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MALR
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Ministry of Agriculture & Land Reclamation
US Agency For Intl. Development
Agriculture Policy Reform Program
Reform Design and Implementation

وزارة الزراعة واستصلاح الأراضي
الوكالة الأمريكية للتنمية الدولية
مشروع إصلاح السياسات الزراعية
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Ministry of Agriculture and Land Reclamation

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Reform Design and Implementation Unit

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PN-ACS-422

Report No. 74

POLICY, TECHNICAL AND ECONOMIC ISSUES AFFECTING THE ESTABLISHMENT OF PRIVATE COLD STORAGE FACILITIES

WITHIN THE CUSTOMS AREA OF THE CAIRO INTERNATIONAL AIRPORT:

A PRE-FEASIBILITY CONSULTANCY

Prepared by:
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ACRONYMS LIST

APRP – Agriculture Policy Reform Program
ATUT - Agricultural Technology Utilization & Transfer Project
BOT – Build, Operate, and Transfer
CAA - Cairo Airport Authority
CAv.A – Civilian Aviation Authority
EA – Egypt Air
EAS – Egypt Aviation Services
FOB – Free On-Board
HEIA - Horticultural Export Improvement Association
IRR – Internal Rate of Return
MALR – Ministry of Agriculture and Land Reform
PD – Presidential Decree
RDI – APRP Reform Design and Implementation Unit
S.A.E. – Egyptian Private Stockholding Corporation
ULD – Unit Lift Devices
USAID – United States Agency for International Development

EXECUTIVE SUMMARY

Background

Horticulture offers great potential for rapid growth in employment generation in agriculture and in the volume and value of exports from Egypt. The public and private sectors have made important investments in horticultural crop production, packaging, and, over the past few years, the pre-cooling and cold storage of fruits and vegetables before shipment. Europe and the Gulf are Egypt's primary export markets.

These investments have expanded employment, increased exports, accelerated technological change, and generated foreign exchange. Further growth in high value, but highly perishable, fresh produce exports is hindered by substantial breaks in the cold chain needed to transport and deliver high quality fresh products by air to export markets. The ocean-shipping channel for refrigerated containers has opened up since 1997, and will become more important over time, but it will not reduce the requirement for airfreight shipments of the more perishable products. Ocean shipping will also not be able to meet the need to get early and late season produce to European markets quickly to establish the Egyptian market presence each year and to take advantage of the highest value market windows.

The current air cargo ground handling facilities at Cairo International Airport are swamped by imported cargo volume. Overflow operations are carried on outside the import and export handling facilities. The situation for perishables export handling is even worse. Perishables typically spend a minimum of 8 to 9 hours in the open air before they are loaded onto aircraft. Even in the winter and early spring months, ambient air temperatures at night and the early morning hours will not preserve product quality for most of the perishable products shipped. From May to October, all perishable products are exposed to temperatures that will significantly damage them, reducing their shelf life by from 2 to 5 days. Reduced shelf life means reduced prices in the marketplace, reduced profitability for the grower, small or large, and reduced foreign earnings for Egypt.

Strawberries, for example, easily lose half of their shelf life at the airport increasing spoilage rates at the final destination. After only a few hours of warm temperatures, grape stems start to dry out and berries become soft and shatter easily from the bunches. Green beans rapidly lose water and arrive at the market in a limp condition, having lost two to three days of shelf life.

Increasing competition for market share in Europe requires all exporters to improve the quality and the diversity of the fresh fruits, vegetables, and flowers that they offer. Exporters all over the world are responding through improved packaging, handling, and transport infrastructure and practices. Over the past few years, the pace of change in perishables airfreight facilities has accelerated. On the African continent, Kenya, Zimbabwe, South Africa, Zambia, Ivory Coast, and Ghana have completed or embarked on airport cold store development. Latin American investment in their cold chains for perishables at both seaports and airports has run a decade ahead of cold transit facilities in Africa and the Near East. European and North American airports are seeing a wave of new perishable transit facilities developed by airlines and logistics companies. Egypt needs to decide soon whether it will encourage investment in a perishables transit facility at its major international airports to remain competitive, or watch its market share erode as better-equipped origins provide fresher product with longer shelf life.

Producers, shippers, air freight forwarders, airlines, customs authorities, the Cairo Airport Authority (CAA), and the receivers of Egyptian produce in Europe all agree that a transit cold store for perishables is urgently needed at Cairo International Airport. The basic conditions for success of the cold store are that it provide an uninterrupted cold chain from receiving to the time that product is moved to the aircraft, reducing the time that produce is exposed to warm air from an average of 9 hours to less than 2 hours. Meeting this objective requires that the perishables cold store be located inside the customs and security zone with ramp access. HEIA and its members, who grow and ship perishables from Egypt, have targeted October 2000 as the date for start-up of operations of the transit cold store. To meet both objectives will require the solution of a series of policy, technical, economic and business issues in very short order.

The principle steps required to move the project moving forward include:

- A formal decision from the CAA to allow a privately operated facility in the customs zone;
- approval by CAA of build, operate, and transfer (BOT) terms for the facility;
- approval by CAA of the design of the facility;
- construction authorization by CAA;
- award of duty free status and fiscal incentives for the project;
- a detailed feasibility study including a final facilities construction design;
- organization of the ownership and management of the facility; and
- financing of the project.

The first four steps are policy and regulatory issues under the purview of the CAA and the Ministry of Transport. The fifth step is the domain of the Ministry of Finance and the Ministry of Agriculture and Land Reform. Clearly the final three are the responsibility of the promoters of this project, who currently include HEIA, which as an association now legally entitled to own shares in private companies, and individual HEIA members[1]. HEIA members include growers, packers, shippers, brokers, freight forwarders, input and service providers.

The CAA has embarked upon a praiseworthy, and much needed, master plan for the further development and renovation of Cairo International Airport. A preliminary plan has been developed and used to write the specifications for an overall tender to produce more detailed designs, a feasibility study, a final design, and individual BOT tender documents for all airport components, including a new cargo village. The CAA is currently negotiating the contract for the master plan with an American firm selected by competitive bidding. We assume that negotiation will take a minimum of three months. Once the contract is negotiated, the selected American engineering firm will have 21 months to complete the work. Tendering and review of individual BOT offers will take another year. Contract negotiations and construction, using optimistic assumptions would take a further 18 to 24 months. This means 4.5 to 5 years before a perishables cold store can be completed using this timetable. This time frame is too long for shippers who will lose market share permanently without this facility. It is also too long for investors who have planned new higher value export projects, such as cut flowers, or who have invested in pre-cooling facilities at their farms or pack houses.

[1] Law No. 153 allows associations such as HEIA to own shares in private investments, though the investment must be reviewed by the Ministry on a case-by-case basis. Explanatory notes to Law No. 153, which should elaborate on association ownership, have not been released as of this writing.

A workshop on July 26, 1999 presented four options for cold store development to HEIA members, and representatives of airlines, the MALR, industry suppliers, Customs, USAID, APRP, and ATUT.

- Option One: Develop a fast-track design and obtain approval for a BOT tender for a privately-operated transit cold store in the designated new cargo village area to be accepted by the CAA in time to permit construction and operation during some portion of the 2000-2001 export season (October 2000-June 2001);
- Option Two: Develop a fast-track design and obtain approval by the CAA for construction of a transit cold storage facility on Egypt Air's (EA) existing lease-hold Cargo Village or expansion zone. This option would require a partnership with EA. It too would target the 2000-2001-export season.
- Option Three: Gain CAA and Ministry of Transport approval for a temporary structure to serve as a transit cold store with a shorter-term lease. Options discussed at the workshop include prefabricated structures, concrete pad and inflatable structures, and, reefer containers. This option targets the 2000-2001-export season.
- Option Four: Wait for the Cairo Master Plan final design and BOT tender, continuing minor technical improvements to airport operations and increasing the use of insulated and cooled air containers and pallets to reduce damage to exported perishables. This option would target operations in the 2003-2004-export season.

There was general agreement that Option Four was unacceptable. Evaluation of the pros and cons of the three remaining operations will be the topic of follow-up by HEIA, APRP, and ATUT and the actors in the air transport sector.

Policy and Regulatory Issues

The most important policy and regulatory issues relate to changes needed to accelerate the authorization, construction and operation of the transit cold store. The bulk of the changes are administrative exceptions to the way that the CAA implements existing laws and decrees. In our discussions with the CAA, we were told that these modifications would require Board of Directors' approval. Since the Board of CAA includes both the Office of the Prime Minister and the Minister of Transportation, the project stakeholders will need to broach these topics at the highest level possible. Workshop participants concluded that the support of the Minister of Agriculture is essential to the success of this initiative, as the facility is needed to permit the expansion of production and export of high value, and highly perishable, horticultural products. The project is in the national interest for the promotion of exports, investment, and generation of agricultural and service employment.

Siting and Land Lease – The CAA approves sites and land leases for approved airport construction. The simplest and most economical solution for the perishables transit cold store would be for the CAA to allocate land in one of the two new cargo village areas designated on the map prepared by National Airport Consultants as part of the design specifications for the Cairo Airport Master Plan. These are both located within the customs and security zone of the Airport. These two areas are adjacent to the existing Egypt Air Cargo Village with good access to roads leading to aircraft ramps and taxiways. Only these sites would permit the

completion of construction by October 2000. Site and civil works could be carried out without disruption of the existing airport traffic. Strategic Options 1, 3, and 4 could be executed on this site. Option 2, using part of the existing EA Cargo Village space, would be more complicated. The costs for site works would be higher as the vacant area available is a deep depression. The transit cold store would become a tenant of Egypt Air, subject to a potentially higher rent than that charged by CAA. We recommend that the project seek a land lease of 25 years with a fixed rate of land rental. If Option 4 is selected, a 10-year land lease should be obtained to ensure that potential delays in Master Plan construction do not jeopardize export operations that are dependent on the transit cold store.

BOT Terms – 1. Tender and Evaluation Periods. The CAA tender period is normally six months followed by a six-month bid evaluation period. We strongly recommend that the CAA reduce the tender development period and the bid evaluation period to three months. 2. BOT Tendering Process. If the project promoters or investors prepare the transit cold store final design and specifications, we suggest that the Board of the CAA award preference points to the promoters and/or investors who provide an approved design. Alternatively, the Board may wish to consider a combined DBOT (design-build-operate-transfer) tender. 3.CAA Concession Fees. The CAA currently charges a percentage of gross receipts (presumably net of value added taxes) on airport concessions. The CAA prefers to renegotiate this percentage every two years, increasing or decreasing the percentage levied as BOT turnover increases or declines. This approach increases the financial risks associated with the BOT and provides an incentive to the operator to understate gross income. It may also create a disincentive to further investment or service enhancements by the BOT leaseholder. We recommend a negotiated fixed fee as a percentage of gross receipts. Depending on the results of the detailed feasibility study, a waiver of fee on the first year, or up to twenty years, of transit cold store operation may be appropriate. The justifications for this waiver are the increase in airfreight volume and value from the new facility, and the benefit to the agricultural economy of an unbroken cold chain from farm to airplane.

Design Approvals – 1. Design standards and specifications. The CAA has recommended that the project promoters and /or investors complete a feasibility study with construction design and submit it for technical review. The preparation of preliminary and final designs requires the release of all relevant site works, materials, building, equipment, safety, and operations design standards and specifications by the CAA. Airport specific standards, such as control tower line-of-sight, vibration tolerance, earthquake standards, noise and emissions, if any, should also be released. 2. Review period and resubmission. Review and approval, or call for revisions, should be achievable over a two-month period. Review of design revisions should be achievable over a one-month period. If there are technical reasons for longer review periods these should be specified in advance of the design process.

Construction Authorization - Once a design is approved and a BOT concessionaire is selected, construction authorization should only be contingent on the establishment of construction performance guarantees. If construction supervision independent of the BOT's general contractor is required, the supervisor should be identified by the CAA -- or appropriate Ministry office -- coincident with design approval. We recommend that the costs of construction supervision and supervisor identification and approval be incorporated as part of the feasibility and design study.

Award of Duty Free Status and Tax Exemption – The transit cold store is intended primarily to support the growth of an export industry that will generate both direct and indirect benefits. Increased foreign exchange receipts, employment, cold chain transport, private investment in new crops, and postharvest handling facilities on-farm and as service companies should result. As a BOT within the Cairo Airport, the project should be awarded duty free status on any building materials, machinery, and equipment needed for its establishment. The same income tax holidays should be granted to this project as are granted to postharvest facilities on agricultural land, i.e., for ten to twenty years.

Export Procedures - While air cargo procedures for imported goods seem to cause substantial delays, the export operations observed do not seem to pose major delays. While there is substantial paperwork that could be simplified, produce moves from palletization and container stuffing areas to airlines fairly rapidly. While shippers and freight forwarders complain about the complexity of the paperwork for exports, the level of delay is minor. Our discussions with Cairo Airport customs officials indicate that they would dedicate sufficient manpower to facilitate export declarations.

Technical Issues

The technical objective is to reduce the time that produce is exposed to ambient (warm to hot) air at the airport from an average of 9 hours (European destinations) or 14 hours (Gulf destinations) to an average of less than two hours. The facility design presented in this report fits Options 1 and 2. Options 3 and 4 would require different designs. To move either Option 1 or 2 forward, the most important technical issues are the completion of a detailed feasibility study and a final design for the airport transit cold store. The following key design assumptions were discussed with HEIA in a meeting on July 6, 1999. They will need to be re-examined in the feasibility study:

Peak Flow Assumption. The volume and type of product that will pass through the facility are the most important design elements. The facility is needed for 100% of the fresh perishable volume that transits the airport from the shippers to the EU. It is expected that export volumes will grow substantially in the next five to ten years. The facility should be able to handle the full peak flow today, and a doubling of the flow over the next ten years, without major new construction. The facility should be able to handle a portion of the flows to the Gulf States as well. Peak combined flows are expected to be about 230 MT a day in May of fruit, vegetables, and, eventually, flowers. These products can be grouped in three major transit temperature categories and projected initial seasonal peaks:

Transit Temperature	Average Peak Volume	Month of Peak Volume
0-2 degrees C	110 MT/Day	May
7-10 degrees C	133 MT/Day	December
13-16 degrees C	30 MT/DAY	May, September

We assume that 50 percent of the estimated maximum perishable volume moves through the facility in the first year, 75 percent in the second, 80 percent in the third, 85 percent in the fourth, and 90 percent in the fifth year and beyond.

Packing Capacity. All products arriving at the facility will be packed. No space will be allocated for packing, which will be done by small exporters at other locations.

Unitization. Unitization on Europallets will not be a requirement as nearly 80% of current volume arrives packed but loose at the airport. Unitization may be encouraged by charging lower rates on produce that is delivered on Europallets or as loaded Unit Lift Devices (ULD) such as air pallets or air containers.

Pre-Cooling. All of the produce arriving at the facility will be pre-cooled to a maximum acceptable transit temperature. **This is perhaps the most controversial design point.** Some believe that this will exclude the small shipper from using the facility. Though small shippers send substantial volumes of product to the Gulf States which is not pre-cooled, many small shippers add volume to EU shipments that are pre-cooled at pack houses operated by larger exporters. Because a new airport cold store will encourage new pack house pre-cooling facilities access to pre-cooling for small shippers will improve. This will offer significant added benefits to smallholders. We believe that it is in the industry's interest in maintaining market share and reputation to develop pre-cooling facilities outside the airport in the production zones, rather than transport hot products to the airport for pre-cooling. **Pre-cooling at the airport will not reverse the damage done to produce from multiple and rough handling at harvest, packing and transport at high temperatures to the airport.** The best it can do is to stabilize the damaged product. Pre-cooling at the airport to handle 20 to 30 percent of the peak total volume, or 69 MT a day could easily add more than $500,000 to the investment costs of the project.

Product Accumulation. Product accumulation for up to two days before shipment would help reduce HEIA members peak operating costs for harvesting, packing, and refrigerated transport. This design is 50 percent larger than peak daily capacity to allow for accumulation. The potential for use for horticultural imports should be examined at the feasibility stage.

Handling Equipment. Operations within the facility will be based on the rapid building of air pallets from loose boxes or Europallets, stuffing of air containers, and eventually, handling of pre-built air pallets or air containers as pre-cooled Unit Lift Devices (ULD's). The design incorporates air-lock doors on the loading dock, pallet elevators, forklifts, and static and mechanically driven pallet rollers. Three air pallet scales are included to permit rapid weighing and completion of airline acceptance documents. Two air pallet scanners located in a cooled area just before the delivery points to the airlines will ensure that cargo security requirements can be met. Greater mechanization of the facility may be needed if volumes expand beyond those projected here.

Refrigerated Transport Services. Egypt has two refrigerated truck manufacturers and is reducing its import duties on trucks, truck parts, and refrigeration equipment, and consequently, the value added tax on refrigerated vans. HEIA, or others, may want to consider the addition of a refrigerated trucking service to handle unitized air cargo (Europallets or ULD's) as an additional service. However, this option may unduly complicate the feasibility study, and may be better considered as a separate company. Some firms are already studying the feasibility of mobile pre-cooling equipment introduction as a service integrated with their intermodal truck-to-vessel reefer container transport.

