

Gebal Egypt –Nexus Farming Feasibility

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Study Resources

This study draws upon a wealth of data sources, including over **44 primary and secondary data sources**.

Primary data are represented in calls that have been held with Experts and suppliers:

Suppliers:

- Lotus for agricultural projects
- Rays for solar solutions



Experts:

- Eng. Ahmad Abdelrahman
- Dr. Hesham Haggag / Al-Haggag farm for aquaponics
- Mr. Hussein Mohy El-Din Ahmed



In addition to mystery shopping activities; **8 supermarkets** were visited over 4 days at different times in two areas in Cairo: Heliopolis and Nasr City.

In Nasr City:

- 2 Seoudi Supermarkets on Tayaran Street and Al Manteqah Al Thamenah.
- 1 Spinneys branch in Al Manteqah Al Thamenah.
- 1 Kheir Zaman branch in Al Manteqah Al Thamenah.



In Heliopolis:

- 1 Carrefour branch in El zaytoun.
- 1 Metro Market branch in Heliopolis.
- 1 Carrefour City Centre branch in Almaza.



Secondary data are verified from many reports published by prestigious institutes and references.

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Executive summary

Study approach

The study aims to assess the feasibility of farming using aquaponics, shading nets and greenhouses models and the opportunities and challenges in the market through analyzing products, prices, and most popular products observed from our visits and analysis of **8 Supermarkets**. Also, through checking market size, most exported vegetables, the area planted for each crop, number of greenhouses and total area for targeted crops, and average per capita consumption.

The target audience was, as well, observed and analyzed; their behavior, segmentation and characteristics. In addition to the legal feasibility of the project including greenhouse and aquaponics licenses and taxes responsibilities and the risk analysis and plan to avoid or make use of uncertain events and conditions that may occur.

Summary

This study aims to identify the economic opportunity of using integrated farming models such as nexus farming , aquaponics in agriculture that matches the opportunity of the eco-friendly impact that it has on the environment , and how it satisfies many SDGs of the UN objectives of sustainable development.

An analysis of the competitors in the organic vegetable market, prices and products represented in cherry tomatoes, cucumbers, colored pepper, Baladi pepper, onions, potatoes, mushroom and garlic to determine customers' behavior based on primary data represented in observations in our mystery shopping activities and secondary data collected from studies and reports.

Determining the most required products in the Egyptian market and the size of the cultivated area.

Also, we have determined the operating assumptions through technical specifications and how nexus farming achieved the SDGs.

Also identified the licenses, the required documents and the tax responsibilities needed for establishing greenhouses and aquaponics.

Smart Agriculture¹

Climate-smart agriculture (CSA) is an approach that helps guide actions to transform agri-food systems towards green and climate-resilient practices. CSA supports reaching internationally agreed goals such as the SDGs and the Paris Agreement. It aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible.

Integrated Farming Model²

Integrated fish farming is based on the concept that ‘there is no waste’, and waste is only a misplaced resource that can become a valuable material for another product (FAO, 1977). In integrated farming, the basic principles involve the utilization of the synergetic effects of inter-related farm activities and the conservation, including the full utilization of farm wastes.

It is assumed that all the constituents of the system would benefit from such a combination. However, in most cases, the main beneficiary is the fish which utilizes the animal and agricultural wastes directly or indirectly as food. As integrated farming involves the recycling of wastes, it has been considered an economic and efficient means of environmental management.

Nexus Farming Model

The nexus farming models were designed to advance more sustainable and climate-smart production methods for Egyptian farmers that help Egypt in achieving the SDGs and complying with the Paris Agreement, while also helping to increase food production while reducing the number of resources needed

Aquaponics

According to Dr. Hesham Haggag one of the study’s experts

The combination of aquaculture (raising fish) and hydroponics (the soil-less growing of plants) grows fish and plants together in one integrated system. The fish waste provides an organic food source for the growing plants and the plants provide a natural filter for the water the fish live in. The third participants are the microbes (nitrifying bacteria) and composting red worms that thrive in the growing media. They do the job of converting the ammonia from the fish waste first into nitrites, then into nitrates and the solids into vermicompost which are food for the plants.



Instead of using dirt or toxic chemical solutions to grow plants, aquaponics uses highly nutritious fish effluent that contains all the required nutrients for optimum plant growth. Instead of discharging water, aquaponics uses the plants and the media in which they grow to clean and purify the water, after which it is returned to the fish tank. This water can be

¹ <https://www.fao.org/climate-smart-agriculture/en/>

² <https://www.notesonzoology.com/india/fishery/integrated-fish-farming-principles-advantages-and-disadvantages/787>

reused indefinitely and will only need to be replaced when it is lost through transpiration and evaporation. Two primary methods of aquaponics growing are most widely in use today.

Nexus Integrated Model Cost Saving

1. Farmers are operating small Diesel pumps that they drag to the canals where they are needed to pump water from the canal level up to the field level which is becoming increasingly expensive, due to price increases that are based on the roll-back of state subsidies as well as market price fluctuation and inflation so, GEBAL's nexus greenhouse models are entirely powered by solar energy given the many sunny days and the long sunshine hours, farmers recover the cost of solar power installations many times over throughout the duration of the project (five times to be specific) also, that helping to saves up to 4,000 liters of Diesel per year or 10,000 kg of CO₂ per year.
2. The nitrogen fertilizer coming out of the fishpond and into irrigation water, which considered as saving fertilizer source replacing of the high-cost chemical fertilizers.
3. The greenhouse design enables the production of both fish and crops with a similar amount of water using of underground drainage system which saves on water consumption by working in a close cycle using water from fishpond to irrigate plants and return surplus to the fishpond that saves between 37% to 42% of water or up to 2 million liters of water per year as compared to an open field farming method of the same size irrigated by flood irrigation.

Gebal Previous Implementations

El-Heiz Model

El-Heiz Farm in western desert in Egypt is an implemented model of Nexus farming with a tunneled greenhouse equipped with a 63% shading net and also with plastic as a second covering layer.

In this type of greenhouse, the climate is manually controlled by using the black net to reduce the temperature in summer and the plastic cover for internal heating in winter. In addition, this greenhouse has a polyethylene water tank with a capacity of 12 cubic meters.

Irrigation is done by drip irrigation from the water source in the water tank of the



Figure 1: El-Heiz Farm

greenhouse with the help of a submersible pump with a capacity of 0.25 kilowatts, which is powered by solar energy to irrigate the entire 320 square meter greenhouse. The water tank for irrigation is also used for fish farming, with a capacity of up to 1,000 fish that can produce 200 kilograms of fish annually.

Dandara Model

Dandara Model is considered as one of nexus integrated models which implemented by Gebal, it is considered as cooling system greenhouse covering an area of 640 square meters.

The climate is controlled to achieve an optimal climate for the plants to maximize productivity by raising the temperature above the preset limit through control panels, activating air extraction units to remove hot air from inside the greenhouse and replace it with cooler air from outside the greenhouse, which is passed through cooling cells to lower the temperature. After a few minutes, all the hot air is replaced by cool air inside the greenhouse. When the temperature reaches the optimum value preset in the control panel, all exhaust systems and the cooling pumps stop operating.

The cooled greenhouse model includes a water tank with a capacity of 36 cubic meters to store water for irrigation purposes. This water is also used for raising tilapia fish in the greenhouse. The water capacity is sufficient for about 3,000 fish. The fishpond can produce up to 750 kilograms of fish.

In addition, this greenhouse is irrigated by a drip irrigation system to preserve every drop of water supplied to the plants, and the irrigation water is pumped by a submersible pump with a power of only 0.25 kilowatts.

This is enough to irrigate the 640 square meter greenhouse and this pump, like all systems of this model, is powered by solar energy.

In addition, the greenhouse has an underground agricultural drainage network that drains excess water and returns it to the water reservoir used for plant irrigation. This creates a closed water cycle, and every drop of water is used optimally.

Its productivity per square meter is estimated to average 39 kilograms per year, since its climate control system allows for more intense plantations and a prolonged season of 9 months instead of 6. It can allow for 2,500 plants a year with a productivity of 10 kilos per plant totaling 25 tons from an area of 640 square meters.

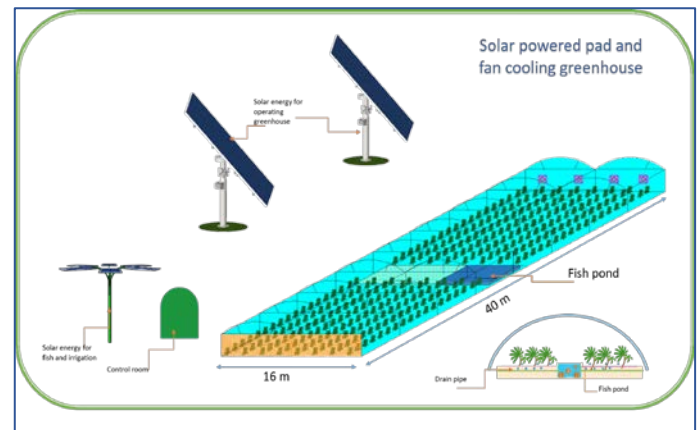


Figure 2: Cooling system model



Figure 3: Dandara model example

Miss Samar Abdul-Aziz's Farm

Miss Samar Abdul-Aziz's farm is located in the Egyptian Delta in Kafr Shubra Belola, Monufeya with a total area 34.704 FD.

Miss Abdul-Aziz currently rents out the entirety of her farmland to a number of tenants who all cultivate small portions of the land. The dominant crops produced on these rented lands are field crops such as wheat, clover, and maize with some vegetables (potatoes, beans, onions). All farmers practice flood irrigation.

GEBAL proposed to transform an initial 4.8 FD of land plus the uncultivated land plot located right next to the farmhouse into a sustainable, integrated farm venture that combines fruit, vegetable, and poultry production.

The farm design is based on the concept of using resources such as water and electricity in the most efficient ways, improving the natural environment and soil health of the farm over time, reducing pollution, CO2 emissions, and negative environmental impact, and minimizing the use of chemical fertilizers and pesticides which will increase the productivity.

Gebal helps to increase productivity by implemented nexus integrated model in producing many crops such as mangoes "Keitt" under new technology of Ultra-high-density plantation (UHDP) which has the potential to yield 200% more produce than that of the traditional method.

Also, in peach cultivation the recommended option is to plant three varieties of peach (each variety on 1.5 Feddans), to take advantage of the different harvest seasons.

Target market analysis

Market opportunities

Shading nets

This type of agriculture is currently profitable in Egypt, because the crops are scarce, both at the local market level and at the global market level used for export. In shading nets, crops such as climbing tomatoes, bell peppers, beans, cucumbers, and many vegetable crops can be cultivated. Those crops are highly useful because the cultivation method can reach 100% organic which results in a healthier product, but the production cost is expensive, as it is expensive to build and needs strong expertise for a successful management.³



³ <https://www.almaal.org/the-most-important-and-profitable-agriculture-in-egypt>

Aquaponics

Integrated farms

The covid-19 crisis and Climate Change Crisis has proven the necessity of transforming our agri-food system using sustainable resource-efficient integrated farming methods such as "aquaponics" pattern, combining the production of crops with fish, as they contribute to agricultural diversity and the introduction of alternative products adapted to extreme conditions, which consume less water and contain high nutritional value, as well as increasing the value of the local plant and animal product. ⁴



Sustainable farming

Aquaponics is considered a sustainable and efficient method of farming that combines raising fish (aquaculture) with growing plants (hydroponics) in a closed system.⁵ Integrated farms are expected to contribute to an increase in the annual production of **varied crops and fish by 200%** compared to other agricultural patterns, while material revenues will **increase by at least 80%** compared to the return of traditional agricultural patterns. ⁶



Water efficiency

Most Arab countries suffer from a severe water crisis. Of the 22 Arab countries, 19 fall below the annual threshold for the scarcity of renewable water resources of **1,000 cubic meters per capita** and **13 below the threshold for the scarcity of absolute water of 500 cubic meters per capita per year**. Aquaponics systems consume only a small amount of water. These systems require only **10% of the water** used in traditional agriculture, whether for plants or regular fish farming. These systems help to conserve the limited water resources of Arab countries. ⁷



⁴ <https://www.alroeya.com>

⁵ <https://igrownews.com/aquaponics-a-sustainable-efficient-farming-method>

⁶ <https://www.alroeya.com/>

⁷ <https://al-ain.com/article/aquaponics-food-security-arab-experiences>

Food security

After Egypt's massive Arab Spring protests in early 2011, many of the Egyptian diaspora returned to Egypt. Amongst the returning emigres was "Faris Farag", formerly a London banker, with a bright idea for improving Egyptian food security. He began to research aquaponics, a technique for cultivating fish and plants together, so that they sustainably support each other.

According to Dr Jay Biernaskie⁸ who is a Daphne Jackson Fellow working on using evolutionary biology for sustainable intensification in agriculture.

Cereal crops like wheat will have a particularly important role in future food security, yet their worldwide yields have plateaued.

With agricultural land at a premium, one of the most urgent global challenges is to increase food production without expanding agricultural land area.

And according to "The Swiss-food platform" it states "Comprehensive resource efficiency is one of the great challenges – comprehensive means efficient use of finance, energy, labor and natural resources."⁹ which are the same principles that Nexus farming models have.

The risk of widespread food-insecurity and hunger looms is increasing in Egypt, with its rapidly growing population and decreasing amounts of water and arable land. These challenges, in "Farag's" view, make aquaponics ideally suited to the Egyptian context. "Aquaponics is at the nexus between food security, water conservation, and efficient land use," he explained. An aquaponics facility recycles water and needs relatively little space for impressive produce yields¹⁰.



Figure 4- Faris Farag/ Owner of Bustan Aquaponics

Importing opportunities

Hussein Abdulrahman, Captain General of Peasants, pointed out that resorting to organic farming will inevitably lead to a significant increase in the prices of crops, noting that under the European Union's requirement for an organic farming law, as a prerequisite for importing from Egypt, by the beginning of 2020, Parliament is currently debating the passage of the Organic Agriculture Act.¹¹

According to Mr., Hussein Abdulrahman, Head of the Farmers Syndicate to:

- There is an expected significant increase in the prices of agricultural crops as a result of resorting to organic farming.
- The European Union requires a law for organic farming as a basic condition for importing from Egypt starting in 2020.
- Parliament is currently discussing the issuance of the Organic Farming Law.



