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REAP | Restoring Efficiency to Agriculture Production
საპარტეზოლს სხსოფლო-სამეურნეო
წარმოების ეფექტიანობის აღდგენის პროექტი

COLD STORAGE OPERATIONS ASSESSMENT

USAID/GEORGIA RESTORING EFFICIENCY TO
AGRICULTURAL PRODUCTION



February 2016

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DISCLAIMER

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ACRONYMS

FSU	Former Soviet Union
GFC	Georgia Food Company
HRI	Hotels, Restaurants, Institutions
IQF	Individually Quick Frozen
MT	Metric Tons
REAP	Restoring Efficiency to Agriculture Production
USDA	United States Department of Agriculture



EXECUTIVE SUMMARY

The REAP project is aiming its efforts at providing industry expertise and financial assistance to agriculture sector businesses. This report focuses on the cold storage companies or “grantees” of the program. This assignment rapidly assessed four cold storage companies to determine each company’s current state readiness and capability in the overall global cold supply chain. The Georgian cold storage operations are relatively new to the food supply chain. Of the four operations visited, all were constructed within the past 2-5 years.

In Georgian cold storage operations, there is a tendency to implement new technologies, but also a reluctance to maintain old processes related to the handling of fruits and vegetables in the cold chain. The result of this reluctance to trust in the processes followed by leading cold supply chain industry practitioners is a tremendous shortening of product shelf life and therefore a shortening of value and quality. Interestingly, the companies who own the cold storages are operating them with the belief that the building will somehow add value to the product simply by being cold. The businesses are failing to adopt and follow the proven product handling processes which will genuinely provide them with the value they are seeking.

The tendency to look toward new technology as the primary solution to storage issues must be reduced. **Processes are the primary problem at this time.** Most of the technology that is needed is available already, and in most cases, it is already on-site with the exception of precooling and ethylene removal equipment. The failure to understand how the technology fits into the overall scheme of the cold chain is causing many of the problems. The aims of cold storage are to extend shelf life, slow the aging process, maintain quality and taste, maintain resale value, reduce losses, and maintain food safety. Building upon these goals, followed by the introduction of market strategies, perhaps in alignment with those ideas outlined by REAP’s Domestic Market Assessment, new value chains can be created domestically and eventually in the export market.

Developing the traditional cold chains into a modern cold chain to sell to a growing, middle and upper middle class market in Tbilisi, Batumi and other urban centers will provide an economic injection to the agricultural sector, including exports. This approach also increases employment and economic opportunities in the rural agro-economic areas and will ultimately help to mitigate food borne illnesses.

The cold storage warehouses visited all shared the same basic symptoms of process improprieties, as well as the same general building and equipment capabilities. In short, most of the solutions can be generalized with very little need for unique, company specific approaches. Of course each business has its peculiar issues, which are identified in this report with known solutions. However, most of the issues in the Georgian cold supply chain can be addressed in a comprehensive, broad approach.

Of the facilities visited, the primary, repetitive concerns centered around the following issues:

1. Pre-Cooling
2. Processing, (Sorting, Grading, Cleaning, Waxing, Boxing, etc.)



3. Cold Storage Operations (commonly includes humidity, ethylene, & microbial growth control for produce)
4. Building & Equipment Management & Maintenance

Working with the owners and management of the cold storage businesses and encouraging them to adopt a robust, comprehensive, “end to end” strengthening of their cold chain will ultimately provide them and the customers with the products and value they desire. In addition, by working with REAP to adopt a marketing regime that includes a select group of hotels, restaurants and institutions (HRI) and premium brand retailers to support a more profitable value chain, the profitability of the sector can be increased.

High quality horticulture value chains are an opportunity market within Georgia, as is the export market for those who are willing to make the changes necessary to seize the opportunity. To do this, there are several operational and technical support areas which need to be addressed. First, the harvesting and pre-cooling of product must be managed and better understood at both the farm and the receiving operations area of the cold store facility. Second, the cold storage facility managers must understand the daily responsibility of the building, environmental controls, and product quality, along with a basic understanding of refrigeration systems, operation, and product handling. This must be addressed immediately. Third, some investment in ethylene removal systems, pre-cooling equipment, and other building materials must be made. Further, warehouse operations management training must be initiated to aid the businesses in reaching a positive return on investment and to aid the industry in moving forward with efficiencies and higher standards of care. Though opportunities exist for robust use of the new cold storage facilities, a lack of marketing expertise within a modern cold value chain related to agriculture is apparent. Further training and support should be leveled at this issue and a marketing plan created. In this report, Good Management Practices and general industry guidance is provided for each cold storage business to aid them in what they must do to prepare for the next agro-business season.

Finally, industry associations are strong and knowledgeable supporters of the sector. The warehouse companies, transportation companies, and any other person or business involved in the food supply chains and cold chains should look to be involved with and knowledgeable of various industry associations, designed to further their economic interests, provide training and technical knowledge, aid in the development of marketing and other business materials, and to serve as knowledge pools and network links to the global food industry. This is also a key area where the expertise and guidance of the REAP team can be a positive influence.