Freezer Space. Airlines have indicated that the current freezer space at the airport requires careful scheduling of arrivals of frozen speciality meat and poultry, medicines, and some vaccines. Import and transit storage at 0, -5, and –18 degrees C should be studied during the feasibility phase, as well as the potential use of freezer space for processed horticultural and other export products. Options may include the use of plug-in freezer containers that could be positioned to meet seasonal needs.

Economic Benefits

In addition to returning financial rewards to investors and to shippers, the facility should return a net economic benefit to the country, particularly if it is to qualify for tax holidays, reduced lease and fee payments. The facility should also strengthen Egypt's cold chain and spur additional investment in horticultural production, packing, transport, and marketing. Smallholders will benefit as the marketing channels develop greater capacity to handle a wider range of perishables, improving the environment for outgrowers of specialty fruits, vegetables, and flowers.

Four categories of economic benefits were considered:

Reduction in physical losses. Physical losses are a problem resulting from flight delays or cancellation. However, we were unable to quantify these losses during this study. While exporters occasionally have to divert product to the domestic market due to technical problems with aircraft, this is not a major financial problem.

Reduction in peak requirements. Peak requirements for harvest, packing, pre-cooling, and transportation may be reduced if producers and packers can accumulate product at the airport transit cold store over a two-day period. The potential savings should be studied in greater detail in the feasibility study.

Improvement in the quality of exported products. If exposure to ambient temperatures can be reduced to two hours or less during loading operations, significant gains in shelf life and quality should be obtained. As Egypt becomes known for consistent quality, it should also gain market share. In other countries, improvements in the cold chain have helped increase produce price from 5 percent to 40 percent. HEIA price reports indicate, for example, that strawberries from Egypt may be trading at 15 to 35 percent lower than that from Israel or Australia. Based on a representative FOB price of $0.85 per kilogram of exported Egyptian produce, a 6 percent increase in value would yield a financial IRR to the project of 42 percent

Indirect benefits. Two important categories of products are missing from the Egyptian horticultural product mix, flowers and fresh cut produce. Neither of these products can be successfully shipped without a continuous cold chain. The presence of the transit cold store should stimulate investment in these products and further increase employment and specialized horticultural handling facilities, such as pre-cooling facilities, and services on farms.

Financial Issues

Investment Cost. The total estimated investment cost of the project is about $1.83 million, plus or minus 20%. The quality and unit costs of many basic materials and equipment varies tremendously in Egypt. A decision not to award duty-free status to the project would increase costs from 20 to 40 percent. The biggest cost uncertainty is whether the as yet unknown design standards of the CAA will increase construction costs or require greater mechanization of cargo handling than assumed in this prefeasibility study.

Operating costs. Operating costs are estimated to be about $224,500 per year. Electricity purchased from the grid and supplied by the project's own generator account for about 15% of operating costs. If the cold store accepts product that is substantially warmer than the needed transit temperature, these energy costs will grow at an alarming rate. It is essential that the temperature of all products entering the cold store is measured, and that no product is accepted that is more than 2 degrees above the desired transit temperature. Operating costs are based on full operations starting from year 5. We conservatively make no allowance for reduced costs during the early years of lower operations.

Rate of return. The financial IRR of the cold store is 28 percent. This IRR is based on handling charges of LE 80 per ton for unitized and LE 90 per ton for loose packed product. Sensitivity analysis of the IRR on different handling charges are as follows:

- IEC rate of LE 45 for unitized and loose — 5 percent IRR
- 25 percent decrease - LE 60 for unitized, LE 68 for loose — 17 percent IRR
- 15 percent decrease – LE 68 for unitized, LE 77 for loose — 22 percent IRR

The IRR is less sensitive to increases in capital costs compared to changes in handling charges. The results are as follows:

- Increase of 20 percent in capital cost — 23 percent IRR
- Increase of 30 percent — 21 percent IRR
- Increase of 40 percent — 19 percent IRR

The IRR is also insensitive to changes in operating costs.

- Increase of 20 percent in operating cost — 26 percent IRR
- Increase of 50 percent — 22 percent IRR

It is unlikely that 100 percent financing will be available for this project. Discussions with bankers in Cairo suggest that a minimum of 20 percent of the project should be equity and that 40 percent equity would be preferred. HEIA members have indicated that they could band together to cash finance this project. Other sources of equity and loan financing that should be examined during the feasibility study include those of USAID, the European Commission, and the Commonwealth Development Corporation.

The Net Present Value (NPV) of the project with equity investment of 25 percent is $392.188 using a discount rate of 18 percent. The IRR on equity is just over 37 percent. (This assumes an interest rate on borrowed capital of 15 percent and on working capital of 14 percent, and

corporate income tax rate of 32 percent.) Incentives such as income tax holidays obviously will increase the returns. The favorable return on equity indicates that the owners will have some flexibility to reduce handling charges if demand for the facility lags expectations. For example, if handling charges are reduced to LE 68 for unitized and LE 77 for loose product (15 percent decrease), the NPV remains positive at $67,800 with and IRR on equity of 29 percent. However, a decrease of 20 percent in the handling charges yields a negative NPV.

Higher levels of equity investment of course lower the NPV and IRR on equity. With an equity portion of 40 percent, the NPV is $338,380 and the IRR on equity is just over 29 percent.

Ownership and Management of the Facility

There are several ownership and management options for the transit cold store. The S.A.E. (Egyptian Private Corporation) appears to offer the greatest operational flexibility.

HEIA ownership. Under the new association Law No.153 of 1999, HEIA can be a shareholder in private corporations. Review of the law and the level of ownership that an association can hold needs to be undertaken. HEIA members include growers, packers, shippers, brokers, air, sea, and truck freight forwarders, transporters, refrigeration companies, and other service providers.

HEIA members. HEIA members could also form the operating company directly outside the association.

Either of these formulations would not provide direct management experience in air cargo ground operations. Currently, Egypt Air, Egypt Air Services, Air France, British Air, Lufthansa, and KLM run air cargo ground operations. The foreign airlines are limited to providing ground services only to their own aircraft, or aircraft of the new alliances. Competition for freight is such that majority ownership or controlling interest by any one airline probably should be avoided. An option is to invite participation by an experienced produce logistics firm in the ownership and management of the facility.

Egypt Air. Egypt Air handles most of the perishable freight shipped from the Cairo International Airport. The problem with their majority or controlling ownership would be the strengthening of the quasi-monopoly EA already holds on perishables handling.

Conclusion

A privately operated transit cold store at the Cairo International Airport will be profitable financially and of substantial economic value to the horticultural export sub-sector. Its viability depends upon authorization by the Cairo Airport Authority or its supervising instances of a fast-track design and BOT tender to be issued within 6 months of August 1999.

I. POLICY AND REGULATORY ISSUES

Policy and regulatory issues shape the administrative environment that will influence the feasibility of the transit cold store. This section of the report examines the legal background for the proposed project, and the issues related to the way that the relevant laws are currently implemented as policy and regulatory procedures.

Legal Background

Three legal briefs set the stage for the policy and regulatory issues facing the Cairo Airport Transit Cold Store:

> Law No. 3/1997. On Awarding the Public Utility Concession for the Establishment, Management, and Exploitation of Airports and Landing Grounds. The law provides that the Cairo Airport Authority (CAA) controls the award and management of all concessions at the Cairo Airport. Approval of cold store design, construction, and operation is, therefore, dependent on the CAA's approval.
>
> Ministerial Decree No. 216/Aviation of 1997. Relative to Land Services at Egyptian airports. The decree establishes that the CAA is responsible for ensuring an adequate supply and quality of grounds services delivered. Egypt Air and Egyptian Air Services are listed as the two organizations that can provide ground services and load any airliner's aircraft. Foreign carriers may use their own equipment, but may load only their own aircraft. The implication is that the transit cold store will deliver freight to the existing ground service companies and individual airlines.
>
> Presidential Decree (PD) No. 89/1998. Dealing with the regulation of the bidding process for build-operate-and-transfer projects. The Presidential Decree has the intent of ensuring that competition occurs through a bidding process. It appoints the CAA as the manager of the BOT process and lays out the responsibilities and rights of the CAA and the bidders. PD No.89/1998 is currently being followed by the CAA as it contracts for the feasibility study, preliminary design, final design, and tender documents for a two-phase Cairo Airport Master Plan.

The most important policy and regulatory issues relate to changes needed to accelerate the construction and operation of the transit cold store as a BOT project. The bulk of the changes are administrative exceptions to the way that the CAA implements existing laws and decrees. In our discussions with the CAA, we were told that modification would require Board of Directors approval. Since the Board of CAA includes both the Office of the Prime Minister and the Minister of Transportation, the project promoters will need to broach these topics at the highest level possible. Participants at the July 26, 1999 workshop concluded that the support of the Minister of Agriculture is essential to the success of this initiative, as the facility is needed to permit the expansion of production and export of high value, and highly perishable, horticultural products.

Siting and Land Lease

The CAA approves sites and land leases for approved airport construction. The simplest and most economical solution for the perishables transit cold store would be for the CAA to allocate land in one of the two new cargo village areas designated on the map prepared by Netherlands Airport Consultants. These two areas are both located within the customs and

security zone of the Airport. They are adjacent to the existing Egypt Air Cargo Village with good access to roads leading to aircraft ramps and taxiways. Also, their ground elevation should permit construction of up to a 10-meter tall structure. This overall height would permit the cold store operators to install up to two levels of pallet rollers or three levels of Europallet racks, should the volume of produce exports and expand more rapidly than expected.

We believe that only the selection of one of these two sites would permit the completion of construction by October 2000. Site and civil works could be carried out without disruption of the existing airport traffic. Strategic Options 1, 3, and 4 could be executed on this site. Option 2, using part of the existing EA Cargo Village space, would be more complicated. The costs for site works would be higher. The vacant area between the new EA workshop project and the existing scale and storage areas of the Cargo Village is a deep depression. While the depth below the existing taxiway provides space for a basement level, it would increase the road access, site work, and foundation costs of the cold store, unless these were borne by EA as part of its overall renovation project. The siting of the transit cold store within EA space would also make the cold store a tenant of Egypt Air, subject to a potentially higher rent than the 54 piastres per square meter that is charged by CAA.

We recommend that the project seek a land lease of 25 years with a fixed rate of land rental. If Option 4 is selected, a 10-year land lease should be obtained to ensure that potential delays in Master Plan construction do not jeopardize export operations that are dependent on the transit cold store. Banks generally want a minimum guaranteed 10-year lease to finance a project of this nature.

BOT Terms

The terms of PD No. 89/1998 seem intended to ensure an orderly BOT bidding process that will result in competitive bidding that is financially advantageous to the Egyptian treasury. These are worthy objectives. However, the lengthy CAA process for BOT Master Plan development does not meet the needs of the Egyptian horticultural industry. It must build volume and quality if it is to expand its European and Gulf market presence, and establish flows that can be defended with the EU in the EU Mediterranean trade talks, as well as the next round of GATT.

1. Tender and Evaluation Periods. The CAA tender period is normally six months followed by a six-month bid evaluation period. We strongly recommend that the CAA reduce the tender development period to three months and the bid evaluation period to three months.

2. BOT Tendering Process. In the event that the project promoter prepares the transit cold store final design and specifications, we suggest that the Board of the CAA award preference points to the promoters who provide an approved design. Alternatively, the Board may wish to consider a combined DBOT (design-build-operate-transfer) tender.

3. CAA Concession Fees. The CAA currently charges a percentage of gross receipts (presumably net of value added taxes) on airport concessions. We were informed that the CAA prefers to renegotiate this percentage every two years, increasing or decreasing the percentage levied as BOT turnover increases or declines. This approach increases the financial risks associated with the BOT and provides a strong incentive to the operator to understate gross income. It may also create a disincentive to further investment or service enhancements by the BOT leaseholder. We recommend that the project promoters and

the CAA consider negotiating a BOT agreement that fixes the BOT fee as a percentage of gross receipts. Depending on the results of the detailed feasibility study, a waiver of fee on the first year of transit cold store operation may be appropriate.

Design Approvals

The consultant was able to meet only once with the CAA engineering staff on the existence and process for bidding the Cairo Airport's Master Plan. Discussions were held with EA engineering staff and with a large construction company currently building a new passenger terminal at the airport. We were unable to discuss with the CAA what the specific design requirements were for air cargo structures at the airport under the master plan.

1. Design standards and specifications. The CAA has recommended that the project promoters complete a feasibility study with construction design and submit it for technical review. It will be extremely difficult for any architectural or engineering firm to develop realistic preliminary and final designs without the release of any and all relevant site works, materials, building, equipment, safety, and operations design standards and specifications by the CAA. Airport specific standards, such as control tower line-of-sight, vibration tolerance, earthquake standards, noise and emissions, if any, should also be released to the promoter's architects and engineers.

2. Review period and resubmission. Design review should be neither a lengthy process nor an indeterminate one. Review and approval, or call for revisions, should be achievable over a two-month period. Review of design revisions should be achievable over a one-month period. If there are technical reasons for longer review periods these should be specified in advance of the design process.

Construction Authorization

Once a design is approved and a BOT concessionaire is selected, construction authorization should only be contingent on the establishment of construction performance guarantees. If construction supervision independent of the BOT general contractor is required, the CAA should identify the supervisor -- or appropriate Ministry office -- at the same time that it approves the design. We recommend that the costs of construction supervision and supervisor identification and approval be incorporated as part of the feasibility and design study.

Award of Duty Free Status and Tax Exemption

The transit cold store will support the growth of an export industry that will generate both direct and indirect benefits. Increased foreign exchange receipts, employment, cold chain transport, private investment in new crops, and post-harvest handling facilities on-farm and as service companies should result. As a BOT within the Cairo Airport, the project should be awarded duty free status on any building materials, machinery, and equipment needed for its establishment. The same income tax holidays should be granted to this project as are granted to post-harvest facilities on agricultural land, i.e., for ten years.

While air cargo procedures for imported goods seem to cause substantial delays, the export operations observed do not seem to pose major delays. While there is substantial paperwork that could be simplified, produce moves from palletization and container stuffing areas to

airlines fairly rapidly. While shippers and freight forwarders complain about the complexity of the paperwork for exports, the level of delay is minor. Our discussions with Cairo Airport customs officials indicate that they would dedicate sufficient manpower to facilitate export declarations.

II. TECHNICAL ISSUES

The technical analyses of this study are based upon the assumption that the CAA can and will quickly approve a well-designed and financially-viable cold transit store as a privately owned and operated BOT project developed in parallel with the Cairo Airport Master Plan.

Temperature Challenges

The consultant spent five evenings at the Cairo International Airport observing delivery, receiving, and acceptance operations for perishables. Air temperatures, box air temperatures, pulp temperatures, and relative humidity were measured at half-hour to hour intervals from midnight to 3:30 am. Daytime delivery and handling of fruits and vegetables for some Gulf destinations was observed on three days. Two days were spent observing harvest, packing, and pre-cooling at crop farms and packing sheds, focusing on grape and green bean exports.

Both refrigerated and non-refrigerated trucks deliver produce to the air cargo zones. The range in temperature of products arriving at the airport is great. Superior and Flame Seedless grapes arrived at temperatures well above their ideal transit levels of 0-2°C. Our visits to packing stations, discussions with the ATUT table grape team, and prior reports done by ATUT on the cold chain (Tator and Hargreaves, 1997. Tator, 1998. Tator and El Ansari, 1998.), indicate that the shed packing of grapes is delaying the pre-cooling of grapes. The daily scramble to complete the packing and shipping of grapes to meet a midnight to 2:00 am delivery deadline also leads to overloading of the pre-cooling positions. Most of the packing stations and pre-cooling facilities do not have docking doors so that even palletized and pre-cooled product will warm during the 30-minute or longer loading process. As a result, refrigerated trucks were delivering grapes to be shipped to the EU at pulp temperatures ranging from 4.5°C to 15.5°C in early July. Individual boxes delivered on the same wooden Europallets showed pulp temperatures 4°C to 6°C different from one another, suggesting that pallets were built with cartons of fruit from different sources. Some shippers indicated that they would pre-cool only to 4-6°C, because the aircraft cargo holds are not cooled below 5-6°C. Grapes and other products destined for the EU average about 9 hours exposure to ambient airport temperatures before shipment. Receivers in the UK report that temperatures of Egyptian grapes at arrival are often 11-12°C, and that a few air shipments have arrived at 18°C.

Products destined for the Gulf are generally not refrigerated before delivery to the airport. Pulp temperatures for honeydew melons, watermelons, okra, eggplant, snap beans, zucchini squash, kiwi fruit, prickly pear cactus fruit, grapes, coriander and fennel averaged about 25°C, the same temperature as the night air at the airport. High delivery temperatures were made even worse by stacking of boxes against the Cargo Village loading dock that was radiating heat at 31°C. Boxes placed directly on the parking lot pavement were heated from arrival temperatures of 25°C to 29°C in the space of an hour. Flights to the Gulf leave in the early afternoon, meaning that these products are exposed to the higher daylight summer temperatures of 35°C and above. The average period that produce for Gulf destinations is exposed to ambient air conditions is about 14 hours.