Figure 5- Hussein Abdulrahman/ syndicate chairman of Peasants

⁸ <https://www.jic.ac.uk/blog/how-can-we-produce-more-food-on-less-land/>

⁹ <https://swiss-food.ch/en/articles/production-more-food-with-fewer-resources>

¹⁰ <https://www.theswitchers.eu/en/switchers/plant-fish-farming-technical-know-how-marketing-savvy-egypt/#>

¹¹ <https://alfallahalyoum.news/>

- The Organic Farming Law will regulate the production and trading of organic products and ensure that what is written on the organic packaging matches the reality and the organic production standards for production, processing, and trading of organic products according to international standards.
- Organic farming means stopping the use of industrial inputs such as chemical fertilizers, pesticides, veterinary drugs, genetically modified seeds and strains, preservatives, and additives.
- The use of chemical fertilizers in fertilization should be banned or reduced.
- This step may lead to lifting the subsidy on chemical fertilizers.¹²

¹² <https://alfallahalyoum.news/>

Healthy food trend

Egyptian fruits and vegetables market size is projected to increase by 11.26 million t and the market size is estimated to grow at a CAGR of 5.6% between 2022 and 2027. In 2017 the size of the market was valued at USD 28.83 million.¹³

COVID-19 pandemic has positively affected the market due to the growing awareness of health and nutrition diets. Therefore, this has increased the demand for organic fruits and vegetables worldwide. The growing demand for organic fruit and vegetables is mainly due to its increased production and increased global consumption. However, the supply of organic fruit and vegetables is limited relative to demand, due to the high cost of production. Despite the high prices of organic fruits and vegetables, consumers are willing to pay more for organic foods, due to the low use of pesticides and high nutritional value, so sales of organic fruits and vegetables are expected to boost.¹⁴

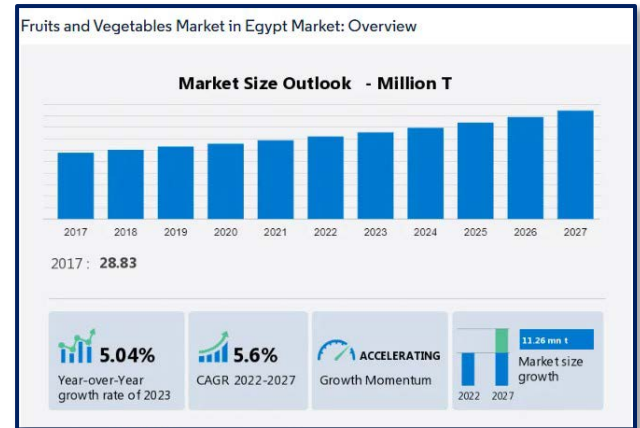


Figure 6- Current & Expected Market Size for Fruits & Vegetables

¹³ <https://www.technavio.com/report/egypt-fruits-and-vegetables-market-analysis>

¹⁴ <https://www.mordorintelligence.com/ar/industry-reports/egypt-fruits-and-vegetables-market>

Organic agriculture trend

In **2016**, the area under organic management in Egypt reached **105 908 hectares** accounting for **5.9%** of the total organic land area in Africa. Looking at the share of organic land area in total agricultural land, Egypt comes on the top with **2.8%**.¹⁵ According to the research institute of Organic Agriculture (FIBL)¹⁶ in 2021 there was another report that indicates the increase of the land used in organic agriculture in Egypt to **116000 Hectares**.¹⁷

Rank	Country	Organic agriculture land area (Ha.)	% to Africa's organic area	Share of organic area in total agric. Land by Country (%)
	Africa	1801699	100	0.2
1	Tanzania	268 729	14.9	0.7
2	Uganda	262 282	14.6	1.8
3	Ethiopia	186 155	10.3	0.5
4	Tunisia	181 076	10.1	1.8
5	Kenya	154 488	8.6	0.6
6	Sudan	130 000	7.2	0.2
7	Egypt	105 908	5.9	2.8
8	Congo, D.R.	94 386	5.2	0.4
9	Sierra Leone	69 686	3.9	1.8
10	Madagascar	60 023	3.3	0.1

Figure 7- The Area of Organic Agriculture Land According to the research institute of Organic Agriculture

Country/Territory	Hectares
Australia	35687799
Argentina	4074804
France	2776554
China	2753700
Uruguay	2741845
India	2657889
Spain	2635442
United States of America	2326551
Italy	2186159
Germany	1802231
Brazil	1482406
Canada	1215589
Austria	679119
Russian Federation	655457
Sweden	606669
Romania	578718
Czech Republic	558124
Greece	534629
Poland	509286
Uganda	505308
United Kingdom	489200
Ukraine	422299
Peru	374926
Ethiopia	332519
Finland	327736
Türkiye	327583
Portugal	308289
Denmark	299998
Hungary	293597
Latvia	291150
Tanzania	286627
Tunisia	279389
Lithuania	261782
Mexico	238075
Estonia	226605
Slovakia	222896
Philippines	216334
Sierra Leone	193954
Switzerland	181444
Bolivia (Plurinational State of)	179425
Thailand	167985
Chile	152773
Togo	130858
Kenya	128018
Croatia	121924
Dominican Republic	117312
Egypt	116000
Kazakhstan	113247
Paraguay	113147
Belgium	101828

Figure 8- The Area of Organic Agriculture Land in Hectares

¹⁵ <https://hal.science/hal-02137639/document>

¹⁶ <https://www.fibl.org/en/>

¹⁷ <https://www.fibl.org/fileadmin/documents/shop/1254-organic-world-2023.pdf>

Market challenges.

Aquaponics

Organic laws

Hussein Abdulrahman, Captain General of Peasants added that the Organic Agriculture Law will regulate the production and circulation of organic products and categories to which the law will apply and conform to what is written on organic packaging to the truth and the organic production standards for availability, processing and circulation of organic products by international standards. Its provisions will apply to all persons working in the production, manufacture, processing, import and export of organic inputs or donors.¹⁸

Low awareness

There has been very weak demand for organic products in the country, likely owing to the more expensive price tags which the majority of Egyptian incomes are unable to support, in addition to a lack of awareness concerning the extent of contamination of regular produce. As such, most organic Egyptian produce has been destined for export.¹⁹

Greenhouse

Greenhouse opportunities

Reclamation

Greenhouse farming is primarily growing plants or crops in a structure with walls and a roof made principally of transparent material. The interior of a greenhouse exposed to sunlight is significantly warmer than the external temperature, protecting its plants from extreme conditions. And providing an opportunity to grow year-round in harsh conditions.²⁰ Egypt has a total land area of approximately 1 million km² or the equivalent of 238 million acres. Most of it is desert and only 5.5% is inhabited.²¹ Recently, the Governments of some developing countries such as Egypt started to support the applications of solar energy in desert areas to increase the reclamation of agricultural land sand to maximize the utilization of solar energy, as well as to guarantee the sustainability of food and energy production.²²



Aquaponics Benefits

1. Waist-high aquaponics gardening eliminates weeds, back strain and pests' access to the garden.
2. Reuse resources currently considered "waste". In aquaponics, there is no more toxic run-off from either hydroponics or aquaculture.
3. Aquaponics uses only 1/10th of the water of soil-based gardening and even less water than hydroponics or recirculating aquaculture.

¹⁸ <https://alfallahalyoum.news/>

¹⁹ <https://egyptianstreets.com/2018/09/24/egypts-organic-food-movement/>

²⁰ <https://blog.growlink.com/benefits-of-greenhouse-farming#:~:text=What%20is%20Greenhouse%20Farming%3F,its%20plants%20from%20extreme%20conditions.>

²¹ <https://web.archive.org/web/20160805090350/http://www.sekem.com/assets/the-future-of-agriculture-in-egypt.pdf>

²² https://scholar.cu.edu.eg/sites/default/files/redagreen/files/advanced_applications_of_solar_energy_in_agricultural_greenhouses.pdf

4. Watering is integral to an aquaponics system. You can't under-water or over-water.
5. Fertilizing is also integral to an aquaponics system. You can't over-fertilize or under-fertilize.
6. Gardening chores are cut down dramatically or eliminated. The aquaponics grower can focus on the enjoyable tasks of feeding the fish and tending and harvesting the plants.

General opportunities

Greenhouse and shading net Cultivation²³

The production of underground seedlings is one of the best ways of producing seedlings for both exposed land and protected cultivation due to the following advantages:



1. Preservation of planted seeds, where the chance of successful seed germination in the arboretum is great resulting in the economy of seeds, especially when using hybrid varieties.
2. Easy to protect plants against exposure to inappropriate weather conditions
3. Easy service of seedlings in the arboretum.
4. Easy to exclude infected seedlings and increase the efficiency of anti-fatigue programs in the arboretum.
5. Economy at the time through the possibility of performing service operations for sustainable land during the sapling's production period.
6. Protection of seedlings in an early stage by protecting them from inappropriate weather conditions.
7. Produce high-quality seedlings reflecting on the crop.
8. Provision of irrigated water.

Demand of vegetables

The market share growth by the vegetable segment will be significant during the forecast period. Vegetables are the largest segment of Egypt's fruits and vegetables market and will remain the largest segment during the forecast period. The growing food industry worldwide, coupled with increasing consumer expenditure on fresh food products such as vegetables, is expected to drive the segment's growth during the forecast period.²⁴



Figure 9- The Segmentation of Fruits & Vegetables in Egypt's Market

²³ <https://agricultureegypt.com/Agenda/Articles/>

²⁴ <https://www.technavio.com/report/egypt-fruits-and-vegetables-market-analysis>

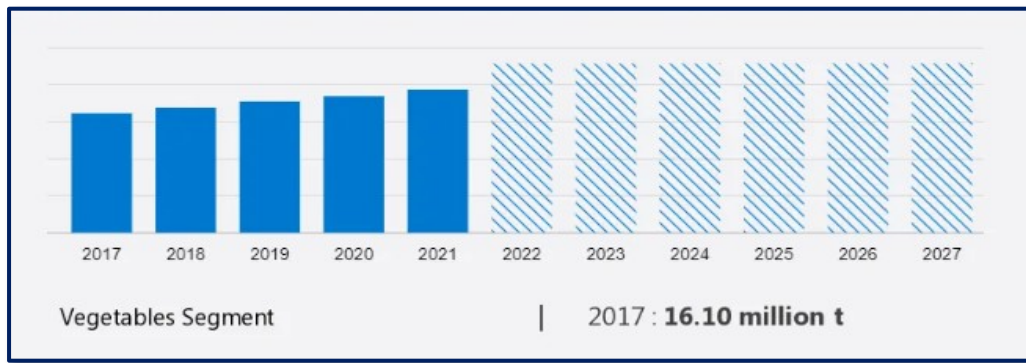


Figure 10- Vegetables Current & Expected Market Size

General challenges

Agriculture Illness

Egypt suffers a food-borne illness. Salmonella is a major food-borne illness in Egypt. Consuming contaminated food makes people more likely to become sicker or develop a serious illness. These contaminants can infiltrate the supply chain in a variety of ways, rendering food products unsafe for consumption. Marine biotoxins, cyanogenic glycosides, mycotoxins, and toxins found in toxic mushrooms are examples of naturally occurring poisons. Long-term exposure to oxalates, which are found in staple fruits such as peach palms, can affect the immune system, disturb normal development, and even cause cancer in consumers. Such factors are, in turn, expected to hamper market growth during the forecast period. ²⁵



Raise of Costs

According to the World Bank figures, the situation is further exacerbated because approximately 20% of the Egyptian population is below the national poverty line and another 20% of Egyptians are considered to be near poor. This affects mainly those people working in the agricultural sector which represents around 40% of the Egyptian workforce. ²⁶ In addition to increasing prices resulting from inflation, this may be one of the obstacles facing the agricultural field, which requires spending a lot of money for development.

Open-field cultivation's main problems

- Agriculture Pests
- High water consumption
- Plant-disease contagion
- The air & soil-borne insects
- High Energy Consumption
- Seasonality Agriculture
- Quality challenges
- Weather challenges
- Fertilizers Availability
- Inflation

²⁵ <https://www.technavio.com/report/egypt-fruits-and-vegetables-market-analysis>

²⁶ <https://web.archive.org/web/20160805090350/http://www.sekem.com/assets/the-future-of-agriculture-in-egypt.pdf>

Aquaculture's most traditional problems

- The tank water becomes polluted with fish effluent which gives off high concentrations of ammonia. Water has to be discharged at a rate of 10-20% of the total volume in the tank daily. This uses a tremendous amount of water.
- This water is often pumped into open streams where it pollutes and destroys waterways.
- Because of this unhealthy environment, fish are prone to disease and are often treated with medicines, including antibiotics.

Solutions

– Bio Filters:²⁷

Biofilters are used to filter the water in Aquaponics systems and keep the water in your system clean. Connect a biofilter to a pump, and the biological action inside the biofilter breaks down excess matter into food suitable for plants.

– Irrigation Process:²⁸

The main purpose of Drip Irrigation systems is to use water as efficiently as possible. It is believed that a properly designed Drip Irrigation system doesn't allow loss of water due to run-off, evaporation, or deep percolation in sandy soils. As it is known very clearly that the availability of water resources is decreasing each day due to industrialization and less rainfall, the need to increase alternate sources of irrigation has become highly essential. The micro-irrigation methods have helped farmers cultivate crops in areas of less rainfall and low water availability. This is important to maintain self-sufficiency in the food produced. The network of pipes and tubes supplies water to the essential parts of the plant, thereby helping in higher yield from plants, which is very important for higher productivity and income generation.

– Continuous Cleaning of Fish Pond:²⁹

Continuous cleaning of fish ponds is an important component of integrated farming, as it plays a critical role in maintaining water quality and promoting optimal fish growth and health. The process involves removing excess organic matter, such as uneaten feed and fish waste, from the pond regularly, to prevent the buildup of harmful bacteria and toxins. Continuous cleaning can be achieved using a variety of methods, including mechanical filtration, biological filtration, and chemical treatment. Mechanical filtration involves the use of filters or screens to remove solid particles from the water.

