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Impact of the Added Value on the Economic Return of some Horticultural Crops under Egyptian Conditions

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ABSTRACT

The study mainly aims to estimate the economic return of the investigated commodities added value through estimating the added value resulted from using the post-harvest treatments such as grading, storing and manufacturing of different commodities such as potatoes and onion. This entails estimation of the subsequent returns from those treatments and their comparison to the pre-application situation. In addition, the added value net return should be compared to the total loss of the investigated commodities. The study has relied on designing questionnaires for the studied crops in order to realize its cherished goal to estimate the added value of resulted from grading and different storing and the added value estimation of the investigated manufacturing commodities. This entails the studying the crop grading process and the various storing methods of the various investigated commodities besides the processed potatoes commodity. Among the important findings concluded by the study are the added value resulted from using some post- harvest treatments represented in the processes of grading and storing of the potatoes and onion crops. The processed potatoes results in direct increase of the ton return. This return differs according to the adopted treatment method for the one crop and the different methods. In addition, it is necessary to pay attention to the post- harvest treatments due to their clear impact on the net return increase per ton for different crops and hence can overcome the losses to which the producer may be exposed such as the loss high rate of the orchard crops. Furthermore, the necessity of providing Nawala with required standards that contributes to storing the potatoes crop besides the onion crop storing of which the required efficiency should be observed. It necessary to train those in charge of the storage process to ensure the commodity quality during the storage period. It is necessary to encourage investors to invest in the different stored refrigerated crops and the different factories to manufacturing the agricultural commodities through providing soft loans that encourage the investors to invest their funds in it. This helps increase the amounts of stored and manufactured commodities. Therefore, the exports of the commodities in their manufactured form will be increased. Thus, it will be possible to overcome the problem of exports reduction of some main exporting crops in Egypt particularly potatoes through opening new Arab and African markets whose imports depend on the foreign markets.

Key words: Economic return- added value- horticulture crops, onion, potato

Introduction

Horticulture, which includes the production of fruits, vegetables, flowers, spices, medicinal and aromatic plants and plantation crops has emerged as a major economic activity. Postharvest priorities across the globe have evolved considerably over the past four decades from being exclusively technical in their outlook, to being more responsive to consumer demand. Fresh produce after harvest can be considered as being in a live form, as it continues the process of respiration and transpiration until its reserves of food and water are exhausted (Simson and Straus, 2010)

Physiological changes or the rate of deterioration of fresh produce is influenced by the temperature, composition of the air surrounding the produce, and the humidity of the environment. No matter how good the quality, if packaging, transportation and marketing are not properly taken care of; fresh produce will be damaged and will undergo rapid decay. The causes of losses in fresh produce vary widely (Kader, 2002).

The horticultural crops are exposed to various changes after harvest due to their different morphological composition (roots, leaves, blossoms, fruits etc) and their chemical composition and physiological composition. It is characterized by high content of humidity so exposed to lose water, fading out, wilting, mechanical harms , bacterial and fungal infection since the beginning of harvest till finally consumed by the consumer. This leads to lose a great amount of quantitative and qualitative in those fruits estimated 5-25% in the developed countries and 20-50% in the developing countries according to the crop type and nature. The fruit harvest method and the timing of harvest affect the crop's quality and marketing. At the harvest stage, the orchard crops carrying out several post-harvest treatments which include: (Flores, 2000)

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Sorting:

The main objective of this operation is to attain a uniform product for the market. Fresh vegetables are classified by size, weight, or degree of maturity. Classification by size can be done manually in small packing houses with trained personnel. In mechanized packing houses, operations are carried out with perforated belts, divergent belts or cylinders, and sieving. Sorting by mass is usually done electronically but some manually operated machines can classify different weights by a tipping mechanism. Classification by degree of maturity can be done using colour charts or by optical methods. A preliminary sorting of produce should remove unmarketable pieces and foreign matter (plant debris, soil or stones) before the produce passes on to further operations. All discarded material should be quickly hauled away from the packing house or placed in closeable bins for later removal. This is because accumulations of decaying or infested waste in or near the packing house will contaminate produce destined for market. (FAO, 2003)

Grading:

Grading of fruits and vegetables after harvesting is an essential step in post-harvest management. Grading of fruits and vegetables on the basis of physical characteristics like weight, size, colour, shape, specific gravity, and freedom from diseases depending upon agrocliamatic conditions. The known methods of grading of fruits and vegetables are manual grading, size grading (Simson and Straus, 2010).