I. COLD STORAGE OPERATIONS

I.1 OVERVIEW

The REAP project aids agriculture business development and increases opportunities in high potential value chains including the cold supply chain, or food supply chain. Of particular interest and need in this chain is the design, development, and professional operation of cold storage warehouse facilities.

The core concepts and recommendations are as follows:

1. Develop numerous necessary and helpful cold storage plain language guides, including outlining specific “Do’s and Don’ts” with regard to handling and storage of various products.
2. Aid the grantees in sourcing, pricing and procuring necessary equipment for the warehouses, including consumable products such as plastic strip curtains for the doorways, pre-cooling fan equipment, ethylene scrubbing equipment, sanitation products, and environmental measuring instruments, such as hygrometers, ethylene meters, and thermometers, paying close attention to sourcing instruments which can be re calibrated or replace easily.
3. Select a test plot cold storage warehouse to support improvements working through the technical experts including staff. The ultimate goals are to increase the value of the products stored, increase the shelf life for the retailers, and possibly increasing the earning potential for farmers interested in learning how they can help increase product value with low and no-cost processes.
4. Conduct a workshop(s) at the test plot facility providing cold storage management operational processes training, as well as product handling, storage recommendations, mechanical systems recommendations, and human resource needs. Include safe handling and application of products for rodent control, and preservation of products in the workshop(s).
5. Develop a cold storage cost – benefit analysis tool and train business management in the use of the tool.
6. Develop a teamed approach marketing plan that brings HRI, premium brand retailers, and select cold chain practitioners together to create a premium brand domestic fruits and vegetable value chain.
7. The REAP management team can serve as a constant “team leader” or project manager to help the grantees stay on schedule with the progress they should be working on, and be of help when particular assistance is needed.

I.2 COLD STORAGE FACILITIES REVIEWED

Four (4) cold storage facilities were visited, reviewed and discussed with local management or ownership contacts. All facilities visited were new or recently constructed (estimated between 2-5 years old) with a modern design, common in the cold storage industry. Refrigeration and humidification



equipment were also new, as were ancillary components such as doors, lighting, weather stripping, concrete finish, walls, insulation, and load bearing design.

A synopsis of each of the four facilities is provided below to give the reader a visual cue to the advice provided to the storage companies. In some cases, pictures are noted to guide the reader to the condition, situation, concern, or equipment of note.

1.2.1 GEORGIA FOOD COMPANY (GFC) - GURJAANI

Name:	Georgia Food Company Limited (GFC)
Region/City:	Gurjaani
Contact:	Ioseb Manjavidze
Contact Position/Duty	Manager
Total Storage (SM)	350 MT
Total Pre-Cooling (SM)	None
Total Processing (SM)	Unknown
Year Built	2015

Produce Stored:	Peach, Nectarine, Pomegranate, Persimmon
Building:	New Modern Turkish Design <ul style="list-style-type: none"> • Insulated walls • Insulated Ceiling • Vapor Barrier Flat Concrete Floor • Insulated Doors • Strip Curtains at Exterior Doors - None • Strip Curtains at Interior Doors - None • Covered Docks – Minimally covered • Central Air Controlled Corridor to separate storage rooms – Not Controlled • Pre-Cooler Room - None
Processing/Sorting Room:	Minimally controlled
Refrigeration Equipment:	Minimal/Adequate
Humidification Equipment:	Inadequate, Non Functional
Ethylene Reduction:	None
Material Handling Equipment:	
Business Model:	Purchase from Farmers
Business Plan:	Collect fresh products from farmers, sort, store and export to Ukraine, Belarus and Russia.
Operations Plan:	None
Marketing Plan:	Unknown
Current Status:	Empty, Equipment Turned Off, Minimally Functional

BUILDINGS & EQUIPMENT RECOMMENDATIONS

The centralized humidity system was substandard. The system does not allow for each room to be controlled separately for different products. The owner asked for recommendations.



- See Cuoghi NEB6500 with Dickson Humidistat and heater from GeoFrost (Georgian Company) approximately \$1,900.00.
- It is highly recommended that the humidifier, humidistat, and heater be purchased together, installed, then calibrated for accuracy. The owner/management must be trained in the proper calibration technique.

Storage is a large refrigerated, racked room, with two smaller refrigerated rooms connected to it. The design appears to have been made for the large room to serve as a refrigeration controlled processing area, though the ceiling is storage height (6 Meters).

- Add strip curtains allowing each curtain to overlap the adjacent curtain by 30mm.
- If possible, do not purchase curtain units all-in-one pre-mounted but rather purchase large rolls of strip curtain material (cost savings), then create a mounting rail above door openings which allows for simple replacement of individual curtains when they are torn/damaged.

It is a concern that the processes do not seem to match the building design. There may be a need to redesign and add walls to create smaller rooms and temp/humidity buffer areas. Also, if the processing area is to be used as a processing area, the following should be considered:

- Lower the ceiling to conserve energy and more easily control environment
- Add temperature control
- Note: the business has added a new Unitech grading line for stone fruits and apples

The owner asked for the following specific recommendations:

- Ethylene/Microbial scrubber: see FreshPlus Ethylene Scrubber, landed cost in Tbilisi \$4,555.00 www.freshplusintl.com
- Individually Quick Frozen (IQF) for berries:
 - See USDA Economic Appraisal of Freezing Methods: <http://www.advancedfreezer.com/content.php?cat=109>
 - Also See MODULAR (all in one) IQF Cascade Freezer for Fruits: http://www.advancedfreezer.com/plistings_239_43.php

There are currently no precooling equipment or processes. The owner should purchase a pre-cooling unit and enact precooling processes immediately to maintain quality and product value.