²⁷

<https://www.aquagardening.com.au/aquaponics/filtration/filters/#:~:text=Bio%20filters%20are%20used%20to,into%20food%20suitable%20for%20plants.>

²⁸ <https://www.agrifarming.in/drip-irrigation-system-complete-guide>

²⁹ <https://www.agrifarming.in/key-rules-to-maintain-water-quality-in-aquaculture-parameters-management-effects-of-water-quality-on-fish-growth>

Products analysis

Products pricing analysis

Based on each conducted site visit, we have gone to supermarkets: Seoudi, Carrefour, Spinneys, Kheir Zaman and Metro. Based on our observation on each site visit we have concluded the following:

Seoudi Supermarket:

1st Branch in Tayaran St.:

Products included:

Cucumber in brands: Sekem

Green bell pepper in brands: Farm Fresh

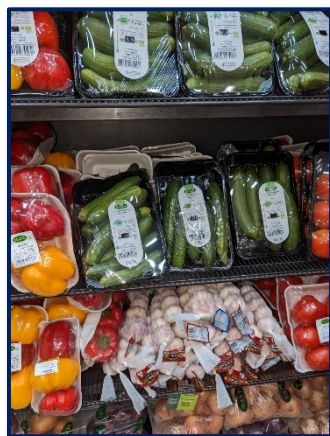
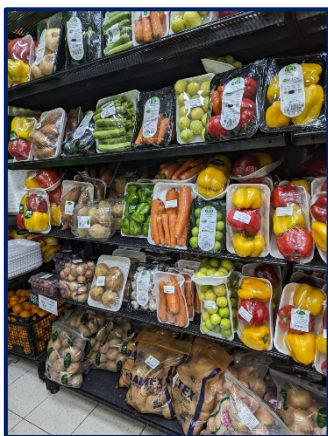
Colored bell pepper in brands: Sekem, Farm Fresh, Mafa

Okra in brands: Tabarek

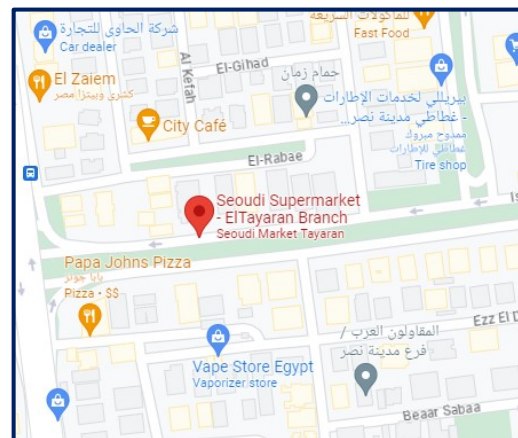
Cherry Tomatoes in brands: Farm Fresh

Garlic in brands: Al-Hassan and Sekem

Potatoes in brands: Sekem



سعودي
SEoudi™
SINCE 1938



2nd Branch in Al Mintaqah Al Thamenah:

Products included:

Cucumber in brands: Sekem

Green bell pepper in brands: Farm Fresh

Colored bell pepper in brands: Sekem and Farm Fresh

Okra in brands: Tabarek

Cherry Tomatoes in brands: Farm Fresh

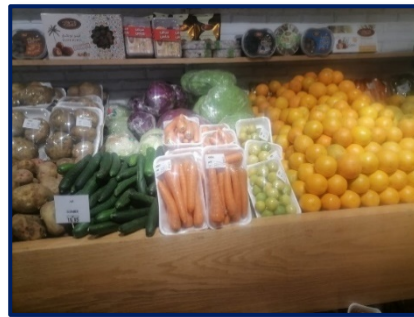
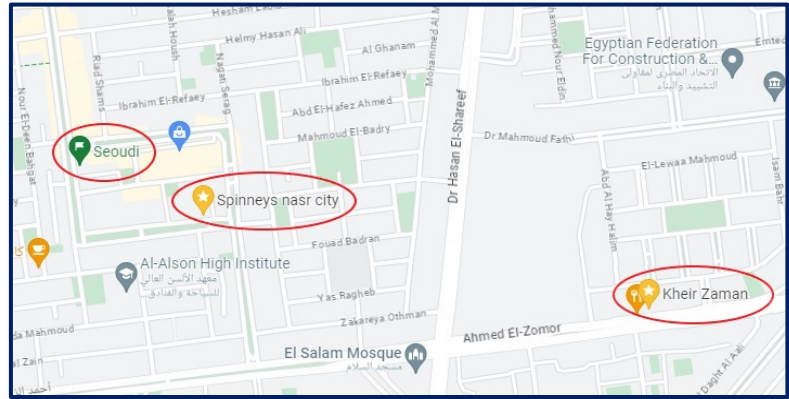
Garlic in brands: Al-Hassan and Sekem

Potatoes in brands: Sekem

Mushroom in a brand: El-Tarouty

Onion in brands: Sekem, Mafa & Desert

Potatoes in brands: Sekem, Daltex, Mafa, Tabi3y



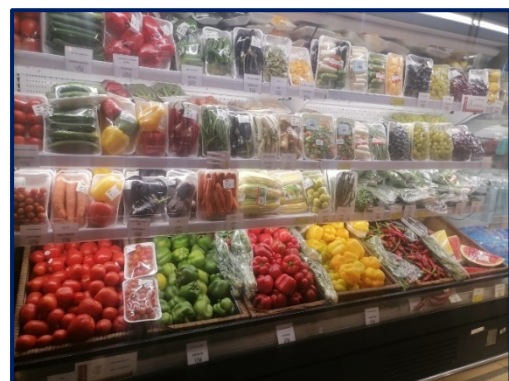
Spinneys Supermarket: Al Mintaqah Al Thamnah:

Products included:

Green bell pepper in brands: Bedaya

Colored bell pepper, okra, Cherry Tomatoes

Garlic Potatoes, Cucumber packaged in Spinney's brand.



Carrefour Supermarket:

1st Branch in City Centre Almaza Mall:

Products included:

Cucumber in brands: Sekem & Bio land

Green bell pepper in brands: Tabark

Colored bell pepper in brands: Sekem, Bio land & Mafa

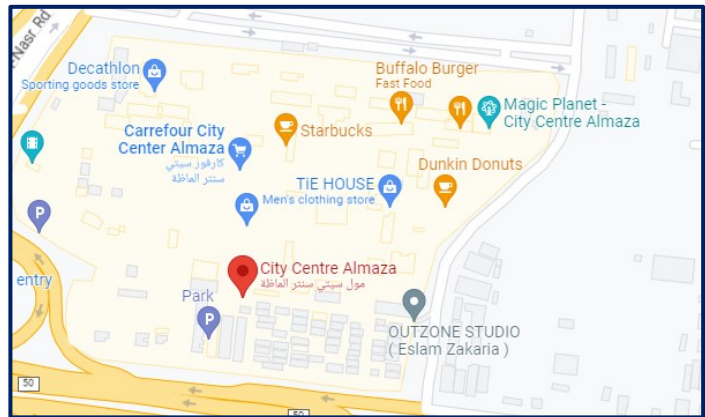
Okra in brands: Tabarek

Cherry Tomatoes in brands: Mafa

Garlic in brands: Sekem

Potatoes in brands: Mafa & Bio land

Onion in brands: Sekem, Bio land, Daltex, Mafa



2nd Branch in El Zaytoun:

Products included:

Cherry Tomatoes in brands: Mafa

Potatoes in brands: Mafa & Daltex

Onion in brands: Mafa

Mushroom in a brand: Mister



Metro Supermarket:

Heliopolis branch:

Products included:

Cucumber in brands: Mafa & Greenish

Green bell pepper in brands: Greenish

Colored bell pepper in brands: Sekem, Mafa & Ramsco

Okra in brands: Tabarek

Cherry Tomatoes in brands: Mafa

Garlic in brands: Ramsco

Potatoes in brands: Mafa & Sekem

Onion in brands: Sekem & Mafa

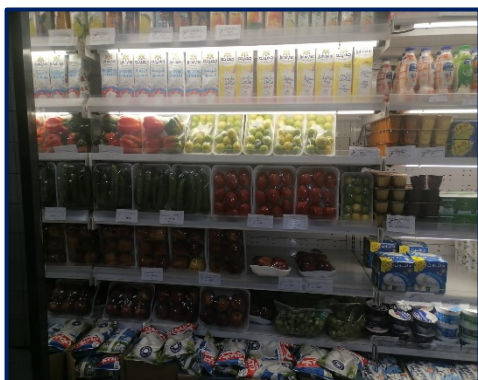
Mushroom in a brand: El-Tarouty



Kheir Zaman Supermarket:

Al Mintaqah AL-Thamenah branch:

All the vegetables were loose not packaged with a branded label.



Vegetables analysis based on site visits observation

Organic vegetables analysis

The following table discusses the variety in the prices of organic vegetables in supermarkets based on the observation noting that there are many other brands.

Note: Average price was calculated by adding all the prices of the organic vegetables divided by their numbers

Product	Highest Price	Brand	Weight	Lowest Price	Brand	Weight	Average Price
Cucumber	44.50 EGP	Isis - Sekem	900 G	42.50 EGP	Isis - Sekem	900 G	40.9 EGP
Colored bell pepper	46.99 EGP	Isis - Sekem	350 G	35.95 EGP	Isis - Sekem	350 G	40.16 EGP
Garlic	63.95 EGP	Isis - Sekem	500 G	43.99 EGP	Ramsco	500 G	39.9 EGP

Table 1- The Analysis of Organic Vegetables Based on Observation of the Site Visits

- With regard to the colored bell pepper, prices varied between supermarkets even for the same brand. The Metro market had the colored bell pepper for the highest price, indicating the market's segmentation and location. However, it should be noted that Metro market also sells Bio Land, a brand with a nearly identical price. Carrefour had the colored bell pepper for the lowest price.
- The highest price for cucumber was found in Seoudi supermarket while the lowest price was in Carrefour.
- There was no organic cherry tomato, green bell pepper and okra in any of the supermarkets.
- The highest price of the garlic was in the Carrefour market while the lowest price was found with different brands in the Metro market.
- Green Bell Pepper was found organic in ISIS band packaged with colored bell pepper.

Premium vegetables analysis

Product	Highest Price	Brand	Weight	Lowest Price	Brand	Weight	Average Price
Cucumber	27.99 EGP	Mafa	500 G	18.99 EGP	Greenish	1 Kg	18.75 EGP/ 500 G
Colored bell pepper	29.95 EGP	Mafa	500 G	25.95 EGP	Mafa	500 G	27.95 EGP/ 500 G
Garlic	99.95 EGP	Garlic	0.361 G	36.18 EGP	Garlic	0.361 G	68 EGP/ 0.361 G
Potatoes	16.95 EGP	Khalil	1 Kg	37.50 EGP	Mafa	3 Kg	14.725 EGP/ 1 Kg
Cherry Tomatoes	74.99 EGP	Mafa	500 G	34.95	Mafa	250 G	
Green Bell Pepper	27.25 EGP	Farm Fresh	500 G	16.99 EGP	Greenish	500 G	22.12 EGP / 500 G
Red Onion	35.99 EGP	Mafa	1 Kg				
Yellow Onion	37.75 EGP	Mafa	1 Kg				
Mushroom	44.99 EGP	Tarouty	200 G	22.95 EGP	Mister	200 G	30.5 EGP/ 200 G

Table 2: The Analysis of Premium Vegetables Based on Observation of the Site Visits

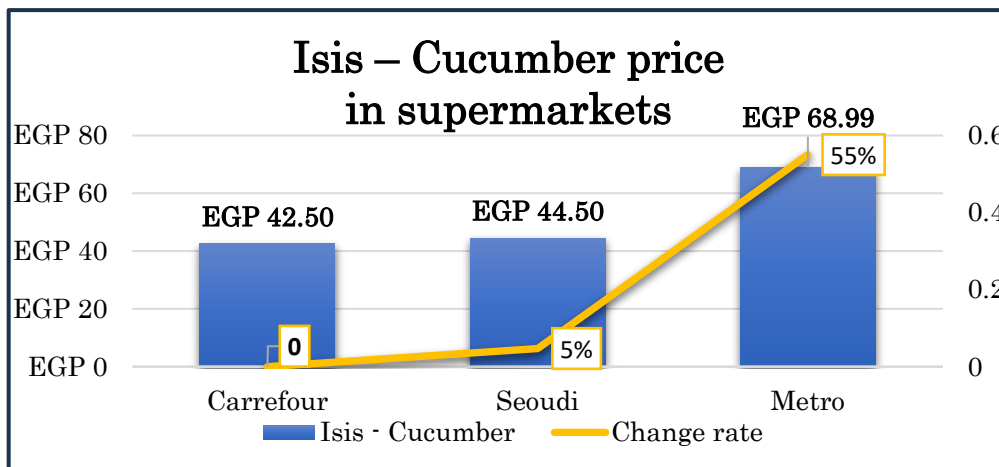


Figure 11- Compared prices of Cucumbers in Supermarket

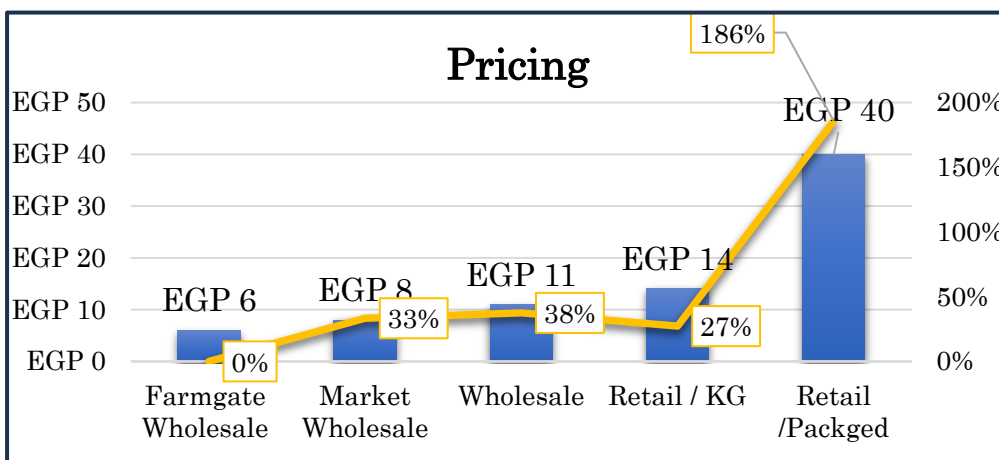


Figure 12- Comparing Prices in Each market Type

Consumer behavior analysis

Target audience

Target audience overview

The population in Egypt is growing at a high and increasing rate, according to figures published on the Central Agency for Public Mobilization and Statistics website, bringing the population to about 105,027,413 million in June 2023.