Due to the crops genetic diversity and the difference in size and shape, the grading process should be conduct prior to packing as the grading gives a fixed commercial feature known to both the buyer and the seller. Without the grading process, the fruit value subjects to personal estimation. Throughout the grading process, fruits are sorted into two degrees or more according to the used quality standards. Grading has two major functions: first, the undesired fruits will be removed while packing such as the rotten fruits that may rotting other fruits. Second, devising fixed standards for every type of fruits so as the fruits can be classified according to the type, size, appearance and the rates of quality and defects. All these things can determine the places of marketing, prices and the expected return. The advantage of grading process including: Losses the selling price due to presence of substandard products or specimen can be easily avoided. It increased marketing efficiency by facilitating buying and selling a produce without personal selection. As well as, grading enhanced to set good price for graded products, Heavy marketing cost in packing and transportation can be avoided by grading. On the other side, in grading diseased and defected specimen are not damaged due to contact of diseased specimen sand thus gets high price in market. By grading there is fairness to both buyers and sellers. Properly graded vegetables and fruits are purchased by the consumer easily without inspection (Simson and Straus, 2010).

Packing:

Most fresh produce ready for market is composed of large numbers of small units of similar size which must be moved in amounts conveniently handled by one person. This is best achieved by using containers of capacities from 3 to 25 kg, up to dimensions of about 60 per 40 per 30 cm. Some commodities (e.g. potatoes) may be marketed in 25 or 50 kg sacks, and other large items, such as whole bunches of bananas, are moved without packaging. Leafy vegetables can be sold loose or tied in bundles and not packaged.

Most developing countries use traditional baskets, sacks and trays to carry produce to markets. These are usually of low cost, made from readily available materials such as dried grass, palm leaves or bamboo. They serve the purpose for fresh produce carried over short distances, but they have many disadvantages in big loads carried long distances (FAO, 1989).

Packaging is an integral element in the marketing of fresh horticultural produce. It provides an essential link between the producer and the consumer. Packaging plays a very important role in protecting fresh produce. It provides protection from dust and it reduces microbial contamination from the surrounding environment also from consumer contact. As well as. It helps to maintain the freshness of produce, it extends the postharvest shelf life and it increases the sale of fresh produce. (Simson and Straus, 2010) .

Packing helps protect the crop in order to be suitable for marketing and attractive for the consumer. Packing can be conducted in the field, under the packing umbrellas, or in the packing houses of different designs depending on the crop type, targeted market and the type of investment. The packing process and its used equipment have been developed to suit different purposes and reduce damage as much as possible. The use of woodenware has become restricted to certain products and has been replaced by light cartoon packs. The repacking of vegetables and fruits has become easier due to the production of suitable covers. The polyethylene substance has become one of the used substances for various purposes as it is characterized with durability and transparency. It may add to the attraction of the product to become more attractive in the markets. Generally the repacking process leads to fruits homogeneity and preserve them from being rotten during storage. It helps increase the product life through preserving the humidity rates and improving the quality standards (FAO. 1988.).

Cooling:

Several methods of cooling are applied to produce after harvesting to extend shelf life and maintain a fresh-like quality. Some of the low temperature treatments are unsuitable for simple rural or village treatment but are included for consideration as follows:

Precooling: Fruit is precooled when its temperature is reduced from 3 to 6°C (5 to 10°F) and is cool enough for safe transport. Precooling may be done with cold air, cold water (hydrocooling), direct contact with ice, or by evaporation of water from the product under a partial vacuum (vacuum cooling). A combination of cooled air and water in the form of a mist called hyraircooling is an innovation in cooling of vegetables.

Air precooling: Precooling of fruits with cold air is the most common practice. It can be done in refrigerator cars, storage rooms, tunnels, or forced air-coolers (air is forced to pass through the container via baffles and pressure differences).

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Icing: Ice is commonly added to boxes of produce by placing a layer of crushed ice directly on the top of the crop. An ice slurry can be applied in the following proportion: 60% 36 Post-harvest Technology of Horticultural Crops finely crushed ice, 40% water, and 0.1 % sodium chloride to lower the melting point. The water to ice ratio may vary from 1:1 to 1:4.

Room cooling: This method involves placing the crop in cold storage. The type of room used may vary, but generally consists of a refrigeration unit in which cold air is passed through a fan. The circulation may be such that air is blown across the top of the room and falls through the crop by convection. The main advantage is cost because no specific facility is required.