The Cairo International Airport has a challenging temperature regime. Figure 1 is a graph of the mean minimum and maximum temperatures along with the historical high and low temperatures for each month. Climate data for the Cairo Airport and several production areas around the country are provided in Annex 1.

Figure I. Cairo Airport Long-Term Monthly Minimum and Maximum Temperatures

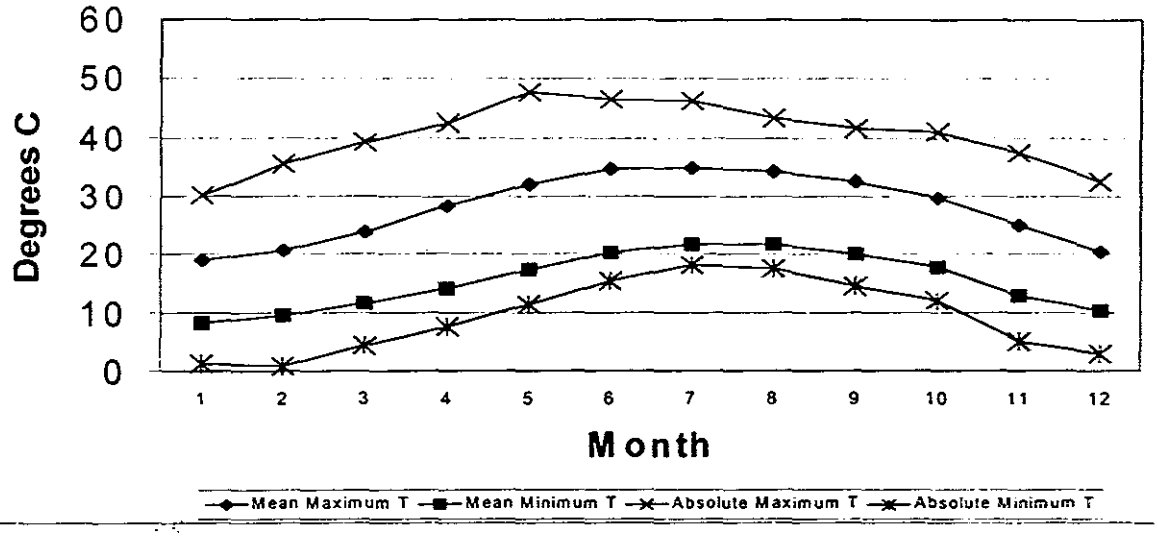


Figure 1 suggests that only in December, January, and February will ambient air conditions be cool enough to maintain the quality of the least demanding crops in terms of transit and storage temperature. Based on our study of the monthly volumes of fruits and vegetables shipped, we estimate that about 85 percent of the fresh produce exported suffer significant losses in shelf life and quality during transit through the airport. This estimation assumes that produce requiring 7-10°C and 13-16°C transit temperatures can be shipped without damage from December through February, a total volume of about 6,000 MT out of the 42,000 MT of produce shipped annually through the Cairo Airport.

The objective of the transit cool store is to find a financially viable way to reduce the damage that current practices cause. This will be achieved if the cold store can reduce the time that produce is exposed to ambient (warm to hot) air at the airport from an average of 9 hours (European destinations) or 14 hours (Gulf destinations) to an average of less than 2 hours. The facility design concept presented in this report fits Options 1 and 2. Options 3 and 4 would require different designs. To move either Option 1 or 2 forward, the most important technical issues are the completion of a detailed feasibility study and a final design for the airport transit cold store. The following key design assumptions were discussed with HEIA in a meeting on July 6, 1999. They will need to be re-examined for the feasibility study:

Peak Flows.

The volume and type of product that will pass through the facility are the most important design elements.

Product Considerations. Fruits and vegetables that are picked and shipped fresh are alive. When they are plucked from the plant, vine, or tree, they lose their connection to water and nutrients. They begin to dry out and deteriorate as they burn up sugars that are no longer supplied by the plants they grew on. Other biochemical and physical changes take place, sometimes for the better (deeper color and sugar development), sometimes for the worse

(wrinkling of the skin, browning of plant tissue). Over the years, growers, packers, shippers, and marketers have found that cooling fresh produce is the best way of slowing the negative changes to ensure that the fruit or vegetable that is picked can be delivered to a client in good shape and with good quality. The movement of produce to the market and the consumer is a race against time, temperature, and a few other factors. The fruits and vegetables that consistently arrive in good shape and have a good shelf life (don't rot or fall apart in storage or on the merchants' display shelves over the longest possible marketing period) will generally obtain the best prices in the market.

Different groups of products have different cold storage requirements. Generally, products fit one of three temperature and relative humidity classes as shown in Figure 2 below. The quicker that fruits and vegetables are cooled after harvest and held at their proper storage temperatures, the more likely it is that they will remain in good condition through the marketing chain. If produce is allowed to warm while being transported, handled, stored, or displayed in the retail store, its shelf life will be reduced. A commercial cold chain maintains good temperature and relative humidity from shortly after harvest and packing until the fruit or vegetable displayed to the consumer for sale.

Figure 2. Storage and Transit Conditions for Common Fresh Fruits and Vegetables Shipped from Egypt (* indicates that products are easily damage by ethylene)

Storage/Transit Conditions	Vegetables	Fruits
0-2 degrees C Vegetables at 90-98% relative humidity (RH) Fruit at 85-95 % RH Ethylene below 1ppm	Artichoke, asparagus, broccoli, cauliflower, fennel, garlic, green onion*, herbs (not basil), mint, snow pea*	Apricot, avocado, cantaloupe, date, fig, grape, kiwifruit*, peach, pomegranate, strawberry
7-10 degrees C 85-95% RH Ethylene below 1ppm	Basil, snap and green bean, eggplant*, okra*, bell pepper, chili pepper, zucchini squash*	Unripe avocado, cactus pear, grapefruit*, guava, Juan canary melon, lemon, lime*, mandarin, orange, tangerine, watermelon
13-16 degrees C 85-95% RH Ethylene below 1ppm	Dry onion, potato, sweet potato, taro, tomato, winter or hard-shell squash	Banana, casaba melon, honeydew melon, mango, Persian melon

Source: Adapted from Thompson, Kader, and Sylva, 1996.

When holding periods are short (five hours or less), some small airport cold stores with only one room will pick an average temperature, say 10°C. This temperature will reduce the rate of warming of produce compared with ambient air. The chilling sensitive products will not be damaged by the short exposure time, and that the warming of the low temperature products will not be excessive. This approach is not recommended for Cairo, because the peak daily volumes shipped are too large to employ a single storage temperature. Exporters also want to be able to accumulate product at the airport for up to two days.

Volume Considerations. Statistics on Egyptian exports are somewhat difficult to interpret. CAPMAS figures show far less product being exported to the EU, for example, than Eurostat figures show being imported. Freight forwarder records track individual flows. The ATUT

project develops statistics based on phytosanitary certificates. We have used the ATUT figures here. For purposes of this study, we have used total export data and eliminated products shipped primarily by sea or land to arrive at an air transport figure. Data tables and larger scale charts are provided in Annex 2. The feasibility study must verify the information presented here, especially in regards to the mode of transport used.

Figure 3 displays the average daily shipments of fresh produce from Cairo Airport to destinations in Europe, both within and outside the EU in 1996, 1997, and our projections for the early portions of the next millennium. The April and May peaks are mainly green beans, green onions, and peas, supported in 1997 by a large volume of grapes in June. The November and December peaks are primarily green beans and green onions.

Figure 3.

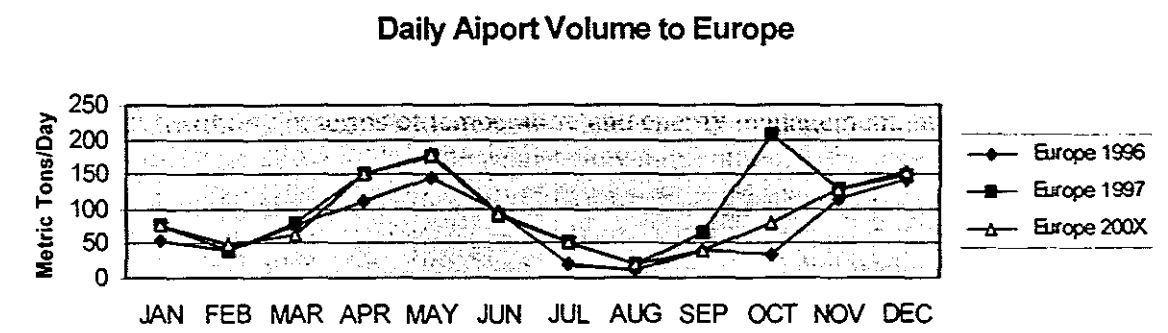


Figure 4 shows the average daily volume to destinations outside Europe, mainly Gulf States. A broader range of products is shipped to the Gulf States than to Europe, with substantial volumes of fresh onions, green mangoes, lemons, limes, grapes, and leafy potherbs such as coriander and fennel. Daily volume to the Gulf has smaller seasonal peaks than to Europe. The volume shipped is lowest during the summer vacation and the end of year vacation periods. Air freight forwarders and airlines characterize these periods as "dead seasons." Interestingly, the availability of flights is very high in the July and August period, because Egypt is a favorite tourist destination for the region. Most produce shipped to the Gulf is not pre-cooled and is packaged for immediate sale in small boxes. Improvements in cooling, handling, and packaging would improve Egyptian access to the new produce distribution channels that are developing in the Gulf States.

Figure 4.

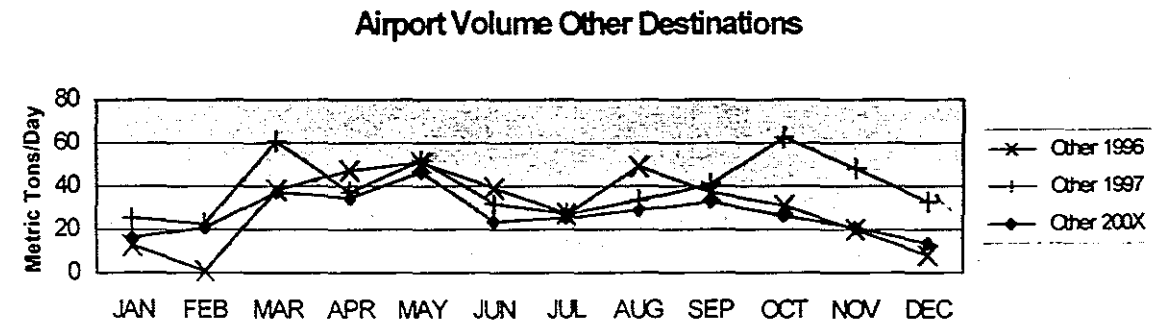
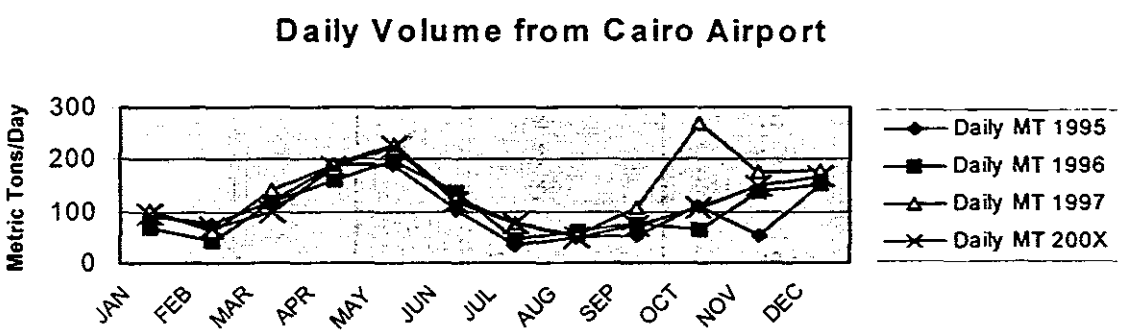


Figure 5 combines the export flows to Europe and other destinations to show the total daily volumes shipped by air from the Cairo International Airport. The chart covers the period from 1995 through 1997, and includes a projection through the early part of the next millennium, marked as the future year 200X. The dominant influence of European demand on the seasonal peaks and valleys for fresh produce exports is clear.

Figure 5.



The transit cold storage facility is needed for 100% of the fresh perishable volume that transits the airport from the shippers to the EU. It is expected that export volumes will grow substantially in the next five to ten years. The facility should be able to handle the full peak flow that occurs today, a doubling of the flow over the next ten years, and provide space for expanded services, such as emergency transit cold storage and freezer storage, without major new construction. The facility should be able to handle a portion of the flows to the Gulf States as well.

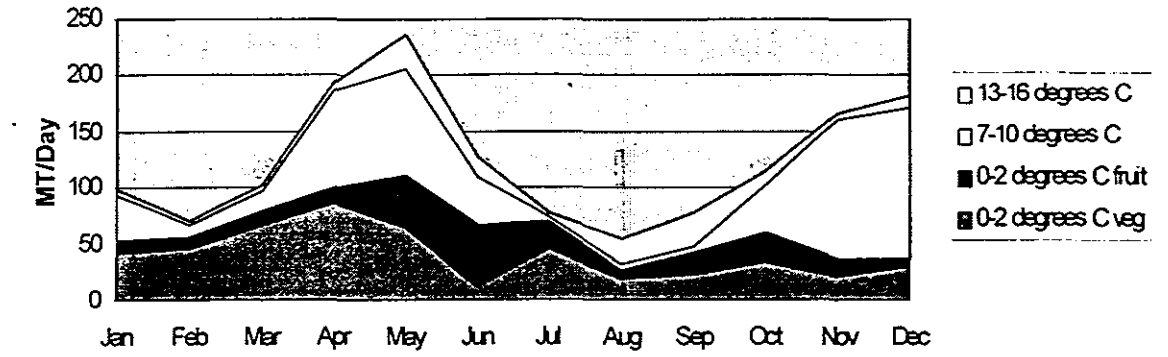
Peak combined flows are expected to be about 230 MT a day in May of fruit, vegetables, and, eventually, flowers. These products can be grouped in three major transit temperature categories and projected initial seasonal peaks:

Figure 6. Projected Volumes of Produce Exports through the Cairo Airport by Transit Temperature Class

Transit Temperature	Average Peak Volume	Month of Peak Volume
0-2 degrees C	110 MT/Day	May
7-10 degrees C	133 MT/Day	December
13-16 degrees C	30 MT/DAY	May, September

The data and charts on daily volumes by transit temperature class and destination are provided in Annex 2. Figure 7 is a chart of the projected flows for the future year 200X.

Figure 7.



Most of the produce in the 0-2 degrees transit temperature category now arrives at the airport at 4-5 degrees C. It is likely that the transit cold storage room(s) for products in this temperature category will have to operate initially at about 4 degrees until additional improvements in pre-cooling and refrigerated truck transport are made at the producer and packing house levels.

We assume that 50 percent of perishable volume moves through the facility in the first year, 75 percent in the second, 80 percent in the third, 85 percent in the fourth, and 90 percent in the fifth year and beyond.

The facility has been designed to accommodate a volume that is 50 percent higher than current average volumes with only one level of pallet rollers. We recommend that the ceiling heights, foundations and floors be designed to permit a second level of pallet rollers and mechanical handling equipment to be installed when volume exceeds the one-level operating capacity. The refrigeration capacity has been estimated to permit twice the current peak volume to be handled.

Packing Capacity

All products arriving at the facility will be packed. No space will be allocated for packing, which will have to be done by small exporters at other locations. Currently, many small-scale shippers buy produce and pack it in the parking lots outside the ACE cargo building, the Air France/Swiss Air cargo building, or along the truck docks of the Egypt Air Cargo Village. The requirement for delivery of packed produce is a simple decision. Permitting unpacked product to enter the facility and be packed would simply move the current confusion and the damaging handling practices from the out-of-doors to the inside of the air cargo facility. It would also increase the level of solid waste that would have to be handled by the facility from dropped and damaged produce. Unpacked product is also unlikely to be pre-cooled.

Unitization

Europallet unitization will not be a requirement because nearly 80% of current volume arrives as break-bulk freight at the airport. Large volume shippers of green beans, grapes, and strawberries tend to palletize for pre-cooling and to reduce damage to the produce from multiple handling of the same box and the need to turn around refrigerated trucks quickly.

Unitization may be encouraged by charging lower rates on produce that is delivered on Europallets or as loaded Unit Lift Devices (ULD) such as air pallets or air containers. Observations at the airport showed that it took about 40 minutes to unload a 40 foot refrigerated truck van and build air pallets, while it took about 20 minutes to unload a van and build an air pallet with produce already stacked and strapped onto Europallets. Clients who are building mixed commodity pallets for different clients will be likely to continue delivering loose boxes to the airport. One way to solve the needs for these clients would be to develop a system to deliver empty air pallets and air containers to packing sheds and accept fully loaded air pallets and containers for shipment. Packinghouse inspection and customs sealing of these shipments would be needed, along with roller-bed-equipped refrigerated trucks. Phytosanitary and customs inspectors are already doing pre-shipment clearance and sealing of refrigerated ocean containers at the larger packing sheds. One reefer truck manufacturer and three trucking service operators said that they would be able to install roller beds in reefer trucks if that market developed in Egypt.

