ICARDA, IP and post harvest component

Pilot study on
Mapping Tomato Value Chain and potential options to reduce losses in Nubaria, ARE

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Abstract

Building upon previous work under the CRP Dryland Systems between ICARDA and ARC, regarding the High Value Chain Cluster, Innovation Platforms, this study was conducted to map Tomato value chain, identify root causes of post-harvest losses, and identify technical, organizational or social options available to reduce Tomato losses in Egypt. In specific, the study aims to:

1. Identify the main players and their role of tomato value chain within the horticulture value chain in Noubaria.
2. Determine the relations between players and its functional bases
3. Describe value chain nodes where tomato losses occur.
4. Document respondents' suggestions to reduce tomato losses as indication for potential innovations

The study was conducted in Nubaria, the new land of Behira Governorate. Tracking the value chain of Tomato extended to Alexandria governorate to interview traders and transport drivers. The sample amounted to 196 respondents, distributed as: 60 farmers, 5 nursaries, 13 input suppliers, 46 picking labors, 25 farmers wives, 15 drivers, 11 wholesale traders, 20 retailers, 5 associations, and one exporter. Data was collected by personal interview respondents during the second and third week of December 2014 using questionnaires and interview guides. Only the exporter was interviewed by phone.

The main results of the study revealed the following:

1. Main players of Tomato value chain and their role in the chain were a part of the horticulture value chain in Noubaria, i.e., none of the players was specialized in Tomato.

2. There are many types of connections/alliances within Tomato value chain. These were: The commodity value chain, Financing connections, Extension connections, Manufacturing factories connections, Seeds/seedlings connections, and Palm crates connections. These alliances put its members under pressure, and any intervention should consider all players in this alliance.

3. Value Chain nodes where Tomato losses occur.
    a. **General stage of Tomato losses**: Respondents referred the reasons of tomato losses to an earlier stages mainly: governmental strategy and unpredictable supply/demand.
    b. **Input supply stage (pre-production):** Supplies and suppliers are seen to have a hand in tomato losses mainly by farmers and their wives in the pre-harvest or post-harvest stages. The main factors were found to be: Pesticides, Varieties, Information/knowledge, Labor, Financing and Fertilization.
    c. **Production stage:** Reasons mentioned by respondents causes losses in Tomato quality and quantity in both pre-harvest and post harvest stages. The main factors could be categorized in: Plant protection reasons, Weather reasons, Irrigation reasons, Fertilization reasons, Initial reasons, Information reasons, Plant care reasons, Un-recommended practices as well as some other reasons
    d. **Harvest stage:** It seems that significant amount of Tomato losses due to fruit damage occur in this stage. Some of Tomato losses that appear in this stage are the result of production stage like infected fruit, sun-burnet, cracked fruit due to thirst and recent irrigation and delay harvest, yet, most of other damage are due to carelessness causes. Farmers do their best to manipulate this kind of losses

by refraining to grade the production, sell the production on its plants, topping the crates … etc.

e. **Transportation stage:** There are some damage occur directly during transportation. In general, drivers do not pay for this damage, yet more likely farmers do. The wholesale trader needs to receive intact crates in the market especially when selling for the farmer's favor. Un-noticeable damage in Tomato quality can also occur when transportation is delayed either in picking up the load or on the road to market. The results shows also that most reasons were mentioned by retailers, which might indicate that they are the most vulnerable category to losses occur during transportation.

f. **Wholesale stage:** Most of the respondents were focusing on supply/demand of Tomato, which is reflected directly on the wholesale in domestic market. Whether traders get rid of the production or sell it in a very low price to factories, farmers pay for it and traders also suffer from lower commission (it is always 7% if the production was sold for the farmer's favor). Usually this kind of losses does not appear in the post-harvest losses statistics although it can reach a significant number. As it will appear later, respondents claim for rational planning before season, or the interference of the government. Such an exclusive intervention is almost impossible, but it is a good chance to organize an alliance within the platform especially that this situation involves many players like farmers, wholesale traders, exporters, factories and supermarkets and restaurants.

g. **Retailing stage:** There are no statistics indicating market shares of supermarkets, restaurants, vegetable shops and wondering retailers. Anyway, all damage and infected tomato is disposed in this stage. Small retailers indicated that losses vary according to the grade, but it can reach 15% according to their estimates. Most of the reasons given, focused on customer's behavior or habits. Changing customer's behavior, diet pattern or bio-products demands an alliance of another kind of value network that includes mass media, companies, supermarkets, customer associations … etc.

h. **Exportation stage:** International market has good potential to absorb more production, especially with the competitive advantage of Egyptian Tomato abroad. Farmers' problem with exportation is that they have to send their production to the collection centers, which takes only the first grade (15-20% of the product). They have to find another way for selling the rest in this long process and vulnerable product.

4. Respondents' suggestions to reduce Tomato losses as indication for potential innovations were focusing on production stage and especially extension recommendations. Some of the suggestions points to the necessity of government intervening as a regulator for input, supply regulation, extension efforts, adapting a master plan for Tomato production to harmonize supply/demand, markets regulator … etc.
5. There are two types of knowledge value chain, domain/professional knowledge and shared knowledge. Both types are very important, yet, shared knowledge is still far behind concern.

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Introduction

There are many factors that make tomato the main vegetable crop in Egypt. Firstly, Changing Egyptian consumer attitudes have increased the interest in nutrition and health, which in turn has increased the demand for vegetables of high nutritional value like tomato. Secondly, the fact that tomato in Egypt can be grown in any type of soil, from pure sand to heavy clay. Thirdly, tomato can be grown (in Egypt) all year round, allowing three-harvest season. The largest acreage is carried out between July and October, followed by a season (November-February). The smallest acreage is of the season from March to June. Consequently, tomatoes enjoy the highest cropping intensity ratio in land use among all vegetable crops in Egypt[1].

On the other hand, Tomato consumption is high in Egypt because of the diet pattern. Tomato is a main ingredient in fresh salad and some pastries like pizza and pasta. It is the sauce in vegetable cooked meals like pea, beans, spinach, cauliflower …etc. It also the median in rice staffed cabbage, vein leaf, eggplant, pepper, artichoke …etc. The importance of Tomato is that, it supports those vegetables consumption, hence its prices affects directly those vegetables i.e., when Tomato price gets high, the prices of these vegetables gets down drastically. Somewhat, the taste of Egyptians is still traditional.

The distribution of Tomato production spreads along the Nile. Winter season production is mainly provided by Upper Egypt governorates, while summer season production is covered by Lower Egypt governorates.

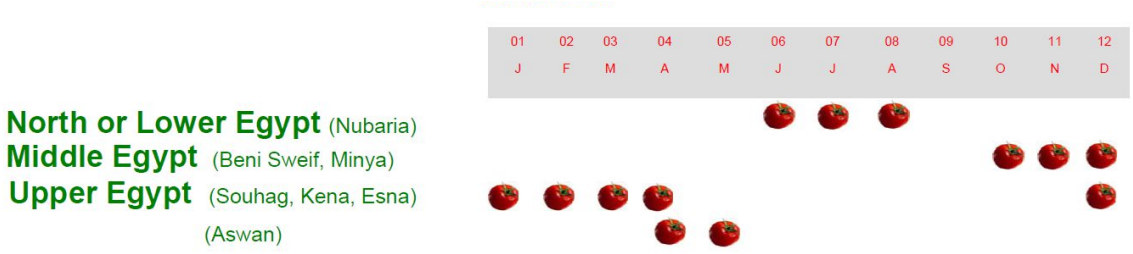

Figure 1. Geographical distribution of Tomato production in Egypt[2]

Cultivated area of tomatoes in Egypt has increased to the three loops from 456.89 thousand feddan in 1998 to 525.23 thousand feddan in 2012, with an average amounted 497.08 thousand feddan throughout the period (1998-2012). feddan productivity average of tomatoes was about 15.75 tons / feddan during the same period, while the total production average of tomato crop in Egypt amounted to 7820.3 million tons during the same period (1998-2012).
The area planted with tomatoes has increased at an annual rate by 8.22 thousand feddan. While productivity increased by annual rate has reached about 0.19 tons, production increased by an annual rate of 227.68 thousand tons[3].

Egypt is ranked the fifth in world production and area harvested after China, India, US, and Turkey. Total Tomato production reached 8.533.803 tons, and harvested area amounted to 212.946 hectares in 2013[4].

[1] Alboghdady, M.A. (2014), Nonparametric model for measuring impact of inputs density on Egyptian tomato production efficiency, International Journal of Food and Agricultural Economics, 2(4), 81. www.foodandagriculturejournal.com/vol2.no4.pp81.pdf
[2] Tinawy, Yousri (2010), Egyptian Tomato Industry, Chamber of Food Industries, Cairo, Egypt, p. 21. www.wptc.to/pdf/commissions/Exchange101.pdf
[3] Dosokki, M.A., Ahmed, R.H., Alam, H., Dhehibi, B., & Kassie, G.T. (2014, unpublished study), Value Chain Analysis of Tomatoes in Sharkia Governorate ARE, ICARDA & AERI (ARC), pp. 3-4.

Table 1: Top five countries in Tomato production (2013)

	Country	Total production (tons)	% of world production
1	China	50.664.255	30.89
2	India	18.227.000	11.11
3	United States	12.574.550	7.67
4	Turkey	11.820.000	7.21
5	Egypt	8.533.803	5.20
	World	163.963.770	

http://www.factfish.com/

Sequentially, the average of the exported amount of Egyptian fresh tomatoes reached 17.92 tons during the period (1998-2012), where the amount increased from 19.48 thousand tons in 1998 to 29.26 thousand tons in 2012. Value of Egyptian exports of fresh tomatoes was increase from 7.84 million pounds in 1998 to 174.37 million pounds in 2012 with an average of about L.E 48.7 million[5].

Fresh fruits and vegetables post harvest losses causes a notable reduction in the availability of fruits in markets, in addition to an increase in per unit cost of transport and marketing (Subrahanya, 1986). By consequence, fresh produce and the consumers are impacted negatively. Efforts to reduce post harvest losses contribute in increasing the fresh produce quantities offered to markets, and the costs incurred in preventing losses is considerably lower than those spent in producing the same saved quantity of fruits and vegetables. Both quantitative and qualitative losses occur in horticulture commodities between harvest and consumption. Qualitative losses, such as loss in edibility, nutritional quality, caloric value, and consumer acceptability of fresh produce, are more difficult to assess than are more quantitative losses of fresh fruits and vegetables, which reduction of quantitative losses is a higher priority than qualitative losses in developing countries. The opposite is true in developed countries where consumer distant is faction with produce quality results in a greater percentage of the total post harvest losses. The reduction of post harvest food losses is a complementary mean for increasing food production, food losses reduction is normally cheaper, faster, and need less effort than producing a similar additional amount of food for the same quality, when needed to cover the increasing food shortage in the world accompanying the increased population[6].

Tomato is cultivated in three different methods, open field cultivation, greenhouses, and plastic tunnels, but the problem is that it has a long harvest season. Due to its thin skin and juicy content, it cannot be stored for long on its plants nor in stores. "Tomatoes may be harvested at the mature green stage, semi-ripe or fully ripe, depending on marketing requirements. They are very perishable and subject to surface and internal damage, and must be handled accordingly. Tomatoes are sensitive to chilling injury, with varying degrees of intensity depending on the maturity of the fruit. Proper temperature management for ripening and storage are critical to maintain quality. Tomatoes will not ripen normally at temperatures above 80 F. Fruit held below 50 F become susceptible to Alternaria decay during subsequent ripening. Low temperatures in the field may also damage mature-green tomatoes. Severity of chilling increases with increases in exposure time.

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[4] http://www.factfish.com/statistic-country/egypt/tomatoes%2C%20yield

[5] Dosokki, M.A., Ahmed, R.H., Alam, H., Dhehibi, B., & Kassie, G.T. (2014, unpublished study), Value Chain Analysis of Tomatoes in Sharkia Governorate ARE, ICARDA & AERI (ARC), p. 4.

[6] Dosokki, M.A., Ahmed, R.H., Alam, H., Dhehibi, B., & Kassie, G.T. (2014, unpublished study), Value Chain Analysis of Tomatoes in Sharkia Governorate ARE, ICARDA & AERI (ARC), p. 38.

Chilling periods for fruit while in the field, during transit, and in storage have a cumulative effect. Thus, fruit chilled for only a short period in the field can become very susceptible to decay when held for only a short period at chilling temperature during transit or storage. Tomatoes should be kept out of cold, wet rooms because in addition to potential development of chilling injury, extended refrigeration damages the ability of fruit to develop desirable fresh tomato flavor"[7].