Thus, the increase in population is directly related to the increase in food consumption for several reasons:

1- Direct demand: The greater the population, the greater the direct demand for food. Each new individual needs a certain amount of food.

2- Increase in total income: An increase in population is usually associated with an increase in economic growth and the total income of a country, which leads to an increase in people's ability to buy and consume food.

3- Changing food tastes: The higher the standard of living, the more people tend to consume meat and nutritionally richer foods, which increases food consumption.

4- Changing age structures: An increase in the population usually indicates an increase in the proportion of young people compared to the elderly, and this group consumes a greater amount of energy and nutrients.








Class	Markets	Super Markets	
		A	B
A			
B			
C			

Table 3- The Class Segmentation of Customers in Markets & Supermarkets

There has been a change in consumer behavior and consumption patterns with more people choosing healthier and more sustainable products due to environmental concerns.

Consumer purchase intention for green products is an important topic. Factors like environmental awareness influence consumer intention to purchase green products.

The change in environmental attitudes and consumption is partly due to the goal of addressing global challenges. This applies to emerging markets like Egypt with a large youth population.

According to one statistical study, the percentage of female shoppers in Egypt reaches **68%**.

- In another study, it was found that **75%** of customers of commercial establishments in Cairo are women.
- According to Forbes Egypt magazine, about **66%** of the total purchasing power in Egypt is represented by women.
- Statistics from the Ministry of Commerce indicate that women account for more than **70%** of the total customers of traditional markets and supermarkets in Egypt.
- In general, most experts agree that the percentage of female shoppers in Egypt is very high and that women are responsible for the needs of the family and make most of the purchases. But the accurate statistics lack precision.
- While there is limited data on the proportion of female shoppers for businesses in Egypt, estimates point to women representing between **66% to 75%** of customers. This indicates that women account for the majority of consumer spending in the country.
- Experts agree that Egyptian women play a dominant role when it comes to household purchases and fulfilling the needs of their families.

Data for the present study were collected in 2020 and were collected from a questionnaire passed to a random sample of 186 individuals from the city of Cairo (Egypt).

Demographics

- Gender: Female by 63%, Male by 37%.
- Age:
 - Between (16:25) years old (55%),
 - Above 25 years old (43%),
 - Below 16 years old (2%).

Based on our observations, we agree with this study as we noticed that the age group present in supermarkets ranges between **25 and 70 years** old but with different distributions depending on the timing of the visit.

- Educational level: High educational level.
- Occupation:
 - Working (Senior Management, Team Leaders, executive positions, or in the field of entrepreneurship and investment).
 - Housewifery or Head of the Family.
- Income: Middle/High-income level.

Geographic

- Areas:
 - Nasr City.
 - Heliopolis.
 - New Cairo.
 - Sheikh Zayed.
 - 6th October.

Behavioral

- Targeting customers who:
 - Looking for healthy products.
 - A healthy way of life.
 - Looking for Fresh premium vegetables.
 - Dressing Modern / Casual / Semi-formal / Formal.
 - Healthy lifestyle trend.

Psychographic

- The target person will be:
 - Sociable.
 - Healthier.
 - Youth
 - **Social status:** Class A+, Class A, Class B+, Class B.

Notes:

Organic food and green consumerism are still emerging in Egypt compared to developed countries. However, there are signs of growth in this area.

Age 25 : 50



Medium Income

Middle Income Group

Monthly Income Range (7K-14K)

Higher Middle Income (14K-50K)

A new segment of health-conscious and environmentally-aware Egyptian consumers, especially young people, is forming who regularly buy organic food. This represents an opportunity for marketers.

Convincing Egyptian consumers of the value of organic food and green lifestyles remains a challenge for companies.

Understanding how lifestyle, values and age influence organic food purchase intention can help companies target this segment more effectively.

Older Egyptian consumers (older women or men) tend to purchase vegetables by weight, not by package.

For young Egyptian consumers, organic food purchase intention seems linked more to a focus on health and well-being rather than purely environmental motives.

To appeal to this segment, marketers should:

- Show how organic food fits into consumers' daily healthy routines
- Highlight both health and environmental benefits
- Use packaging and communication that reflects ecological values
- Focus marketing on health issues, habits and environmental awareness
- Offer products that give consumers a sense of effectiveness and fulfilling intrinsic values

In Conclusion, researching the Egyptian market for organic products by profiling consumers according to lifestyle, values and age could generate valuable insights to help companies design tailored strategies and messaging to attract this lucrative sector of the market. The messaging may especially resonate if it focuses on health, wellness and environmental benefits.³⁰

³⁰ https://aja.journals.ekb.eg/article_120314_a75ea116efa4cc5cc350d4ce5fe5906f.pdf

Recommended additional products

Observation from the field activities.

The most popular products were:

Potatoes: it's packaged in large packages, in high demand as they are a main, and common use vegetable based on the behavior, observation and the opportunity for exporting.

Onion: it's packaged in large packages, high demand as it's a main and common use vegetable based on the observation.

Mushroom: it has a high demand as it gets consumed very quickly also there aren't many competitors in this kind of crop as the most common is a brand called Tarouty and the other was found once in the Carrefour market called Mister Mushroom.



Products' estimated market share

Most required products.

The top exported vegetables ³¹

In April 2023, the Central Agency for Public Mobilization and Statistics (CAPMAS) issued a report on the per capita consumption for the year 2021.

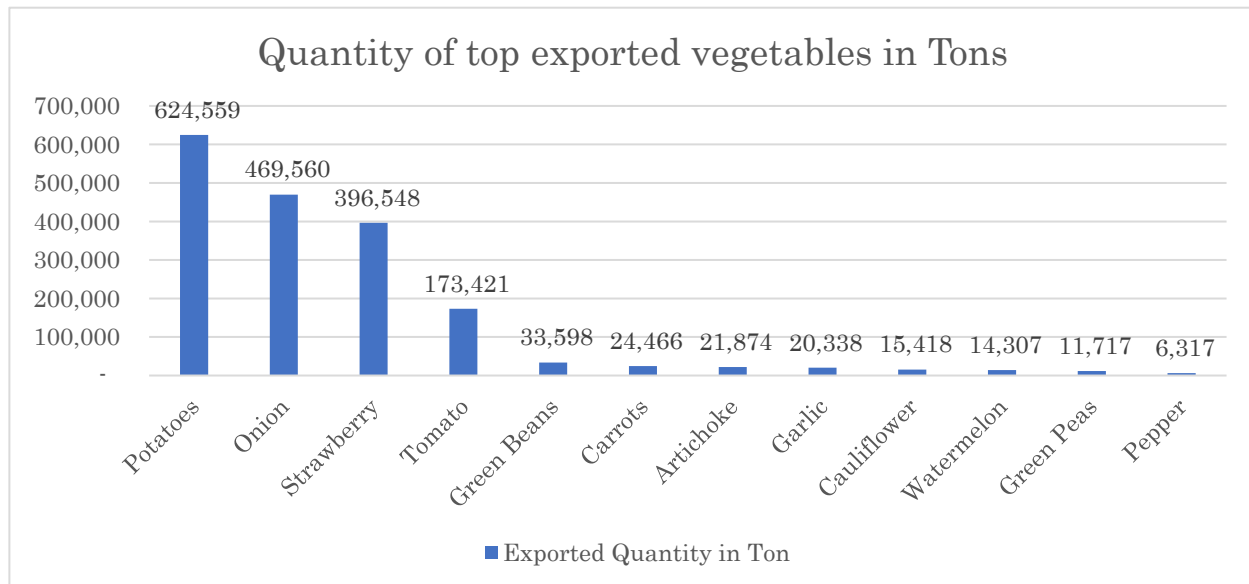


Figure 13- The Quantity of Exported Vegetables in 2021 in Tons

Product Name	Exported Quantity in Ton
Potatoes	624,559
Onion	469,560
Strawberry	396,548
Tomato	173,421
Green Beans	33,598
Carrots	24,466
Artichoke	21,874
Garlic	20,338
Cauliflower	15,418
Watermelon	14,307
Green Peas	11,717
Pepper	6,317
Cucumber	5,240
Cabbage	3,835

Table 4- The Quantity of Exported Vegetables in Tons in 2021

The report indicates that **potatoes** are the highest crop used in exporting with a value of **624,559 Tons** and the least quantity represented in **pepper** with a value of **6,317 tons**.

³¹ <https://drive.google.com/file/d/15VNJuCUR-0TpiS7-j7nnp5oJCcfIZFh/view?usp=sharing>

The most consumed Crops³²

Egypt has a long agricultural history and a population that depends heavily on the local production of crops. The following crops represent some of the most important agricultural products and the most consumed vegetables:

1. Tomatoes



2. Onions



3. Eggplants



4. Chilies and Pepper



5. Cabbages



6. Pumpkins, Squash, and Gourds



7. Cucumbers and Gherkins



Per Capita Consumption³³

In April 2023, the Central Agency for Public Mobilization and Statistics (CAPMAS) issued a report on the per capita consumption for the year 2021 that presents the average per capita consumption of fresh vegetables, based on dividing the net production by the number of individuals.

Products	Net Food in thousands of Tons	Per Capita Supply in KG
Onion	2398	23.5
Tomatoes	4104	40.2
Potatoes	3532	0.346
Garlic	327	3.2
Eggplant	958	9.4
Pepper	456	4.5
Cucumber	353	3.5
Cabbage	320	3.1
Squash	270	2.6
Artichoke	242	2.4
Sweet Potato	185	1.8
Strawberry	182	1.8
Carrots	134	1.3
Taro	90	0.9
Green Beans	82	0.8
Green Peas	66	0.6
Cauliflower	62	0.6
Okra	57	0.6
Molokhia	42	0.4

³² <https://www.mordorintelligence.com/industry-reports/egypt-fruits-and-vegetables-market>

³³ <https://drive.google.com/file/d/15VNJuCUR-0TpiS7-j7nnp5oJCcfIZFh/view?usp=sharing>

Green Bean	29	0.3
Spinach	23	0.2
Green Kidney Beans	12	0.1
Lettuce	10	0.1

Table 5- The Consumption Per Capita According to CAPMAS in 2021

The report indicates that **tomatoes have the highest average per capita consumption**, followed by onions, which suggests a **larger net production**. Conversely, **lettuce and green kidney beans have the lowest average per capita consumption**, indicating a smaller net production.

The size of the cultivated area³⁴

Open field cultivated area

The 5 main crops field area

In January 2023 the **Central Agency for Public Mobilization and Statistics (CAPMAS)**, illustrate the areas of open fields for crop cultivation for the **year 2020/2021**.

Product	Measuring Unit	Field Crop	Reference Page
Garlic	Acre	44,591	24
Green Pepper	Acre	97,284	44
Cucumber	Acre	46,820	44
Tomatoes	Acre	356,896	44
Okra	Acre	13,446	44

Table 6-The Area of Fields Per Each Crop According to CAPMAS in 2020/2021

The data presented in the table and graph, notes that **tomatoes, including both regular and cherry varieties, are the most widely cultivated crop**, followed by green peppers, including bell and hot peppers. **Cucumber and garlic have similarly sized planting areas**, while **okra has the smallest**.

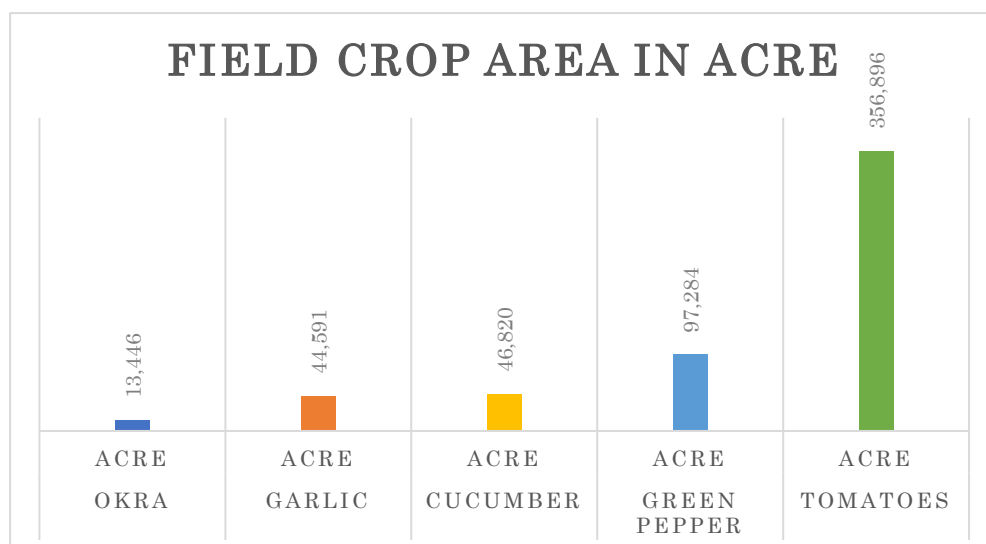


Figure 14- The Area of Filed Per Each Main Vegetables According to CAPMAS in 2020/2021

³⁴ <https://drive.google.com/file/d/1MxdAgW5pBccL4C-KajZyGqaeyKtcqyIV/view?usp=sharing>

The Top Vegetables in Field Area

The following table will represent the top 5 vegetables in cultivated areas in Egypt

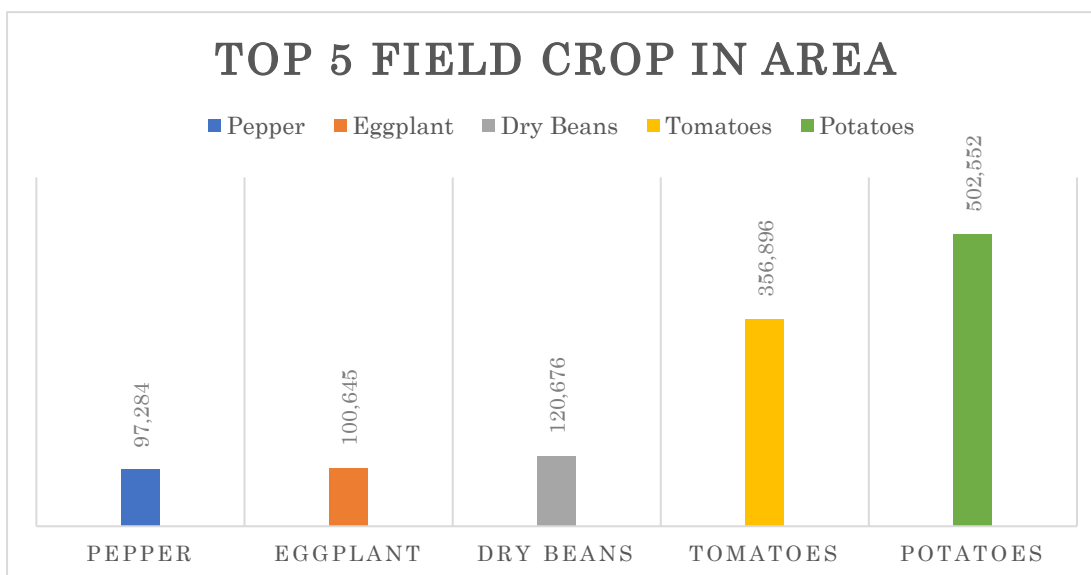


Figure 15- Top 5 Vegetables Cultivated in Egypt

The Central Agency for Public Mobilization and Statistics (CAPMAS) clarified in a published report for the year 2020/2021 that the most cultivated crops and planted area are potatoes followed by tomatoes.