Pre-Cooling

All of the produce arriving at the facility will be pre-cooled to a maximum acceptable transit temperature. **This is perhaps the most controversial design point.** Some believe that this will exclude the small shipper from the facility. Small shippers send substantial volumes of product to the Gulf States and add volume to the shipments to the EU. Other refrigeration specialists pointed out that the International Export Center and Multifruit cannot cool product to 0°C.

We believe that it is in the industry's interest in maintaining market share and reputation to develop pre-cooling facilities outside the airport in the production zones, rather than transport hot products to the airport for pre-cooling. **Pre-cooling at the airport will not reverse the damage done to produce from delayed pre-cooling, multiple and rough handling after harvesting, and packing and transport at high temperatures to the airport.** The best it would do is to stabilize the condition of the already-damaged product. Further, pre-cooling at the airport to handle 20 to 30 percent of the peak total volume, or 69 MT a day, could easily add up to $500,000 or more to the investment costs of the project.

We expect that the growth of production and export of fruits and vegetables will lead to investment in packing sheds, cold stores, and pre-cooling facilities in the zones of production. With an airport facility in place, investors who are currently doubtful about siting flower or fresh- cut fruit and vegetable products would become more interested in siting their projects in Egypt.

Product Accumulation

HEIA members indicated that they would like to be able to accumulate product at the airport for up to two days before shipment. This would help reduce their peak operating costs for

harvesting, packing, and refrigerated transport. The building design has 50 percent greater capacity than the current peak daily capacity. This surplus will enable exporters to accumulate product. This capacity could also be used for transit storage in the event that air cargoes from Europe, East and Southern Africa or the Gulf going to other destinations develop technical problems during their technical stops at the airport. The potential for use for horticultural imports should also be examined at the feasibility stage. Transit and import operations were not part of the pre-feasibility brief, but are an important concern of the airline and freight forwarding companies operating at Cairo International Airport.

Handling Equipment

Operations within the facility will be based on the rapid building of air pallets from loose boxes or Europallets, stuffing of air containers, and eventually, handling of pre-built air pallets or air containers as pre-cooled Unit Lift Devices (ULD's) delivered to the airport. The design incorporates air-lock doors on the loading dock, pallet elevators, forklifts, and static and mechanically driven pallet rollers. Three air pallet scales are included to permit rapid weighing and completion of airline acceptance documents. Two air pallet scanners located in a cooled area just before the delivery points to the airlines will ensure that cargo security requirements can be met. Air pallets and air containers would move around the facility on pallet dollies. Transfers would be made from storage rooms onto pallet dollies for delivery to pallet roller positions or to ground service pallet dollies or air pallet lifters. The feasibility study must refine this design based on the logistics requirements for loading aircraft at peak volume periods. During the peak green bean export period in December, for example, up to five regularly scheduled airlines and two charters may be loading 120 to 180 MT of produce within the same three-hour period. Greater mechanization of the facility may be needed if volumes expand beyond those projected here.

Refrigerated Transport Services

Egypt has two refrigerated truck manufacturers and is reducing its import duties, and consequently, value added tax on refrigerated vans. HEIA may want to consider the addition of a refrigerated trucking service to handle unitized air cargo (Europallets or ULD's) as an additional service. However, this option may unduly complicate the feasibility study, and may be better considered as a separate company. Some firms are already studying the feasibility of mobile pre-cooling equipment introduction as a service integrated with their intermodal truck-to-vessel reefer container transport.

Freezer Space

Airlines have indicated that the current freezer space at the airport requires extremely careful scheduling of arrivals of frozen specialty meat and poultry, medicines, and some vaccines. Import and transit storage at 0, -5, and –18 degrees C should be studied during the feasibility phase of this project, as well as the potential utilization of freezer space for horticultural and other export products. Options may include the use of plug-in freezer containers that could be positioned to meet seasonal needs.

General Floor Plans

Two general floor plans were considered during the pre-feasibility study and are shown in Figures 8 and 9. Common to both designs is a receiving and acceptance zone that is cooled to a temperature that is a compromise among product needs, operating costs due to high heat loading (from equipment, personnel, and high daily air volume exchanges with outside air) and the ergonomic need to maintain worker productivity. It is likely that the receiving area will be operated at a temperature of 10 to 15°C. Both also contain a security zone after the main transit storage area where airline personnel can screen all pallets and air containers before they are loaded on aircraft.

The main difference between the two designs is in the central storage zone of the facility. Figure 8 shows the zone divided into three large chambers maintained at transit storage temperature. This permits the greatest flexibility in terms of floor space use, but is likely to be the less than efficiently utilized in the early years of operation, when only half to two-thirds of the space is filled at peak periods. Figure 9 shows the central storage zone divided into multiple rooms each capable of handling 12 air pallets on one level. This design offers the greatest flexibility in terms of temperature and energy management, but its use of floor space would be less efficient than the design shown in Figure 8. The reason is that more of the floor area in Figure 9 is used as the central transit corridor area.

A common airport cold store design, that of a drive through facility was eliminated from consideration, because it would not be able to handle the peak requirements for handling loose cartons over the next five to ten years; and would raise additional cargo security concerns on the part of European airlines.

FIGURE 8

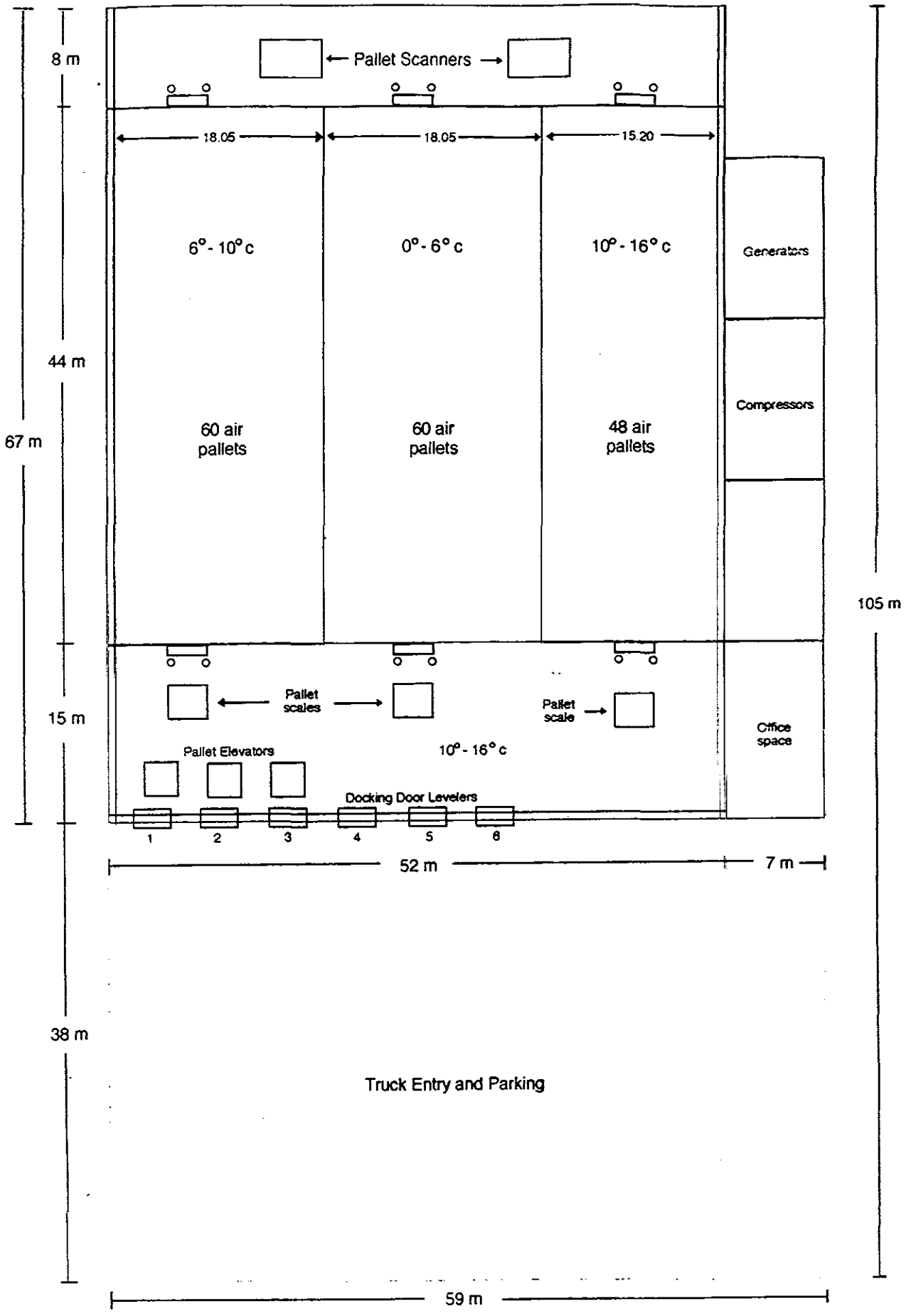
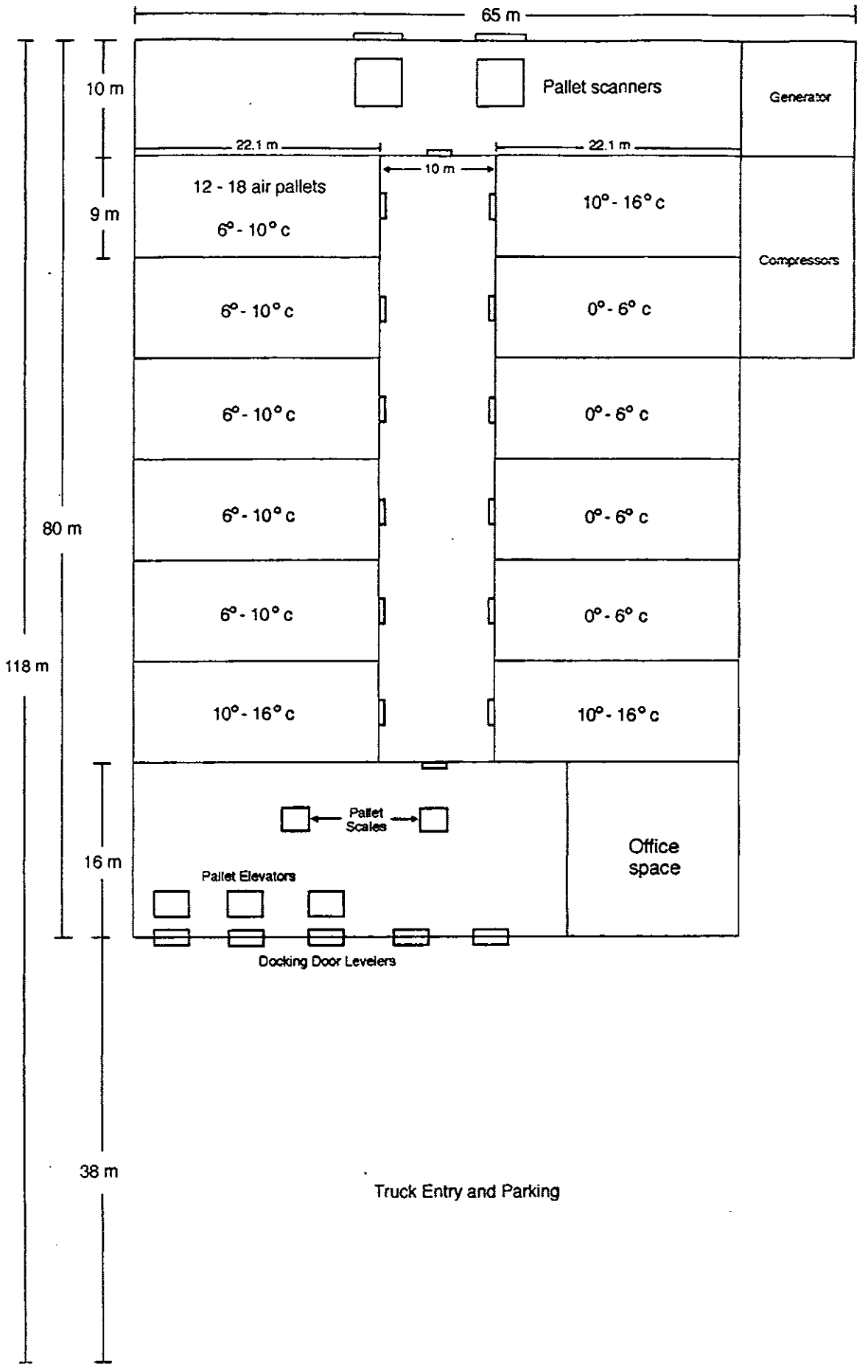

8 m
44 m
15 m
67 m
105 m
38 m
Pallet Scanners
18.05
18.05
15.20
6° - 10° c
0° - 6° c
10° - 16° c
Generators
Compressors
60 air pallets
60 air pallets
48 air pallets
Pallet scales
Pallet scale
Office space
Pallet Elevators
10° - 16° c
Docking Door Levelers
1
2
3
4
5
6
52 m
7 m
59 m
Truck Entry and Parking

FIGURE 9


65 m
10 m
Pallet scanners
Generator
22.1 m
22.1 m
10 m
9 m
12 - 18 air pallets
6° - 10° c
10° - 16° c
Compressors
6° - 10° c
0° - 6° c
6° - 10° c
0° - 6° c
6° - 10° c
0° - 6° c
6° - 10° c
0° - 6° c
80 m
118 m
10° - 16° c
10° - 16° c
Pallet Scales
Office space
16 m
Pallet Elevators
Docking Door Levelers
38 m
Truck Entry and Parking

III. ECONOMIC AND FINANCIAL ISSUES

To be competitive the airport transit cold store has to return financial rewards to investors and to shippers. To qualify for tax holidays, reduced lease and fee payments, the facility should also return a net economic benefit to the nation as a whole. This study suggests that the project should qualify on both counts.

Cold chain development usually results in investment backward into the supply and production channels and forwards into the marketing channels for any perishable commodity. Workshop participants estimated that 15 pre-cooling facilities were currently operating in Egypt.
More will be built if the airport transit cold store is developed, and mobile forced air pre-cooling units will also be introduced. As the integrity of the cold chain increases, producers are also more likely to invest in the growing, packing, and marketing of more perishable products. Flowers, more baby vegetables, and cane berries are examples. Services to support the horticultural industry should grow, with packaging and plant nurseries among the first to benefit.

Estimation of Economic Benefits

Four categories of economic benefits were considered during this pre-feasibility study.

1. Reduction in physical losses. Total physical loss of product that is accepted for air transport at the airport is rare. The only instance of a total loss in the 1998/1999 shipping season came when a flight was delayed overnight and the shipper refused to move the product into cold storage. Moving product into cold storage currently requires shippers to fill out forms to re-import their shipment, move it out of the bonded customs zone to the International Export Center or an off-airport cold store, and repeat the export documentation process the following day. Assuming that the equivalent of one 40 MT plane load of green beans is lost each year because of delay or cancellation of an aircraft, and valuing the beans at a winter season price of $2/kg yields a net loss of $80,000 per year. While exporters indicated that they occasionally have to sell product on the domestic wholesale market if a plane develops a technical problem, they indicated that forced sales on the national wholesale market is not a major loss.

2. Reduction in peak requirements. Producers and packers may be able to reduce their peak requirements for harvest, packing, pre-cooling, and transportation if they can accumulate product at the airport transit cold store over a two-day period. We were unable to quantify the potential savings, but they should be studied in greater detail in the feasibility study.

3. Improvement in the quality and shelf life of exported products. This is the area of highest potential economic return to the transit cold store. If exposure to ambient temperatures can be reduced to two hours or less during loading operations, significant gains in shelf life and quality should be obtained. As Egypt becomes known for consistent quality, it may also gain market share. In other countries, improvements in the cold chain have helped increase produce price from 5 percent to 40 percent. HEIA price reports indicate, for example, that strawberries from Egypt may be trading at 15 to 35 percent lower than Israel or Australia. Assuming an

average FOB price of $0.85 per kilogram of exported Egyptian produce a 6 percent increase in value would yield a financial IRR of 42 percent, by itself, i.e., excluding the income from handling charges. In other words, if the cold store set its prices to zero, the financial IRR would reach 42 percent based only on the increased value of the product passing through the facility. The project appears to offer substantial potential for economic benefit.

4. Indirect benefits. Two important categories of products are missing from the Egyptian horticultural product mix, flowers and fresh cut produce. Neither of these products can be successfully shipped without a continuous cold chain. The presence of the transit cold store should stimulate investment in these products and further increase employment and specialized horticultural handling facilities and services on farms. Many packing stations on farms are temporary structures built of shade cloth. Additionally, very fragile products raspberries and blackberries may be interesting additions to the small fruit category of Egyptian exports when the airport transit cold store is in place. Expansion of current production of baby vegetables would also occur. The labor demand of these crops is high, as there is no practical way to mechanize their harvest for the fresh market. Smallholders could play an important role in the expansion of the production base as outgrowers associated with packing hoses. Outgrowers are already major contributors to successful green bean export, inducing a demand for refrigerated transport to packing sheds. Suppliers of cartons, wraps, liners, and pads should see their business increase as both the volume and diversity of product increases.