Worldwide post harvest tomato losses are as 30 to 40% and even much higher in some developing countries such as Egypt due to the use of improper handling procedures and lack of methods to prevent decay and senescence. In Egypt, tomato fruits for the domestic market are not subjects to low temperature storage due to high costs. Consequently, gluts occur during harvest with shortfalls experienced afterwards. Crop grown for export do have low temperature storage facilities but quality and sensory traits of fruit losses still occur[8].

Several studies were conducted to detect losses in fruit and specifically in Tomatoes. Most of these studies either focused on one reason (pest, disease …), or a treatment or more (cooling, packaging …). Recommendations to solve the problem of Tomato losses of most studies came traditional and general.

Examples of such innovative solutions are:

- Protect produce from the sun; keep it cooler during handling and preparation for marketing to reduce produce loses value due to weight loss or wilting.
- Protect produce from damage by using better quality packages and containers to reduce produce loses value due to mechanical damage during the marketing period
- Add value by using proper harvesting, sorting, grading and packing practices to increase produce market value by avoiding poor appearance, decay or damage during handling
- Short term storage in cool chambers to reduce produce loses value due to exposure to high temperature if it cannot be sold right away
- Transform produce to a more stable product that can be stored for months, then consumed or sold when market prices recover to overcome market value plunges during peak harvest period[9].

In Ghana, Issahaku (2012) found that "The major problems confronting the tomato value chain were found to be low prices, price volatility, lack of access to credit, poor quality of tomatoes, inadequate storage and warehousing facilities, inadequate transportation facilities, dispersed nature of source of supply, high interest rate and lack of adequate information. While farmers ranked low price as their most worrying constraint, poor quality of Ghana

[7] UNCTAD, Commodity Profile - Tomato, United Nations Conference on Trade and Development, Retrieved from www.unctad.info/en/Infocomm/AACP-Products/COMMODITY-PROFILE---Tomato/

[8] Abd_Allah, E., Hashem, A., & Al-Huqail, A. (2011). Biologically-based strategies to reduce postharvest losses of tomato. African Journal of Biotechnology, 10(32), 6040-6044. Retrieved from www.academicjournals.org/journal/AJB/article-abstract/004ADCB30744

[9] Kitinoja, Lisa (2013), Innovative Small-scale Postharvest Technologies for reducing losses in Horticultural Crops, Ethiopian Journal of Applied Sciences and Technology, Special Issue No.1, pp 14-15

produced tomatoes was ranked as the most pressing constraint of wholesalers and retailers. For the NSTC, the most pressing constraint was inadequate capital for the purchase of equipment and raw materials. The paper recommends that interventions in the value chain should be coordinated in a manner as to affect all actors, taking into consideration their specific priority needs[10]".

More recent study[11] in Egypt also recommended:

- The need for a strategic and integrated plan to produce and export of tomatoes.
- The development and modernize the institutional structure of the governmental and private bodies.
- The establishment of regions specializing in the production of tomatoes orient to export.
- Improving the performance of services related to the production and marketing of tomatoes
- Develop a flexible system, enjoys with justice and equity to ensure the production and export incentives.
- The need for training workers and labors to post-harvest operations .
- Cultivation of export varieties which has increasingly demand
- Paying attention to the farmers in their land itself as that would lead to their access to the optimal size of the production of more of their dependence on seedlings ready, especially if they are taking into account and use the recommended amounts of seed and nursery care service with attention to the provision of labor required to service the crop.
- Study new situations, on both needs and the suitability of the current situation of the productive market.
- Reconsider the existing marketing system for export.
- The need to conduct field studies of the actual costs for the processing companies of tomato sauce.
- Coordination between production windows and exporting windows

Although most of these recommendations are vague and lack concrete evidence, it point out that more holistic research approach is needed to map the situation of losses related to all players, analyze critical points and relations, and detect appropriate solution.

Focus in agriculture research for decades were on farm production in both application and research. Melted geo-political boarders by trade and communication imposed strategic research approaches to emerge to fulfill local and international market needs.

One of the concepts that appeared recently in this regard is the Agricultural Innovation System (AIS). The World Bank[12] defines it as a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into social and economic use, together with the institutions and policies that affect their behavior and performance. The innovation systems concept embraces not only the science suppliers but also the totality and interaction of actors involved in innovation. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways.

[10] Issahaku, Haruna (2012), An Analysis of the Constraints in the Tomato Value Chain, International Journal of Business and Management Tomorrow, Vol. 2 (10), Retrieved from https://www.academia.edu/3235497/An_Analysis_of_the_Constraints_in_the_Tomato_Value_Chain, in 10/2/2015.

[11] Dosokki, M.A., et al, op cit. pp 37-38.

[12] World Bank. 2007. Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems. Washington, DC: The World Bank, ARD. p. XIV.

The AIS suggests three types of innovations namely: technological, social and organizational innovations. It covers aspects in an international, national, local, domain or professional community, which are connected and functioning in a harmonized fashion.

Innovation platform is one of the many approaches that were suggested to implement this research strategy. An innovation platform is a space for learning and change. It is a group of individuals (who often represent organizations) with different backgrounds and interests: farmers, traders, food processors, researchers, government officials etc. The members come together to diagnose problems, identify opportunities and find ways to achieve their goals. They may design and implement activities as a platform, or coordinate activities by individual members[13].

The platform itself should be a part of a domain or a community whether physical of virtual. Such a role, facilitate identifying players in the innovation system as well as functions, connections and relations.

In a commodity domain like Tomato, researchers use the value chain to locate value flow, players and connections. More recently, a wider approach for research to handle such studies is the commodity chain. A "commodity chain" perspective implies that, for a given crop, the approach is not restricted to the conventional agricultural components related to increase in productivity, but rather that the crop is considered "as a whole" in all aspects of a chain (or a system), that goes from production through to its consumption or use by the consumers[14].

A "Value Network" is a set of connections between organizations and/or individuals interacting with each other to benefit the entire group. A value network allows members to buy and sell products as well as share information. These networks can be visualized with a simple mapping tool showing nodes (members) and connectors (relationships).

A value network is a business analysis perspective that describes social and technical resources within and between businesses. The nodes in a value network represent people (or roles). The nodes are connected by interactions that represent tangible and intangible deliverables. These deliverables take the form of knowledge or other intangibles and/or financial value. Value networks exhibit interdependence. They account for the overall worth of products and services. Companies have both internal and external value networks.[15]

External value networks include customers or recipients, intermediaries, stakeholders, complementary, open innovation networks and suppliers. Internal value networks focus on key activities, processes and relationships that cut across internal boundaries, such as order fulfillment, innovation, lead processing, or customer support. Value is created through exchange and the relationships between roles. Value networks operate in public agencies, civil society, in the enterprise, institutional settings, and all forms of organization. Value networks advance innovation, wealth, social good and environmental well-being.

13 R4D (2013), Innovation platforms practice brief 1, Department For International Development, UK, November 2013, http://r4d.dfid.gov.uk/pdf/outputs/WaterfoodCP/Brief1.pdf.

14 GFAR (2001), Linking Farmers to the Market: Post-Harvest, Rural Innovation Systems and Rural SMEs, Global Forum on Agricultural Research, Rome. http://www.egfar.org/content/linking-farmers-market-post-harvest-rural-innovation-systems-and-rural-smes

15 http://en.wikipedia.org/wiki/Value_network#cite_note-1

Study problem

Although Egypt is ranked fifth in area harvested (212.946 hectare) and production (8.533.803 tons) in 2013, it comes the world's number 53 in harvested production per unit of harvested area of tomato (400.750 hectogram per hectare) at the same year [16].

This variation appears also within production areas in Egypt. Figure (2) illustrates that, although Noubaria's tomato production in 2012 (about 450.000 tons) was higher than Suhag (about 320.000 tons), Suhag's yield (about 27 tons/acre) was much higher than Noubaria (about 19 tons/acre). Assuming that Nubaria would have applied the same conditions in Suhag, its tomato production should have been increased by 133.333 tons (as much as the total production of Hungary, Macedonia, Malaysia or Rwanda at the same year).

It seems that pre-harvest losses are significant in tomatoes, which is also reflected somehow on the post-harvested production.

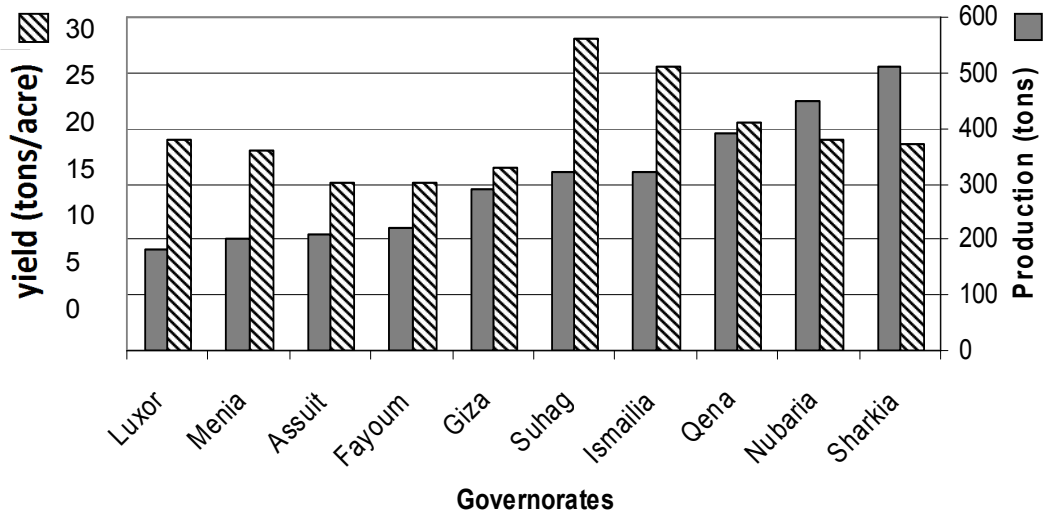

Figure 2. Top Ten Governorates of Tomato Production in Egypt in 2012[17]

Postharvest losses of tomatoes in Egypt account for 27-43%, depending on the source (University of California, 2009)[18]. Assuming that estimates of losses are 30% on average, then Egypt might have lost about 2,560.141 million tons out of the 8,533.803 million tons produced in 2013, worth almost 3,840 billion Egyptian Pounds (ton price is LE 1.500 on average in the local market).

Losses in Tomato whether estimated in the pre-harvest stage or the post-harvest stage can occurs in any process allover the value chain. Focusing on losses occurrence or direct causes are not enough to solve the problem, root causes should be detected too. Farmers only can not be blamed for the looses because they try always to adapt to input suppliers on one hand, and market demands on the other hand.

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[16] http://www.factfish.com/statistic/tomatoes%2C%20area%20harvested, http://www.factfish.com/statistic/tomatoes%2C%20production%20quantity, & http://www.factfish.com/statistic/tomatoes,%20yield

[17] Alboghdady, Mohamed Altabei (2014), (Revised), Nonparametric Model for Measuring Impact of Inputs Density on Egyptian Tomato Production Efficiency, International Journal of Food and Agricultural Economics, Vol. 2 No. 4, p. 82

[18] Fruit Profits, Reducing postharvest losses and improving fruit quality worldwide: the one-billion-dollar untapped business opportunity, Retrieved from www.fruitprofits.com/ing/articulo.asp?reg=26, 6/11/2011.

The study objectives

Building upon previous work under the CRP Dryland Systems between ICARDA and ARC, regarding the High Value Chain Cluster, Innovation Platforms, this study was conducted to map Tomato value chain, identify root causes of post-harvest losses, and identify technical, organizational or social options available to reduce Tomato losses in Egypt.
In specific, the study aims to:

1. Identify the main players and their role of tomato value chain within the horticulture value chain in Noubaria.
2. Determine the relations between players and its functional bases
3. Describe value chain nodes where tomato losses occur.
4. Document respondents' suggestions to reduce tomato losses as an indication for potential innovations

Methodology

1. The study framework

The study was conducted in Nubaria, the new land of Behira Governorate. Tracking the value chain of Tomato extended to Alexandria governorate to interview traders and transport drivers. Data was collected by personal interview of the study sample during the second and third week of December 2014 using questionnaires and interview guides. Only the exporter was interviewed by phone.