Greenhouses Area

The Main Crops Area in Greenhouses

In January 2023, the Central Agency for Public Mobilization and Statistics (CAPMAS), illustrate the areas and the numbers of greenhouses for crop cultivation in the year 2020/2021.

Product Name	No. of Greenhouses	Greenhouse Area	Reference Page
Garlic	7,248	3,681,175	58
Bell Pepper	64	22,548	58
Cucumber	64,122	24,524,493	58
Cherry Tomatoes	613	171,000	58
Okra	5	1,589	58
Colored Bell Pepper	1,654	633,527	58

Table 7-The No. & Total Area of Greenhouses in Acre according to CAPMAS in 2020/2021

Greenhouse crops

The area of the greenhouse is multiplied by the total number of greenhouses for each crop represented in **acres**.

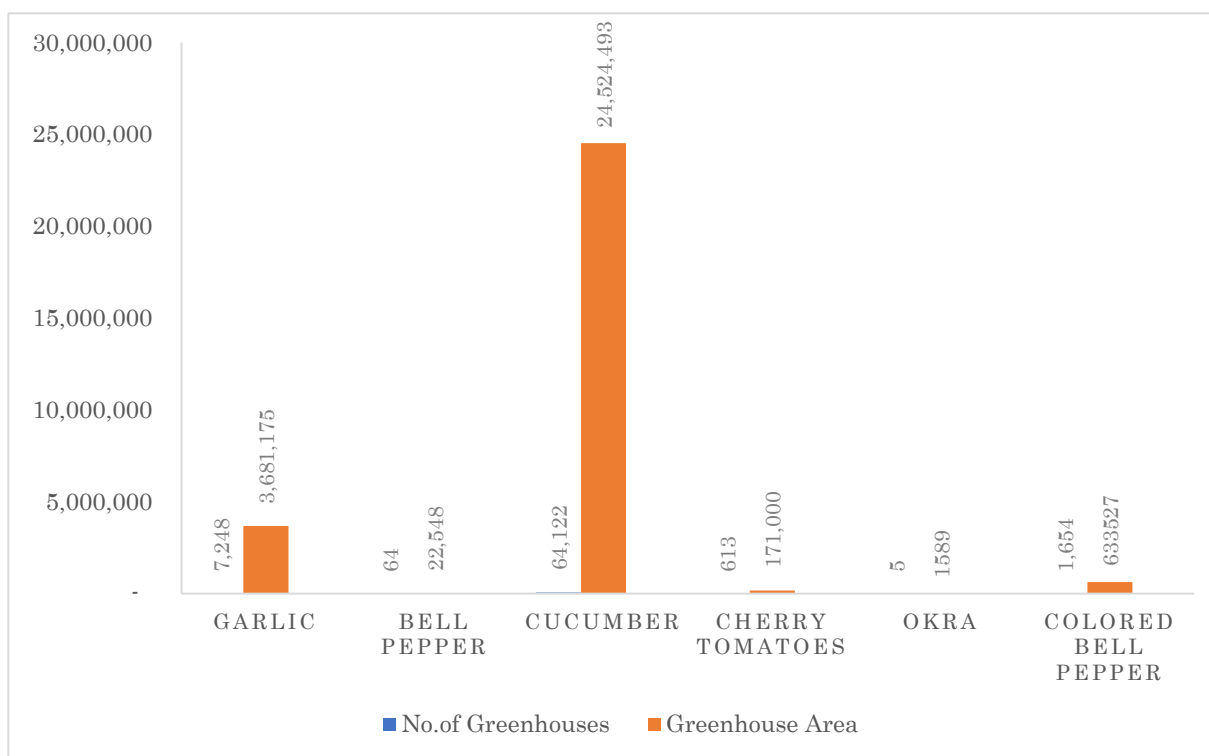


Figure 16 - The No. & Total Area in Acre Per Each Main Crop According to CAPMAS in 2020/2021

The data presented in the table and graph, which were released in the report indicates that the greenhouses for cultivating **cucumbers** have the highest prevalence among all other crops, while the greenhouses for cultivating **okra** have the smallest areas.

Top 5 Vegetables Cultivated in Greenhouses

The following table represents the top vegetables planted and cultivated in greenhouses in Egypt.

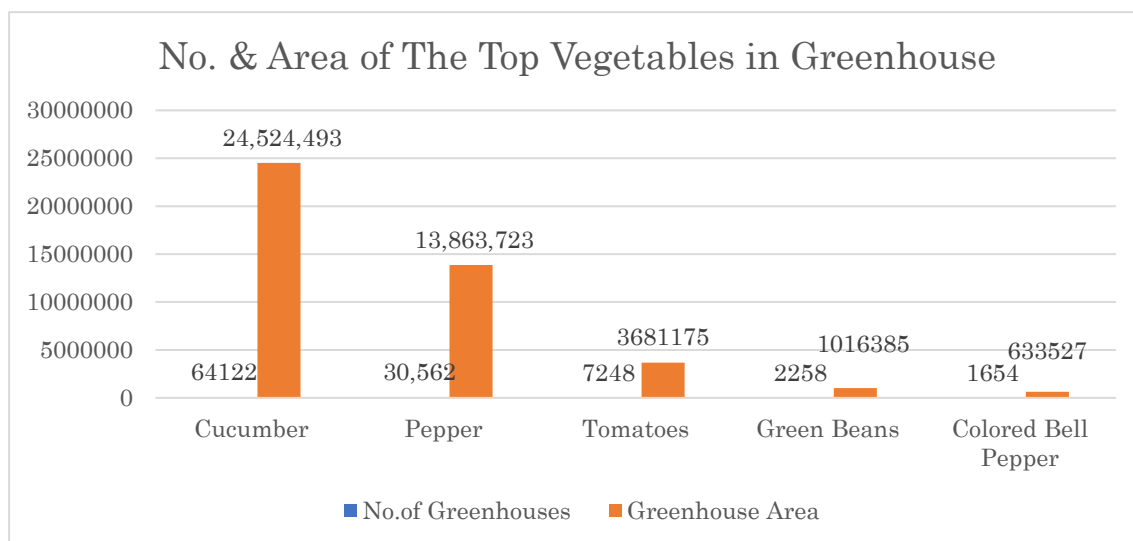


Figure 17- Top 5 Vegetables in No. & Area in Greenhouses

Top Greenhouse Crops ^{35 36 37}

These crops are characterized by their high adaptability and are some of the most widely cultivated crops in Egypt's greenhouses:

- Eggplant
- Green onion
- Squash
- Red Cabbage
- Beans
- Strawberry



³⁵ <https://planting.mawdoo3.com/p/>

³⁶ <https://daily.rosaelyoussef.com/>

³⁷ <https://akhbarelyom.com/news/newdetails>

Operating assumptions according to Gebal organization

To reach organic products which are “Produce can be called organic if it’s certified to have grown on soil that had no prohibited substances applied for three years prior to harvest. Prohibited substances include most synthetic fertilizers and pesticides. In instances when a grower has to use a synthetic substance to achieve a specific purpose, the substance must first be approved according to criteria that examine its effects on human health and the environment” according to the US Department of Agriculture.³⁸

We need to structure greenhouses using one of the next nexus farming models “Simple shade house and Climate-controlled greenhouse” which were designed by Gebal that are based on integrated fish and crop production, both are powered by solar panels.

The inclusion of a fish pond enables a circular production process wherein water from the fish tank is used for the irrigation of vegetables grown in the greenhouse. For that purpose, a portion of the shade house was designated to house a small fish pond. The fish pond consists of a polyethylene sheet and can house up to **3000 fish** as done already by Gebal Egypt in Dandara.

The model can save between **37% and 42% of water** or up to **2 million liters of water per year** as compared to an open farm of the same size irrigated by flood irrigation.

The system also saves up to **4,000 liters of Diesel per year** or **10,000 kg of CO₂ per year**.

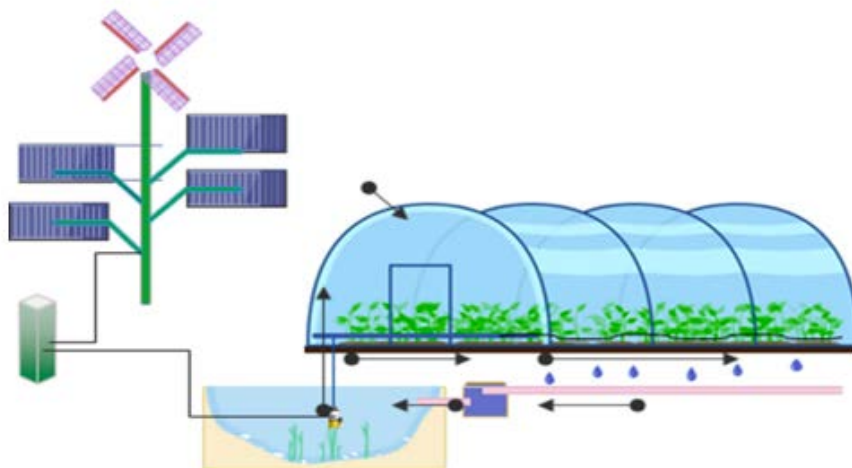


Figure 18: Schematic overview of the solar-powered greenhouse with fishpond, a growing area for seedlings, a solar

³⁸ <https://www.usda.gov/media/blog/2012/03/22/organic-101-what-usda-organic-label-means>

Technical Specifications for implemented models

	Climate-controlled greenhouse	Simple shade house
Dimensions	16m x 40m (640m ²)	8m x 30 m (240m ²)
Construction	Galvanized steel pipes 200µm Plastic sheets	Galvanized steel pipes Shade net
Off-Grid Power Supply	15 kW PV modules + 15 kW inverter (drive) + 2 batteries (200 Amp, 12 Volt) for fish pond aeration	1.4 kW PV modules + 3 kW inverter (drive) + 2 batteries (200 Amp, 12 Volt)
Cooling System	4 exhaust fans + 2 circulating fans + 1.5 HP motor + pad-cooling material	No cooling system
Climate Control	Temperature sensors + controller	No climate control system
Required power	To operate the cooling fans and cooling pump we need 7 kilowatts	Manually
Irrigation	Drip irrigation lines, 16 lines x 40 m length, dripper providing 4 l / hour each 320 cm	Drip irrigation lines, 8 lines x 30 m length drippers providing 4 liters/hour every 30 cm
Submersible pump power	0.25 kilowatts	0.25 kilowatts
Targeted Plants	Vegetables, herbs, seedlings	Vegetables, herbs, seedlings
Fishpond dimensions	4 m x 6 m x 1.5 m 30 m ³ with aeration system,	4 m x 4 m x 1.5 m 24 m ³ with aeration system,
Water tank capacity	36 cubic meters	12 cubic meters
Fish capacity	3,000 fish	1,000 fish
Drainage system	Underground agricultural drainage network	Underground agricultural drainage network
Plants accommodation	Accommodate 3000 plants for cultivation	Accommodate 900 plants for cultivation

Table 8: Technical Specifications of climate-controlled greenhouses and simple shade Houses

Nexus Farming and the SDGs

To assess the nexus farming models' performance concerning different SDGs, data was collected in two of the greenhouses entailed:

- Water consumption (water meters were installed for in and out)
- Electricity consumption
- Fertilizer Consumption and Cost
- Pesticide consumption and cost
- The temperature inside the greenhouse
- Water temperature in the fish pond
- Ph value of the fish pond water
- The oxygen level of the fish pond water
- EC (electric conductivity) of the fish pond water
- The salinity of the fish pond water
- Amount and cost of fish feed

This data was used to calculate the total productivity and economic performance of the greenhouses, as well as their environmental performance which are,

SDG 1: No Poverty

SDG 1 entails the eradication of poverty by 2030, The nexus greenhouses designed by GEBAL have the potential to increase productivity, particularly in small agricultural areas whose sizes are too small to sustain the income of a farming family.

The project entailed an economic feasibility study that included the production of detailed business plans and models for the different greenhouse models. This assessment was critical in the context of determining whether the nexus greenhouse models represent viable and sustainable investment opportunities and can potentially enhance farmers' incomes in the medium to long term (within 5 to 10 years).



SDG2: Zero Hunger

The second SDG sets out to end hunger by 2030, it is critical that the smallest pieces of land produce as much food as possible, but in a sustainable manner that is resource efficient, relies on the use of all resources and waste products in a circular manner, that is water- and energy efficient, as well as climate neutral.