Forced air-cooling: The principle behind this type of precooling is to place the crop into a room where cold air is directed through the crop after flowing over various refrigerated metal coils or pipes. Forced air-cooling systems blow air at a high velocity leading to desiccation of the crop. To minimize this effect, various methods of humidifying the cooling air have been designed such as blowing the air through cold water sprays.

Hydrocooling: The transmission of heat from a solid to a liquid is faster than the transmission of heat from a solid to a gas. Therefore, cooling of crops with cooled water can occur quickly and results in zero loss of weight. To achieve high performance, the crop is submerged in cold water, which is constantly circulated through a heat exchanger. When crops are transported around the packhouse in water, the transport can incorporate a hydrocooler. This system has the advantage wherein the speed of the conveyer can be adjusted to the time required to cool the produce. Hydrocooling has a further advantage over other precooling methods in that it can help clean the produce. Chlorinated water can be used to avoid spoilage of the crop. Hydrocooling is commonly used for vegetables, such as asparagus, celery, sweet com, radishes, and carrots, but it is seldom used for fruits.

Vacuum cooling: Cooling in this case is achieved with the latent heat of vaporisation rather than conduction. At normal air pressure (760 mmHg) water will boil at 100°C. As air pressure is reduced so is the boiling point of water, and at 4.6 mmHg water boils at O°C. For every 5 or 6°C reduction in temperature, under these. conditions, the crop loses about 1 % of its weight. This weight loss may be minimized by spraying the produce with water either before enclosing it in the vacuum chamber or towards the end of the vacuum cooling operation (hydrovacuum cooling). The speed and effectiveness of cooling is related to the ratio between the mass of the crop and its surface area. This method is particularly Post-harvest Handling 37 suitable for leaf crops such as lettuce. Crops like tomatoes having a relatively thick wax cuticle are not suitable for vacuum cooling (Dhatt and Mahajan 2007; Simson and Straus, 2010). .

Transportation:

Transportation is a big and often the most important factor in the marketing of fresh produce. Ideally, transport would take produce from the grower directly to the consumer, as in many developing countries. In more complex marketing systems (those serving towns, cities or distant countries)' the cost of transport contributes significantly to the price paid by the consumer, and sometimes exceeds the value of the raw product (FAO, 1989).

Fresh produce is primarily transported by road, from farmer to consumer. A marketing concern is that fresh produce should be of the highest quality and should be kept in the best condition during transportation. Minimizing losses during transportation, necessitates that special attention be given to vehicles, equipment, infrastructure and handling. Fresh produce is transported using both refrigerated and non-refrigerated vehicles.

The horticultural markets and the consumption centers are usually far from the horticultural crops production areas. Therefore, marketing of horticultural crops depends on the promptness and easiness of transportation and distribution. The development of transportation by using refrigerated trucks by lands, trains, and ships marketing the vegetables crops through lessening damage and distributing highly demanded crops to the far remote markets. The air transportation of high-value and promptly spoilable crops has helped as well preserve the goods from damage and waste (Ryall and Lipton, 1983).

Storage:

The continued supply of vegetable crops all over the year in order to meet their demand in spite of their seasonal production requires the necessity of their storage and preservation for a long period as possible free of diseases and harms which impede their consumption. The storage way differs according to the fruits type, period of storage and the purpose of storage. Storage usually requires the control of temperature, humidity, oxygen, carbon dioxide and various gases. The lowest temperature that does not cause chilling injury is the ideal storage temperature for fresh fruits and vegetables. Mechanical refrigeration is generally used for the storage of fruits and vegetables. Mechanical refrigeration is, however, energy intensive and expensive, involves considerable initial capital investment, and requires uninterrupted supplies of electricity which are not always readily available, and cannot be quickly and easily installed. The marketable life of most fresh vegetables can be extended by prompt storage in an environment that maintains product quality. The desired environment can be obtained in facilities where temperature, air circulation, relative humidity, and sometimes atmosphere composition can be controlled. Storage rooms can be grouped accordingly as those requiring refrigeration and those that do not. (Gross *et al.,* 2002; Simson and Straus, 2010)

Food Processed:

Processing activities are of critical importance to expansion and diversification within the fruit and vegetable sector in that they increase market opportunities for fresh fruits and vegetables and add value while minimizing postharvest losses. Furthermore, processing improves the viability, profitability and sustainability of fruit and vegetable production systems by increasing farm incomes, and generating rural employment and foreign exchange.