2. Tools

Ten questionnaires and interview guides were prepared to cover the main players on Tomato value chain: Farmers, Nurseries, Input suppliers, picking worker, Farmers wives, Transporters, Wholesale traders, Retailers and Cooperatives. These tools were validated by the judgment of 5 specialized researchers from AERDRI before data collection.

3. Geographical Distribution of the study sample

a. Farmers

The sample of farmers amounted to 60 respondents, distributed as follow:

Respondents	Village
22	Mostafa Ismaiel
18	Village 1
10	Village 2
3	Village 3
2	Alisha/ Village 20
3	Mohamed Abdul-Wahab
1	Mostafa Kamel
1	Village 19

b. Nurseries

Owners of 5 nurseries were met, where all were in village 1.

c. Input suppliers

Thirteen suppliers were interviewed, 4 from village 2, 3 from Alisha/Village 20, 2 from village 1, and a supplier from each of Mostafa Ismaiel, Village 13, Mostafa Kamel, and Village 19.

d. Picking worker

The sample amounted to 46 workers, all from Mostafa Ismaiel village.

e. Farmers wives
Twenty-five wives were interviewed, 11 from village 1, 9 from Mostafa Ismaiel and 5 from Mohamed abdul-Wahab Village.

f. Transporters
Ten drivers were met, 5 in El-Amria market, 3 in Mostafa Ismaiel village, and one from each of Mohamed Abdul-Wahab village, and Ezbit El-Hagana in El-Amria.

g. Whole sale traders
Eleven traders were interviewed, 6 in El-Hadara whle sale Market and 5 in El-Amria whole sale Market

h. Retailers
A total of twenty sellers were met, ten in Sidi Gaber customer market in Alexandria, and ten in Abo-Bakr village market.

i. Cooperatives
Five coops were visited as follows:

- Coop of marketing vegetables and fruit in Tiba Zone, Alesha village.
- Marketing Coop in Intelak, Imam Malek village .
- Marketing Coop in West Nobaria, El-Safa village.
- Salah El-Deen Coop in Village 13.
- Coop of Vegetable and Fruit Production and Marketing, Village 15.

Tabulation, frequencies, percentages and graph illustrations were used to present and analyze the study results.

Study results

1. Main players of tomato and their role in the value chain within the horticulture value chain in Noubaria

The platform has a structure and function as a system. The structure consists of the main players working in the system, i.e., the value chain/network in our case and relations between them. Tomato platform is a part of a wider platform of horticulture and field crops. Although the commodity/product, prices, seasons …etc. change, the main players, their relations and functions are almost the same.
Starting from Farmers as producers, tomatoes value chain could be tracked to its complementary supply and market chains assuming that farmers as the main target are in the middle of the process.

a. Farmers
Due to the seasonality of tomato production, farmers like all other player on the chain are not specialized in Tomato. As indicated by respondents, all of them are a part of fruit and vegetable value chain. Most of them plant field crops especially in winter.

Table 1: Other crops produced by Tomato farmers

Season	crop	Frequency
Summer	Maize	46
	Pepper	35
	Cantaloupe	25
	Water melon	23
	Egg plant	20
	Beans	9
	Sesame	5
	Potatoes	1
	Squash	1
	Summer cabbage	1
Winter	wheat	58
	Clover	54
	Faba bean	23
	Artichoke	18
	Beat	12
	Cabbage	5
	Cauliflower	3
	Beans	3
	Garlic and onion	1
	Parley	1
Nilei (3 months between summer and winter)	maize	22
	Beans	1
	Potatoes	1

n=60

b. Nurseries

Nurseries are very vital for tomato production because they help to cut the season short by almost two months, and reduce losses of small plants in the beginning of planting, and hence, reduce the effort needed for patching the field. They also control the varieties planted and sometimes infection of the crop. They have a strong influence on the chain as was revealed by other player. Nurseries were also a part of the same fruit value chain.

Table 2: Other crops produced by Tomato nurseries

Season	crop	Frequency
Summer	Pepper	5
	Water melon	5
	Cabbage	3
	Egg plant	3
	Cantaloupe	3
Winter	Cabbage	3
	Cauliflower	3

n=5

The importance of nurseries in the value chain is mainly because the owners often select the varieties presented to farmers.

Table 3: Nurseries source of Tomato seeds

Source	Freq.
Seeds production companies (Dar El-Nabatat, Delta for seeds)	2
Seed companies sales agent	2
What farmers purchase and bring to the nursery	1

n=5

Nurseries mentioned more than 17 variety of Tomato available as seeds, but they usually have to select from them. their common criteria to select Tomato variety is shown in the next tabe.

Table 4: Criteria used by nursery owners to select Tomato varieties

Criterion	Freq.
High yield	5
Tolerant to temperature variation in the area	4
Resistant to disease	3
Requested by farmers	2
Tolerant to drought	1

n=5

The other aspect of nursery importance is that their owners are considered one of the information sources for farmers. There are at least two types of knowledge nursery owners present: knowledge about specifications of the variety (especially new ones), and planting knowledge package (extension recommendations and best practices). All owners mentioned that their source of knowledge is the seed production companies. Although this type of information complement farmers' knowledge, yet owners sole source of information might not be enough or valid.

c. Input suppliers

Input suppliers have a powerful impact on Tomato production. Due to the weakness in extension efforts, farmers consider them the main source of production information. Because of their close contact with farmers, they afford multiple services and supplies such machinery, seeds, fertilizers and pesticides. All suppliers interviewed were pesticide dealers, but more importantly, they present their own prescription of mixed chemicals for pest control. It seems that they influence a good deal of the quality and quantity of Tomato losses. On the other hand, they are not specialized in Tomato value chain only, but they serve all common crops in the area since their work is based mainly on the operations rather than the product.

Table 5: Other services and products presented by input suppliers

Services	Freq.
Pesticide	13
Fertilizer	8
Seeds	7
Machinery renting (spraying motors, on-the-back sprayers, irrigation equipment …etc.)	3

n=13

Input suppliers connect input companies, wholesale traders of inputs, and agents to farmers. The importance of this role is that they are responsible for balancing the quality and price of their goods by selecting the lowest price variety that produces the best quality possible. On the other hand, they also control the quantity, i.e., black market that appeared lately in fertilizers.

Table 6: Sources of goods dealt with by input suppliers

Sources of goods	Freq.
From wholesale traders of inputs	5
From a single trader	5
From companies	2

n=13

Another important role of input suppliers is the extension role. This role affects the quantity and quality (infected and polluted) of Tomato produced. There are many factors affect this information's accuracy or validity. The first factor is the source of information. Data revealed that traders use many sources of information through diverse channels. It is noticeable that none of the respondents mentioned research as a source, although the area is covered by two research stations (in Nobaria and Etai El-Baroud).

Table 7: Sources of information of input suppliers

Sources of information	Freq.
Product pamphlet	13
Agricultural Extension	8
Training courses of product companies	6
Companies	2
Private extension agent	1
The internet	1
Research	0

n=13

Impact of these information on production quality and quantity, and hence losses, appeared to be in 4 stages: pre-production as farmers consult the trader about recommended varieties, fertilizing schedule, infection, and types, quantities and preparation of pesticides.

Table 8: Common questions/problems farmers consult of input suppliers about it

Questions/problems	Freq.				Weight
	Always	Some-times	Rarely	Never	
Problems of disease and pest infections	9	3	1	0	**34**
Recommended types, quantities and rates of pesticide usage	8	5	0	0	**34**
Recommended types and quantities of fertilizers	2	5	3	3	**19**
Recommended varieties	4	5	2	2	**2**

n=13

In the Tomato case, it seems that it is no exception. Pest control ranked first, close to other recommendations.

Table 9: Information related to Tomato presented to farmers by input suppliers

Information type	Freq.
Diagnoses of Tomato infections	13
Types of diseases affecting Tomato	13
Types and methods of using pesticides for protection and treatment	13
Types of pests and insects affecting Tomato	11
Quantities and dates of adding fertilizers	10
New varieties	9
Methods and practices of planting new varieties	9
Bio-fertilizers	9

n=13

Input traders indicated that the accuracy of diagnoses is rather high as 8 of them mentioned that farmers always follow their recommendations, while 5 of them said that this occurs sometimes.

Table 10: Input suppliers opinion about what recommendations the farmers follow

Recommendation	Freq.
The suitable type of pesticide to be used	13
Quantities of pesticides to be used	11
Safe use of pesticide	10
Varieties that should be planted	9
Quantities and types of fertilizers	8

n=13

The way of diagnoses also affects its accuracy. Anyway, this depends on both farmers and traders.

Table 11: The ways that input suppliers diagnose infections

Sources of goods	Freq.				Weight
	Always	Sometimes	Rarely	Never	
Farmer brings the infected plant	11	2			35
Farmer orally describes the problem		8	1	4	17
Field inspection by trader	2			11	6

n=13

The influence of input suppliers on the chain is not limited to varied supplies, price control of supplies and extension services, but it also covers some innovative solutions. They mentioned that they provide farmers with some unconventional prescriptions. Of the 13 respondents, 3 of them do that often, 1 sometimes and 3 rarely.

d. Picking worker

Harvesting Tomato in Egypt still depend on hand labor. In this stage, Tomato picking method and packaging is the first post harvest phase of losses. Picking workers are also involved in harvesting all other crops in the area. All of the 46 respondents indicated that their preference of harvesting any kind of crop depends on the wages offered to them. Anyway, 32 indicated that they prefer picking Tomato because its fruit is big, easy to pick, it is picked in large amount, and working hours are short with higher return.

The importance of this category is that they are the first ones to handle Tomato. Their contribution in losses is picking over ripped fruits, raw fruits, damage made to the plant, and physical damage to the fruit. Workers understand the good practice to follow, yet, they rarely do it. Respondents mentioned the following picking conditions.

Table 12: Practice of picking Tomato mentioned by picking workers

Practice	Freq.
Cutting by hand	33
Leaving a part of the stem attached to the fruit	31
Leave the unripe fruit on the plant	14
Drop infected fruit on the ground to collected later for Tomato factories	13
Separate infected fruits	8
Using scissors	5

n=46

The same result was detected with fruit maturity signs. Respondents mentioned the following signs. Although it seems the right signs, they mentioned later that they arrange the fruits in the basket putting the good ones on the top (give the basket a face, a mirror), which means that bad ones goes inside. These signs depend also on the harvest timing selected by farmer, that might delay the right date to catch a better price (store the fruit on the plant). This would make over ripe fruit increase the rate of losses.

Table 13: Signs of suitable Tomato for picking mentioned by picking workers

Signs	Freq.
Suitable size depending on the variety	46
Red color or half colored depending on request	46
The fruit separates easily from the stem	36
Smooth fruit surface without injury	34
Round shape	31

n=46

The contradiction between what workers know and what they do can be explained by examining their source of knowledge. Variation in following the good practices comes from the various destinations of Tomato: local market, manufacturing or exportation. They are helpless to give the client what he wants. In the same time, Farmers are also helpless against workers carelessness under time pressure of harvest.
It is worth mentioning here that there are two types of factories, big factories with good reputation (like Heinz), and rather small or multi-production factories. Big factories have an integrated program for tomato production, i.e., contract farming. They provide farmers with their own variety of seeds or seedlings, regularly inspect their field during the season, observe harvest process under their terms, and use their crates and transportation means. Other factories collect unmarketable tomato, either from the field after selling the main product (the left over) in a very cheap price, or the unsold tomatoes from the market. Unfortunately, this is a very bad way to reduces tomato losses.

Table 14: Conditions of picking mentioned by picking workers

Item	Manufacturing		Exportation		Local market	
	Condition	Freq.	Condition	Freq.	Condition	Freq.
Clothes	Ordinary	38	Their overall and gloves	20	Shirt and pants	25
					Ordinary	16
Picking tools	Hands	15	Hands	20	Hands	46
Packages	Plastic crates	32	Wood boxes	4	Date palm crates	22
			Plastic crates	22		
Timing	At the end of the day	25	6/10 AM	38	5-10 AM	35

n=46

e. Farmers wives

Although farmers' wives do not have a direct role in decision making of Tomato production or harvest, they help in reducing harvest left over. Women are also are the main customer of Tomato. The wives have many ways to make use of Tomato left after sorting as indicated in the following table.