With regard to equipment operations and maintenance manuals, the following practices should be adhered to:

- Store all Manuals on-site to allow for quick access to repair and maintain equipment;
- Assure that all manuals are in a commonly understood language; and
- Assure that traditional “wear and tear” equipment parts are “in stock” and readily available for immediate replacement. Typically, equipment manufacturers will provide manufacturers recommendations for both routine maintenance of the equipment, as well as the parts which may need replacement or repair from time to time. Examples of parts might be fan belts, fan blades, compressor rebuild parts, water, air, or gas filters, Freon, ammonia, etc.



Finally, the buildings, equipment, pallets, boxes and crates should all be sanitized with a 10% chlorine solution before and after each use. It is imperative that storage equipment not be reused until they have been sanitized.

PERSONNEL & OPERATIONS RECOMMENDATIONS

The general recommendation for personnel and operations include a need to focus management attention on people, product, process, and equipment management as well as:

- Establish operating temperature and humidity parameters for each room, and store only those products that are compatible with each other in this room (see storage compatibility chart).
- Monitor and measure equipment and environment at least 1 time per day but preferably 3-4 times per day to ensure equipment, room, and product meet requirements.
- Monitor receiving process to ensure proper handling upon receipt and precooling process is being managed.

As new value added processes are implemented, such as the sortation line, IQF or other VAP, the overall facility design and layout should be considered. This can help determine redesigns and process the floor plan and process flows for better efficiencies and product value.

The following practices should be followed as well:

- Assure that Humidification levels can be managed exactly to within 3%RH +/- in each room
- Assure that Temperature levels can be managed exactly to within 1c in each room
- Assure that Ethylene levels can be managed to less than 1 ppm in each room
- Separate products into compatible rooms
- Understand, Monitor, and Manage Temperature and Humidity & Ethylene levels at least daily

SUGGESTED TRAINING AND STARTUP TIMELINE

GFC LTD							
Activity	APR	MAY	JUN	JUL	AUG	SEP	OCT
Develop Pre Cooling Plan			X				
Source Pre Cooling Equipment Motor, Fan Blades, etc. and build pre-coolers	X	X					
Add Pre Cooling Equipment				X			
Add Ethylene Scrubber					X		
Calibrate all monitoring Equipment to industry standards	X	X	X	X	X	X	X
Create Sortation area for product			X				
Develop Sortation Process		X					
Develop Cleaning and Sanitation Process for Building	X						



Develop product separation and quarantine procedures for products found that do not conform with quality standards	X						
Clean Facility according to new Cleaning and Sanitation Process written			X				
Purchase strip curtain material, install curtains at all doors including exterior doors to maintain sanitation and retard excessive heat entry into building. Also, maintain additional strip curtain material on site for replacement of ripped curtains		X					
Test run all equipment for 4 hours, 1 time per week to assure that all equipment is operable, lubricated, and ready for operation (YEAR ROUND)	X	X	X	X	X	X	X
Develop an "Expedited Post Harvest Process" with farmers to try to minimize the time the product is exposed to heat after it is picked.			X				
Test run expedited Post Harvest Process to assure effectiveness			X				
Operations Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Sanitation Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Equipment Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Equipment Calibration Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Product Monitoring Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Temperature Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Humidity Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Ethylene Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Sanitize all pallets, boxes, crates, other conveyance items that product will come in contact with (2 - 3 WEEKS PRIOR TO IST LOADS)			X				
Design product layout template for each storage room to assure that product "overloading" in rooms does not occur. Maintain effective air flow between stacks of product.				X			

PRIORITY INVESTMENTS

Priority	Urgent	RECOMMENDED
I st High Velocity Pre Cooler	X	



2nd Ethylene Scrubber	X	
3rd Strip Curtains	X	

I.2.2 GEORGIA FOOD COMPANY (GFC) - GORI

Name:	Georgia Food Company Limited (GFC)
Region/City:	Gori
Contact:	Numerous Partners, Dubious Management Oversight. Giorgi Kvitsinadze
Contact Position/Duty	Director
Total Storage (SM)	70MT, 70MT, & 130MT = 270 MT with front operations area adjacent to all 3 storage rooms (see sketch below)
Total Pre-Cooling (SM)	None (room available in front operations area)
Total Processing (SM)	None (some room available in front operations area)
Year Built	2015



Produce Stored:	Pears, Apples (Numerous Brands) Owners asked for additional produce handling requirements for: <ul style="list-style-type: none"> • Pears • Apples - All Cultivars • Persimmon • Other
Building:	New Modern Turkish Design <ul style="list-style-type: none"> • Insulated walls • Insulated Ceiling • Vapor Barrier Flat Concrete Floor • Insulated Doors • Strip Curtains at Exterior Doors - None • Strip Curtains at Interior Doors - None • Covered Docks – None • Central Air Controlled Corridor to separate storage rooms – Not Controlled • Pre-Cooler Room - Inadequate, Non Functional • Processing/Sorting Room – Inadequate, Non Functional
Refrigeration Equipment	Minimal/Adequate
Humidification Equipment	Inadequate, Non Functional
Ethylene Reduction	None
Material Handling Equipment:	Unknown
Business Model:	Semi Vertical, purchases some products



Business Plan:	Unknown
Operations Plan:	None. The operational procedures are harvest or purchase → ambient transport to cold storage → moderately sort → store in refrigerated room → reduce temperature to target.
Marketing Plan:	Unknown
Current Status:	Around 20 tons of pears and 60 tons of apples. Humidifier malfunctions in I30 MT room.