Traditional processing technologies such as thermal processing (bottling and canning),freezing, dehydration (salting, brining and candying) drying, and fermentation are widely applied in the processing of fruits and vegetables at various levels (artisanal, intermediate and high) and scales (cottage, small, medium and large). Tropical juices and fruit pulps, canned pineapples, tomato paste and canned and dried mushrooms are examples of fruit and vegetable products produced using traditional processing technologies and which are increasingly entering in international trade. Dried and canned mushrooms produced in China, currently account for 52% of world trade in processed mushrooms, while canned pineapples produced in Thailand accounts for approximately 45% of that product in world trade (FAO. 1997)

Food crops can be preserved for a long period through food manufacture by transforming these food materials into another less damaging form such as dryness, packing, frozen, evaporation and pickling. The manufacture process much helps in the process of marketing different goods. Generally, each one of these processes adds an added value to the investigated commodity.

The added value refers to the value created during a certain stage of the production or marketing stages. The production of a commodity, all production elements perform a certain service which increases the unit price of such commodity in a suitable way with the commodity cost. Thus, the added value means the selling price subtracted the production cost. Generally, the added value concept is related to the concept of the company increased wealth which will have a greater return on the company owners that exceeds the debt cost and property.

The problem statement:

During the post-harvest transactions, the horticultural crops are exposed to unforgivable waste rate of production. Several previous studies agreed that this rate may exceed 30% (Solieman, 1997) which can directly affect the profits of traders and producers.

Aim of the study:

The study mainly aims to estimate the economic return of the investigated commodities added value through estimating the added value resulted from using some of the post-harvest transactions such as grading, storage, manufacture of some horticultural commodities including potatoes and onion. This entails the estimation of the subsequent returns of using such transactions while comparing them to the pre-application status. In addition, the added value net return is compared to the total loss of the investigated commodity.

Research method and data collection:

The study has relied, to realize its pending objective, on designing questionnaire forms for the investigated crops in order to estimate the added value based on the various storing methods. It also aimed to estimate the added value of the investigated commodities manufacturing. The study has relied as well on some relevant electronic websites to the investigated topic.

First: The Grading Process:

The grading process is conducted in order to sort out the crop according to different sizes. The study sampling shows that the crop grading leads to having three different sizes. As for potatoes cultivated in sandy soil, it is divided into large, medium and small sizes estimated per tons about 20%, 30% and 50% respectively. The grading process results in crop amount loss plus a rate of 1% of drought waste because of storing the crop in Almarawd for a month. The grading process results in two types of loss: quantitative loss estimated about 75 kilograms representing almost 7.5% of the total crop amount and value loss valued about L.E. 104 pounds representing almost 7.4% of the crop total value valued almost L.E. 1400 pounds/ton as shown in Table (1).

Table 1: The loss of ton grading process of the cultivated potatoes crop in the sandy soil.

Gradation	Kg	Price (LE / kg)	Value (LE)	Losing %	Losing amount (kg)	Losing value
Large Size	200	1.50	300	11	22	33.00
Medium size	300	2.00	600	6	18	36.00
Small size	500	1.00	500	7	35	35.00
Total	1000	1.400	1400	7.5	75	104.00

Source: calculated and collected from the questionnaire data, LE: Egyptian pound

As for potatoes cultivated in clay soil, the research sampling shows the loss rate will increase by 4% compared to that cultivated in sandy soil as shown in Table no. (2). The crop grading process results in quantitative loss estimated about 115 kilograms representing almost 11.5% of the crop total amount and value waste valued almost L.E. 160 pounds representing about 11.4% of the crop total value amounted to about L.E. 1400 pounds/ton.

Table 2: The loss of ton grading process of the cultivated potatoes crop in the clay soil.

Gradation	Kg	Price (LE / kg)	Value (LE)	Losing %	Losing amount (kg)	Losing value
Large Size	200	1.50	300	15	30	45.00
Medium size	300	2.00	600	10	30	60.00
Small size	500	1.00	500	11	55	55.00
Total	1000	1.400	1400	11.5	115	160.00

Source: calculated and collected from the questionnaire data, LE: Egyptian pound

As for the onion crop, the ton grading process results in having three large sizes representing 10%. This crop size is not preferred because of its excessively increased rate of water and containing diseases. Medium sizes representing almost 40% and small sizes representing about 50% of the total ton as shown in the study sampling. It is shown that the crop ton grading process results in quantitative loss reaches almost 31 kilograms representing about 3.1% and value loss amounted to L.E. 57.8 pounds representing almost 3.2% of the total amount and the ton value as shown in Table. (3).