Table 15: Ways of making use of Tomato left after sorting in the field as indicated by farmers' wives

Item	Freq.
Making tomato past and use it at home	22
Home consumption as fresh	14
Selling it as fresh in the village market	6
Making Tomato past and selling it the village market	1
Plowing it in the field	1

n=25

As gatekeeper of hygiene and nutrient for the family, they decide what tomato losses are. Their source of knowledge and judgment is only experience and common sense, which makes these criteria in question.

Table 16: Criteria of spoiled Tomato as indicated by farmers' wives

Criteria	Freq.
Rotten	16
Infected with Tuta absoluta	12
Acidified (by bacteria)	11
Sunburned	9
Infected and wet	9
Yellow	5
Unmarketable	5

n=25

Another reason for the importance of women in Tomato losses is their way of using expendable Tomato as shown in the next table.

Table 17: Using expendable Tomato as indicated by farmers' wives

Usage	Freq.
To be stored in the deep freezer and used when the prices are high	9
Cook it as a Tomato paste	7
Sliced, packed in plastic bags and stored in the deep freezer	6
Spread on a tray and turned around daily, not to be rotten	2
Use it in cooking	2
Put the green tomato in a basket in the air until it become red	1
Squeeze in a blinder, concentrated and story in the fridge for daily consumption	1
Cut away the damaged part, squeezed in a blinder and store in the fridge	1
Store the good tomato in the fridge to be used as fresh	1

n=25

Wives are also responsible for handling spoiled Tomato when farmers bring it home. They still use traditional ways to get rid of useless Tomato as presented in the following table.

Table 18: Wasting spoiled Tomato as indicated by farmers' wives

Ways	Freq.
Use it to feed birds	11
Throw it in the water canals or burry it in the field	5
Throw it in the trash	1

n=25

f. Transporters

Interviewing truck drivers transporting Tomato revealed that they are specialized in vegetable and fruit products, and not field crops. Drivers seem to have a reputation or prefers specific crops to carry, which indicates that they have a wide and trusted communication network.

Table 19: Vegetable and fruit crops that drivers transport from Nubaria

Signs	Freq.
All vegetables and field crops	3
Tomato, Onion, Garlic, and Eggplant. Orange and Mandarin	2
All vegetables, grapes, Orange and Cantaloupe	1
Cantaloupe, Apple, Orange, Grapes, Eggplant, Pepper, Cabbage, and Cauliflower	1
Watermelon, Tomato and Cantaloupe	1
Pepper, Squash, Eggplant and most vegetables	1
Orange, Apple and Grapes	1

n=10

Trucks are usually hired by all players on the value chain either individually or through a transport companies. Only one driver said that he signs a contract, while the rest of drivers said that their work is based on informal agreement. Although transportation does not affect quantities produced or its quality, it affects the losses either during the process or in the pick-up timing. The also affect the prices of Tomato when the distance is long, yet their tariff is mostly fixed.

Table 20: Value chain players using transportation as indicated by drivers

Signs	Freq.
Farmers	5
Small markets	5
Wholesale traders (wholesale markets)	4
Vegetable traders (retailers)	3
Wholesale markets	3
Food factories	2
Crop middle men (in the field selling)	1

n=10

g. Whole sale traders

Trader in the whole sale markets are key players in Tomato marketing process. Like all other player, they are a part of the fruit and vegetable value chain. Due to the nature of Tomato as a commodity not storable, supporting other types of vegetable, and an all-year-season crop, wholesale traders make least benefit from it.

The importance of this category is that they control Tomato prices up and down the chain, although the price is fixed daily by auction. Traders found other ways to make some profits beside tomato.

- They sometimes give farmers loans before season just to guarantee having the production in a fare price.
- They often sort the stock of Tomato into two grades, and sometimes reject it, which affect its price.
- Traders sometimes deal with drives to bring the Tomato from the farm in cases like on-farm selling, informal contract or under loan case.
- Yet, the most important way of all is basket renting. Wholesale traders own the date palm crates and rent it to both farmers and retailers.

Traders' place in the wholesale marker (usually called the agency) has these specifications.

Table 21: Specifications of wholesale market facility as indicated by traders

Facility	Freq.
Shaded place	11
Cooling room	2
Storage fridge	2
Platform scales	3
Empty crates	1

n=11

Relation between farmers and wholesale traders takes many forms determined by farmers. Yet, the common way is when traders sell the production in the market for farmers for a commission.

Table 22: Selling production in the wholesale market as indicated by traders

Method	Freq.
Friendly agreement (Oral) with farmers for a commission	10
A loan/down payment from the trader until delivering the production	6
Direct purchase from the farmers by middle men (on-farm selling)	3

n=11

Terms of agreement seems fare between farmers and traders from the viewpoint of traders. Anyway, it is the best option for independent farmers. It is worth mentioning that, losses is not visible in this stage as traders try to pass it to other players like retailers, Tomato past manufacturers or supermarkets.

Table 23: Terms of agreement to receive Tomato in the market as mentioned by traders

Item	Terms	Freq.
Quantity	As agreed on the number of crates	6
	All the quantities sent by farmers	8
	Prices are subject to supply and demand	2
Quality	Price is determined according to quality	10
	Grading Tomato into two grades	9
	According to farmer's grading, and crates are sold as is	4
	To be clean and hard. It will be sold even if it was bad	1
Package	Date palm crates (20-25 Kg)	10
	Using the traders' crates stamped by his mark	8
Date of delivery	All day long	9
	When farmers are ready	8
	From 07:00 to 12:00 AM	2

n=11

Wholesale traders control Tomato packaging almost allover the chain. Only one respondent mentioned that the package should be furnished. This means that losses resulting from the type of crates depend on their opinion and not farmers as believed. Their belief is based on the criteria mentioned in the following table.

Table 24: Preference criteria of Tomato package as mentioned by traders

Item	Criteria	Freq.
Best package to reduce damage	Date palm crates	10
	Plastic crates	3
Best package for transportation	Date palm crates	8
	Plastic crates	3
Best package to get best price	Package does not affect Tomato prices	6
	Plastic crates	3
	Date palm crates	2

n=11

Because the package is not expendable and is used many times, it has fixed specifications.

Table 25: Specifications of Tomato package as mentioned by traders

Item	Specification	Freq.
Type	Palm crates	11
	Carton crates	1
	Plastic crates	0
Weight capacity	20-25 kg	8
	25 kg	4
	10-15 kg	3
	20-22 kg	2
Source	Fayoum and Upper Egypt	9
	Plastic factories	3
	Client if specific features needed	2
	Common traders in the market	2
Average price	LE 8.25	
specifications	47 cm long	8
	Date palm crates has the trader's tag	8
	Unified	1
	Heavy material and compacted structure	2

n=11

h. Retailers

Retailers like other players are mostly deal with all vegetable. Only 3 respondents (small wondering sellers) out of the 10 interviewed are specialized in Tomato because it is an all-year season crop. Wholesale market is the source of trailer Tomato. Most of retailers purchase tomato directly from the market and transport it themselves; while some others, depend either on a distributers or intermediaries.

Retailers deal directly with customers, hence main losses in Tomato appears here. Retailers vary significantly from hypermarkets and vegetable shops that deal in hundreds of kilos, to wondering sellers dealing in few kilos.

This category is the only one that sorts Tomato by fruit. Usually they have 3 grades, but small wondering sellers sometimes make it 4 or 5 grades. Grading is very important to reduce losses for them, manipulate packaging way farmers use (putting good tomato on the top of the crate), and in the same time, it is suitable for the way of picking fruits accustomed by consumers. Another way to reduce losses they used to do is that they put their Tomato for selling crate by crate.

i. Cooperatives

Cooperatives in Nubaria are distinguished because of the strong support they had from the "West Nubaria Rural Development Project" to be market-oriented. They preferred to be registered under the Ministry of agriculture to be for-profit entity, rather than under the Ministry of Social Solidarity to be not-for-profit. Although coops in Nubaria still facing many problems especially after the project concluded and loan facility seized, they still function and make progress in helping farmers (members and non-members) in many ways.

These coops have a wide network with strong relations as a body for mass supply. The importance of the alliances they establish is that it can find solutions in favor of farmers through negotiations with buyers for contract farming.

Table 26: Connections and relations in Coops' networks

Player	Specifically	Freq.
Production	Farmers	5
	West Nubaria marketing association	1
	Regular Coops	2
Transportation	Truck owned by the coop	2
	Freelance truck drivers	5
	Transportation company	1
Factories	El-Ein	5
	Heinz	4
	Juice and concentrates	3
	El-Khobara (The Experts)	1
	El-Khier	1
	Farag Allah	1
Traders	Wholesale traders	1
	Exporters	0
Agricultural Extension	West Nubaria Rural Development Project	1
	Agricultural Research Center	1
	ACDI/VOCA project	3
	Extension department-Agricultural Directorate	1
	Non	1
Input supplier	Suppliers	1

n=5

Three of the five coops interviewed were dealing with farmers other than members, which indicate the high extent of its flexibility.

Table 27: Coops' terms of conditions to deal with non-member farmers

Terms	Freq.
Plant the variety indicated in the contract	2
Signing the contract	1
Provide farmer with input supplies with a receipt	1
Provide farmer with extension package of recommendations	1
Farmers should apply the recommended program of fertilization and pest and control	1
Non-members should have a guardian from among board members	1

2. Relations between players and its functional bases

The previous review of the main players on Tomato value chain is supported by other players that can affect the performance of the chain indirectly. Anyway, the effect of all players depends on the value they contribute in the chain, hence, relations between and among players are mainly value-oriented.

Most economists deal with the value from the financial perspective, but in fact, the value network includes more than one type of value chain. There are monetary value chain, nutritional value chain, environmental value chain, knowledge value chain, social value chain, legal value chain …etc.

Value chain players generally have formal and informal relations/connections based on some common interest. These types of connections take the shape of alliance, especially informal ones. An alliance is a pact, coalition or friendship between two or more parties, made in order to advance common goals and to secure common interests.

The study revealed that there are many types of connections within Tomato value chain. The nature of the alliances based on these connections were not investigated in details, e.g., leading person/entity, complying measures, coherence, mutual effect with other crops value chain, mutual effect with other alliances in the same value chain … etc.

The importance of studying alliances is that it presents an external influence that puts its members under pressure. For example, using palm crates starts with farmers and many studies recommended not to use it, yet, farmers cannot change that because they are a part of an alliance led by wholesale dealers and extends to retailers. Hence, trying to reduce Tomato losses by using plastic crates should aim at all players in this alliance, and find ways to compensate any party that might loose money or status.

a. The commodity value chain

Figure (1) illustrates the physical commodity (Tomato) chain starting from the seed. Although the seeds companies affects the production, and hence losses, it is not included in the diagram. Most of the seeds varieties are imported. Farmers usually tend to use foreign hybrids.

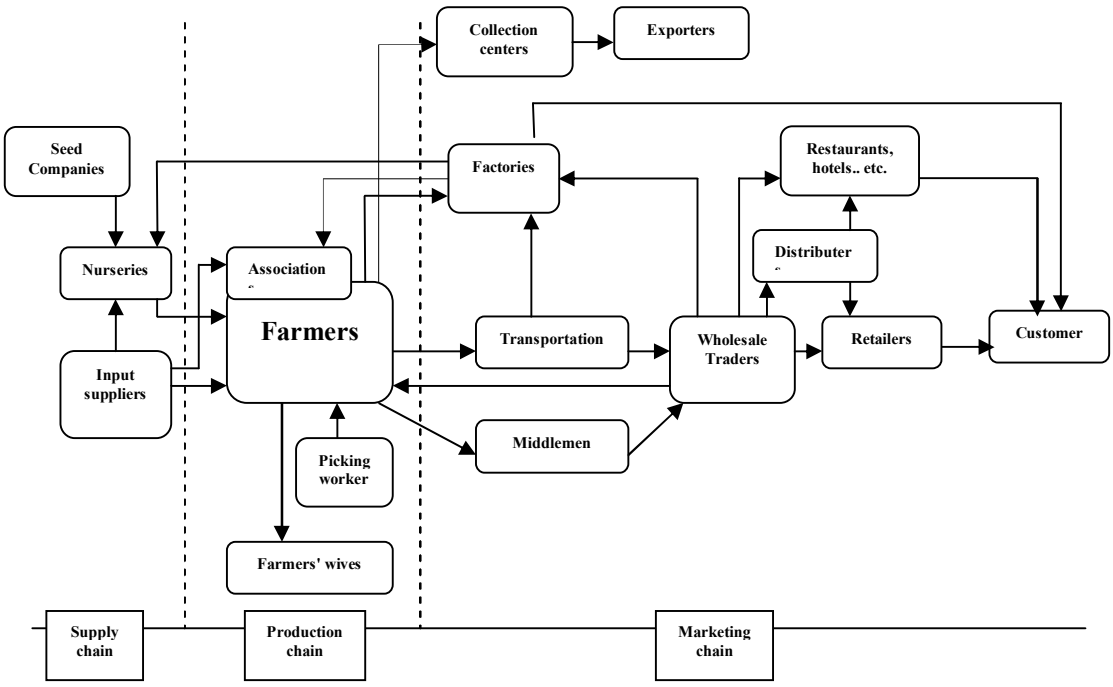


Figure 3: Commodity (Tomato) chain

In this regard, Heinz is an exception as the company produces its own variety and collects the production. This variety is only suitable for manufacturing and farmers indicated that its losses are the minimum. This case show clearly that this is the only case that research and breeding were done in the right way.
Other than that, nurseries usually control the varieties since the Tomato seeds are not planted directly in the soil. Nurseries have the power of time, as they should be prepared before season, the power of money as they usually get paid on delivery, and the power of knowledge either of where to find what variety farmers needs, or by supporting farmers with the recommendation package along with the seedlings especially for the new varieties. In few cases, farmers bring their own seeds to the nursery.
It is clear from figure (4) that there are two main bottlenecks in tomato chain, i.e., nurseries and wholesale market. Their knowledge and tools have a significant control on knowledge, time and money factors affecting Tomato production.