Production: Estimated Product Volume in 2016 = 80MT apples, in 8 varieties as follows:

Varieties	%	Harvest Season	Days	Volume (MT)	MT per period	MT per day
Lodi	0.75	7/15 - 7/25	10	6	6	0.6
Gala	0.75	8/25 - 9/5	10	6	6	0.6
Jonamac	0.75	9/5 - 9/15	10	6	6	0.6
Elstar	0.375	9/20 - 9/25	5	3	3	0.6
Elstar	0.375	9/25 - 9/30	5	3	3	0.6
Granny Smith	1.5	9/25 - 10/5		12		
Fuji	1	9/25 - 10/5		8		
Golden Delicious	3	9/25 - 10/5	10	24	56	5.6
Mutzu	1.5	9/25 - 10/5		12		
TOTAL	10			80	80	

As the table above shows, the amount of volume begins to exceed the facilities capability to adequately preserve its quality and value by about week 9/25 – 10/5. This is due to the amount of time it takes to adequately precool the product prior to storage in a tempered cold room with other products. The need to increase the precooling areas and capacity is extremely important if they intend to increase the storage length (shelf life) and product value. This can easily be accomplished through the purchase of a precooling unit (hi-volume fan in a cold room environment).

BUILDINGS & EQUIPMENT RECOMMENDATIONS

Humidifiers were inoperable, or not operating to product standards.

- Should purchase Cuoghi NEB6500 with Dickson Humidistat and heater from GeoFrost (Georgian Company) approximately \$1,900.00.
- cursory inspection shows Cuoghi Humidifiers are in place. However, it is not known if the heaters are in place and operating properly or if the humidistats are set properly and calibrated.
- It is recommended that the humidifier, humidistat, and heater must be installed per manufacturers recommendations then calibrated for accuracy. The owner/management must be trained in proper calibration technique.

There is a large centralized “receiving area” with 4 cold storage rooms (2 large, 2 small) adjacent. The central room is not controlled, and may not be refrigerated. The following is recommended:

- Add strip curtains allowing each curtain to overlap the adjacent curtain by 30mm. If possible, do not purchase curtain units all-in-one pre-mounted but purchase large rolls of strip curtain material (cost savings), and then create a mounting rail above door openings which allows for simple replacement of individual curtains when they are torn/damaged



- There is potential for the central area to be beneficially used as a receiving, sorting, cleaning, and precooling area. This room must be refrigerated to be considered for a precooling area.
- Adding refrigeration to the central area to serve as receiving, sorting, and cleaning area should be considered.
- Adding precooling units or rooms to the central area should be considered.

The owner asked for ethylene equipment recommendations and is advised to see FreshPlus Ethylene Scrubber, landed cost in Tbilisi \$4,555.00 www.freshplusintl.com.

There are currently no precooling equipment or processes. The owner should purchase a pre-cooling unit and enact precooling processes immediately to maintain quality and product value.

With regard to equipment operations and maintenance manuals, the following practices should be adhered to:

- Store all Manuals on sight to allow for quick access to repair and maintain equipment
- Assure that all manuals are in a commonly understood language
- Assure that typical replacement parts are in stock locally or readily available for immediate replacement

Finally, the buildings, equipment, pallets, boxes and crates should all be sanitized with a 10% chlorine solution before and after each use. It is imperative that storage equipment not be reused until they have been sanitized.

PERSONNEL & OPERATIONS RECOMMENDATIONS

The general recommendation for personnel and operations include a need to focus management attention on people, product, process, and equipment management as well as:

- Establish Operating Temperature and Humidity parameters for each room, and store only compatible products with each other in this room (see Storage Compatibility Chart).
- Monitor and Measure equipment and environment at least 1 time per day but preferably 3-4 times per day to ensure equipment, room, and product meet requirements.
- Monitor receiving process to ensure proper handling upon receipt, and precooling process is being managed.

Owners should also assure the following:

- Humidification levels can be managed exactly to within 3%RH +/- in each room.
- Temperature levels can be managed exactly to within 1c in each room.
- Ethylene levels can be managed to less than 1 PPM in each room.

Finally, products should be separated into compatible rooms including sensitive apple cultivars. Ethylene temperature and humidity levels should be monitored and managed daily.