Table 3: The loss of ton grading process of the onions crop

Gradation	Kg	Price (LE / kg)	Value (LE)	Losing %	Losing amount (kg)	Losing Value
Large Size	100	1.40	140	3	3	4.20
Medium size	400	1.70	680	2	8	13.60
Small size	500	2.00	1000	4	20	40.00
Total	1000	1.82	1820	3.1	31	57.80

Source: calculated and collected from the questionnaire data, LE: Egyptian pound

The added value resulted from the investigated crops grading process:

The grading process of the potatoes crop cultivated in sandy soil and clay soil result in an increase of ton cost, ton revenue and the ton net return estimated L.E. 65 pounds, 129 pounds, and 64 pounds representing almost 10.4%, 10.1%, and 9.9% successively compared to non-graded ton as shown in Table 4. The invested pound return will reach about L.E. 2.04 pounds, 2.035 pounds, 1.985 pounds for graded potatoes, non-graded potatoes and the added value of the grading process respectively. The loss rate, amount and value increased by about 7.5%, 107.1%, and 116.9% successively for sand soil cultivated potatoes and 11.5%, 164.3%, and 179.8% successively for clay soil cultivated potatoes. Comparison of the total loss value of the graded ton reaches about L.E. 192.97 pounds and 224.97 pound and the graded ton net return from the added value reaches about L.E. 128.97 pounds, 160.97 pounds with a decreased rate estimated almost 66.8% and 71.6% compared to the graded ton loss value for sandy and clay soils cultivated potatoes successively. However, there is an increase in the graded ton net return estimated almost 9.9% compared to non-graded ton net return as shown in Table (4).

Table 4: Added value grading process of the potatoes crop

The statement	Non grading crop	Sandy soil			Clay soil		
		Grading	Added value	%	Grading	Added value	%
The cost per ton	623	688	65	10.4	688	65	10.4
Revenue per ton	1271	1400	129	10.1	1400	129	10.1
Net return per ton	648	712	64	9.9	712	64	9.9
The return / per investment pound	2.040	2.035	1.985	-	2.035	1.985	-
% the Losing per ton	7.00	7.5	14.5	-	11.5	18.5	-
The amount of the Losing per ton	.070	0.075	0.145	107.1	0.115	0.185	164.3
The value of the Losing per ton	88.97	104.00	192.97	116.9	160.00	248.97	179.8

Source: calculated and collected from the questionnaire data

Table (5) shows the added value of the onion crop from the grading process leads to an increase in the ton cost, net revenue, and ton net return by almost L.E. 75 pounds, 683 pound, and 608 pounds representing about 40.5%, 60.1% and 63.7% respectively. The non-graded onion invested pound return researches almost L.E. 6.146 pounds whereas it amounted to L.E. 7 pounds and 9.107 pounds for the graded onion, the added value resulted from the grading process. The graded ton rate, waste, and value increased by almost 3.1%, 37.8% and 60.9% compared to the non-graded crop. Comparison of the total waste value amounted to almost L.E. 152.67 pounds, the graded ton added value net return amounted about L.E. 608 pounds. This indicates an increase of the graded ton net return by almost L.E. 455.33 pounds representing almost 298.2% compared to the total waste value of the onion crop graded ton.

Table 5: Added value grading process of the onion crop.

The statement	Non-graded Onion	Graded onion	Added value	%
The cost per ton	185	260	75	40.5
Revenue per ton	1137	1820	683	60.1
Net return per ton	955	1560	608	63.7
The return /per investment pound	6.146	7.000	9.107	-
% the Losing per ton	17.0	3.1	20.1	-
The amount of the Losing per ton	0.082	0.031	0.113	37.8
The value of the Losing per ton	94.87	57.80	152.67	60.9

Source: calculated and collected from the questionnaire data

Second Storing: The storing process as one of the post-harvest transaction results in adding time benefit for the investigated commodity. Generally, the farmer and trader tend to store commodities for several months in order to benefit from the rising prices resulted from the commodity supply in times when the supplied commodities in the domestic markets is lessened.