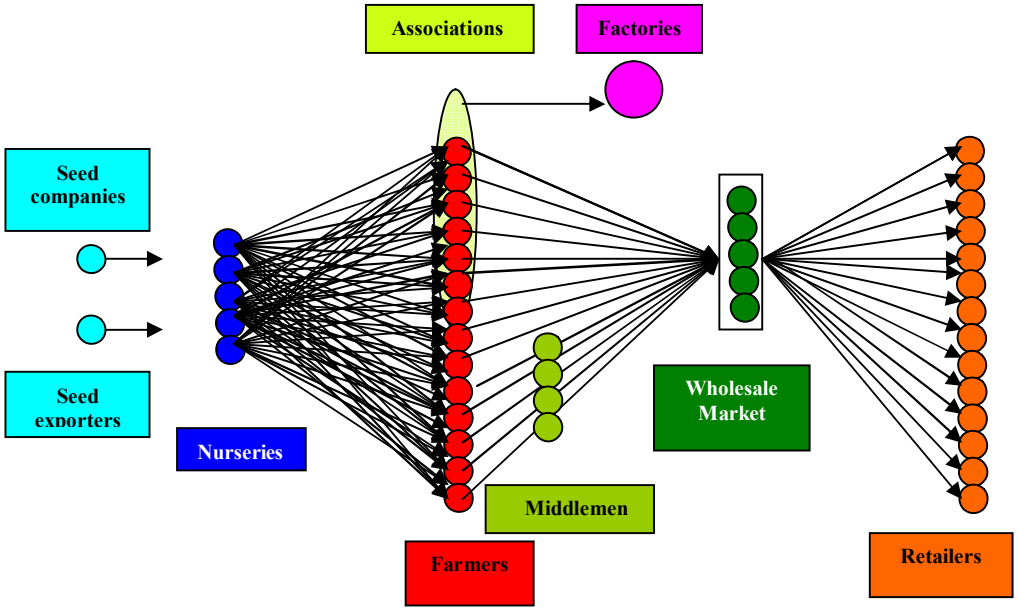


Figure 4: Platform relations based on commodity/Tomato

b. Financing connections
Not all players in Tomato chain finance their own business. This means that some of the money value added is displaced. Except formal contracts between factories, associations and farmers, most other financial arrangements are informally based on reputation.
Farmers are the weakest link in the chain. Traders and input suppliers took advantage of that either to ensure a source of their trade or to gain more money. This might be the strongest connection in the platform. In general, the principle Bank of Agricultural Development Credit (PBDAC) and West Nubaria Rural Development Project (WNRDP) are available sources of credit for agricultural production including Tomato. WNRDP used to provide associations with the source of finance through a revolving fund, but that was stopped very recently after the project concluded.
Farmers indicated that they deal more often with traders than PBDAC, which might be due to their preference to oral agreement with traders; unlike the ties of formal contract with PBDAC, as well as traders do not ask for a guarantee.

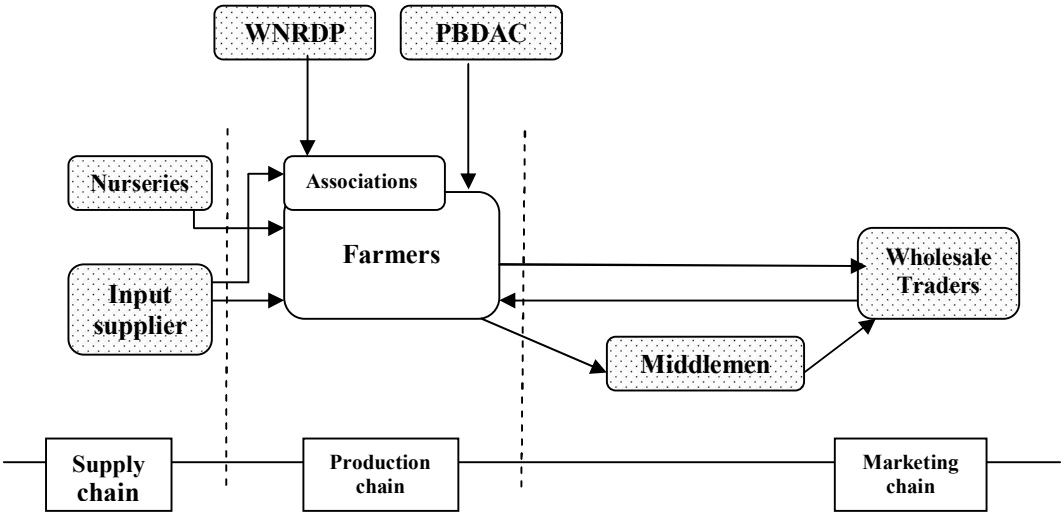


Figure 5: Financial connections in Tomato value chain

Table 28: Farmers sources of finance

Terms	Freq.
Tomato wholesale traders	15
Input suppliers	14
Principle Bank of Agriculture and Credit (PBDAC)	2
Friends	1

n=60

Farmers might prefer to deal with traders because of the payment method, which is usually associated with production delivery. As farmers indicated, they can have a loan from the trader or a down payment after contracting to deliver the production. The last method includes an early agreement on delivery price, which is usually lower than market price.

Table 29: Payment methods of farmers' loans to wholesale traders

Terms	Freq.
The loan is extracted from the production price at marketing	20
Down payment	3
Payment after selling the production	1

n=60

Farmers also used to be in debt to nurseries although not for long. This deal seems not to be due to shortage of finance, but just to guarantee fulfilling the terms of delivery. Only one respondent indicated that he pays for the seedlings after marketing.

Table 30: Farmers payment method to nursery

Terms	Freq.
Down payment on agreement and the rest on delivery of seedlings	50
Total price on delivery	5
Down payment on agreement and the rest after marketing	1
Half the price after planting	1
LE 10 for the tray	1

n=60

The nature of financial connection/relation depends on the way of selling the production. There are three main ways of selling to traders that farmers have the choice to select among them. These ways complement the contracts farmers sign with factories through associations, and selling the harvest remaining to factories directly by the end of the day.

Table 31: Farmers' ways of selling Tomato

The way	Freq.
Selling in the market (farmers pay for picking and transportation)	34
Selling the crop on plants (traders pay for picking)	24
Selling the production in the field (farmers pay for picking)	21
Contracting	3

n=60

c. Extension connections

Farmers have many sources of information depends on the problem they face. Formal extension and even research seems to be almost absent.

Anyway, when farmers are asked about their source of information, they usually perceive it as the cultivation recommendation package related to their domain knowledge (profession knowledge), thus shared knowledge throughout the chain is not clear in the following table. Evidence of shared knowledge appeared in table (31), when farmers pointed out that there are reliable sources for seeds meaning that they know and evaluate seed sources. In table (35), they indicated that losses occur due to delay in transportation, and also as a result of market rules in table (36).

In fact, all chain players show significant understanding of what is going throughout the chain regarding losses. This kind of shared knowledge is true also regarding prices, commissions, supply and demand, production-market timing, exportation, quality specifications … etc.

Community communication networks play core role in sharing this knowledge (farmers/producers community, wholesale trader community, nursery owners community, input supplier community, picking labor community …etc).

Table 32: Extension connections: farmers sources of information

Terms	Freq.
Nursery owners	24
Neighbors and friends	24
Input suppliers	10
Seed shops	9
The coop	5
Agricultural Companies	4
West Nubaria project	3
Agricultural Engineers	3
Experienced labor	3
Bulletins in the nursery	2
Agricultural Research Centre	1
The market	1
Personal experience	1
Agricultural Directorate	1

n=60

d. Manufacturing factories connections

The study revealed that there are two types of factories, those who are committed to cover market share especially on the international level, and those who have more flexible mandates. Heinz and El-Ein companies are example for the first type of connections. They engage in contract farming through associations. They usually sign a contract with the association to provide the seeds through local nurseries, impose recommendation package, send their extension and monitoring personnel, quantities and price, timing, specifications of product delivery and other legal terms. Usually farmers or the association takes care of transportation. On the other hand, the association contract farmers to deliver Tomato to fulfill its contracts with the food companies. Associations used to lend farmers money from a revolving fund and extension services supported by the WNRDP.

Although this contract farming model seems ideal, it is not spreading fast. Usually farmers contract to deliver 1/2 to 1/3 of their production to minimize the risk of price fluctuation. The major problem is that prices are fixed before season. Usually these companies calculate the prices based on market studies and not like the wholesale traders whom calculate the price based on planted areas or expected supply. Most of the time, farmers see that the company prices are very low due to the following:

1. Farmers do not understand how to calculate the price before season.
2. Farmers do not appreciate other facilities the company offers like accepting the production even the prices were low in the market, or accepting to buy the rest of the production.
3. Farmers do not count for extension services or guaranteed seeds/seedlings.
4. The farmer should be a member in an association and accept its contract roles.

The other type of factories like Farag-Allah sends his trucks to the farms by the end of the day to collect unmarketable Tomato from the fields, or purchase unmarketable tomato from the wholesale markets.

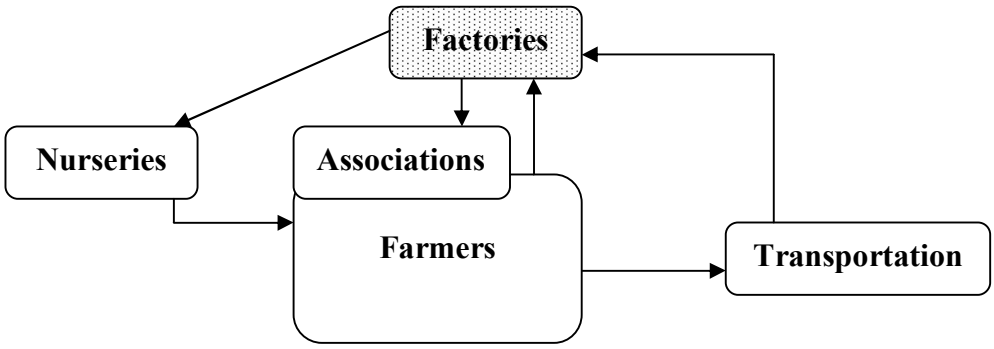


Figure 6: Factories-Associations-farmers connections

e. Seeds/seedlings connections

Two third of respondent farmers indicated that they coordinate with nurseries to plant specific varieties for them, which is bought by the nursery. This informal agreement usually done 2-3 months before seedlings delivery. In 20% of cases, farmers do not care about the variety, and take whatever seedlings available in the nursery. In most cases, nursery has some down payments from farmers. Farmers also rely on nursery for extension recommendation package especially if the variety is new.

Nurseries are usually a part of the factory connection either by committing to deliver certain variety demanded by the factory, or by planting whatever variety brought by the factory.

Table 33: Seedlings sources for nursery (farmers' responses)

Terms	Freq.
Farmers have an informal agreement on a specific variety with nursery	40
Farmers buy whatever varieties available in the nursery	12
Farmers buy seeds and nursery plant it for them	8
Farmers use the same variety of last season	1
Farmers use the same variety as their neighbors	1

n=60

The following graph illustrates that connection.