Financial Issues

Cost of investment. The total estimated investment cost of the project is about $1.83 million, plus or minus 20 percent. The quality and unit costs of many basic materials and equipment varies tremendously in Egypt. A decision not to award duty-free status to the project would increase costs in the form of duties from 20 to 40 percent. The biggest issues in the cost of the investment are whether the as yet unknown design standards of the Cairo Airport authority will increase construction costs or require greater mechanization of cargo handling than assumed in this pre-feasibility study. Figure 10 details the estimated investment cost.

Figure 10. **Airport Cool Transit Store for Perishables**

Item	Units	Qty	Unit Price ($US)	Total
Steel Building	sq. meters	4000	$115	$460,000
Foundation Works	cubic meters	2450	$52	$127,400
Docking Doors	units	6	$5,000	$30,000
Load Levelers	units	3	$2,000	$6,000
Pallet Elevators	units	3	$10,000	$30,000
Pallet Scales	units	3	$25,000	$75,000
Pallet Scanners	units	2	$55,000	$110,000
Cool Room Insulation	sq. meters	4960	$20	$99,200
Refrigeration System	ton of refrigeration	59	$2,500	$147,536
Insulated Doors & Fittings (3 m)	units	6	$4,000	$24,000
Sprinkler System	units	1	$35,000	$35,000
Alarm System	units	1	$20,000	$20,000
Generators	units	1	$175,000	$175,000
Lighting	units	176	$200	$35,200
Electric forklifts	units	4	$16,000	$64,000
Pallet rollers	units	168	$1,000	$168,000
Drive units for rollers	units	72	$1,200	$86,400
Fuel tanks	units	2	$5,000	$10,000
Office furnishing and equipment		1	$25,000	$25,000
Subtotal				$1,727,736
Contingency			0.06	$103,664
Total				**$1,831,400**

Operating costs. Operating costs are estimated to be about $224,400 a year. As Figure 11 shows, these costs are dominated by personnel (45 people to cover three shifts) and power charges. Electricity purchased from the grid and supplied by the project's own generator account for about 15 percent of operating costs. If the cold store accepts product that is substantially warmer than the needed transit temperature, these energy costs will grow at an alarming rate, destroying project feasibility. It is essential that the temperature of all products entering the cold store is measured, and that no product is accepted that is more than 2 degrees above the desired transit temperature (within the accuracy of most inexpensive digital thermometers). An early exception will have to be for the 0-2 degree category of products, as much of the currently installed pre-cooling capacity cannot cool products this low. Also, improvements in the cold stores at packing sheds are needed to ensure the integrity of the cold chain. Cooled corridors leading to the loading bays, sealed docking doors, plastic-strip curtains, and more widespread cooling of reefer vans before they are loaded are required changes.

Figure 11 **Estimated Operating Costs Airport Transit Cool Store**

Estimated Energy Consumption 3413 BTU/kWh	kWh/day 1245	Rate USD $0.05	$24,642.60
Personnel	Units	Unit Rate	
Manager	1	$9,520	$9,520
Supervisors	3	$3,810	$11,430
Forklift Operators	4	$1,715	$6,860
Laborers	32	$1,525	$48,800
Secretaries	2	$1,715	$3,430
Accountant	1	$3,810	$3,810
Bookkeeper	2	$1,715	$3,430
Telephone	2	$5,000	$10,000
Fax	1	$3,000	$3,000
Fuel	10000	$1.00	$10,000
Land Rent CAA Square Meter	6825	$0.16	$1,068
Cairo Airport Authority	930352	0.03	$27,911
Percent of Gross Water, Sewage, Solid Waste/month	12	$115.00	$1,380
Insurance	1831400	0.01	$18,314
Personnel Transport Contract	45	$500.00	$22,500
Maintenance and Repair	$1,831,400	0.01	$18,314
Total			$224,409

Rate of return. Income projections are based on simulations of different volume and price per kilogram models, taking into account the price range for cooling and cold storage for perishables at privately operated cold stores near the Cairo Airport. The analysis is based on product handling charges of LE 80 per MT for palletized or otherwise unitized produce and LE 90 per MT for loose carton handling shown in Figure 12. These rates are considerably higher than HEIA had originally targeted, but they are in line with the improvements in economic value of the project. Manipulating these two variables shows that the feasibility of the project is volume dependent, because there is a narrow price range that can be charged. Volume assumptions for the facility are 50% of total airport perishables flows in the first year increasing to 90 percent by the fifth year. Unitized volume increasing and loose packed volume increasing and then decreasing. Operating costs are based on full operations starting from year 5. No allowance is made for reduced costs during the early years of lower operating levels.

Figure 12

	Unitized	Loose
	LE/MT	
Proposed Facility Rate	80	90
HEIA Target Rate	20	30
Egypt Air Rate	10	10
International Export Center Rate	45	45
MultiFruit Rate	100	100

Assumptions:

1. Perishables Volume
   1. Year 1 50% of total Cairo Airport Flows
   2. Year 2 75% of total Cairo Airport Flows
   3. Year 3 80% of total Cairo Airport Flows
   4. Year 4 85% of total Cairo Airport Flows
   5. Year 5 90% of total Cairo Airport Flows
2. Unitization

	Unitized	Loose
1. Year 1	20%	30%
2. Year 2	30%	45%
3. Year 3	40%	40%
4. Year 4	50%	35%
5. Year 5	60%	30%

3. Inflation of Operating Costs — Zero

The financial IRR of the cold store is 28 percent, as shown in Figure 13. This IRR is based on handling charges of LE 80 for unitized and LE 90 for loose packed product. Sensitivity analysis of the IRR on different handling charges are as follows:

- IEC rate of LE 45 for unitized and loose — 5 percent IRR
- 25 percent decrease - LE 60 for unitized, LE 68 for loose — 17 percent IRR
- 15 percent decrease – LE 68 for unitized, LE 77 for loose — 22 percent IRR

Conversely, rates as high or higher than Multifruit (LE 100), while raising the IRR, will not return an increase in benefits to the growers and packers.

The IRR is less sensitive to increases in capital costs compared to changes in handling charges. The results are as follows:

- Increase of 20 percent in capital cost — 23 percent IRR
- Increase of 30 percent — 21 percent IRR
- Increase of 40 percent — 19 percent IRR

The IRR is also insensitive to changes in operating costs.

- Increase of 20 percent in operating cost — 26 percent IRR
- Increase of 50 percent — 22 percent IRR
- Figure 13 here

Figure 13. Airport Transit Cool Store Financial Analysis

Income Projection	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Tonnage (MT)		21,150	31,725	33,840	35,955	38,070	38,070	38,070	38,070	38,070	38,070
Unitized Volume (LE)		676,800	1,015,200	1,353,600	1,692,000	2,030,400	2,030,400	2,030,400	2,030,400	2,030,400	2,030,400
Loose Volume (LE)		1,142,100	1,713,150	1,522,800	1,332,450	1,142,100	1,142,100	1,142,100	1,142,100	1,142,100	1,142,100
Total Projected Income (LE)		1,818,900	2,728,350	2,876,400	3,024,450	3,172,500	3,172,500	3,172,500	3,172,500	3,172,500	3,172,500
Total Projected Income (USD)		533,402	800,103	843,519	886,935	930,352	930,352	930,352	930,352	930,352	930,352
Capital Cost	1,831,400										
Operating Cost		(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)
Annual Profit and Loss	(1,831,400)	309,002	575,703	619,119	662,535	705,952	705,952	705,952	705,952	705,952	705,952

Project IRR **28%**

Capital Financing and Returns to Equity. It is unlikely that 100 percent financing will be available for this privately owned project. Discussions with bankers in Cairo suggest that a minimum of 20 percent of the project should be equity and that 40 percent equity would be preferred. HEIA members have indicated that they could band together to cash finance this project. Other sources of equity and loan financing that should be examined during the feasibility study include those of USAID, the European Commission, and the Commonwealth Development Corporation.

The Net Present Value (NPV) of the project with equity investment of 25 percent is $392,188 using a discount rate of 18 percent. Refer to Figure 14. The IRR on equity is just over 37 percent. This assumes an interest rate on borrowed capital of 15 percent and on working capital of 14 percent, and corporate income tax rate of 32 percent. Incentives such as income tax holidays obviously will increase the returns. The favorable return on equity indicates that the owners will have some flexibility to reduce handling charges if demand for the facility lags expectations. For example, if handling charges are reduced to LE 68 for unitized and LE 77 for loose product (15 percent decrease), the NPV remains positive at $67,800 with and IRR on equity of 29 percent. However, a decrease of 20 percent in the handling charges yields a negative NPV.

Higher levels of equity investment of course lower the NPV and IRR on equity. With an equity portion of 40 percent, the NPV is $338,380 and the IRR on equity is just over 29 percent.

Data Quality for Economic and Financial Analysis.

Export statistics in Egypt are very difficult to reconcile with import statistics in destination countries. Detailed breakdowns by mode of transport are equally perplexing. Using a variety of data sources, we have had to work backwards from total exports flows and subtract products that are generally shipped by ocean or truck. We then adjusted the resulting figures to account for air shipments of some products that are shipped by air and surface. Finally, the results were compared with airline and freight forwarder information on seasonality and volume. A better statistical database would reduce the margin of error of this and all export-oriented studies. We have to assume that our figures could be off by 20 percent or more. This is within the normal range for a pre-feasibility study, but unacceptable for a feasibility study.

Figure 14. Airport Transit Cool Store Cash Flow Analysis

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net Sales		533,402	800,103	843,519	886,935	930,352	930,352	930,352	930,352	930,352	930,352
Cost of Sales		(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)	(224,400)
Depreciation		(147,060)	(147,060)	(147,060)	(147,060)	(147,060)	(147,060)	(147,060)	(147,060)	(147,060)	(147,060)
Operating Profit		161,942	428,643	472,059	515,475	558,892	558,892	558,892	558,892	558,892	558,892
Interest Expense		(224,702)	(223,889)	(213,738)	(201,838)	(187,924)	(170,176)	(149,766)	(126,294)	(99,302)	(68,260)
Before Tax Income		(62,760)	204,754	258,321	313,638	370,967	388,716	409,126	432,598	459,590	490,632
Income Taxes		-	(65,521)	(82,663)	(100,364)	(118,710)	(124,389)	(130,920)	(138,431)	(147,069)	(157,002)
Depreciation		147,060	147,060	147,060	147,060	147,060	147,060	147,060	147,060	147,060	147,060
Principal Repayment		(67,650)	(77,798)	(89,467)	(102,887)	(118,321)	(136,069)	(156,479)	(179,951)	(206,943)	(237,985)
Cash Flow	(457,850)	16,650	208,495	233,251	257,446	280,997	275,318	268,787	261,276	252,638	242,705
Cumulative Cash Flow	(457,850)	(441,200)	(232,705)	546	257,992	538,989	814,307	1,083,094	1,344,369	1,597,007	1,839,712
Cash Flow Net Present Value @ 18%	392,188										
Equity amount	457,850										
Percentage Equity	25%										
Loan amount	1,373,550										
Principal Repayment		67,650	77,798	89,467	102,887	118,321	136,069	156,479	179,951	206,943	237,985
Interest Expense (Fixed Capital)		206,033	195,885	184,215	170,795	155,362	137,614	117,204	93,732	66,739	35,698
Working Capital Interest @ 14% -		18,669	28,004	29,523	31,043	32,562	32,562	32,562	32,562	32,562	32,562

IV. OWNERSHIP AND MANAGEMENT OF THE FACILITY

There appear to be several ways to structure the ownership and management of the transit cold store. The S.A.E. (Egyptian Private Corporation) appears to offer the greatest flexibility in terms of operations of the cold store.

HEIA ownership. Under the new association law, HEIA can be a shareholder in private corporations. Review of the law and the level of ownership that an association can hold needs to be undertaken. HEIA members include growers, packers, shippers, brokers, air, sea, and truck freight forwarders, transporters, refrigeration companies, and other service providers.

HEIA members. HEIA members could also form the operating company directly.

Either of these formulations would not provide direct management experience in air cargo ground operations. Currently, Egypt Air, Egypt Air Services, Air France, British Air, Lufthansa, and KLM run air cargo ground operations. The foreign airlines are limited to providing ground services only to their own aircraft, or aircraft of the new alliances. Competition for freight is such that majority ownership or controlling interest by any one airline probably should be avoided. An option that may be worth considering at the feasibility stage is inviting participation by an experienced produce logistics firm in the ownership and management of the facility.

Egypt Air. Egypt Air handles most of the perishable freight shipped from the Cairo International Airport. The problem with their majority or controlling ownership would be the strengthening of the quasi-monopoly EA already holds on perishables handling.

Conclusion: A privately operated transit cold store at the Cairo International Airport will be profitable financially and of substantial economic value to the horticultural export sub-sector. Its viability depends upon authorization by the Cairo Airport Authority or its supervising instances of a fast-track design and BOT tender to be issued within 6 months of August 1999.

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ANNEXES

Annex 1. Meteorological Data

Annex 2. Air Freight Volume - Historical and Projected

Annex 3. Financial and Economic Analysis

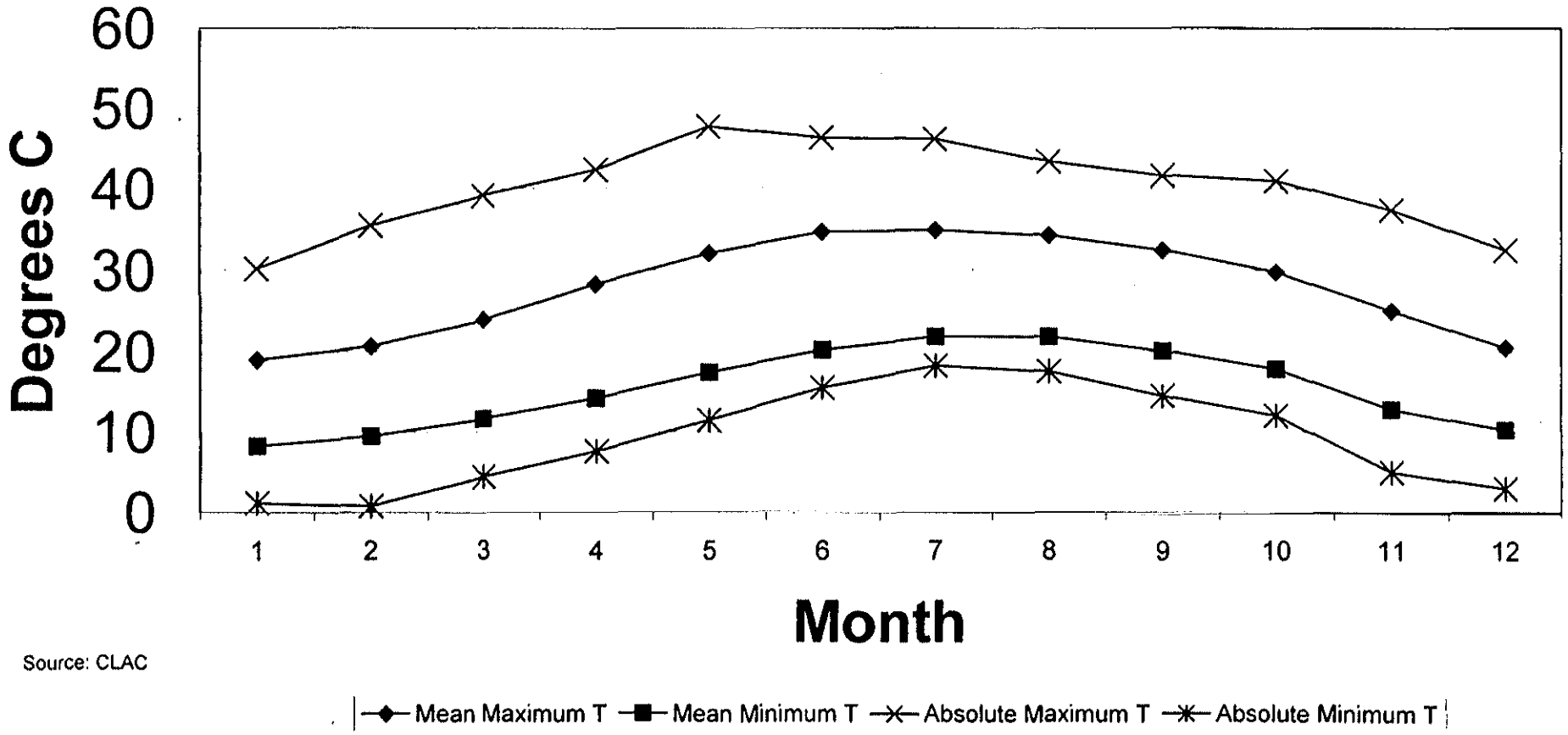
Annex 1

Meteorological Data

Table 1. Monthly Minimum and Maximum Temperatures Egyptian Growing Areas (Degrees Celcius)
Cairo Long-Term Records