Requirements for storing potatoes:

The quality loss of potatoes during storage depends on storage management and the treatments received as early as seed storage as well as during growth and at harvest. These losses can be minimized and tubers can be stored successfully by proper crop management, and proper storage design and conditions (Booth and Shaw, 1981; Gottschalk and Ezhekiel, 2006).

First: Storing in Nawala:

Traditional Nawalla is the common name of storage room used to store potato seed tuber after harvesting in Egypt which are typically privately owned and are concentrated in the northern governorates with lower average temperatures. Walls are typically from 2.5 to 3.5 meters high and 30 to 60 cm thick. Storage period is normally for five months, May to September. Roofs consist of bamboo matting, rice straw, and mud supported by wood or bamboo frames. Tubers that will be stored in the Nawala are directly transported in the field boxes to the Nawala as they must not be transported in bags. The Nawala is a store built of the bricks or red stones with exchanged holes exist everywhere except in the Alqibly side for the purpose of ventilation as the lower hole are located on the Alqably side to allow in the cool air at night and upper holes to push out the hot air. The holes are wired-covered to prevent the entry of insects and rodents. The height of pyramid-shape Almerwada does not exceed 80-100 centimeters high along the length of the Almerwada with 1.5-2 meters wide. The Almerwada is then covered with a lay of clean and dried straw rice of 50 centimeters thick. It is necessary to conduct regular check and sorting to remove any rotten tubers. The Nawala external walls can be painted white in order to reflect the sunlight and thus reduce the internal temperatures. It should be observed as well that there are varieties that can be stored in the Nawala which are characterized with high storing ability such as Alpha, Draga, Diamond, Cara, Lady Rosetta and Kardinal. Among the Nawala storing defects are the increase of total loss rate of the tuber yield, the breaking the dormancy period and the tuber weak storing ability (Marzouk, et al., 2007).

Table (6) indicates that the added value of the stored potatoes crop in Nawala has contributed to the ton cost increase by almost L.E. 80 pounds. This increase reflects the storing costs that represent almost 12.8% compared to the non-stored to cost. Both the ton total revenue and the stored ton revenue increased by about L.E. 339 pounds representing almost 32.9% and 52.3% successively compared to the non-stored. The increase reflects the time utility value resulted from the crop storing. The invested pound return reaches about 2.04 pounds, 2.404 pounds and 5.238 pounds for non-stored potatoes, stored potatoes and the added value of their storing successively. The comparison of the total stored ton amounted to L.E. 173.47 pounds and the ton added value net return of the stored ton valued almost L.E. 339 pounds, indicates that the stored ton added value net return researches almost L.E. 165.53 pounds representing 95.4% compared to the stored ton waste value.

Table 6: Added value of storage in Nawala for 2-3 months

The statement	Potatoes not stored	Stored potatoes	Added value	%
The cost per ton	623	703	80	12.8
Revenue per ton	1271	1690	419	32.9
Net return per ton	648	987	339	52.3
The return /per investment pound	2.040	2.404	5.238	-
% the Losing per ton	7.00	5.00	12.0	-
The amount of the Losing per ton	0.070	0.050	0.120	71.4
The value of the Losing per ton	88.97	84.5	173.47	94.9

Source: calculated and collected from the questionnaire data

Second: Storage in Refrigerator:

Part of harvested tuber resulted from summer season is stored in the refrigerators effective the month of May as tuber seeds for their cultivation in both the Nili season and intermediate season (planted throughout November) between Summer and Nili or stored for fresh consumption or manufacturing (sizes of tubers from 28060 millimeters). Generally, the potatoes tuber seeds are stored at the 4- 5 temperatures and humidity of 85-95%, while the cooking potatoes at the 7 temperatures and humidity of 85-90%, the crisps or chips potatoes are stored at 10 temperatures and humidity of 85-90% (Marzouk, *et al.,* 2007).

Requirements that should be observed when storing at the refrigerators:

The potato tuber put into bags or Sacks should be lined on wooden pallets on the floor of the ward in lots with the height ranged between 6-8 rows while leaving distances among them observing that sacks do not touch the walls of the ward in order to allow the cold air pass through in all directions. It also should be observed the upper lined sacks do not touch the cooling pipes in order to avoid the seeds damage within the sacks as a result of getting frozen. It also be observed that extra amounts should be stored and not exceed the ward capacity, fearing of the occurrence of the black hear phenomenon for the stored tubers. Another observation is getting rid of the dioxide results from the tubers breath through ventilation holes once a week. It should be observed that other crops should not be stored with potatoes such as appeal, pears, and Cantaloupe.