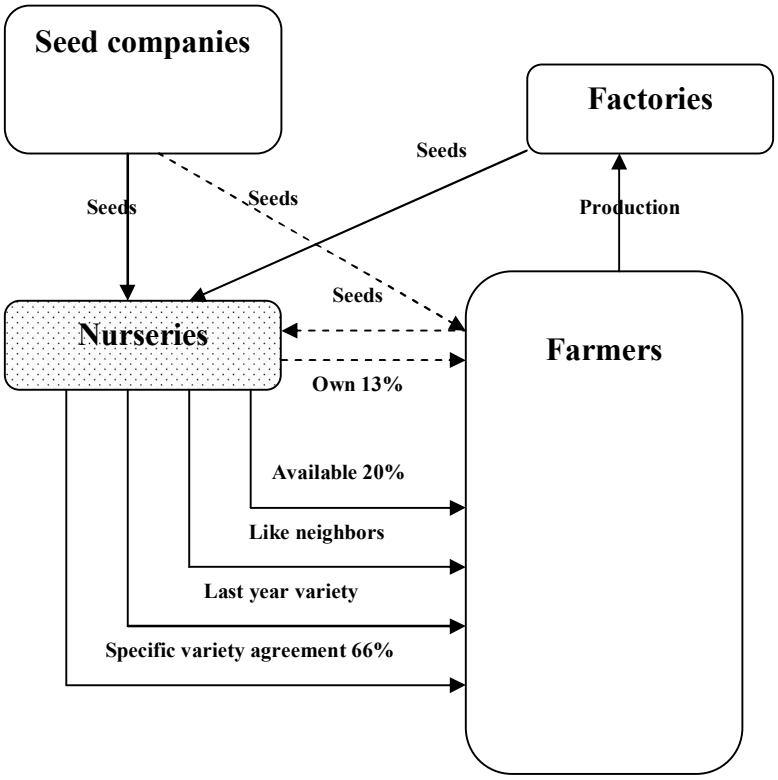


Figure 7: Nursery-farmers connections

f. Palm crates connections

Due to the soft nature of Tomato fruit, it is impossible to re-package the product from the field to the consumer. Exportation is the only case that Tomato is graded, cleaned and re-packaged in collection centers. Picking half colored and hard Tomato helps in this preparation processes. Although the price in this case is high, accepted Tomato for exportation does not exceed 20% of the whole production.

Table 34: Types of package usually used by farmers

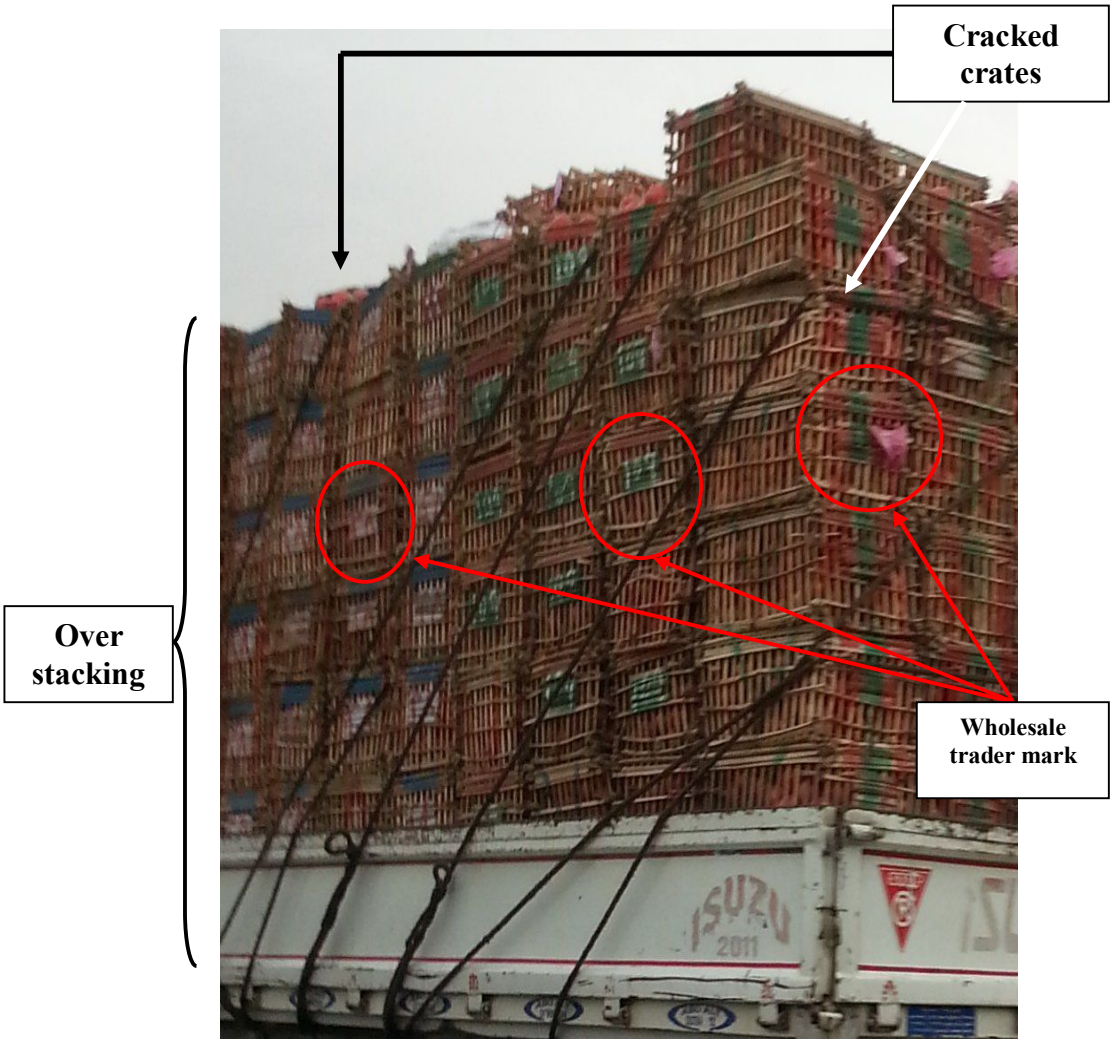
Package	Freq. %
Palm crates for local market	53
Plastic crates for factories	20
Carton boxes for exportation	1

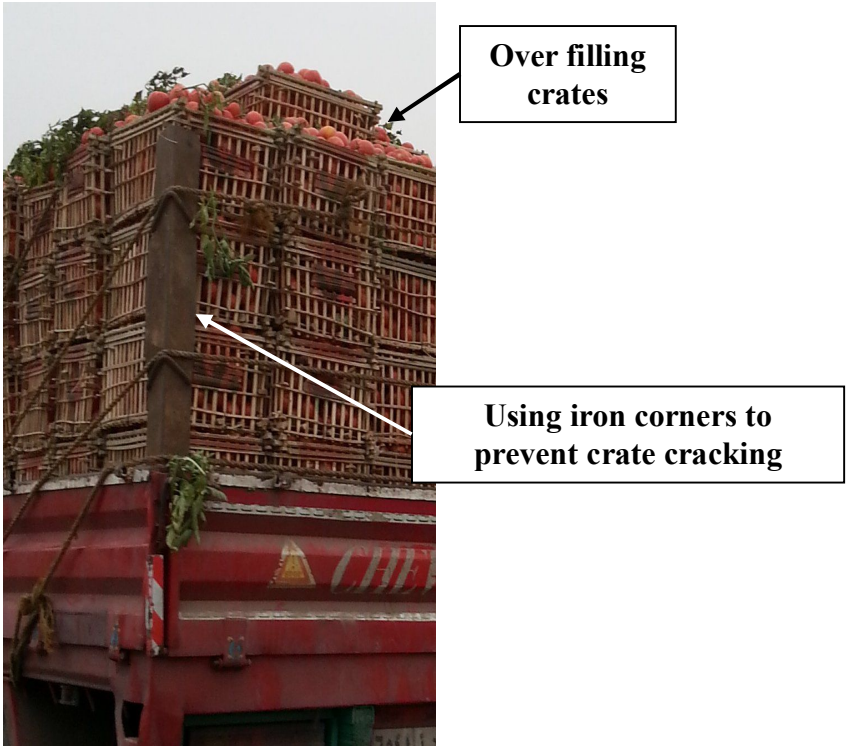
n=60

Durable package like palm crates are favorable because it is tolerable to careless handling by labor and during transportation.

Problems of using palm crates are:

- Its inside edges are rough.
- Farmers overfilling it.
- It can be cracked when tightening ropes during transportation.
- It is hard to clean between cycles.


Cracked crates
Over stacking
Wholesale trader mark


Over filling crates
Using iron corners to prevent crate cracking

Arrangements to use palm crates by farmers, drivers, wholesale traders, retailers and sometimes factories are done by wholesale traders. In fact, it is a business dominated by wholesale trader. They own the stock of crates, have their mark on it and other players should lease it.

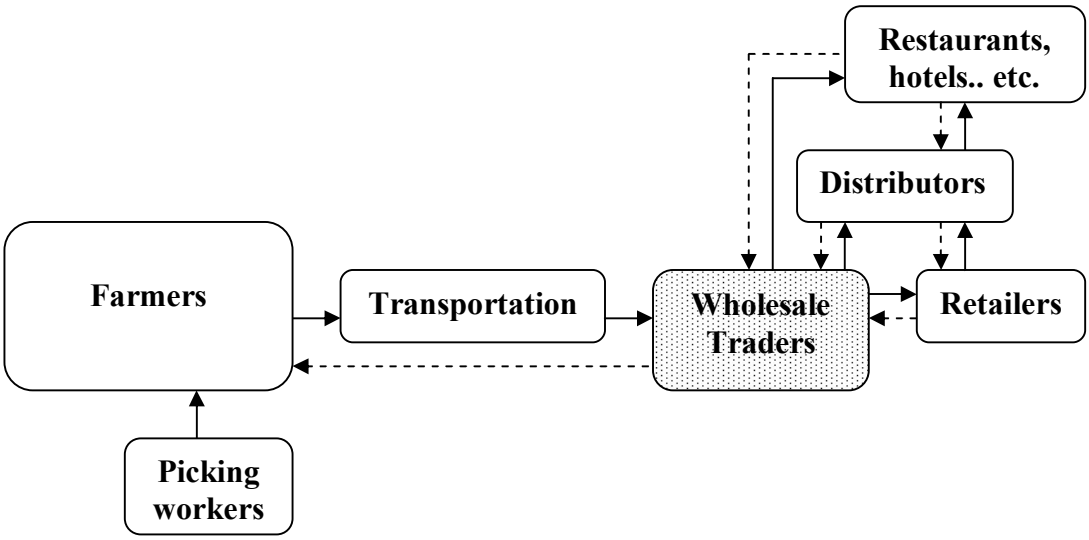


Figure 8: Palm crates connections

3. Value Chain nodes where Tomato losses occur.

a. General stage of Tomato losses

Respondents reflected the reasons of tomato losses to earlier stages before production. Only two categories had this insight, exporters and women. Logically, exporters understand the big picture where the government should have a role, but surprisingly, it was found that farmers' wives had that view. This seems to be a strong evidence that wives have a significant role in farmers' decision making. Although women are always in the shade, and have a very weak communication network, they must have a strong intuition to understand how the game being played. They should be included in the platform and encourage taking an active part both in decision and innovation process. This result can be summarized in two factors: strategy and unpredictable supply/demand.

Table 35: Reasons of Tomato losses before production

	Respondents	Reason	Freq.
1	Exporters	The government have no clear vision for exportation	1
2	Women	Planting large area in the same time/season	1
3	Women	High supply of tomatoes	2
4	Women	Farmers consider tomato as a golden crop, when it makes profit in one year, they continue planting it	1
5	Women	Farmers imitate each other, as when they see good prices in a certain time of the year, most of them plant the same crop at the same time in the following year, so prices fall due to high supply	2

b. Input supply stage

Supplies and suppliers are seen to have a hand in tomato losses mainly by farmers and their wives. Reasons mentioned can cause losses either in the pre-harvest or post-harvest stages. These reasons are just superficial, yet, in depth analysis should be done to reveal its root causes and solutions.