Hence, the usage of Nexus farming which term was used in the natural resource realm in 1983 under the Food-Energy Nexus Program, which sought integrated solutions to food and energy scarcity.³⁹



³⁹ [Nexus approaches to global sustainable development Jianguo Liu1 *, Vanessa Hull2 , H. Charles J. Godfray3,4, David Tilman5 , Peter Gleick 6 , Holger Hoff7,8 , Claudia Pahl-Wostl9 , Zhenci Xu1 , Min Gon Chung1 , Jing Sun1,10 and Shuxin Li1](#)

With the increasing productivity per square meter of agricultural land using Nexus farming the movement towards achieving the SDG of zero hunger is satisfied.

SDG 3: Good Health and Well-Being

SDG 3, good health and well-being, is strongly connected to SDGs 1 and 2.

The nexus greenhouse improves the availability of healthy food that is locally produced in good soil, using unpolluted water for irrigation and only a bare minimum of fertilizers and pesticides by using the circular production system of the nexus greenhouse which ensures that fish droppings in the water produce natural fertilizer for the vegetables that help in keeping the use of fertilizer to a minimum, meaning that chemical fertilizer is only needed when plants are showing signs of nutrient deficiency.



SDG 4: Quality Education

Access to quality education is limited in Egypt's rural areas. Most farmers in Egypt are not familiar with the problems of water scarcity and climate change and are thus not aware of how they can adjust their farming operations to these threats.

This project provides a training program designed to familiarize local farmers with the,

- Climate-smart nexus farming in the context of water scarcity, food security, and climate change.
- Basics of greenhouse farming, including information on solar-powered greenhouses, water-efficient irrigation, and farming models based on nutrient circulation.
- Applications of solar energy systems in agricultural practice.
- Integrated Pest Management (IPM).
- Agricultural waste management.
- Basics of farm management and the formulation of business models for a nexus greenhouse: planning, SWOT analysis, bookkeeping, and records.



SDG 5: Gender Equality

GEBAL's nexus greenhouse has the potential to foster gender equality and women's empowerment in local communities. Women's involvement in farming is often limited in Egypt's rural areas, as women are not supposed to work much outside the house. GEBAL has assessed the gendered experience of operating a nexus greenhouse and the potential impact of the greenhouse on more gender equality in the farming process.

Another element of gender empowerment was the participation of female trainers in the training of trainers' programs.

Enabling women's access to loans and funding in the context of sustainable agricultural entrepreneurship was one of the project objectives.



SDG 6: Clean Water and Sanitation

Besides access to clean water and sanitation, efficient water use and water management are important components of SDG. The design of GEBAL's nexus greenhouse has considerable potential to reduce the need for irrigation water per unit of food produced, while also ensuring "more crop per drop".

The greenhouse design enables the production of both fish and crops with a similar amount of water, as well as the reuse of water in the agricultural system.



SDG 7: Clean and Affordable Energy

There are indirect expenses for irrigation through the cost of pumping.

In the Delta, farmers are operating small Diesel pumps that they drag to the canals where they are needed to pump water from the canal level up to the field level.

The use of Diesel and electricity in pumping is becoming increasingly expensive, due to price increases due to price increases that are based on the roll-back of state subsidies as well as market price fluctuation and inflation besides the Russian-Ukraine conflict.

For this reason, solar pumping is becoming more and more popular in Egypt so, GEBAL's nexus greenhouse models are entirely powered by solar energy given the many sunny days and the long sunshine hours.



SDG 8: Decent Work and Economic Growth

Farmers in Egypt's rural areas often do not get as much money for their products as they deserve.

This is the case because products are often sold at Farmgate or on lower price rural markets.

The nexus greenhouse allows farmers to produce a higher quality product that can be marketed at a higher price.



SDGs 11 and 12: Sustainable Cities and Communities / Responsible Consumption and Production

Construction, transportation, farming, packaging, and consumption are all processes that are not always very sustainable in Egypt.

As mentioned before the use of Diesel-powered pumps and vehicles, old pumps and vehicles that are responsible for increased air pollution, unsustainable farming techniques that are not very water- or energy-efficient and that depend on chemical fertilizer and pesticides, packaging of food and agricultural products in plastic and Styrofoam materials, and the consumption of unhealthy food are all examples of unsustainable living patterns in Egypt's communities. Daily behaviors, including the farming process, are often high in CO₂ emissions and contribute negatively to the country's carbon footprint.

GEBAL's nexus greenhouses are models and living labs built close to farming communities that function as examples of how farming and food production can be more sustainable. Showing farmers, a model of efficient water and electricity consumption that has zero carbon emissions and that increases food production while lowering resource consumption is an important step towards upscaling such sustainable practices.



SDG 13: Climate Action

Climate change is a real and undeniable threat to our entire civilization, it leads to global warming that is occurred due to many reasons one of the main reasons is what occurred by the agricultural sector which is represented in greenhouse gases in the atmosphere, caused primarily by the burning of fossil fuels.

The nexus greenhouse replaces fossil fuel by using solar panels to generate power as a renewable energy source which offers a sustainable solution to the challenges of climate change, while also providing long-term economic benefits.



Proposed operating model

The integrated farming approach aims to maximize productivity while minimizing the use of resources and reducing the costs of fertilizers and pesticides. This approach involves utilizing every by-product of the farming system and creating an ecosystem where natural processes work together in a balanced environment. This concept is based on the interconnections between the components of a functioning ecosystem, which is borrowed from nature itself. By implementing this approach, farmers can save money and resources while creating a sustainable and efficient agricultural system.

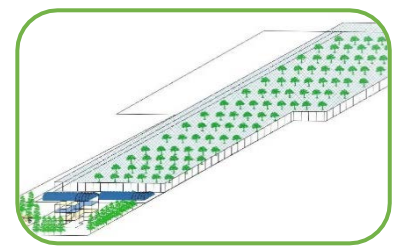
Sustainable and advanced climate-smart agriculture is divided into two types:

- **Controlled greenhouse**
 - Poultry-based agriculture.
 - Aquaculture
- **Shading net**
- **Nexus open farm**

Controlled greenhouse

Poultry-based agriculture

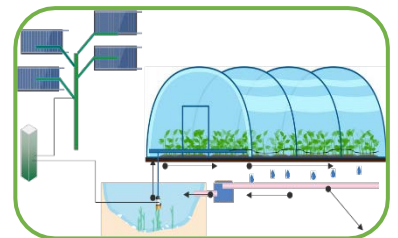
The integrated farming concept involves the efficient use of resources and farming by-products, such as animal manure, to improve soil and plant health. The proposed farming concept combines fruit tree and vegetable production with poultry farming, specifically ducks and chickens, which produce high-value meat and eggs while consuming leftover food scraps and plant residues. The poultry component will provide organic manure and help reduce the farm's waste, thus reducing the costs of fodder. The project estimates the production of **30,000 baladi eggs**, **4,000 kg of duck meat**, and **7,000 duck eggs per year**, which can be sold for competitive prices. Additionally, the project aims to engage the community and empower women by hiring two women to manage this project component on a part-time basis.



Greenhouse with poultry farming

Shading Net

A shading net greenhouse is a structure designed for plant growth that uses a shade cloth or netting to regulate the amount of sunlight and heat entering the greenhouse. A shading net greenhouse is a cost-effective and flexible option for providing optimal growing conditions for plants in areas with intense sunlight or high temperatures.



Shading net

Open Farm Agriculture Model

Traditional farming in Egypt is the method adopted by most farmers in the country which relies heavily on outdated traditional practices and techniques that are inefficient in terms of resource use and environmental conservation. Conventional farming may be unsustainable for several reasons:

- **Use of flood irrigation:** Traditional agriculture in Egypt relies heavily on flood irrigation, which is an inefficient method of using water. This type of irrigation requires large amounts of water and leads to significant evaporation and seepage of water into the soil without making full use of it.
- **Use of chemical pesticides and fertilizers:** Due to the deterioration of soil quality in Egypt, farmers are increasingly relying on the use of chemical pesticides and fertilizers to increase productivity and control pests. However, these practices cause soil and water pollution and affect ecosystems and human health.
- **Monoculture:** Traditional agriculture in Egypt relies heavily on monocultures, which means growing one type of crop on the same land on a large scale. This increases the susceptibility of crops to pests and diseases and makes them more susceptible to deterioration.
- **Use of conventional fuels:** In conventional agriculture, water pumps are powered by conventional diesel or electricity, which leads to carbon dioxide emissions. The use of diesel is also costly due to the high price of fuel.



Figure 19 Open Farm Agriculture



Figure 20 Flood irrigation



Figure 21 Chemical pesticides and fertilizers

In general, traditional agriculture in Egypt suffers from many challenges and is a burden on limited resources, including water, soil, and energy. Therefore, Egyptian farmers must switch to sustainable and efficient agricultural practices, such as adopting modern irrigation techniques, using solar energy to operate agricultural pumps, diversifying crops, and improving resource management.

Nexus open farming model

Integrated farming systems that enable nutrient cycling have been linked with sustainable agriculture reduced fertilizer and water use, and have been researched for their environmental impact. Moreover, they save farmers money on electricity costs, fertilizer, pesticides and expenses for soil improvement.



Figure 22 Nexus open farming model

The Infrastructure Components of this model

Solar Energy System for Water Pumping and Irrigation:

The Gebal proposed solar energy system aims to utilize solar power for water pumping and irrigation, taking advantage of Egypt's geographical location in the "sun-belt" region. This system offers a sustainable alternative to diesel or grid electricity-driven pumping in irrigation, providing several benefits such as cost savings, reduced pollution, and support for climate-smart agriculture.

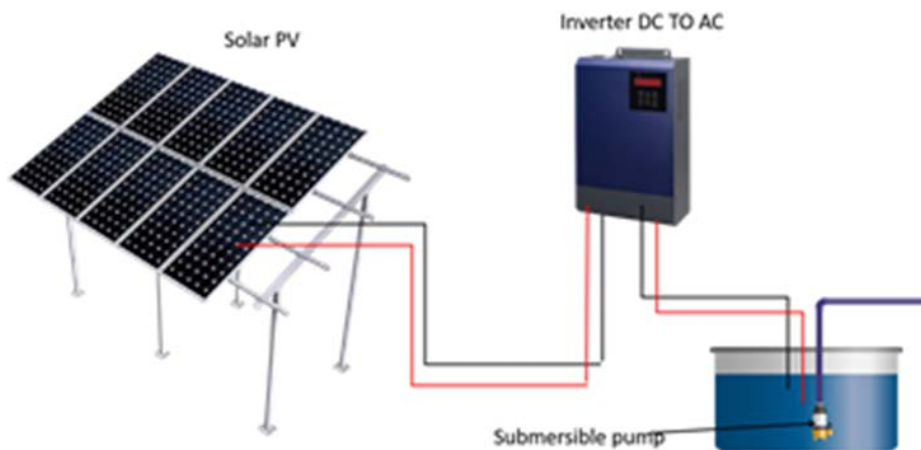


Figure 23 Solar Energy System for Water Pumping and Irrigation

The key components of the solar energy system include:

- **Concrete foundations on the rooftop of the house:** These foundations provide stability and support for the system components.
- **Metal frames for PV modules/panels:** The PV modules or panels will be mounted on metal frames to ensure their proper installation and secure positioning.
- **PV modules:** The system comprises PV modules, each with a rating of 500Wp (watt-peak). PV modules are interconnected solar cells that convert solar irradiance into electrical energy.
- **DC-AC inverter:** This component is responsible for converting the electricity generated by the PV modules into a form suitable for operating the water pump(s).

- **Wiring, interconnection, and control:** All system components need to be properly wired, interconnected, and controlled to ensure efficient functioning.

The Irrigation System:

GEBAL proposes the implementation of a drip-irrigation system for open field crops, the orchard, and the greenhouses. Drip irrigation involves delivering water at low rates directly to the soil near the plant's root zone through a system of emitters or drippers.



Figure 24 The Irrigation System

Fertilizers

This model proposes to rely on organic fertilizers, which can be obtained from :

- while animal manure produces clean and organic manure that, in turn, can be used to improve the nutrient cycle, soil and plant health on the fields.
- Providing compost mass left over from agricultural waste .

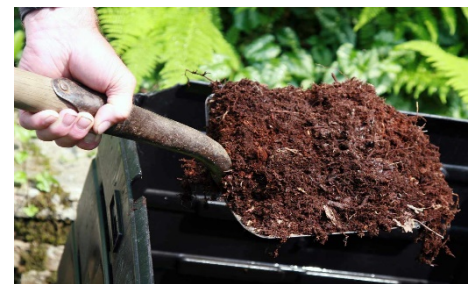


Figure 25 Organic fertilizers

Applications of Nexus open farming

Nexus Farming is a type of integrated production system that combines crops and **livestock such as**

- **Animals:** sheep, goats or cattle.
- **Poultry:** chickens, turkeys, ducks, geese, ostrich, etc.
- **Fish Farming**

The system relies on the accumulation of sufficient soil organic matter to support crop production, while crop residues serve as fodder for livestock and grains provide supplementary feed.

Animals in Nexus Farming play multiple essential roles in the functioning of the farm beyond providing livestock products. They contribute to the overall sustainability of the system by maximizing benefits and supporting food and livestock production. Some key roles of animals in Nexus Farming include:

- **Livestock products:** Animals provide a range of valuable products such as meat, milk, eggs, wool, and hides, which can be used for consumption or generate income.
- **Work and transportation:** Animals, particularly ruminants, can be utilized for farm operations, including ploughing, transportation.
- **Nutrient cycling:** Animal waste, including excreta, contains essential nutrients and organic matter that improve soil structure and fertility. This contributes to efficient resource use and reduces the risk of soil degradation.
- **Soil health:** Animal waste enriches the soil with organic matter, promoting moisture retention, beneficial microbial activity, and overall soil health. This enhances crop growth and resilience to environmental stresses.

Nexus Farming emphasizes efficient resource use, soil conservation, and environmental sustainability. By integrating crops and livestock, this system optimizes the benefits of both components, supports food and livestock production, and promotes a balanced and sustainable agricultural approach.



Figure 26 Figure 1 Nexus open farming Solar energy



Figure 27 Nexus open farming irrigation

One of the previous models implemented by Gabal Egypt:

Miss. Samar A. Abdul-Aziz Project / Farm A Sustainable, Integrated Farm in the Delta which is an integrated production system that combines crops and Poultry production.