Table 7: Added value of storage in the refrigerator for 5-6 months

The statement	Potatoes not stored	Stored Potatoes	Added value	%
The cost per ton	623	966	343	55.1
Revenue per ton	1271	2345	1074	84.5
Net return per ton	648	1379	731	112.8
The return /per investment pound	2.040	2.428	3.131	-
% the Losing per ton	7	3.5	10.5	-
The amount of the Losing per ton	.070	0.035	0.105	50.0
The value of the Losing per ton	88.97	82.08	171.05	92.3

Source: calculated and collected from the questionnaire data

Table (7) indicates the increase of the added value cost of the refrigerator-stored potatoes by almost L.E. 343 pound representing about 55.1% compared to the non-stored ton cost. It shows the increase of both the ton revenue and the refrigerator-stored ton return by almost L.E. 1074 pounds and L.E. 731 pounds representing almost 84.5% and 112.8% compare to the non-stored ton. It also indicated the high return value of the added value unvested pound by storing in the refrigerators by almost L.E. 1.091 pounds representing about 53.5% compared to the non-restored ton invested pound return. The comparison of the total value waste of the stored in the refrigerators estimated L.E. 171.05 to the stored ton added value return estimated L.E. 731 pounds, it indicates the increase of the refrigerators-stored added value by about L.E. 559.95 pounds representing about 327.4% compared to the stored ton waste value.

As for the processed potatoes, the questionnaire form related to potatoes manufacturing indicates that the chips potatoes ton production requires about 4 fresh potatoes ton. Table (8) indicates that the added value of the fresh potatoes transformation process into potatoes chips expresses the formal utility results from the manufacturing process. The added value contributes to the high chips ton production cost by almost 29.3% and the chips ton production return by almost 558.4%, the chips ton return by 1126% compared to the cost, return and net return of 4 fresh potatoes ton production. Comparison of the total value of manufacturing waste amounted about L.E. 2823.52, the net value of the manufactured ton net return valued almost L.E. 29187 pounds, indicates the increase of the net value by about 1126% compared to the pre-manufacturing status. The added value of the return on the invested pound added value results from the manufactured ton is about L.E. 41.037 pound compared to about L.E. 2.04 pounds for non-manufactured potatoes.

Table 8: Added value of the chips potatoes processed .

The statement	Raw Potatoes	The statement	Chips Potatoes	Added value	%
The cost of production (4) tons farm	2492	The cost of production a ton of chips	3221	729	29.3
Revenue (4) tons farm	5084	Revenue production a ton of chips	35000	29916	588.4
Net return (4) tons farm	2592	Net return aton of chips	31779	29187	1126.0
The return /per investment pound	2.040	The return /per investment pound	10.866	41.037	-
%Losing (4) tons farm	28	% lost Manufacturing ton	4	32	-
The amount of Losing (4) tons	1.120	The amount of losses per manufacturing ton	0.040	1.160	3.6
Losing value (4) tons/per pound	1423.52	The lost value of manufacturing ton	1400	2823.52	98.3

Source: calculated and collected from the questionnaire data

Second: The Onion Crop:

Onions are grown for a variety of purposes, namely as fresh shoots for green 'salad' onions and as bulbs for: (i) consumption uncooked; (ii) consumption cooked; (iii) pickling; (iv) use in factory-made food; (v) dehydration; (vi) seed production; and (vii) sets (Brewster, 2008).

The common method of storing is conducted by packing in sacks. Those sacks are the arranged on wooden battens so as onion does not touch the ground. Those battens should be rowed with a distance of not less than a meter among them where air is intermediated. The stored onion is kept away from the sunlight in good ventilated stores with insulated walls. Generally, onion is exposed to a number of damage during its five-month storing period of them the mostly important are as follows:

- Damage manifests as increased respiration and water loss and an increased number of bulbs rotting, all contributing to loss in marketable weight at the end of storage.
- Losing humidity: it loses about 15-20% of its weight during the storing period because of losing the humidity resulted from high temperatures, lack of humidity or both together.
- The respiration rate of bulbs subject to minor impacts declines with time to the level of non-dropped bulbs, but that of bulbs dropped six times from a height of 1.05 m on to steel remained about double that of controls throughout a 10-week storage period.
- Losing the dry matter: onion loses the dry matter through the respiration. As the respiration increases with high temperature, thus, the stored onion high temperature leads to the loss rate increase of the dry matters.
- Sprouting: it means the leaves growth of the onion sprouts. It is accompanied by high respiration and thus the loss rate increase of the dry matter.
- Bulb deterioration due to disease will also increase respiratory outputs.Because of increasing water loss and respiration, the ventilation needed to maintain RH at 65–70% and the cooling or ventilation needed to dissipate heat produced by the bulbs will tend to increase with time.