The main factors affecting Tomato losses in this stage were found to be:

- Pesticides
- Varieties
- Information/knowledge
- Labor
- Financing
- Fertilization

Table 36: Reasons of Tomato losses in the input supply stage

	Respondents	Reason	Freq.
1	Farmers	Low efficiency of pesticides	18
2	Farmers	forged pesticides	6
3	Women	High prices of pesticides	3
4	Women	Lack of unqualified person in pesticide shops to guide farmers selecting the right pesticides	3
5	Farmers	Fraud varieties	6
6	Wholesale traders	Bad tomato varieties	2
7	Women	Seedlings are not guaranteed	2
8	Farmers	Seeds from unreliable source	1
9	Farmers	Infected seedlings	1
10	Farmers	Lack of reliable source of seedlings	1
11	Farmers	Seedlings are not hardened in the nursery	1
12	Farmers	High hand labor costs	1
13	Farmers	Absence of extension services	5
14	Farmers	Lack of capital	1
15	Farmers	Lack of fertilizers	1

c. Production stage

Most of the chain players blamed the farmer for Tomato losses. Even farmers were complaining about losses during this stage. Reasons mentioned by respondents causes losses in Tomato quality and quantity in both pre-harvest and post harvest stages.

The main reasons could be categorized in the following root causes:

- Plant protection and its related information
- Climate and counter measures
- Irrigation and drainage
- Fertilization
- Soil and cultivation timing
- Extension and information
- Applying knowledge
- Un-recommended practices
- External factors

Table 37: Reasons of Tomato losses in the production stage

	Respondents	Reason	Freq.
a. Plant protection reasons			
1	Farmers	Pest and disease infection	32
2	Farmers	Infection with Tuta absoluta	10
4	Farmers	Infection of red worm	2
3	Suppliers	Farmers do not select disease resistant varieties	2
6	Suppliers	Delay in spraying pesticides	4
7	Suppliers	Farmers have pest infection and do not care about spraying	6
8	Suppliers	Farmers do not care of chemical plant protection	3
11	Suppliers	Farmers do not have sufficient information about protection against pests and diseases	3
9	Suppliers	Farmers do not follow chemical spraying regulations	4
5	Women	Increased disease infection	4
10	Women	Using pesticides in an unsuitable way	1
12	Nursery	Using unsuitable pesticides	1
13	Nursery	Insufficient pest spraying	1
14	Nursery	Pest and disease infection	1
15	Exporters	Spraying tomato with pesticides makes it rejected	1
b. Weather reasons			
16	Farmers	Bad climate (high temperature)	25
18	Farmers	Weather conditions (fog ،sow, hot weather)	24
17	Suppliers	Unstable weather	14
19	Women	Unstable weather conditions	3
20	Wholesale traders	Corp encounters unexpected weather conditions	3
c. Irrigation reasons			
21	Farmers	Shortage of irrigation (thirst)	34
23	Farmers	Careless irrigation practices	1
24	Farmers	Delay in irrigation schedule	23
27	Farmers	Artesian irrigation	1
29	Farmers	Bad drainage conditions	2
22	Suppliers	Insufficient irrigation (plant thirst)	2
25	Suppliers	Using brackish water (mixed with drainage water)	4
26	Suppliers	Instable irrigation	1
28	Nursery	Shortage of irrigation water	4
d. Fertilization reasons			
30	Farmers	Low fertilization rates	14
31	Farmers	Fertilize with urea during flowering stage	11
39	Farmers	High fertilization prices	1
32	Suppliers	Using urea in fertilization	1
33	Suppliers	Neglect adding minor elements especially Potassium and calcium	4
34	Suppliers	Over fertilization as a result of ignorance	6

	Respondents	Reason	Freq.
36	Suppliers	Unsuitable fertilization timing	1
37	Suppliers	Calcium deficiency	1
38	Suppliers	Shortage of fertilizers	2
35	Retailers	Over fertilization	1
e. Initial reasons			
41	Suppliers	Plant varieties unsuitable for the season	4
42	Suppliers	Planting in unsuitable seasons	3
40	Women	Unsuitable soil for tomato	2
f. Information reasons			
43	Suppliers	Insufficient extension recommendations	1
44	Suppliers	Farmers do not follow extension recommendations	3
45	Suppliers	Farmers do not follow the variety recommendations	6
g. Plant care reasons			
46	Farmers	careless tillage practices	1
47	Farmers	Less plant care	8
48	Nursery	Insufficient crop service	1
49	Nursery	Carelessness in planting seedlings	1
50	Wholesale traders	Bad or no crop management	7
h. Un-recommended practices			
51	Retailers	Added hormones	1
52	Retailers	Added sulfur	2
53	Wholesale traders	Farmers treatment of tomatoes with Hormones	2
54	Wholesale traders	Farmers treatment of tomatoes with Sulfur before harvest	2
i. Other reasons			
55	Farmers	Fall of globes	2
56	Farmers	High frequency of electric power cuts (irrigation)	5
57	Farmers	Untrained hand labor	1

d. Harvest stage

It seems that significant amount of Tomato losses due to fruit damage occur in this stage. Some of Tomato losses that appear in this stage are the result of production stage like infected fruit, sun-burnet, cracked fruit due to thirst and recent irrigation and delay harvest.

In general, the figures of Tomato production in Nubaria that is recorded at this point expresses the losses of Tomato before harvesting either at the international level or local level comparing to Sohag and Ismaillia governorates (Figure 2). This graph indicate that the average of Nubaria production reaches about 19 ton/acre, while in Suhag is around 28 ton/acre, and Ismailia reaches almost 26.7 ton/acre. It is clear that these figures do not include post harvest losses.

Table 38: Reasons of Tomato losses in the harvest stage

	Respondents	Reason	Freq.
1	Picking labor	Aggressive pulling from the plant makes fruits to fall down	21
2	Picking labor	Untrained labor	17
3	Picking labor	Mixing good fruits with infected ones	16
4	Picking labor	Breaking new shots and make flowers fall due to rough handling	15
5	Picking labor	Labor vary in skills	13
6	Picking labor	Aggressive pulling from the plant make it open and unripe fruit expose to the sun and have sun burn.	12
7	Picking labor	Picking the fruit without the stalk	12
8	Picking labor	Tomato varieties vary in losses	11
9	Picking labor	Turn the plant upside down	10
10	Wholesale traders	No grading	9
11	Farmers	Carelessness of picking labor	8
12	Farmers	Unavailability of picking labor	5
13	Picking labor	Incorrect picking	4
14	Women	Greedy farmers store tomatoes on plants to catch good prices, which leads to lower water content	3
15	Women	Irrigate the crop right before harvesting due to water shortage, which leads to increase water content in fruits till it cracks	3
16	Suppliers	Carelessness of picking labor	3
17	Farmers	Irrigation during harvest	2
18	Suppliers	Longer period between harvesting cycles	2
19	Suppliers	Using unsuitable crates	1
20	Retailers	Lack of grading on the farm	1
21	Picking labor	Overloading crates	1
22	Picking labor	Harvest at noon time	1
23	Wholesale traders	Cracked crates	1
24	Wholesale traders	Delay before selling	3
25	Wholesale traders	Farmers delay delivery to wholesale traders	1
26	Wholesale traders	No grading by farmers and mixing the infected with good fruits	2
27	Wholesale traders	Overfilling Tomato in the crate baskets	7
28	Farmers	Arrange the crate top (give it a face)	1
29	Nursery	Carelessness of picking labor	1

Whatever the reasons of Tomato losses in this stage were, it will be shouldered by farmers. Farmers do their best to manipulate this kind of losses by refraining to grade the production, sell the production on its plants, topping the crates … etc. This is why looses do not appear significant at that point. Anyway, farmers are not the only player responsible for pre-harvest losses that appear at this stage.

Justifications of farmers for topping (putting the best Tomato at the top of crates) are detailed in the following table.

Table 39: Farmers' reasons for arranging the crate top

Reason	Freq.
To cope with market demand	8
It is easer for marketing	7
To package all tomato production, which reduce losses	6
To get the best price	6
To make the crop appealing	3
To adjust the crate	1
To make Tomato tolerate transportation	1
Because the first collection is clean and sold in higher price	1

e. Transportation stage

As the following table indicates, there are some damage occur directly during transportation. In general, drivers do not pay for this damage, yet more likely farmers do. The wholesale trader needs to receive intact crates in the market especially when selling for the farmer's favor. Un-noticeable damage in Tomato quality can also occur when transportation is delayed either in picking up the load or on the road to market. The table shows also that most reasons were mentioned by retailers, which might indicate that they are the most vulnerable category to losses occur during transportation.

Table 40: Reasons of Tomato losses during transportation stage

	Respondents	Reason	Freq.
1	Retailers	Careless transportation	8
2	Retailers	Uploading Tomato on pick-up trucks (1.5-2 Tons load)	7
3	Wholesale traders	Heighten rows in the stake	7
4	Farmers	Delay in transportation	6
5	Retailers	Speedy driving and hitting road pocket aggressively	6
6	Retailers	Uploading Tomato on tricycles	5
7	Retailers	Loosely uploading and arranging	5
8	Retailers	Overloading	5
9	Retailers	Bad arrangement of crates	4
10	Retailers	Over tightened ropes around crates on trucks with no iron corners	4
11	Transport	Tighten ropes unwisely/carelessly	3
12	Nursery	high transportation prices	3
13	Transport	Loading crates over the age	1
14	Transport	Unpaved roads	1
15	Transport	Wrong arrangement of crates in the car	1
16	Transport	Car malfunctions	1
17	Transport	Wrong fruit staffing in crates	1
18	Transport	Falling of some crates	1
19	Wholesale traders	Carelessness of transport uploading/ downloading labors	1

	Respondents	Reason	Freq.
20	Wholesale traders	Cracked crates	1
21	Wholesale traders	Slipping crates	1
22	Farmers	Bad transportation	1

f. Wholesale stage

Most of the respondents were focusing on supply/demand of Tomato, which is reflected directly on the wholesale in domestic market. Whether traders get rid of the production or sell it in a very low price to factories, farmers pay for it and traders also suffer from lower commission (it is always 7% if the production was sold for the farmer's favor).

Table 41: Reasons of Tomato losses in wholesale stage

	Respondents	Reason	Freq.
1	Suppliers	Low prices of tomatoes	5
2	Women	When exportation halts, supply gets high and price gets low	3
3	Wholesale traders	High supply with weak demand	2
4	Wholesale traders	Bad market conditions	2
5	Wholesale traders	Bad climate	2
6	Women	Insufficient markets to absorb big volumes of tomato production	2
7	Women	Unstable marketing makes the prices unpredictable	2
8	Exporters	Fluctuation of prices (when the market prices are high, farmers refrain from delivering the crop)	1
9	Women	More middle men increase losses	1
10	Farmers	Market rules	1

Usually this kind of losses does not appear in the post-harvest losses statistics although it can reach a significant number. As it will appear later, respondents claim for rational planning before season, or the interference of the government. Such an exclusive intervention is almost impossible, but it is a good chance to organize an alliance within the platform especially that this situation involves many players like farmers, wholesale traders, exporters, factories and supermarkets and restaurants.

g. Retailing stage

There are no statistics indicating market shares of supermarkets, restaurants, vegetable shops and wondering retailers. Anyway, all damage and infected tomato is disposed in this stage. The customer is the one who pays for it.

Small retailers indicated that they usually present their tomato in 2-3 grades, where losses vary according to the grade as the following table shows.

Table 42: Estimated Tomato losses at retail stage as indicated by retailers

Grading	Average amount (Kg)	Average losses (Kg)
Grade 1	99	4
Grade 2	52	9
Grade 3	53	20
Total	**204**	**33**

Retailers explained how they calculate selling price to the customer as follows:

1. Add LE 0.5 -1 to the wholesale price and transportation.
2. Wholesale price should be fulfilled from the first grade tomato.
3. Following the retail market price.
4. The highest price I can get.

Most of the reasons they gave concerns the customer's behavior or habits. Changing customer's behavior, diet pattern or bio-products demands an alliance of another kind of value network that includes mass media, companies, supermarkets, customer associations … etc. Anyway, social innovations are the hardest of all, and it often contains technical and organizational innovations.

Table 43: Reasons of Tomato losses in retailing stage

	Respondents	Reason	Freq.
1	Wholesale traders	Common selling method to consumer (free selection)	7
2	Retailers	Delay selling	5
3	Retailers	Expose tomato in the sun for selling	5
4	Retailers	Customer hand selection	5
5	Retailers	Ungraded tomato makes the customer handle it roughly	5
6	Retailers	Exhibit the whole amount at once and not gradually	4
7	Retailers	Expose tomato to the sun for long periods	2

h. Exportation stage

Only one exporter could be interviewed by phone. Although the viewpoint presented below is very narrow, it points out that the international market has good potential to absorb more production, especially with the competitive advantage of Egyptian Tomato abroad. Farmers' problem with exportation is that they have to send their production to the collection centers, which takes only the first grade (15-20% of the product). They have to find another way for selling the rest in this long process and vulnerable product.