SUGGEST TRAINING TIMELINE

GFC Gori							
Activity	APR	MAY	JUN	JUL	AUG	SEP	OCT
Develop Pre Cooling Plan			X				
Source Pre Cooling Equipment Motor, Fan Blades, etc. and build pre-coolers	X	X					
Add Pre Cooling Equipment				X			
Add Ethylene Scrubber					X		
Calibrate all monitoring Equipment to industry standards	X	X	X	X	X	X	X
Create Sortation area for product			X				
Develop Sortation Process		X					
Develop Cleaning and Sanitation Process for Building	X						
Develop product separation and quarantine procedures for products found that do not conform with quality standards	X						
Clean Facility according to new Cleaning and Sanitation Process written			X				
Purchase strip curtain material, install curtains at all doors including exterior doors to maintain sanitation and retard excessive heat entry into building. Also, maintain additional strip curtain material on site for replacement of ripped curtains		X					
Test run all equipment for 4 hours, 1 time per week to assure that all equipment is operable, lubricated, and ready for operation (YEAR ROUND)	X	X	X	X	X	X	X
Develop an "Expedited Post Harvest Process" with farmers to try to minimize the time the product is exposed to heat after it is picked.			X				
Test run expedited Post Harvest Process to assure effectiveness			X				
Operations Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Sanitation Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Equipment Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Equipment Calibration Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Product Monitoring Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Temperature Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				



Humidity Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Ethylene Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Sanitize all pallets, boxes, crates, other conveyance items that product will come in contact with (2 - 3 WEEKS PRIOR TO 1ST LOADS)			X				
Design product layout template for each storage room to assure that product "overloading" in rooms does not occur. Maintain effective air flow between stacks of product.				X			

PRIORITY INVESTMENTS

Priority	Urgent	RECOMMENDED
1st High Velocity Pre Cooler	X	
2nd Ethylene Scrubber	X	
3rd Strip Curtains	X	

I.2.3 ELINEKSTRA COLD STORAGE

Name:	Elinekstra
Region/City:	Kareli
Contact:	Levan Zuroshvili
Contact Position/Duty	Manager
Total Storage (SM)	5 Storage rooms (2 large, 3 smaller), with front, centralized operations area adjacent to all 5 rooms
Total Pre-Cooling (SM)	None (room available in front centralized operations area)
Total Processing (SM)	Total Processing (SM): Plums dehydrating and packaging
Year Built	2015

Produce Stored:	Apples & Plums (some Grape and Other)
Building:	New Modern Turkish/Georgian Design with: <ul style="list-style-type: none"> • Insulated walls • Insulated Ceiling • Vapor Barrier Flat Concrete Floor • Insulated Doors • Strip Curtains at Exterior Doors – None • Strip Curtains at Interior Doors – None • Covered Docks – None • Central Air Controlled Corridor to separate storage rooms – Not Controlled • Pre-Cooler Room - Inadequate, Non Functional



	<ul style="list-style-type: none"> • Processing/Sorting Room – Used for Plum dehydration/packaging • Refrigeration Equipment - Minimal/Adequate • Humidification Equipment – Inadequate, Non Functional • Ethylene Reduction – None
Material Handling Equipment:	Some
Business Model:	Vertical for Apples and Plums, they purchase other products such as Grapes
Business Plan:	Value Added Products such as dehydrated, packaged plums
Operations Plan:	None. Processes are Primarily Focused on NON Refrigerated Warehouse Operations (fruit dehydration/packaging)
Marketing Plan:	Unknown
Current Status:	2 tons of grapes and 1,5 tons of apples stored in small room for a client.

BUILDINGS & EQUIPMENT RECOMMENDATIONS

Humidifiers were inoperable, or not operating to product standards. Owner should look for:

- Cuoghi NEB6500 with Dickson Humidistat and heater from GeoFrost (Georgian Company) approximately \$1,900.00.
- It should be noted that cursory inspection shows Cuoghi Humidifiers are in place. However, it is not known if the heaters are in place, and operating properly or if the humidistats are set properly and calibrated.
- The humidifier, humidistat, and heater must be installed per manufacturers recommendations then calibrated for accuracy. Owner/management must be trained in proper calibration technique.

The owner asked for ethylene equipment recommendations. The FreshPlus Ethylene Scrubber, on sale in Tbilisi for \$4,555.00 (www.freshplusintl.com) is one recommendation.

There are no precooling equipment or processes in place. A precooling unit should be purchased immediately and precooling processes must be put in place to maintain quality and product value.

With regard to equipment operations and maintenance manuals, the following practices should be adhered to:

- Store all Manuals on sight to allow for quick access to repair and maintain equipment
- Assure that all manuals are in a commonly understood language
- Assure that typical replacement parts are in stock locally or readily available for immediate replacement

Finally, the buildings, equipment, pallets, boxes and crates should all be sanitized with a 10% chlorine solution before and after each use. It is imperative that storage equipment not be reused until they have been sanitized.



PERSONNEL & OPERATIONS RECOMMENDATIONS

This facility and business seems to be primarily focused on dehydration and packaging of plums and apples which is traditionally considered “other” when referred to within the cold supply chain, as the primary operational processes are not on refrigerated handling and storage but rather on dehydrating and packaging products.

The refrigerated warehouse portion of the business should be carefully managed and operated separately from the processing business, as their core functionality and processes are completely different.