Location		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
	Mean	1	2	3	4	5	6	7	8	9	10	11	12	
Cairo	Minimum	8.3	9.5	11.6	14.2	17.4	20.2	21.8	21.8	20.1	17.8	12.8	10.3	
	Maximum	19	20.7	23.9	28.3	32.1	34.7	34.9	34.3	32.5	29.8	25	20.5	
	Absolute Minimum	1.2	0.8	4.4	7.6	11.5	15.5	18.2	17.5	14.5	12	5	3	
	Maximum	30.2	35.5	39.2	42.4	47.8	46.4	46.2	43.4	41.7	41	37.4	32.5	
Source:	Central Laboratory for Agricultural Climate (CLAC) long-term reports.													
All Locatio	Min Ave	8.3	9.5	11.6	14.2	17.4	20.2	21.8	21.8	20.1	17.8	12.8	10.3	15.48
	Max Ave	19	20.7	23.9	28.3	32.1	34.7	34.9	34.3	32.5	29.8	25	20.5	27.98
	Difference	10.7	11.2	12.3	14.1	14.7	14.5	13.1	12.5	12.4	12	12.2	10.2	12.49

Figure I. Cairo Airport Long-Term Monthly Minimum and Maximum Temperatures



Source: CLAC

Table 2. Mean Monthly Minimum and Maximum Temperatures (Degrees Celcius) in Egyptian Growing Areas

Location		Jan 1	Feb 2	March 3	April 4	May 5	June 6	July 7	Aug 8	Sept 9	Oct 10	Nov 11	Dec 12
Cairo	Minimum	8.8	9.5	11.6	14.2	17.4	20.2	21.8	21.8	20.1	17.8	13.8	10.3
	Maximum	19	20.7	23.9	28.3	32.1	34.7	34.9	34.3	32.5	29.8	25	20.5
Fayoum	Minimum	5.9	7.3	9.8	13.2	17.1	19.8	21.2	21.4	19.6	17.1	13	8.4
	Maximum	20.3	22.2	25.4	29.9	33.8	36.1	26.8	36.5	33.9	31.6	26.4	21.8
Alexandria	Minimum	10.8	10.8	12.3	14.4	17.4	20.5	23	23.4	22.2	19.8	16.4	12.5
	Maximum	18.1	18.7	20.4	23	26	28.4	29.6	30.4	29.5	27.5	23.8	20.1
Ismaailia	Minimum	7.8	8.8	10.1	12.5	15.9	18.7	21.8	22	20.2	17.4	13.5	9.7
	Maximum	21.1	21.6	23.6	28	32	34.5	36.1	36	33.5	30.5	26.4	21.6
Tanta	Minimum	6.3	6.2	8.6	10.8	14	17.3	19	19.3	17.7	15.1	11.5	7.5
	Maximum	18.7	20.4	23.1	26.1	30.8	33.3	32.6	32.7	32.4	29.4	23.8	19.7
Zagazig	Minimum	6.6	7.1	9.2	12	15.5	18.6	20.2	20.4	18.6	16.6	13	8.6
	Maximum	19.7	21	23.6	27.6	31.4	34	34.4	34.2	32.5	30.2	25.7	21.2
Siwa	Minimum	4.6	5.9	8.6	12.5	16.7	19.6	20.8	20.8	18.6	15	10.1	6.2
	Maximum	19.6	21.8	25.1	29.8	34.1	37.3	37.7	37.5	34.9	31.3	25.9	21.1
Aswan	Minimum	8.1	9.6	13	17.9	21.4	24.3	24.8	24.8	22.6	19.6	14.6	9.7
	Maximum	23.5	26.2	30.5	35.3	38.7	41.8	41.1	41	39.5	36.4	29.8	25

Source: Central Laboratory for Agricultural Climate (CLAC) 1999 website and published reports.

All Locations	Min Ave	7.4	8.2	10.4	13.4	16.9	19.9	21.6	21.7	20.0	17.3	13.2	9.1
	Max Ave	20.0	21.6	24.5	28.5	32.4	35.0	34.2	35.3	33.6	30.8	25.9	21.4
	Difference	12.6	13.4	14.1	15.1	15.4	15.1	12.6	13.6	13.6	13.5	12.6	12.3

Figure A2. Monthly Min and Max Average Temperatures

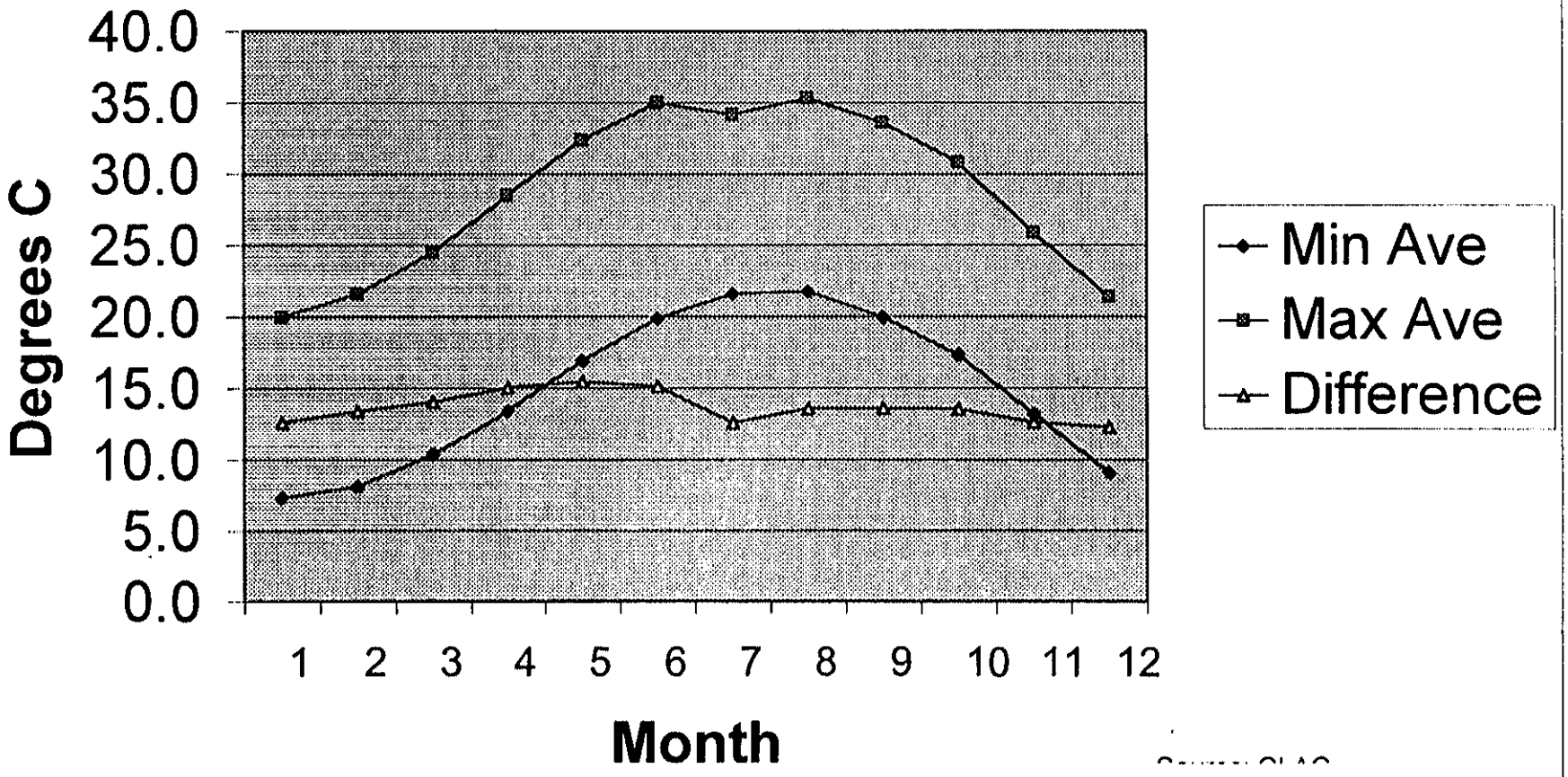
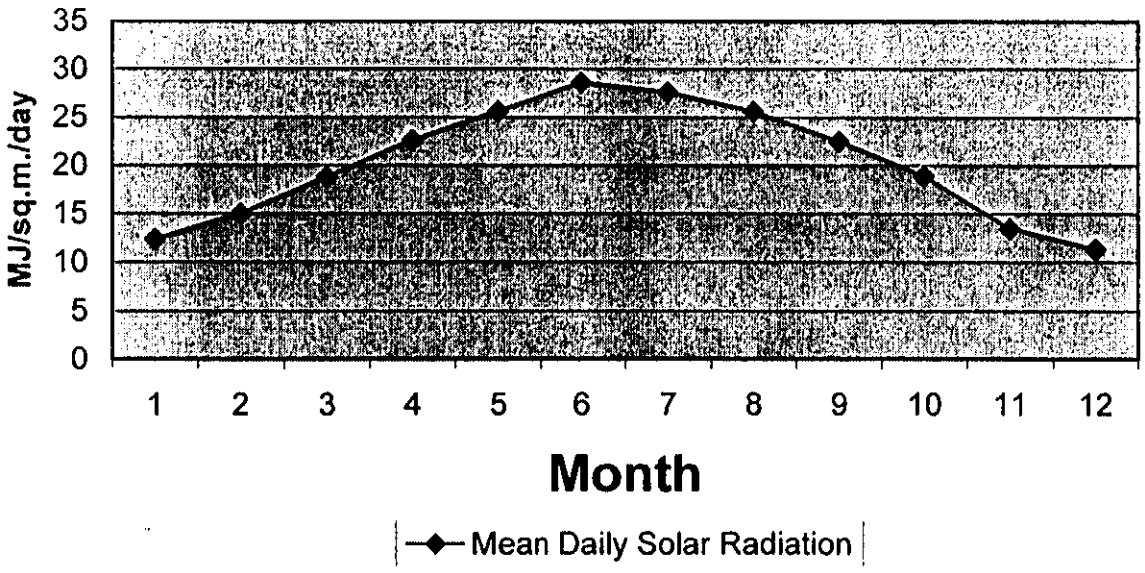


Table 3. **Mean Daily Solar Radiation ($MJ/m^2/day$) in Egyptian Growing Areas**

Location		Jan 1	Feb 2	March 3	April 4	May 5	June 6	July 7	Aug 8	Sept 9	Oct 10	Nov 11	Dec 12
Cairo	Average	12.4	15	18.8	22.6	25.6	28.6	27.6	25.6	22.5	18.9	13.5	11.4
Fayoum	Average	12.5	15.5	19.7	23.6	25.7	26.6	29.5	27.3	23.7	18.2	13.3	10.9
Alexandria	Average	11.9	14.2	18.1	21.6	25.3	28.3	27.7	25.5	21.7	16.9	12.2	10.3
Ismalia	Average	11.8	15.2	19	22.4	25.5	29.3	28.7	26.5	22.6	17.7	13.3	11.2
Tanta	Average	12.5	16.2	20	23.2	27.1	29.7	28.7	26.4	23	18.5	13.5	11.6
Zagazig	Average	12.1	14.9	19.3	23.2	26.2	28.9	28.1	25.9	22.8	17.9	13.4	11.4
Siwa	Average	14	17.2	21.4	24.1	27	30	30.1	27.7	24.3	19.3	14.6	12.7
Aswan	Average	16.2	19.5	22.5	25.4	27.4	29.3	28.5	27.5	25	21.1	17.5	15.5
Source:	Central Laboratory for Agricultural Climate (CLAC) 1999 website and published reports.												
All Locations	Average	12.9	16.0	19.9	23.3	26.2	28.8	28.6	26.6	23.2	18.6	13.9	11.9

Figure A.3. Cairo Airport - Mean Daily Solar Radiation



Source: CLAC Website

Table 4. **Mean Monthly Relative Humidity Egyptian Growing Areas**

Location		Jan 1	Feb 2	March 3	April 4	May 5	June 6	July 7	Aug 8	Sept 9	Oct 10	Nov 11	Dec 12
Cairo	Minimum												
	Maximum												
	Average	58	54	49	45	42	46	54	57	58	57	61	60
Fayoum	Minimum												
	Maximum												
	Average	62	52	49	43	39	40	47	51	52	54	62	64
Alexandria	Minimum												
	Maximum												
	Average	69	71	65	66	65	66	70	71	70	72	72	70
Ismaailia	Minimum												
	Maximum												
	Average	59	62	46	37	38	42	50	53	50	56	59	60
Tanta	Minimum												
	Maximum												
	Average	74	65	64	60	53	56	66	70	68	65	70	73
Zagazig	Minimum												
	Maximum												
	Average	71	66	62	55	50	52	59	64	65	65	69	73
Siwa	Minimum												
	Maximum												
	Average	53	45	38	33	30	30	34	37	41	45	52	56
Aswan	Minimum												
	Maximum												
	Average	35	26	18	14	13	13	16	18	20	22	33	37
Source:	Source: CLAC 1999 website and published reports												
All Locations	Ave %R.H.	60	55	49	44	41	43	50	53	53	55	60	62

Figure A.4. Average Relative Humidity 8 Locations

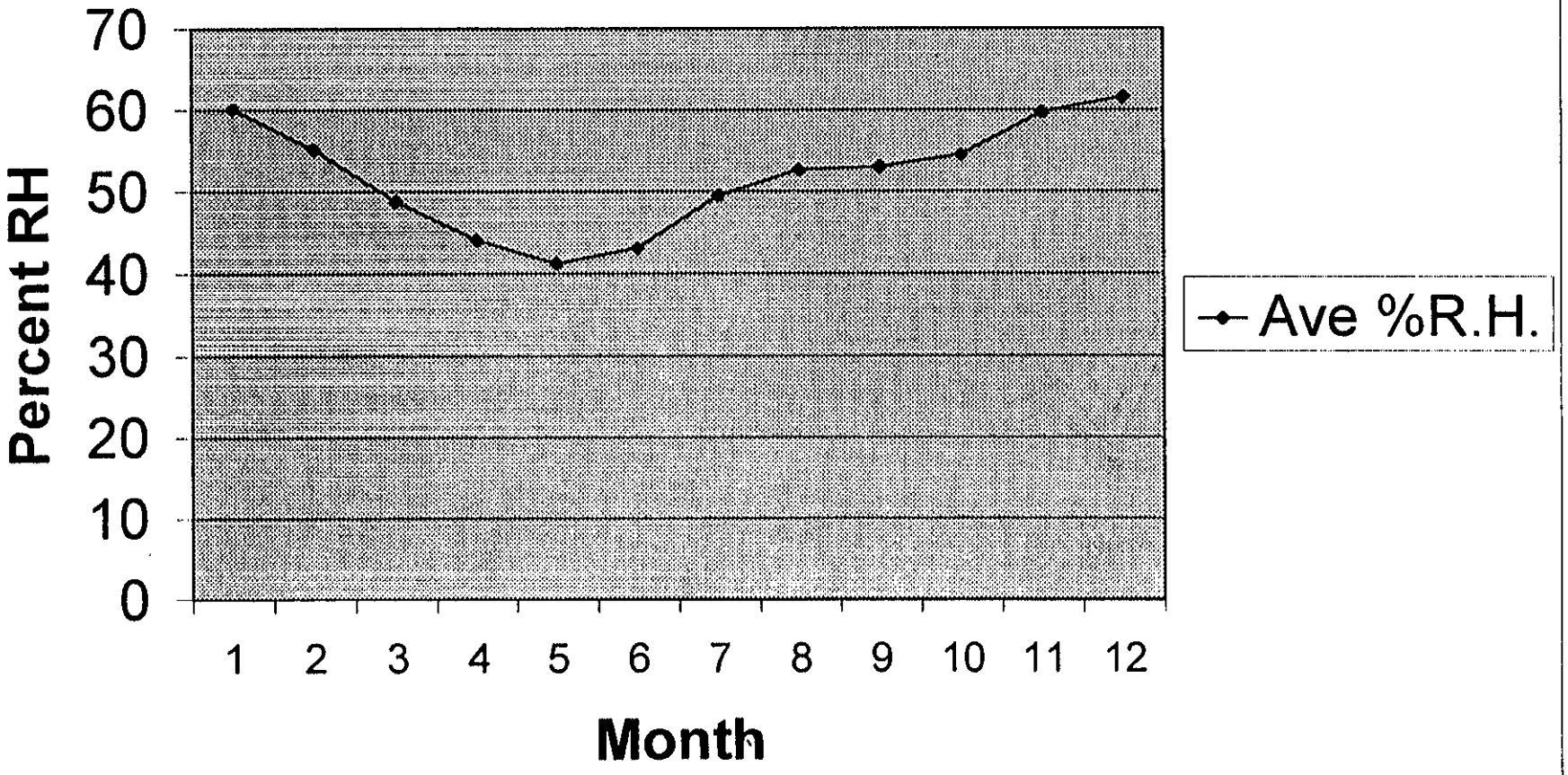
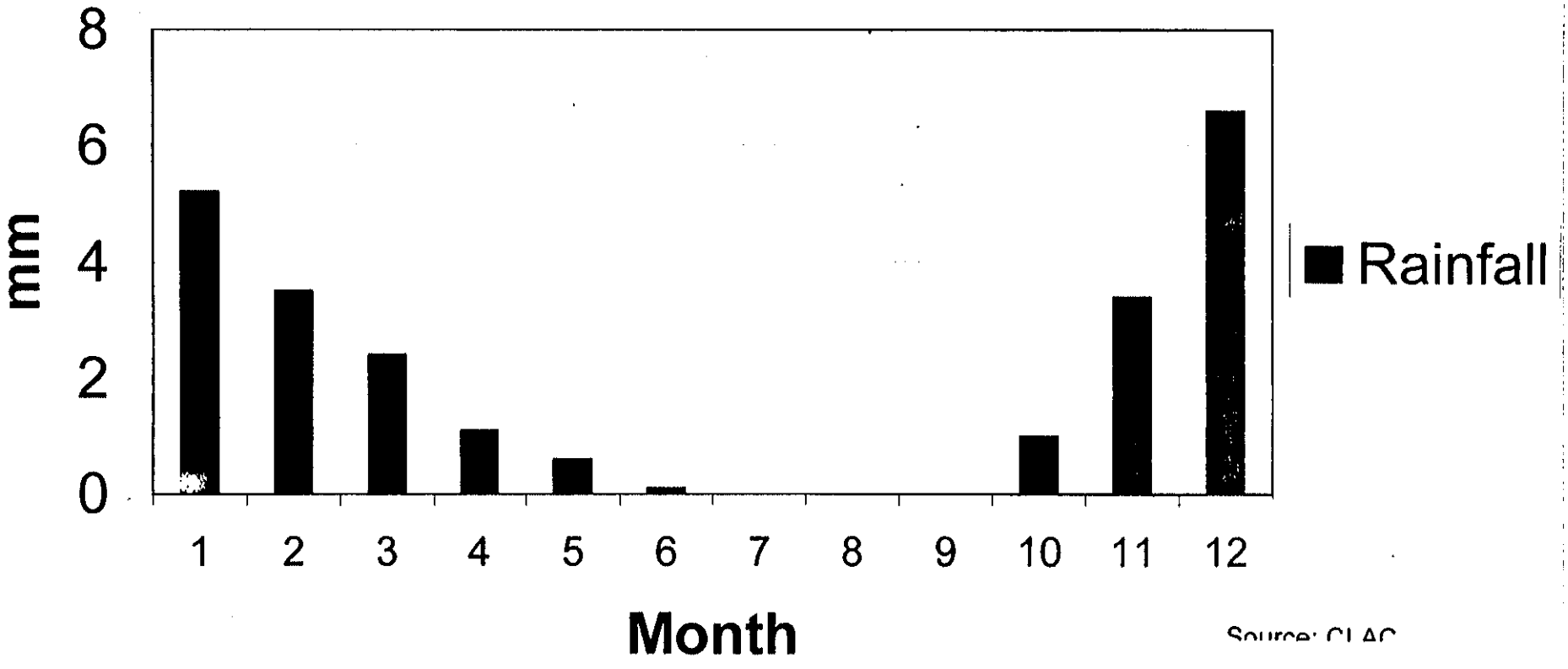