Table 9: Added value of onions storage for 5 months

The statement	Onion not stored	Stored onion	Added value	%
The cost per ton	185	225	40	21.6
Revenue per ton	1137	1665	528	46.4
Net return per ton	955	1440	485	50.8
The return /per investment pound	6.146	7.400	13.200	-
% the Losing per ton	17.0	10.0	27.0	-
The amount of the Losing per ton	0.082	0.047	0.152	57.3
The value of the Losing per ton	94.87	85.21	180.08	89.8

Source: calculated and collected from the questionnaire data

Table (9) indicates that the added value of stored onion crop has contributed to a ton increase amounted to L.E. 40 pounds. This increase reflects the storage cost that represents about 21.6% compared to non-stored ton cost. The total ton revenue and the stored ton net revenue increased by almost L.E. 528 pounds and L.E. 485 pounds representing about 46.4% and 50.8% respectively compared to non-stored ton. The increase reflects the timing benefit resulted from the crop storage. The invested pound return reaches almost 6.146 pounds, L.E. 7.4 pounds and L.E. 13.2 pounds for non-stored onion, stored onion and their added value successively. The comparison of the total waste stored ton value estimated L.E. 180.08 pounds and the ton net return of the stored ton added value by almost L.E. 304.92 pounds represents almost 169.3% compared to total waste value of the stored ton.

The most important findings and recommendations:

Among the important findings concluded by the study are the added value resulted from using some post-harvest treatments represented in the processes of grading and storing of the potatoes and onion crops. The potatoes crops manufacturing results in direct increase of the ton return. This return differs according to the adopted treatment method for the one crop and the different methods. The crop grading process contributes to the increase of the ton net return by almost L.E. 65 pounds and L.E. 608 pounds representing about 9% and 63.7% compared to the ton net return pre-grading for potatoes and onion respectively. The storing process is clarified to have a clear impact on the investigated crops added value. As for the potatoes crop, it is clarified that the added value contributes in the invested pound return increase by about L.E. 3.198 pound/ton, L.E. 1.091 pounds/ton and L.E. 38.997 pound/ton. The increase estimated almost 156.8%, 53.5% and 1911.6% for Nawala and refrigerator storage and manufacturing compared to the invested pound return for the non-stored and non-manufactured ton. Meanwhile the crop storage added value contributes in the case of the onion crop an increase of the invested pound return amounted to almost L.E. 7.06 pounds/ton. The increase estimated almost 114.9% compared to the crop non-stored ton. In the light of the findings, the study recommends the necessity of paying attention to the post-harvest treatment to increase the product obtained return; particularly the crops orchard crops are exposed to high waste rate exceeds 30%. Therefore, the post-harvest treatments may compensate for the amount of waste through the crop high profits.

The study recommends the necessity of paying further attention to providing Nawala of necessary standards that contribute to storing the potatoes crop and the onion crop storage places of which the required efficiency should be observed. Those in charge of the storage process should be trained to ensure the commodity good quality during the storage period besides encouraging the investors to invest in the refrigerators used for different crops storing. Attention should be also paid to different factories to manufacturing the agricultural commodities through providing soft loans. Thus, investors will be encouraged to invest their funds in it particularly the potatoes manufacturing process resulted in profits are very high. The chips manufactured ton return amounts to almost L.E. 31.8 thousand pounds. This profit helps attract investors for investment in this sector. However, this matter requires amending the useless investment laws which the state has been adopting for a long period with other laws that help attract the Egyptian and foreign investors. This what the state needs during this critical period which Egypt is going through. Investment contributes in this field to increase the stored and manufactured amounts of commodities. Subsequently, the exports volume of the commodities in their manufactured form will be increased. Thus, it will be possible to overcome the problem of exports reduction of some main exporting crops in Egypt particularly potatoes through opening new Arab and African markets whose imports depend on the foreign markets.

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