods by traders as soon as they reach the retail market	4	20	5	25
4 - processing the places of sale with good ventilation	5	25	6	30

Source: collected and calculated from preliminary data in the sample of the study in Al-Beheira Governorate in the agricultural season (2016/2017).

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Appendix

Table1. Evolution of some economic variables of potato and orange crops in Egypt during the period (2001-2016)

Average	Potato					Orange				
	Export value (10 ³ \$)	Export quantity (Ton)	Price export (\$ / Ton)	Amount of waste (10 ³ tons)	Estimated value of the loss once exported (10 ³ \$)	Export value (10 ³ \$)	Export quantity (Ton)	Price export (\$ / Ton)	Amount of waste (10 ³ tons)	Estimated value of the loss once exported (10 ³ \$)
2001-05	42191.8	249862.8	169.13	188.2	31850.6	41955.8	179214.0	226.0	163.2	36840.2
2006-10	114488.4	352406.4	354.31	401.4	164932.0	194602.6	408925.4	414.7	163.2	97160.5
2011-16	193883.5	435841.2	450.64	777.0	95447.8	433504.5	799287.5	561.2	367.5	204659.0
2001-2016	121668.9	351649.6	332.6	476	419412.5	236488.7	483526.37	411	264	118734.8
Annual growth rate (%)	14.6**	5.3**	9.3**	13.0**	27.3**	22.8**	14.5**	8.2**	7.3**	15.5**

** : Significant at 0.01level .

Source: compiled and calculated from:

- (1) Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Annual Bulletin of the Balance Sheet, various numbers.
- (2) Central Agency for Public Mobilization and Statistics, Bulletin of Foreign Trade, various editions.
- (3) FAO website www.fao.org