The general recommendation for personnel and operations include a need to focus management attention on people, product, process, and equipment management as well as:

- Establish Operating Temperature and Humidity parameters for each room, and store only compatible products with each other in this room (see Storage Compatibility Chart).
- Monitor and Measure equipment and environment at least 1 time per day but preferably 3-4 times per day to ensure equipment, room, and product meet requirements.
- Monitor receiving process to ensure proper handling upon receipt, and precooling process is being managed.

The presence of Botrytis (and/or other harmful microbial growth is rampant in this facility and nearly everything inside it. Pay particular attention to removing anything showing signs of microbial growth and decay, then cleaning everything thoroughly and drying it in a clean environment using the 10% chlorine solution.

In addition, the following practices should be adhered to:

- Assure that humidification levels can be managed exactly to within 3%RH +/- in each room.
- Assure that temperature levels can be managed exactly to within 1C in each room.
- Assure that ethylene levels can be managed to less than 1 PPM in each room.
- Separate products into compatible rooms including sensitive apple cultivars.
- Monitor and manage temperature, humidity & ethylene levels at least daily
- “Through bolts” for storage room doors are metal and should be nylon. Consider replacing these.
- Pay attention to concrete floors beginning to show cracks in uncontrolled manner. Clean, Seal, and control these cracks.
- The humidifier is set at 99.9%. This is inappropriate for any product that will be stored in this facility.



SUGGESTED TRAINING AND STARTUP TIMELINE

ELINEKSTRA							
Activity	APR	MAY	JUN	JUL	AUG	SEP	OCT
Develop Pre Cooling Plan			X				
Source Pre Cooling Equipment Motor, Fan Blades, etc. and build pre-coolers	X	X					
Add Pre Cooling Equipment				X			
Add Ethylene Scrubber					X		
Calibrate all monitoring Equipment to industry standards	X	X	X	X	X	X	X
Create Sortation area for product			X				
Develop Sortation Process		X					
Develop Cleaning and Sanitation Process for Building	X						
Develop product separation and quarantine procedures for products found that do not conform with quality standards	X						
Clean Facility according to new Cleaning and Sanitation Process written			X				
Purchase strip curtain material, install curtains at all doors including exterior doors to maintain sanitation and retard excessive heat entry into building. Also, maintain additional strip curtain material on site for replacement of ripped curtains		X					
Test run all equipment for 4 hours, 1 time per week to assure that all equipment is operable, lubricated, and ready for operation (YEAR ROUND)	X	X	X	X	X	X	X
Develop an "Expedited Post Harvest Process" with farmers to try to minimize the time the product is exposed to heat after it is picked.			X				
Test run expedited Post Harvest Process to assure effectiveness			X				
Operations Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Sanitation Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Equipment Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Equipment Calibration Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Product Monitoring Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Temperature Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				



Humidity Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Ethylene Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Sanitize all pallets, boxes, crates, other conveyance items that product will come in contact with (2 - 3 WEEKS PRIOR TO 1ST LOADS)			X				
Design product layout template for each storage room to assure that product "overloading" in rooms does not occur. Maintain effective air flow between stacks of product.				X			

PRIORITY INVESTMENTS

Priority	Urgent	RECOMMENDED
1st High Velocity Pre Cooler	X	
2nd Ethylene Scrubber	X	
3rd Strip Curtains	X	

I.2.4 IVERIA COLD STORAGE

Name:	Iveria
Region/City:	Gori
Contact:	Gela Javakhishvili
Contact Position/Duty	Manager
Total Storage (SM)	*240 MT, 2 – 60 MT rooms, and 3- 40 MT rooms
Total Pre-Cooling (SM)	None (room available in front operations area)
Total Processing (SM)	None (some room available in front operations area)
Year Built	2015

*Special Note: The floor layout provided for one of the “60MT” rooms actually provided for only 25.6MT of storage, a total of 42.6% of the storage ability reported. Carrying this percentage forward for the entire building, this means that instead of 240MT of total storage, the business can probably adequately store 102.24MT.

Produce Stored:	Apples, Pears Owners asked for additional Produce Handling Requirements for pears, apples (all cultivars), persimmon, and others.
Building:	New Modern Turkish Design with: <ul style="list-style-type: none"> • Insulated walls and ceiling • Vapor Barrier Flat Concrete Floor • Insulated Doors • No Strip Curtains at Exterior Doors • No Strip Curtains at Interior Doors



	<ul style="list-style-type: none"> • No Covered Docks • Central air controlled corridor to separate storage rooms does not exist • Precool room is inadequate and non-functional • Processing/sorting room is inadequate and non-functional • Refrigeration equipment is minimal but adequate • Humidification equipment is inadequate and non-functional • No ethylene reduction
Material Handling Equipment:	Unknown
Business Plan:	Semi-vertical
Operations Plan:	None, but the procedures are as follows: The project is as follows: harvest or purchase → ambient transport to cold storage → moderately sort → store in refrigerated room → reduce temperature to target.
Marketing Plan:	Unknown
Current Status:	Around 15 tons of apples stored in 60 MT capacity room.