Table 5. **Mean Monthly Total Rainfall (mm) in Egyptian Growing Areas**

Location		Jan 1	Feb 2	March 3	April 4	May 5	June 6	July 7	Aug 8	Sept 9	Oct 10	Nov 11	Dec 12
Cairo	Mean Total	5.2	3.5	2.4	1.1	0.6	0.1	0	0	0	1	3.4	6.6
Fayoum	Total	1	1.4	1.2	0.6	1	0	0	0	0	0.7	0.9	0.4
Alexandria	Total	56.3	28.9	11.7	5.8	2.5	0	0	0.2	0.6	10.7	26.6	50
Ismalia	Total	6.6	1.6	7.4	1.3	3.5	0	0	0	0	2.3	7.7	2.9
Tanta	Total	6.4	4.2	8	5.7	0.4	0.1	0	0	0	4.3	5.4	12
Zagazig	Total	6.7	5.6	3.8	2	2.6	0	0	0	0	1.8	4.3	6.1
Siwa	Total	1	2.1	0.3	1.1	1.2	0	0	0	0.1	0.4	1.1	2.1
Aswan	Total	0	0	0	0.5	0	0	0	0	0	0	0.1	0.1
Source:	CLAC 1999 website and published reports												
All Locations	Average	10.40	5.91	4.35	2.26	1.48	0.03	0.00	0.03	0.09	2.65	6.19	10.03

Figure A.5. Cairo Airport - Monthly Total Rainfall (mm)



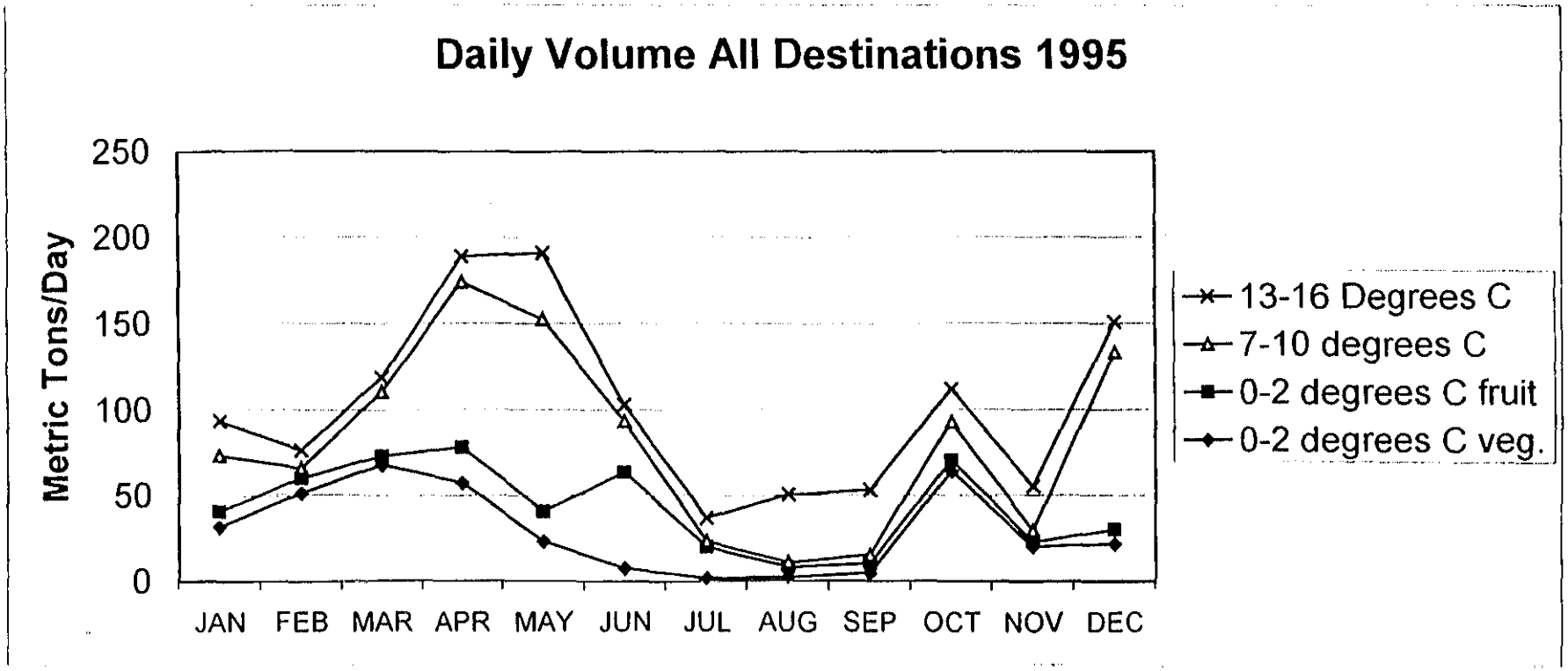
Source: CLAC

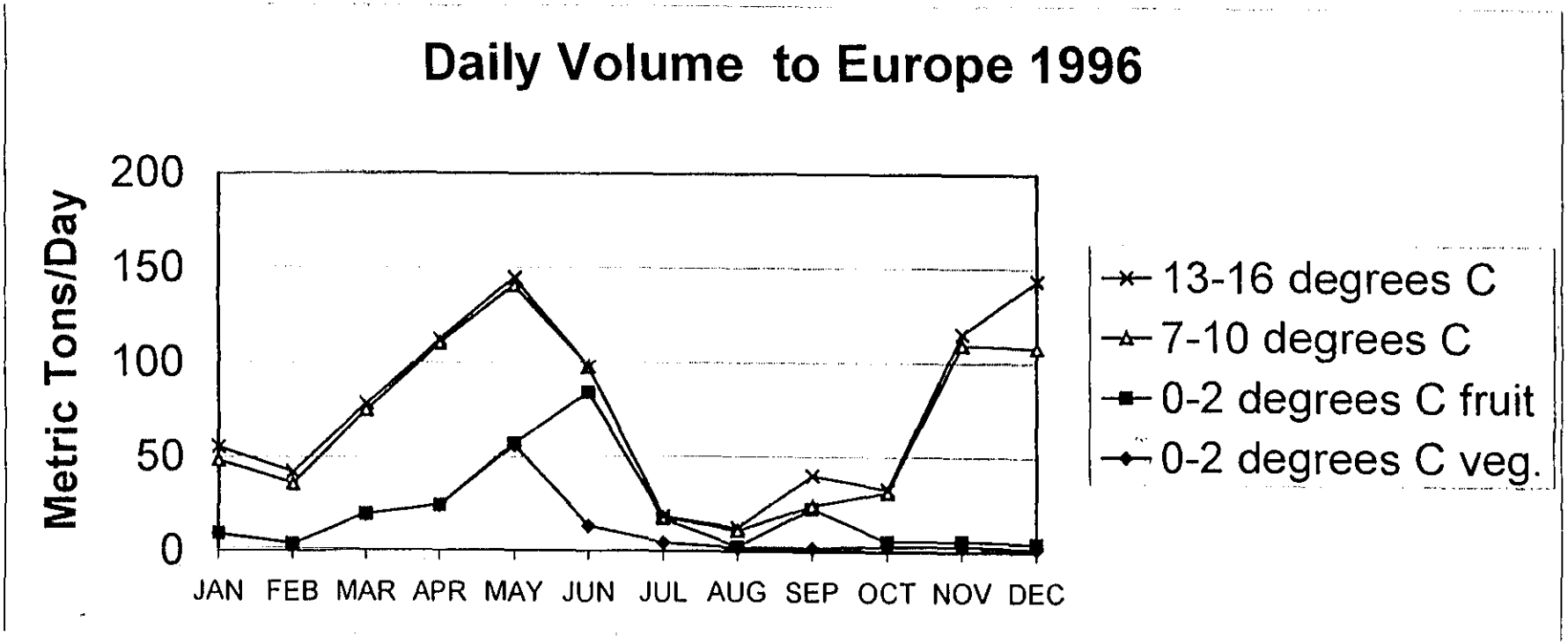
Annex 2

Air Freight Volume – Historical and Projected

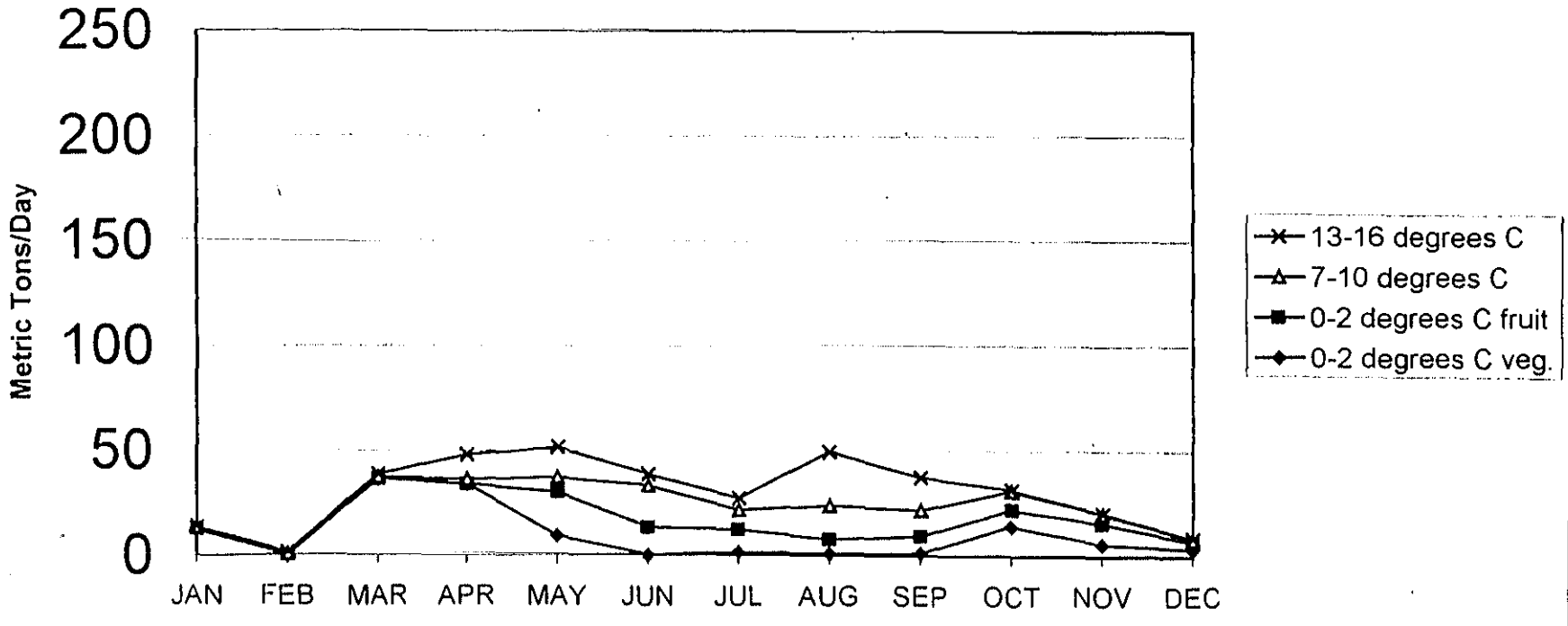
Daily Air Volume from Cairo Airport

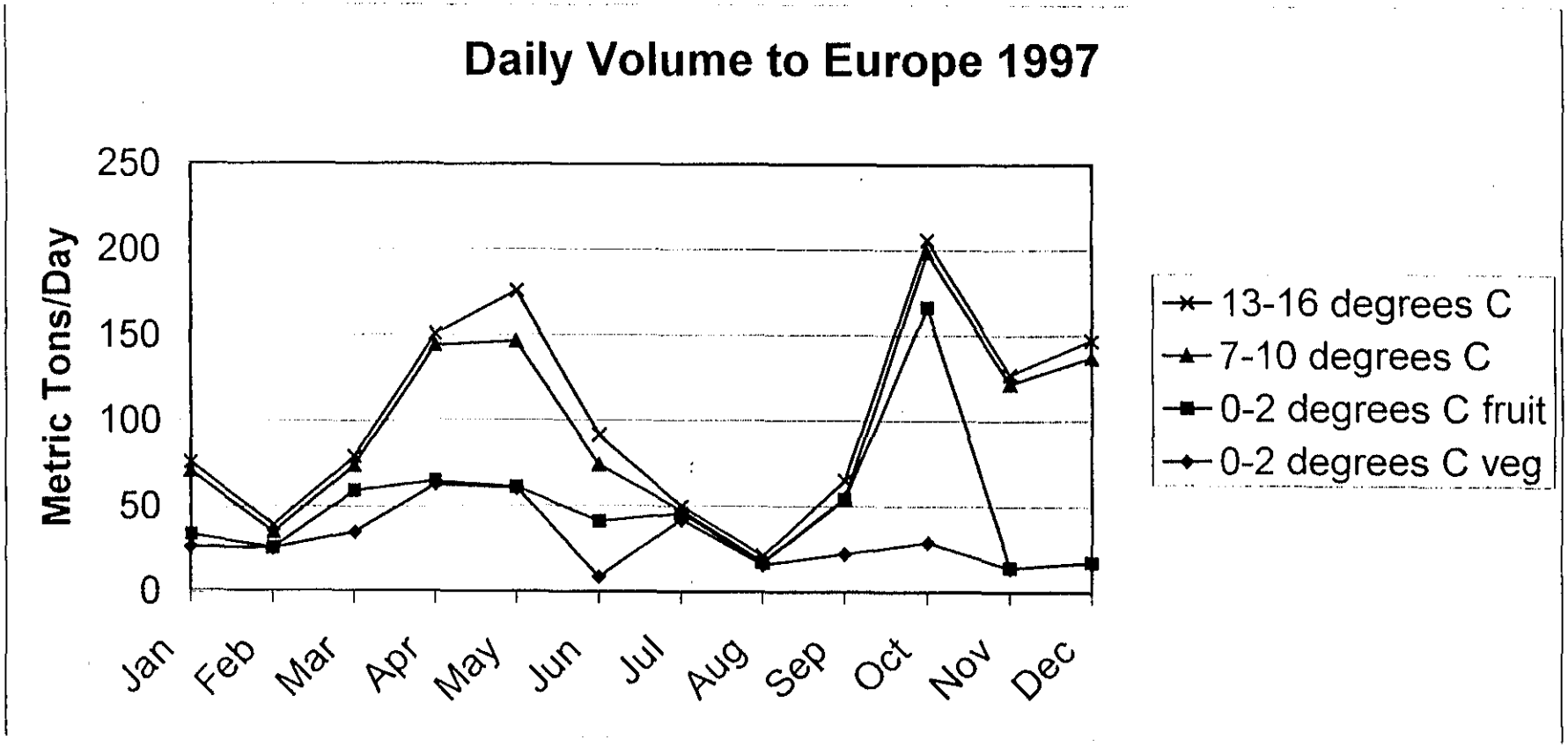
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual Total
Daily MT 1995	93	76	118	189	191	102	36	50	53	112	55	151	36780
Daily MT 1996	68	42	116	159	196	137	46	61	77	64	135	151	37560
Europe 1996	55	41	78	112	145	98	19	12	40	33	115	143	26730
Other 1996	13	1	38	47	51	39	27	49	37	31	20	8	10830
Daily MT 1997	101	62	140	188	228	124	77	55	106	269	175	180	51150
Europe 1997	76	39	79	151	176	92	50	21	65	206	127	147	36870
Other 1997	25	23	61	37	52	32	27	34	41	63	48	33	14280
Daily MT 200X	94	70	99	186	225	117	75	49	72	106	150	167	42300
Europe 200X	78	49	62	151	179	93	50	20	39	80	129	153	32490
Other 200X	16	21	37	35	46	24	25	29	33	26	21	14	9810