The poultry/egg incubator component of the integrated farming concept:

- **Combination of duck and chicken farming:** Ducks are easy to raise, less prone to diseases, and produce high-value meat. Chickens provide eggs and meat. Both poultry species can consume food scraps and on-farm residues while producing valuable manure.
- **Organic manure production:** The poultry component aims to deliver **around 12 tons of organic manure annually**, which can be used to improve nutrient cycling, soil health, and plant growth on the farm. Poultry will consume leftover food scraps and overripe fruits or vegetables and process them into valuable manure, reducing fodder costs.
- **Compost production:** The remaining compost mass (**around 10 tons**) will be provided by agricultural waste from greenhouses and orchard trees.
- **Baladi egg production:** **Starting** with **100** two-week-old chicks (Batch 0), the chicks will be raised in a natural and animal-friendly environment. After 6 months, the mature hens will start laying an average of **100 baladi eggs** per day. Fertilized eggs will be incubated to produce subsequent batches.
- **Egg and meat sales:** The farm is projected to produce and sell approximately **30,000 baladi** eggs per year. Additionally, around **4,000 kg** of duck meat will be produced. Duck eggs can also be sold.
- **Community engagement and women empowerment:** The poultry component suggests hiring two women on a part-time basis to manage the project, providing employment opportunities and empowering women in the community.

In summary, the poultry/egg incubator component of the integrated farming concept focuses on combining duck and chicken farming to produce organic manure, baladi eggs, and duck meat. The component aims to contribute to the farm's nutrient cycle, reduce waste, engage the community, and generate revenue while promoting sustainability and women empowerment.

Advantage of Nexus poultry open farming

The integrated farming concept offers multiple benefits, including increased productivity, resource savings, and cost reduction. By utilizing every by-product of the farming system and promoting interconnections between different components, integrated farming mimics the balanced environment found in nature. This approach not only saves money that would otherwise be spent on fertilizers and pesticides but also maximizes the use of available resources. By borrowing from the interconnectedness of natural ecosystems, integrated farming creates a harmonious and sustainable environment where natural processes work together to enhance productivity and conserve resources.

Solar Energy System

The utilization of a solar system for water pumping and irrigation offers environmental, economic, and social benefits. Environmentally, it reduces the farm's CO2 footprint and positions the Farm as an eco-aware farm, which can be advantageous for its marketing strategy. Economically, the solar system provides independence from grid stability issues, diesel availability, and rising electricity bills and diesel prices. Comparing the costs of operating a water pump with grid electricity and diesel, the solar system proves to be a cost-effective and attractive long-term investment. Socially, the system helps farmers understand the benefits of solar energy and renewable sources, dispelling myths and promoting training sessions for farmers to operate, maintain, and troubleshoot the system effectively.

Irrigation System

This method offers several advantages over flood irrigation and sprinkler irrigation:

- **Water efficiency:** Drip irrigation requires significantly less water compared to flood irrigation, with water-use efficiency reaching up to **95%**. Sprinkler irrigation also consumes more water than drip irrigation.
- **Homogeneous water distribution:** Drip irrigation ensures that water is distributed uniformly between plants, as the irrigation network is designed to reach each tree and plant effectively.
- **Fertigation capability:** Fertilizers can be mixed directly with the irrigation water (fertigation) in a centralized location and evenly distributed to plants, enhancing nutrient management.
- **Manpower efficiency:** Drip irrigation requires fewer workers, as one person can operate a network serving up to **100 acres**.
- **Weed control:** Drip irrigation reduces weed growth, as the soil is only moistened in the root area.

- **Energy efficiency:** Drip irrigation consumes **40%** less energy compared to sprinkler irrigation.

The challenges associated with drip irrigation include proper emitter distribution and regular maintenance to prevent clogging and salt accumulation in the soil. The irrigation system will be installed as a network across the entire farm area.

A Poultry Business and Egg Incubator

Some benefits of a poultry business and an egg incubator:

- There is an increasing demand on healthy and eco-friendly poultry proteins
- Poultry will produce very valuable manure which can be used as liquid fertilizers nourishing the soil and strengthening the trees
- Eggshells are rich in calcium and protein. The compost production and thus plants will benefit from.
- Incubators give healthy chicks, guarantee better yields and encourage hens to lay more eggs (as in usual cases, the hen will not lay any new eggs unless the previous ones are totally hatched)
- Reduces the risk of spreading parasites and certain diseases in comparison to natural incubation.
- The new experience of an egg-incubator will encourage social engagement: the whole process of picking the fertilized eggs, observing the incubation period, taking care of the chicks and breeding the poultry will be very attractive activities for social engagement, especially that of children, girls and women.



Figure 28 Egg incubator



Figure 29 Nexus open farming / Poultry

Risk Assessment Brief

After analyzing the risk management plan for an integrated and sustainable greenhouse, it was determined that certain risks were deemed to be the most probable and impactful, while also providing the most likely opportunities.

Risk Matrix

		Low	Medium	High
		3	6	9
Probability				
High	9	T27, T29	T25	T1, T3, T31, O6, O7, O8, O9
Medium	6	T16, T20	T22, T26	T4, T5, T7, T8, T21, T23, O3
Low	3	T11, T13, T15, T18, T30	T6, T12, T14, T28, O1, O2	T2, T9, T10, T17, T19, T24, T32, T33, O4, O5
		Impact		
		Low	Medium	High

High	Medium	Low

Based on our analysis of the challenges and risks, we have identified that the most significant risks facing the industry are operational risks, which can be overcome through skilled labor and modern, precise systems. However, we have identified that the most likely and high-impact risks are T1, T3, and T31 which are untrained labor, diseases, and pests, as well as the high cost of this farming method. The least significant risks are T11, T13, T15, T18, and T30 which are representing crop losses, incorrect salinity testing, shading net damage, lack of networked marketing, and increased irrigation water usage.

SME consulting has identified the most promising opportunities, which include:

- Land reclamation
- Improving product quality to enter new markets
- Investing in fish farming
- Training and equipping farms with new technologies

All of which can lead to increased investment.

Legal Feasibility

Green Houses license⁴⁰

There is a discrepancy among governorates regarding whether farms are required to obtain licenses or not.

Even if farms are not required to obtain general operating licenses in some governorates, certain approvals and monitoring are still necessary for the water wells and irrigation sources. The key requirements are:

- A license to install a water meter on the well, to monitor the water usage.
- Analysis of the soil and water salinity levels, to ensure the water is suitable for irrigation and will not damage crops or the soil over time.

Banks have specific requirements that must be met by farmers who wish to obtain a loan:

- The land possession contract, ownership contract, or lease agreement, as well as the farmer's ID card (كارت الفلاح).
- If it is an agricultural company, commercial registration and a tax card are required.



Figure 30:Farmer's ID Card



Figure 33:Farmer's ID Card



Figure 38:Online commercial registration



Figure 37:Tax card



Figure 36:Commercial registration

⁴⁰ <https://www.youm7.com/story/2020/6/14/%D9%84%D9%85%D8%B2%D8%A7%D8%B1%D8%B9%D9%89-%D8%A7%D9%84%D8%AE%D8%B6%D8%A7%D8%B1-%D8%AA%D8%B9%D8%B1%D9%81-%D8%B9%D9%84%D9%89-%D8%A7%D9%84%D8%A3%D9%88%D8%B1%D8%A7%D9%82-%D8%A7%D9%84%D9%85%D8%B7%D9%84%D9%88%D8%A8%D8%A9-%D9%84%D9%84%D8%AD%D8%B5%D9%88%D9%84-%D8%B9%D9%84%D9%89-%D8%B1%D8%AE%D8%B5%D8%A9-%D8%B5%D9%88%D8%A8%D8%A9/4807053#:~:text=%2D%D8%B1%D8%B3%D9%85%20%D9%83%D9%88%D8%B1%D9%83%D9%89%20%D9%85%D9%86%20%D8%A3%D8%B5%D9%84%20%D9%88%D8%B5%D9%88%D8%B1%D8%A9,%D8%B9%D9%82%D8%AF%20%D8%A7%D9%84%D8%A3%D8%B1%D8%B6%20%D8%A5%D9%8A%D8%AC%D8%A7%D8%B1%20%D8%A3%D9%88%20%D8%AA%D9%85%D9%84%D9%83.>

A license for a vegetable greenhouse⁴¹

Procedures for farmers wishing to obtain a license for the vegetable greenhouse are as follows:

- Issuing a report of an inspection of the area of the application for a greenhouse license, of an original and a copy, to be prepared and approved by the competent Directorate of Agriculture.
- Drafted map of an original and a copy edited and approved by the competent Directorate of Agriculture.
- 2 recent photographs of the license holder whose name the application was drawn up.
- Postal transfer in the name of the engineer, head of the Central Department of Orchards - third accounts of the Ministry of Agriculture. (Third accounts here refer to the bank account of the Central Department of Horticulture in the Ministry of Agriculture).
- A copy approved by the Association of Possession or a land lease or ownership contract.
- The documents related to licenses shall be sent to the Central Department of Horticulture to obtain the license from the competent Directorate of Agriculture.
- The cost of obtaining a license is 20 pounds.
- The validity of the license is one year from the date of its issuance.

The head of the vegetable department clarified that the cost of obtaining a license for a greenhouse is 20 Egyptian pounds and that the vegetable department continues its work to grant more approvals for agricultural greenhouse licenses.

According to our contacts with Eng. Ahmad Abdelrahman one of the experts, the cost can reach EGP 50:70.

⁴¹ <https://www.youm7.com/story/2020/6/14/%D9%84%D9%85%D8%B2%D8%A7%D8%B1%D8%B9%D9%89-%D8%A7%D9%84%D8%AE%D8%B6%D8%A7%D8%B1-%D8%AA%D8%B9%D8%B1%D9%81-%D8%B9%D9%84%D9%89-%D8%A7%D9%84%D8%A3%D9%88%D8%B1%D8%A7%D9%82-%D8%A7%D9%84%D9%85%D8%B7%D9%84%D9%88%D8%A8%D8%A9-%D9%84%D9%84%D8%AD%D8%B5%D9%88%D9%84-%D8%B9%D9%84%D9%89-%D8%B1%D8%AE%D8%B5%D8%A9-%D8%B5%D9%88%D8%A8%D8%A9/4807053#:~:text=%2D%D8%B1%D8%B3%D9%85%20%D9%83%D9%88%D8%B1%D9%83%D9%89%20%D9%85%D9%86%20%D8%A3%D8%B5%D9%84%20%D9%88%D8%B5%D9%88%D8%B1%D8%A9,%D8%B9%D9%82%D8%AF%20%D8%A7%D9%84%D8%A3%D8%B1%D8%B6%20%D8%A5%D9%8A%D8%AC%D8%A7%D8%B1%20%D8%A3%D9%88%20%D8%AA%D9%85%D9%84%D9%83.>

Aquaponics license⁴²

- Decision No. 13 for the year 2018
- After reviewing Law 124 for the year 1983 and its executive regulations and amendments.
- And the presidential decree No. 465 for the year 1987 and its amendments
- And Law No. 81 for the year 2016
- And the memo of the Central Administration for Production and Operation
- And for the interest of work

Article 1:

All licenses that are issued and contained in the following clauses stipulated in this decision are not considered a deed of possession, ownership, or usufruct over the land on which they are built. They are also not obligatory for the state with all its agencies to connect the utilities except with the approval of those authorities, and they are not exempt from any violation stipulated in another law. Contrary to Law 124 of 1983.

Article 2:

First: Licenses for managing fish farms are issued as follows:

Issuing licenses to manage and operate an integrated fish farm with plant cultivation on desert lands and others, by following conditions:

Ensure the use of wastewater for fish farming by following procedures:

- Submitting a request to the General Administration of Lakes and Fish Ponds, including a statement of the area of the fish farm and the area of land to be cultivated.
- In all cases, the amount of water used in fish farming should not exceed the water needs of the plant-grown area, so that all the fish farm water is used in plant culture.
- Submitting a document of the legality of the land subject to the license, whether it is a lease, ownership, usufruct license, or an acknowledgment by the license holder of his legal possession of the land.
- Provide a schematic drawing of the farm ponds, indicating their dimensions, to collect the fish farm drainage output and the plant culture area.
- Determine the source of irrigation for the farm.
- The applicant pays 1,500 pounds for the site inspection to ensure that the schematic drawing submitted by him matches the site.

⁴² [Mohamed Shihab - Aquacultures \(kenanaonline.com\)](http://www.kenanaonline.com) الهيئة و إبعاد الزرى من ترخيص المزارع التكاملية (سمكية-نباتية) - محمد شهاب - محمد شهاب- المزارع السمكية

- Initial approval is issued
- Initial approval for the establishment of the farm is issued, provided that the applicant is notified to the Authority before starting the operation of the farm to re-inspect without fees to verify the previous conditions.
- In case of commitment, the license is issued to manage the farm after paying the fees, and the license is valid for two years.

Second: Establishing modern integrated fish farms called Aquaponics. A management and operation license are issued as follows:

- Submitting to the General Administration of Lakes a statement of the area in which the farm is to be established, attached to the plan and boundaries of the site.

Tax responsibilities

- Agricultural companies are subject to a corporate tax of **22.5%**.
- The government provides tax exemptions for farmers.
 - **The income tax law specified exemptions for profits:**⁴³
Income tax exemptions on the profits of land reclamation or cultivation facilities for 10 years starting from the date of starting the activity.

⁴³ <https://www.youm7.com/story/2023/1/28/3>

Investment Analysis Brief

Introduction

Our Financial analysis has been performed for the 3 nexus models we have covered in the study (Greenhouse-Shading Net-Open field).

Each implemented Gebal farming model exhibits varying levels of productivity and selling prices, influenced by factors such as soil type, irrigation methods, crop selection, land size and other agricultural variables.

However, for the purpose of conducting financial calculations and facilitating easy comparison, we have made certain assumptions. We have considered a standardized land size of 620 m² across all models and chosen cucumber as the uniform crop. This allows us to establish a consistent basis for evaluation and enables a more straightforward comparison of the financial aspects associated with each farming model.

By employing this standardized approach, we aim to provide a clear and coherent analysis of the financial viability of the different farming models.

Greenhouse Model

The Greenhouse model using Nexus Farming (Fishpond supported) provides great sustainability factors for water, energy and food. In our model, Fish production is used as a source of protein for the farming family and has 0 revenue.