BUILDINGS & EQUIPMENT RECOMMENDATIONS

Humidifiers were inoperable, or not operating to product standards. The following recommendations are made:

- Purchase Cuoghi NEB6500 with Dickson Humidistat and heater from GeoFrost (Georgian Company) for approximately \$1,900.00.
- cursory inspection shows Cuoghi Humidifiers are in place. However, it is not known if the heaters are in place and operating properly or if the humidistats are set properly and calibrated.
- The humidifier, humidistat, and heater must be installed per manufacturers recommendations then calibrated for accuracy. Owner/management must be trained in proper calibration technique.

The owner asked for ethylene equipment recommendations. The FreshPlus Ethylene Scrubber, on sale in Tbilisi for \$4,555.00 (www.freshplusintl.com) is one recommendation.

There are no precooling equipment or processes in place. A precooling unit should be purchased immediately and precooling processes must be put in place to maintain quality and product value.

With regard to equipment operations and maintenance manuals, the following practices should be adhered to:

- Store all Manuals on sight to allow for quick access to repair and maintain equipment
- Assure that all manuals are in a commonly understood language
- Assure that typical replacement parts are in stock locally or readily available for immediate replacement



Finally, the buildings, equipment, pallets, boxes and crates should all be sanitized with a 10% chlorine solution before and after each use. It is imperative that storage equipment not be reused until they have been sanitized.

PERSONNEL & OPERATIONS RECOMMENDATIONS

The facility was reported to be able to store more product than it can store adequately, given the size of the rooms, and the equipment present to handle the products. Care should be given to not overfilling the rooms.

The general recommendation for personnel and operations include a need to focus management attention on people, product, process, and equipment management as well as:

- Establish Operating Temperature and Humidity parameters for each room, and store only compatible products with each other in this room (see Storage Compatibility Chart).
- Monitor and Measure equipment and environment at least 1 time per day but preferably 3-4 times per day to ensure equipment, room, and product meet requirements.
- Monitor receiving process to ensure proper handling upon receipt, and precooling process is being managed.

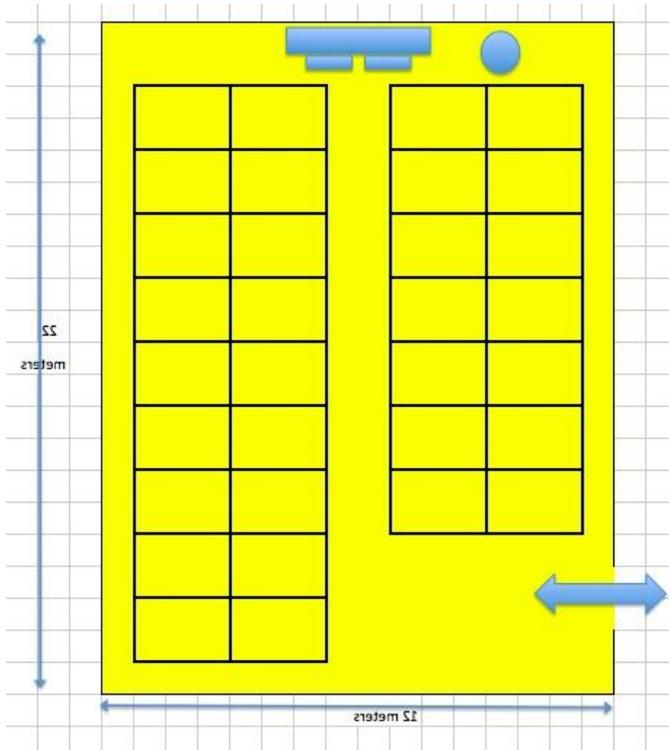
In addition, the following practices should be adhered to:

- Assure that humidification levels can be managed exactly to within 3%RH +/- in each room.
- Assure that temperature levels can be managed exactly to within 1C in each room.
- Assure that ethylene levels can be managed to less than 1 PPM in each room.
- Separate products into compatible rooms including sensitive apple cultivars.
- Monitor and manage temperature, humidity & ethylene levels at least daily

A quick, cursory attempt was made to provide the floor layout and planning for the large storage room at the right of the central area. The description of the floor layout below should be used as a guide in laying out the floor of the other storage rooms also:

- 4 pallets wide
- 7 pallets long on the 2 rows nearest doorway = 14 pallets
- 9 pallets long on far side from doorway = 18
- Total Footprints in room: 32 pallet footprints
- 2 pallets high = 64 Total Pallets in Room
- Storage capacity at approximately 400kg per pallet = 25,600kg

See rough sketch below:



SUGGESTED TRAINING AND STARTUP TIMELINE

IVERIA							
Activity	APR	MAY	JUN	JUL	AUG	SEP	OCT
Develop Pre Cooling Plan			X				
Source Pre Cooling Equipment Motor, Fan Blades, etc. and build pre-coolers	X	X					
Add Pre Cooling Equipment				X			
Add Ethylene Scrubber					X		
Calibrate all monitoring Equipment to industry standards	X	X	X	X	X	X	X
Create Sortation area for product			X				
Develop Sortation Process		X					
Develop Cleaning and Sanitation Process for Building	X						
Develop product separation and quarantine procedures for products found that do not conform with quality standards	X						
Clean Facility according to new Cleaning and Sanitation Process written			X				
Purchase strip curtain material, install curtains at all doors including exterior doors to maintain sanitation and retard excessive heat entry into building. Also, maintain additional strip curtain material on site for replacement of ripped curtains		X					