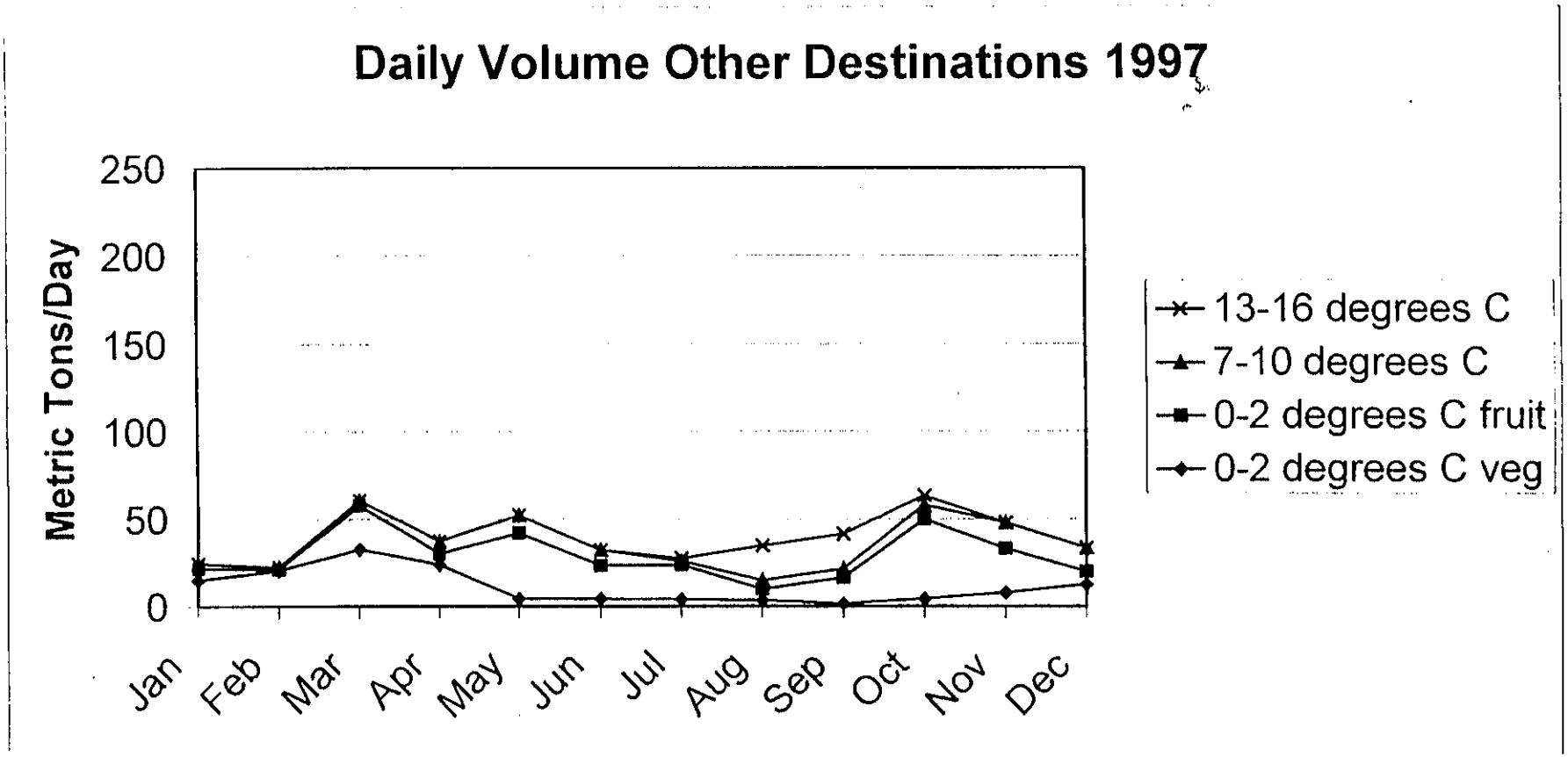

Daily Volume All Destinations 1995
Metric Tons/Day
250
200
150
100
50
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
13-16 Degrees C
7-10 degrees C
0-2 degrees C fruit
0-2 degrees C veg.


Daily Volume to Europe 1996
Metric Tons/Day
200
150
100
50
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
13-16 degrees C
7-10 degrees C
0-2 degrees C fruit
0-2 degrees C veg.

Daily Volume Other Destinations 1996




Daily Volume to Europe 1997
Metric Tons/Day
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
13-16 degrees C
7-10 degrees C
0-2 degrees C fruit
0-2 degrees C veg


Daily Volume Other Destinations 1997
Metric Tons/Day
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
13-16 degrees C
7-10 degrees C
0-2 degrees C fruit
0-2 degrees C veg

Egyptian Exports to Europe - Vision 200X assuming growth of sea freight of grapes and other products.

	Europe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	0-2 degrees C veg													
	Garlic	4	122	308	1105	1399	41	45	21	1	434	1	1	3481
	Peas	147	68	87	279	51	0	0	0	0	10	41	71	754
	Artichoke	0	0	0	0	0	0	0	0	0	0	0	1	2
	Green Onion	643	571	649	498	362	217	1220	447	662	429	374	441	6514
	Sub-total	794	761	1044	1882	1813	259	1265	468	663	872	416	514	10752
Air	Daily vol. 30 d	26	25	35	63	60	9	42	16	22	29	14	17	
	0-2 degrees C fruit Storage Needs 1B													
	Cantaloupe	5	0	11	15	15	0	0	0	0	0	57	7	126
	Grape	0	0	0	0	90	1002	128	0	10	90	0	0	1320
	Strawberries	250	300	200	50		0	0	0	0	0	25	175	1000
	Dates	23	1	16	12	0	0	0	3	106	134	0	0	294
	Peach	0	0	0	3	13	1	0	0	0	0	0	0	17
	Pomegranates	0	0	0	0	0	0	0	33	59	104	1	1	200
	Sub-total	279	301	227	79	118	1003	128	35	175	328	83	183	2957
Air	Daily vol. 30 d	9	10	8	3	4	33	4	1	6	11	3	6	
	7-10 degrees C													
	Beans	1115	273	433	2388	2553	994	41	0	18	968	3219	3585	15586
	Orange	4887	5550	9777	32590	11115	1753	1619	0	0	0	2649	4764	74703
	Lemon	6	5	6	2	3	0	1	10	3	2	3	5	45
	Sub-total	6008	5828	10217	34979	13670	2748	1660	10	22	970	5870	8353	90335
Air	Daily vol. 30 d	37	9	15	80	85	33	1	0	1	32	107	120	
	13-16 degrees C													
	Fresh Onion	51	70	299	1651	8923	5255	579	22	400	2	0	83	17336
	Tomato	40	37	71	17	3	0	0	0	0	2	39	140	350
	Sweet Potato	113	77	58	10	1	0	6	76	239	218	123	158	1078
	Mango	0	0	0	0	0	0	12	21	31	2	0	0	67
	Sub-total	204	184	428	1678	8927	5255	597	119	671	224	161	382	18831
Air	Daily vol. 30 d	5	4	5	6	30	18	3	3	10	7	5	10	
	Grand Total	7285	7074	11916	38619	24528	9265	3651	632	1531	2395	6531	9432	122875
	Daily air volume	78	49	62	151	179	93	50	20	39	80	129	153	

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Oranges and 90% of fresh onions flows are exclud / air cargo volumes

Egyptian Exports to Other Destinations - Vision 200X assuming growth of sea freight of grapes and other products.

	Other	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	0-2 degrees C veg													
	Garlic	146	108	519	413	22	14	20	0	0	0	50	0	1293
	Peas	42	18	14	8	1	0	0	0	0	11	83	91	267
	Artichoke	105	336	251	234	4	0	0	0	0	0	43	108	1081
	Green Onion	171	156	191	62	104	115	101	108	49	123	56	176	1412
	Sub-total	463	619	975	717	132	129	121	108	49	134	231	374	4053
Air	Daily vol. 30d	15	21	32	24	4	4	4	4	2	4	8	12	
	0-2 degrees C fruit													
	Cantaloupe	10	16	64	264	488	255	145	53	10	9	28	17	1359
	Dates	194	6	746	42	0	0	0	11	98	1018	441	213	2638
	Grape	0	0	0	0	0	181	385	105	46	21	4	0	742
	Peach	0	0	6	75	759	162	68	6	0	0	0	0	1076
	Pomegranate	0	0	0	0	0	0	0	9	292	350	317	5	973
	Sub-total	204	22	816	380	1247	599	599	185	446	1398	789	236	6788
Air	Daily vol. 30 d	1	1	5	11	42	20	20	6	12	16	13	1	
	7-10 degrees C													
	Beans	31	6	7	136	249	244	61	126	121	194	372	189	1736
	Orange	6348	2468	9741	3200	20590	1973	493	0	0	0	5696	32426	82935
	Lemon	1162	712	1517	1498	1176	455	120	525	636	1153	1394	4265	14612
	Sub-total	7541	3186	11266	4834	22014	2672	674	651	757	1347	7462	36880	99284
Air	Daily vol. 30 d	3	1	3	7	10	9	2	5	5	8	15	13	
	13-16 degrees C													
	Mango	0	0	0	0	0	1	41	586	586	157	1	0	1373
	Fresh Onion	4059	13791	11685	7159	5530	3589	6866	4840	4566	4589	4490	7347	78512
	Tomato	40	121	0	21	1	4	2	1	423	16436	4782	4844	26675
	Sweet Potato	311	223	255	137	150	63	114	250	173	490	640	736	3541
	Sub-total	4409	14134	11940	7316	5681	3658	7024	5677	5748	21672	9913	12927	110100
Air	Daily vol. 30 d	0	0	0	0	0	0	1	20	20	5	0	0	
	Grand Total	12618	17961	24996	13247	29075	7057	8417	6621	6999	24552	18396	50417	220224
	Daily air volume	19	23	40	42	56	33	28	34	38	34	36	27	

Project Daily Air Volumes to All Destinations from Cairo Airport

Daily Volume	98	71	102	194	236	126	78	54	77	114	165	180
0-2 degrees C veg	42	46	67	87	65	13	46	19	24	34	22	30
0-2 degrees C fruit	10	11	12	14	45	53	24	7	18	27	16	8
7-10 degrees C	40	11	17	87	95	42	4	5	6	41	122	133
13-16 degrees C	5	4	5	6	30	18	4	23	30	13	5	10

56

Oranges, fresh onion, and tomato volume are excluded from estimated daily air volumes. Five percent of lemon volume retained for air freight.
Grape air volumes assumed to remain at 199) from introduction of early season and late season production.

Annex 3

Financial and Economic Analysis

Estimated Capital Costs Airport Transit Cool Store

Item	Units	Qty	Unit Price ($US)	Total
Steel Building	sq meters	4000	$115	$460,000
Foundation Works	cubic meters	2450	$52	$127,400
Docking Doors	units	6	$5,000	$30,000
Load Levelers	units	3	$2,000	$6,000
Pallet Elevators	units	3	$10,000	$30,000
Pallet Scales	units	3	$25,000	$75,000
Pallet Scanners	units	2	$55,000	$110,000
Cool Room Insulation	sq meters	4960	$20	$99,200
Refrigeration System	ton of refrigeration	59	$2,500	$147,536
Insulated Doors & Fittings (3 m)	units	6	$4,000	$24,000
Sprinker System	units	1	$35,000	$35,000
Alarm System	units	1	$20,000	$20,000
Generators	units	1	$175,000	$175,000
Lighting	units	176	$200	$35,200
Electric forklifts	units	4	$16,000	$64,000
Pallet rollers	units	168	$1,000	$168,000
Drive units for rollers	units	72	$1,200	$86,400
Fuel tanks	units	2	$5,000	$10,000
Office furnishing and equipment		1	$25,000	$25,000
Subtotal				$1,727,736
Contingency			0.06	$103,664
Total				**$1,831,400**

Estimated Operating Costs Airport Transit Cool Store

Estimated Energy Consumption	Kwh/day	Rate USD	Daily Cost	Annual Cost	
3413 BTU/Kwh	1245	$0.05	$61.38	$22,402.36	$24,642.60
Personnel	Units	Unit Rate			
Manager	1	$9,520.00			$9,520
Supervisors	3	$3,810.00			$11,430
Forklift Operators	4	$1,715.00			$6,860
Laborers	32	$1,525.00			$48,800
Secretaries	2	$1,715.00			$3,430
Accountant	1	$3,810.00			$3,810
Bookkeeper	2	$1,715.00			$3,430
Telephone	2	$5,000.00			$10,000
Fax	1	$3,000.00			$3,000
Fuel	10000	$1.00			$10,000
Land Rent CAA Square Meter	6825	$0.16			$1,068
Cairo Airport Authority Percent of Gross	930352	0.03			$27,911
Water, Sewage, Solid Waste/month	12	$115.00			$1,380
Insurance	1831400	0.01			$18,314
Personnel Transport Contract	45	$500.00			$22,500
Maintenance and Repair	$1,831,400	0.01			$18,314
Total					**$224,409**

Financial Analysis Assumptions

Refrigeration Loads Average temperature	Degrees C 21.4	Degrees F 70.5	Quantity US Tons (MT x1.12)	Btu/ton/day		Residence Time (day)	External Surface Area sq.m	BTU/hr/sq ft/degree F 24 hour basis
Receiving 13 degrees C	13	55.4						
Temperature Difference	8.4	15.1						
Product Load (BTU)		160000	20	8000		1.00		
Building Transmission		1366					2262	0.04
Miscellaneous heat loads 30%		48410						
Estimated Heat Load (BTU)		209776						
0-6 degrees C (4-Grapes)	4	39.2						
Temperature Difference	17.4	31.3						
Product Load		89600	112	800		1.00		
Building Transmission		66857					2225	0.04
Miscellaneous heat loads 30%		46937						
Estimated Heat Load (BTU)		203394						
6-10 degrees C (7-Beans)	7	44.6						
Temperature Difference	14.4	25.9						
Product Load		1876000	134	14000		1.00		
Building Transmission		46645					1876	0.04
Miscellaneous heat loads 30%		576793						
Estimated Heat Load (BTU)		2499438						
12-16 degrees C (13-Mango)	13	55.4						
Temperature Difference	8.4	15.1						
Product Load		1000000	125	8000		1.00		
Building Transmission		28021					1933	0.04
Miscellaneous heat loads 30%		308406						
Estimated Heat Load (BTU)		1336427						
Total Heat Load BTU		4249035						
Heat load per hour at 12 hour refrigeration		354086						
Peak tons of refrigeration (TR) needed (divide hourly heat load by 12,000 Btu/hr)		30			1 day residence to adjust for high T			
Double for over-temperature product and eventual move to two level storage		59						

Financial Analysis Assumptions

	Unitized LE/MT	Loose LE/MT	
Rate Use	80	90	
HEIA Rate Target	20	30	No pre-co
EA Rate	10	10	No pre-co
IEC Rate	45	45	Pre-coolin
MF Rate	100	100	
			Pre-coolin

Assumptions:

1. Perishables Volume
   1. Year 1 50% of total Cairo Airport Flows 1
   2. Year 2 75% of total Cairo Airport Flows 1
   3. Year 3 80% of total Cairo Airport Flows 1
   4. Year 4 85% of total Cairo Airport Flows 1
   5. Year 5 90% of total Cairo Airport Flows 1
2. Unitization

	Unitized	Loose
1. Year 1	0.20	0.30
2. Year 2	0.30	0.45
3. Year 3	0.40	0.40
4. Year 4	0.50	0.35
5. Year 5	0.60	0.30

3. Inflation of Operating Costs 1