Greenhouse components:

1. Greenhouse infrastructure
2. Solar system
3. Irrigation system

Greenhouse Purchase Cost	Cost	Lifetime
Greenhouse infrastructure	330,000	10 years
Solar system	375,000	10 years
Irrigation system	166,000	10 years
Total	721,000	

Note: All prices are in Egyptian Pound.

-The project has an initial investment cost of approximately 1,400,000 EGP, which includes working capital. The financing for the project consists of 27% equity and 73% debt. The target capital 378,000 EGP, while the targeted debt portion is 1,022,000 EGP, including financing costs during the implementation period.

The debt tenor is estimated of 10 years with an interest rate of 5%.

For the greenhouse operations, the farming land covers an area of 640 m². The chosen crop is cucumber. There is a transportation expense of 4000 EGP/ year and a monthly salary of 300 EGP for an Engineer. It is assumed that the land is owned by the farmer, and its value increases by 10% annually. After 10 years, the estimated salvage value of the land reaches 959,685 EGP.

The retail selling price for the crop is calculated for 3 scenarios;

- 1- At 16 EGP/Kg with a productivity rate of 23 Kg/sqm/year.
- 2- At 17.5 EGP/Kg with a productivity rate of 21 Kg/sqm/year.
- 3- At 18.75 EGP/Kg with a productivity rate of 21 Kg/sqm/year.

Upon the farmers ability of negotiating the price and the correspondent profitable productivity, he can decide which scenario to follow. The retail selling represents the main selling scenario (100% of the quantity).

Based on these factors, the capital budgeting indicators for selling at price **16 EGP/Kg** are as follows:

- The average rate of return on invested capital (ROI) is 215.66%.
- The internal rate of return (IRR) is 14.4%, influenced by the high interest rate.
- The investment cost recovery period (payback period) is approximately 7 years.
- The net present value (NPV) amounts to 24,098 EGP.

While, the capital budgeting indicators for selling at price **17.5 EGP/Kg** are as follows:

- The average rate of return on invested capital (ROI) is 215.66%.
- The internal rate of return (IRR) is 14.4%, influenced by the high interest rate.
- The investment cost recovery period (payback period) is approximately 7 years.
- The net present value (NPV) amounts to 24,098 EGP.

And, the capital budgeting indicators for selling at price **18.75 EGP/Kg** are as follows:

- The average rate of return on invested capital (ROI) is 228.00%.
- The internal rate of return (IRR) is 15.7%, influenced by the high interest rate.
- The investment cost recovery period (payback period) is approximately 7 years.
- The net present value (NPV) amounts to 115,226 EGP.

Shading Net Model

The Shading net model using Nexus Farming differs from the greenhouse that it is not weather controlled.

Shading net components:

1. Shading net model infrastructure
2. Solar system
3. Irrigation system
4. Fish tank system

Shading net Purchase Cost	Cost	Lifetime
Shading net infrastructure + Fish tank system infrastructure	210,000	10 years
Solar system	375,000	10 years
Irrigation system	100,000	10 years
Total	685,000	

Note: All prices are in Egyptian Pound.

-The project has an initial investment cost of approximately 1,200,000 EGP, which includes working capital. The financing for the project consists of 31.8% equity and 68.12% debt.

The target capital 370,000 EGP, while the targeted debt portion is 790,000 EGP, including financing costs during the implementation period.

The debt tenor is estimated of 10 years with an interest rate of 5%.

Same operations inputs in the greenhouse model apply to the shading net model. The expected cucumber productivity starts from 13 Kg/sqm/year, however to achieve the minimum profitability the farmer needs to produce 19 Kg/sqm/year and at price 17,500 EGP/Kg, at least.

The capital budgeting indicators for selling at price **17.5 EGP/Kg** are as follows:

- The average rate of return on invested capital (ROI) is 233%.
- The internal rate of return (IRR) is 15%, influenced by the high interest rate.
- The investment cost recovery period (payback period) is approximately 7 years.
- The net present value (NPV) amounts to 10,959 EGP.

Nexus Open Field Farming Model

The Nexus Open Field model using Nexus Farming differs from the greenhouse that it is not weather controlled and the shading net models.

Nexus Open Field components:

1. Solar system
2. Irrigation system
3. Fish tank system

Open Field Farm Purchase Cost	Cost	Lifetime
Fish tank system infrastructure	110,000	10 years
Solar system	375,000	10 years
Irrigation system	100,000	10 years
Total	585,000	

Note: All prices are in Egyptian Pound.

-The project has an initial investment cost of approximately 1,050,500 EGP, which includes working capital. The financing for the project consists of 35.22% equity and 64.78% debt.

The target capital 370,000 EGP, while the targeted debt portion is 680,500 EGP, including financing costs during the implementation period.

The debt tenor is estimated of 10 years with an interest rate of 5%.

Same operations inputs in the shading model apply to the nexus open field farming except for the shading nets and the related infrastructure to the shading nets model.

The expected cucumber productivity starts from 13 Kg/sqm/year, however to achieve the minimum profitability the farmer needs to produce 16.5 Kg/sqm/year and at price 22.5 EGP/Kg, at least.

The capital budgeting indicators for selling at price **22.5 EGP/Kg** are as follows:

- The average rate of return on invested capital (ROI) is 242.07%.
- The internal rate of return (IRR) is 15.4%, influenced by the high interest rate.
- The investment cost recovery period (payback period) is approximately 7 years.
- The net present value (NPV) amounts to 14,971 EGP.

Notes:

1-Considering the natural production methods, the farmer employs, which utilize fewer chemicals and promote sustainability, there is a significant opportunity to explore exporting as an additional revenue stream. The demand for organically grown products has been steadily increasing, presenting a favorable market for your farm's offerings.

By expanding into the export market, the farmer can leverage the unique selling point of your naturally produced crops. This distinction allows for greater flexibility in negotiating prices and potentially commanding higher rates for your products. Capitalizing on the growing consumer preference for organic and environmentally friendly goods can significantly contribute to your farm's profitability.

2- By lowering the interest rate, we can effectively decrease the cost of borrowing and improve the farm overall financial position. This reduction in interest expense will allow us to allocate more resources towards productive activities and investments, thereby enhancing the performance and profitability of our project.

Furthermore, a lower interest rate would positively impact our payback period. With reduced interest charges, we can expedite the repayment of our debt obligations, accelerating the timeline for achieving financial stability and reducing the overall burden of debt on our organization.

Scope of work limitations

All the **financial information reference** was Gebal's and the prices from the suppliers they provided SME Consulting, based on the existing operating farm of Dandara.

However, very thoughtful research was made to try to validate the shared figures through the available tools like online research and relevant benchmarking of other farms' analysis and experts' judgment, when we could.

In addition to some future estimates that were based on many acceptable assumptions from the data and information that was collected.

As followed in this type of work, the results obtained are valid for a limited period of time and must be re-evaluated at regular intervals based on many aspects in the agriculture industry.

SME Consulting will not be liable to you in respect of any business losses, including without limitation loss of or damage to profits, income, revenue, use, production, anticipated savings, business, contracts, commercial opportunities or goodwill after the project delivery date estimated to be end of September 2023.

The achievement of future revenues, profits and cash flows as described in this study is subject to the availability of the following factors:

- The stability of the currency in Egypt.
- Securing possible markets to sell the products and accordingly commit to the bank payments.
- Implementation of the project high operation system maintenance.
- Availability of trained and skilled technical labor.
- All the other key drivers like – but not limited to - productivity per square meter and target price are achieved

References

1. <https://www.fao.org/climate-smart-agriculture/en/>
2. <https://www.notesonzoology.com/india/fishery/integrated-fish-farming-principles-advantages-and-disadvantages/787>
3. <https://www.almaal.org/the-most-important-and-profitable-agriculture-in-egypt>
4. <https://www.alroeya.com>
5. <https://igrownews.com/aquaponics-a-sustainable-efficient-farming-method>
6. <https://www.alroeya.com/>
7. <https://al-ain.com/article/aquaponics-food-security-arab-experiences>
8. <https://www.jic.ac.uk/blog/how-can-we-produce-more-food-on-less-land/>
9. <https://swiss-food.ch/en/articles/production-more-food-with-fewer-resources>
10. <https://www.theswitchers.eu/en/switchers/plant-fish-farming-technical-know-how-marketing-savvy-egypt/#>
11. <https://alfallahalyoum.news/>
12. <https://www.technavio.com/report/egypt-fruits-and-vegetables-market-analysis>
13. <https://www.mordorintelligence.com/ar/industry-reports/egypt-fruits-and-vegetables-market>
14. <https://hal.science/hal-02137639/document>
15. <https://www.fibl.org/en/>
16. <https://www.fibl.org/fileadmin/documents/shop/1254-organic-world-2023.pdf>
17. <https://alfallahalyoum.news/>
18. <https://egyptianstreets.com/2018/09/24/egypts-organic-food-movement/>
19. <https://blog.growlink.com/benefits-of-greenhouse-farming#:~:text=What%20is%20Greenhouse%20Farming%3F,its%20plants%20from%20extreme%20conditions.>
20. <https://web.archive.org/web/20160805090350/http://www.sekem.com/assets/the-future-of-agriculture-in-egypt.pdf>
21. https://scholar.cu.edu.eg/sites/default/files/redagreen/files/advanced_applications_of_solar_energy_in_agricultural_greenhouses.pdf
22. <https://agricultureegypt.com/Agenda/Articles/>
23. <https://www.technavio.com/report/egypt-fruits-and-vegetables-market-analysis>
24. <https://www.technavio.com/report/egypt-fruits-and-vegetables-market-analysis>
25. <https://web.archive.org/web/20160805090350/http://www.sekem.com/assets/the-future-of-agriculture-in-egypt.pdf>
26. <https://www.aquagardening.com.au/aquaponics/filtration/filters/#:~:text=Bio%20filters%20are%20used%20to,into%20food%20suite%20for%20plants.>
27. <https://www.agrifarming.in/drip-irrigation-system-complete-guide>
28. <https://www.agrifarming.in/key-rules-to-maintain-water-quality-in-aquaculture-parameters-management-effects-of-water-quality-on-fish-growth>
29. https://aja.journals.ekb.eg/article_120314_a75ea116efa4cc5cc350d4ce5fe5906f.pdf
30. <https://drive.google.com/file/d/15VNJuCUR-0TtpiS7-j7nnp5oJcCfIZFh/view?usp=sharing>
31. <https://www.mordorintelligence.com/industry-reports/egypt-fruits-and-vegetables-market>
32. <https://drive.google.com/file/d/15VNJuCUR-0TtpiS7-j7nnp5oJcCfIZFh/view?usp=sharing>
33. <https://drive.google.com/file/d/1MxdAgW5pBccL4C-KajZyGqaeyKtcqyIV/view?usp=sharing>
34. <https://planting.mawdoo3.com/p/>
35. <https://daily.rosaelyoussef.com/>
36. <https://akhbarelyom.com/news/newdetails>
37. <https://www.usda.gov/media/blog/2012/03/22/organic-101-what-usda-organic-label-means>
38. [Nexus approaches to global sustainable development Jianguo Liu1 *, Vanessa Hull2, H. Charles J. Godfray3,4, David Tilman5 , Peter Gleick 6 , Holger Hoff7,8 , Claudia Pahl-Wostl9 , Zhenci Xu1 , Min Gon Chung1 , Jing Sun1,10 and Shuxin Li1](#)
39. <https://www.youm7.com/story/2020/6/14/%D9%84%D9%85%D8%B2%D8%A7%D8%B1%D8%B9%D9%89-%D8%A7%D9%84%D8%AE%D8%B6%D8%A7%D8%B1-%D8%AA%D8%B9%D8%B1%D9%81-%D8%B9%D9%84%D9%89-%D8%A7%D9%84%D8%A3%D9%88%D8%B1%D8%A7%D9%82-%D8%A7%D9%84%D9%85%D8%B7%D9%84%D9%88%D8%A8%D8%A9-%D9%84%D9%84%D8%AD%D8%B5%D9%88%D9%84-%D8%B9%D9%84%D9%89-%D8%B1%D8%AE%D8%B5%D8%A9-%D8%B5%D9%88%D8%A8%D8%A9/4807053#:~:text=2D%D8%B1%D8%B3%D9%85%20%D9%83%D9%88%D8%B1%D9%83%D9%89%20%D9%85%D9%86%20%D8%A3%D8%B5%D9%84%20%D9%88%D8%B5%D9%88%D8%B1%D8%A9,%D8%B9%D9%82%D8%AF%20%D8%A7%D9%84%D8%A3%D8%B1%D8%B6%20%D8%A5%D9%8A%D8%AC%D8%A7%D8%B1%20%D8%A3%D9%88%20%D8%AA%D9%85%D9%84%D9%83.>
40. <https://www.youm7.com/story/2020/6/14/%D9%84%D9%85%D8%B2%D8%A7%D8%B1%D8%B9%D9%89-%D8%A7%D9%84%D8%AE%D8%B6%D8%A7%D8%B1-%D8%AA%D8%B9%D8%B1%D9%81-%D8%B9%D9%84%D9%89-%D8%A7%D9%84%D8%A3%D9%88%D8%B1%D8%A7%D9%82-%D8%A7%D9%84%D9%85%D8%B7%D9%84%D9%88%D8%A8%D8%A9-%D9%84%D9%84%D8%AD%D8%B5%D9%88%D9%84-%D8%B9%D9%84%D9%89-%D8%B1%D8%AE%D8%B5%D8%A9-%D8%B5%D9%88%D8%A8%D8%A9/4807053#:~:text=2D%D8%B1%D8%B3%D9%85%20%D9%83%D9%88%D8%B1%D9%83%D9%89%20%D9%85%D9%86%20%D8%A3%D8%B5%D9%84%20%D9%88%D8%B5%D9%88%D8%B1%D8%A9,%D8%B9%D9%82%D8%AF%20%D8%A7%D9%84%D8%A3%D8%B1%D8%B6%20%D8%A5%D9%8A%D8%AC%D8%A7%D8%B1%20%D8%A3%D9%88%20%D8%AA%D9%85%D9%84%D9%83.>
41. [الهيئة و إبعاد الرى من ترخيص المزارع التكاملية\(سمكية-نباتية\) - محمد شهاب - محمد شهاب- المزارع السمكية \(kenanaonline.com\)](#)
42. <https://www.youm7.com/story/2023/1/28/3>