Table 44: Reasons of Tomato losses in exportation stage

	Respondents	Reason
1	Exporters	Malfunction of the cooling line spoils the product
2	Exporters	Sudden drop of the prices abroad
3	Exporters	Market demand can drop to zero

It seems that there is a good chance for an alliance to take over the whole process. Potentials of this alliance are:

- Tomato is an all year season crop in Egypt.
- Existence of exportation unions and associations.
- Existence of a chamber for food industry
- Fruits are harvested for exportation half ripped
- International market is open especially in Africa
- The new trend in the European market to accept lower prices on the account of quality.
- Acceptance of new forms of manufactured Tomato like dried and canned products.

These reasons are superficial and indicate only what respondents feel or understand. A comparative study can reveal other reasons, and more importantly, reveal applicable technical innovations that is used in other advanced governorates in tomato production like Suhag and Ismailia.

4. Respondents' suggestions to reduce Tomato losses as indication for potential innovations

All categories of respondents were asked for their suggestion to reduce Tomato losses whether before or after harvest. Most of their responses were focusing on production stage and especially extension recommendations. Some of the suggestions points to the necessity of government intervening as a regulator for input, supply regulation, extension efforts, adapting a master plan for Tomato production to harmonize supply/demand, markets regulator … etc.
Most of these opinions are either very limited or very vague. Nevertheless, varying reasons and suggestions proves that there are two types of knowledge value chain, domain/professional knowledge and shared knowledge. Both types are very important, yet, shared knowledge is still far behind concern.

a. Suppliers' suggestions to reduce losses

1. Give attention to suitable chemical fertilization in the suitable time
2. Establish a local Tomato processing factory
3. Protection from pests and diseases
4. Following pesticides usage recommendations
5. Planting resistant varieties
6. Improve irrigation water
7. Increase extension efforts of best practices
8. Following the right extension recommendations
9. Selecting suitable seasons
10. Establish a whole sale market in the village
11. Enhance marketing process
12. Pay more attention to crop services
13. Facilitate exportation channels
14. Stop urea fertilization
15. Adding minor elements
16. Provide market studies
17. Link research with related players and activate its role in innovation
18. Synchronize planted area with industrial, local and country demands
19. Government intervention to regulate marketing

b. Nursery suggestions to reduce losses in seedlings

1. Planting seedlings in the second day of irrigation, and spray directly
2. Planting labor should use gloves
3. Planting labor should sterilize their hand with sulfur
4. Planting labor should handle the seedling from the top or the peat moos, and not from the stem
5. Fertilize with urea after a week from planting
6. Avoid planting seedlings in hot weather
7. Avoid making the root reach the manure
8. Fasten trays on the care carefully and tightly
9. Arrange trays on the car in the proper way

c. Farmers' suggestions to reduce Tomato losses

1. The ministry should inspect nurseries work
2. Avail good varieties
3. Provide good recommendations to farmers
4. Nursery owner should control diseases
5. Farmers should contact nursery more often and flow up their seedlings
6. Seed source should be reliable
7. Deal with experienced nursery owners
8. Farmers should purchase seeds themselves
9. Nursery owner should be qualified in disease control
10. The ministry should establish a nursery in the area
11. Enhance the role of agricultural extension
12. Provide subsided seedlings
13. Soil analysis laboratories should be available
14. Produce resistant varieties
15. Using valid pesticides (not forged)
16. Chemicals should be available
17. Spray with root fungicide
18. Wetting the tray before planting seedlings
19. Arrange mores council to judge uncommitted nursery owners

d. Farmers' wives suggestions to reduce losses

1. Using branded pesticides and not fraud for Tomato spraying
2. Pick tomato before it turn full to red
3. Reduce spraying tomato with hormones because it hasten spoilage

e. Transporters' suggestions to reduce losses

1. Tighten ropes gently in the right way
2. Dealing with road pockets (unpaved) slowly
3. Fruits should not exceed the top of the crates
4. Careful packaging in plastic crates
5. Gentile driving
6. Not to overload the car

f. Wholesale traders' suggestions to reduce tomato losses

1. Farmers should take care of all the season tillage processes
2. Good grading to have good price

3. Lessen rows in the stake during transportation, and reduce the amount in the crates
4. Not to use hormones or yeast as it makes the fruit soft and vulnerable to damage
5. Not to use sulfur before harvesting as it is strong and enhance fruit damage
6. Make fertilizers available in suitable prices
7. Fix land lease prices to keep market prices stable, and hence control supply
8. Control Tuta absoluta and whitefly
9. Establish new markets for tomatoes
10. Establish cooling houses for vegetables
11. More factories for tomato paste that contain the over production of tomato
12. Make market gate easy to go in and out, or separate them
13. Provide markets with loaders to enhance cleanliness
14. Provide markets with a better sewage system to be ready for rainy season

g. Suggestions to reduce losses mentioned by retailers

1. Reduce selling prices if anticipated leftover
2. Grading to two or three grades
3. Protect tomato from the sun especially in summer
4. Use a bed under tomatoes
5. Present tomato for selling basket by basket
6. Select the good fruit from the beginning
7. Farmers should take care of pesticides spraying
8. More care during transportation
9. Farmers should not use hormones
10. Careful grading at the farm level

h. General suggestions to improve exportation

- Companies cultivate Tomato for itself and open a market for itself
- Government should take an effective care of farmers
- Extension services should be exist
- Projects should aim for real results, and not for show (Like CARE and SHAMS)
- Researchers should travel abroad and see how others work
- For manufacturing, Tomato should be planted in not less than 100 feddans.

5. Recommendations

1. Based on the results of this study regarding the causes of tomato losses, it is suggested to conduct a study to identify local innovations (technical and organizational) in Sohag and Ismailia governorates and its applicability/ adaptation to Nubaria.
2. The study suggests conducting a series of workshops to verify the following potential innovation alliances:
    a. Financing alliance
    b. Extension/learning alliance
    c. Manufacture/factories alliance
    d. Seeds/seedlings alliance
    e. Palm crates alliance
    f. Diet pattern alliance

3. Survey potential players in the suggested alliances on the form, function and relations of the mentioned innovative alliances.
4. Conduct a pilot study on the diet pattern social innovation as a related platform to fruit platform and its potential alliance.
5. Conduct an office study or organizing a learning rout to some advanced country in tomato production to adapt their innovative solution to Egypt.

Annex I
School Feeding Project (SFP)

School Feeding Project (SFP) is a project of the Ministry of Agriculture and Land Reclamation (MOLAR) in Egypt. The idea of the establishment was started from the training centers of the Motherhood and Childhood Culture Enhancement and Development Project (MCCEDP) in Egyptian rural areas, which aims to combat poverty and improve the conditions of household headed by female. The SFP produces 111.4 million meals/Academic Year (2009 statistic) through the production centers distributed in different Egyptian governorates: Fayoum- Beni-Suef- Minia- Qalubia- Domiatt- Monoufia- Behera- Port-Said-Ismailia and Sham Sainai.

The aims of the School Feeding Project (SFP)

1. Upgrade the nutritional status of the primary school students which has a positive impact on their; growth , cognitive power and resisting diseases. In general, Upgrades the educational process and reduces the rate of absence and the phenomenon of dropping out of education.
2. Helping in achieving an economic development at the targeted governorates through Provide thousands of job opportunities for girls and youths with different qualifications who work in the production centers.
3. Upgrading the technical and vocational level for managerial level employers and workers in the production centers. This process was carried out through continuous training programs to develop the human resources and add a highest value to their production efficacy.

Achievements of the School Feeding Project (SFP)

1. Increase meal mass production

Academic year	No. meals (millions)
1998/1997	1
1999/1998	8
2000/1999	18.5
2001/2000	22.6
2002/2001	38.6
2003/2002	49.2
2004/2003	52.7
2005/2004	53.2
2006/2005	87.8
2007/2006	77.8
2008/2007	96.3
2009/2008	111.4

2. Assure the quality of the produced meals through:
   - substitution of margarine by butter and shortening.

- Addition of three kinds of jams(strawberry, fig and apricot) in addition to dates
- package the meal with safe and attractive pack which contains a very short message aims to raise the nutritional awareness of the children.

3. Assure the implementation of good practices during preparing and producing the meal through:
   - Assure the quality of supplies materials according to Egyptian specifications,
   - Good storage practices,
   - Good Manufacturing Practices
   - Good Hygiene Practices,
   - Cleaning Programs and
   - Pest Control System.
4. Upgrade the technical and vocational level of managerial level employers and workers through continuous training programs to develop the human resources and add a highest value to their production efficacy.
5. Establishing a new production centers at Behera, Red sea and Qena governorates.

6. Restructuring the financial and technical work in the project to ensure the success of work as follows:
   - Establishing an organizational structure for the project.
   - Prepare an administrative and financial regulation for the project.
   - Establishing a department for the follow up and quality control.
   - establishing financial control before the exchange by the Ministry of Finance and after the exchange by the CAA
   - Held a regular meeting of the Coordinating Committee/monthly aims to upgrade the performance of both facilities and personnel.

Achievements of the School Feeding Project (SFP) From 2007 -2011

1. Finishing Ismailia building providing with equipments to fed Ismailia and Cairo governorates,
2. Increase capacity production of Beni-Sweef center from 130,000 meals to 300.000 via supplying with anther tunnel oven,
3. Operating Koom Osheem 1 factory and incorporating it to fed Fayoum with production capacity 100,000 meal/day.
4. operating corn flakes line after pausing for 7 years in Koom Osheem 1 production center
5. Increase production capacity for Koom Osheem 2 factory from 120,000 to 200,000meal/day and operating cake line.
6. Expanding Monofia factory and fixing automatic line with production capacity 180,000meal/day
7. Developing Port-Saied factory from manual to automatic one
8. Developing Arish factory from manual to automatic one and instructing a new building for MCCDP.

The Motherhood and Childhood Culture Enhancement and Development Project (MCCEDP) in Egyptian Rural Areas

Motherhood and Childhood Culture Enhancement and Development Project (MCCEDP) was established according to the overall reforming strategy of the Ministry of Agriculture and Land Reclamation (MOLAR). This strategy aims to enhance the role of the rural women and girls in the society, where the sector of rural women and girls plays an essential role in society development process.

The Aims of the Motherhood and Childhood Culture Enhancement and Development Project (MCCEDP)

1. Upgrade the level of cultural, environmental and good nutrition awareness for rural women and girls.
2. Provides a lot of job opportunities for the rural women and girls to enhance their economic status in coordination with local governments.
3. Encourage the formulating of cooperative programs for the rural women and girls to benefit from the Social Fund.

Achievements of the Motherhood and Childhood Culture Enhancement and Development Project (MCCEDP)

1. Regarding Upgrade the level of cultural, environmental and good nutrition awareness for rural women and girls the MCCEDP achieves the following:
   - Offer technical and vocational training programs in traditional food processing and traditional home made products to build well qualified human resources for the food processing industry on:
     - processing of local and traditional food products and various agro-industry e.g., baking (bread - biscuits) - dairy products - juices and tomato concentrates- pickling).
     - how they eat and extend the shelf life of the products
     - the nutritional composition of the products and how they should use it in formulating highly nutritious meal for their family.
     - The safety and quality of the product to improve the health status of the family,
   - Offer training programs in maternity care and family planning
   - Offer training programs in first aids.
2. Regarding provides a lot of job opportunities for the rural women and girls the MCCEDP provides about 3000 job opportunities for girls to work in the production centers of the School Feeding Project (SFP)at Fayoum, Beni-Suef, Mini, Qalubia, Domiatt, Monoufia, Port-Said and Shamal –Sinai Governorates.
3. Regarding encourage the formulating of cooperative programs for the rural women and girls to benefit from the Social Fund the MCCEDP offers technical and vocational training programs on the embroidery art and dressmaking for the girls in Sinai to form small projects which enhances their economic status.
4. The MCCEDP established a well equipped clinics and analytical laboratories to enhance the health status of the mother and child.

5. The MCCEDP established Eradication Ignorance Classes in coordination with "The National Eradication of Ignorance Program" to combat the phenomenon of dropping out of education.