Test run all equipment for 4 hours, 1 time per week to assure that all equipment is operable, lubricated, and ready for operation (YEAR ROUND)	X	X	X	X	X	X	X
Develop an "Expedited Post Harvest Process" with farmers to try to minimize the time the product is exposed to heat after it is picked.			X				
Test run expedited Post Harvest Process to assure effectiveness			X				
Operations Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Sanitation Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided	X						
Equipment Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Equipment Calibration Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Product Monitoring Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided		X					
Temperature Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Humidity Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Ethylene Management Plan - Develop Daily, Weekly, Monthly Plans for the specific business, using guidance documents provided			X				
Sanitize all pallets, boxes, crates, other conveyance items that product will come in contact with (2 - 3 WEEKS PRIOR TO IST LOADS)			X				
Design product layout template for each storage room to assure that product "overloading" in rooms does not occur. Maintain effective air flow between stacks of product.				X			

PRIORITY INVESTMENTS

Priority	Urgent	RECOMMENDED
1st High Velocity Pre Cooler	X	
2nd Ethylene Scrubber	X	
3rd Strip Curtains	X	

1.3 BUSINESS PROFILES

The common business profile observed was one of “Agrarian Support.” Similar to other countries visited in the former Soviet Union (FSU), business plans are often based on a model of harvest-store-



sell-wait, with the waiting period stretching until the next season. While if managed properly this model can prove profitable, it discounts ancillary revenue activities that operating a cold store offers. Given the present acumen of cold store management, it is advised that REAP continues to build the capacity of the cold store managers to properly operate their existing facility before engaging in new activities. Detailed activities for a capacity building plan are contained throughout this report. Furthermore, while the design of the cold stores was adequate for their business models, inefficiencies in the layout will cause a reduction of storage capacity when best practices are followed. However, this reduction will be offset by improved quality and storage time, resulting in improved profit for the operator. These problems are not unique to Georgia and improved engineers and exposure to international best practices will continue to improve the sub-sector.

I.4 BUILDING CONSTRUCTION

As mentioned earlier in this report, all of the facilities identified were of new or near new construction. Most of them were of Turkish design and construction, typically found in many of the countries in the region.

All of the facilities observed appeared to be designed according to the latest known technology, though certainly much smaller than most facilities found in the West. The materials and applications used were modern. The following principle areas of construction were observed and considered appropriate for the purpose and of “good design” among all facilities visited:

- Wall Insulation – Sandwich Panel
- Ceiling Insulation – Sandwich Panel
- Floors – Vapor Barrier, Insulated, Polished Slab (limited deviation)
- Doors – Insulated, over-door roller
- Refrigeration Equip – Industrial - Freon based, new Compressors, Condensers and Evaporators with centralized control panels
- Humidifiers – Industrial
- De-Humidifiers – (poor operation)
- Ethylene “Scrubbers” – (none observed)
- Controls – Digital, (poorly monitored)
- Material Handling Equipment – Forklifts, Pallet Jacks, and Hi-Lifts

In most cases, refrigeration, humidification, controllers and other technical equipment were from a reliable manufacturer, but in some cases, it was noted that design considerations were not as thorough as they should have been. Though the buildings seem to have been designed very well and with a reasonable degree of knowledge to the industry needs, it is apparent that there was not a lot of effort given to the specific business needs of each separate facility. In other words, with some small differences, most of the facilities appear to have followed certain typical design molds.

Some of the areas overlooked in many facilities are:

- Ethylene removal: no remedies provided in design for the off-gassing of storage rooms.
- Low Heat/Low kwh Lighting: in almost all facilities, typical fluorescent tubing fixtures were noted.



- Motion Sensors: no motion sensors for lighting noted.
- Room Design: in most cases, the products stored cannot be stacked to maximize the height of the rooms, nor are there immediate plans to add racking to the facilities. Thus, much of the storage space is wasted.
- Strip Curtains: no curtains noted in any facility.
- Driveways: Unfinished in all facilities. All should have been graded at a minimum at the conclusion of construction
- Exterior Color Used: white is the standard color to reflect heat/sunlight away from the building. Dark colors were observed on at least one building
- Temp/Humidity Sensor Location: generally, the sensors were placed in less-than-optimal locations, away from equipment, doors and other devices which could alter the sensor readings. The sensors should be placed so as to read the average environment the product will be subjected to.

In numerous instances it was noted that after construction was completed, local “age-old” methods were introduced to the building to supplant the new equipment and methods. Generally, the mechanics responsible for the equipment are untrained and unfamiliar with refrigeration equipment, especially new, state-of-the-art computer assisted equipment. As a result, they turn to what they know and convince the owners they know what they are doing. The following examples were noted:

- Turn off Humidifier – Spray water on the floors
- Disregard Thermometers & Hygrometers – Apply “wisdom and knowledge” in lieu of calibrating and trusting the equipment
- Open Cooler Doors all the way and purge air to evacuate ethylene

1.5 REFRIGERATION AND CONTROLS

The refrigeration equipment observed was consistent with good design equipment. All equipment was new and still under warranty according to management contacts. It was impossible to review the equipment under normal operating conditions as the facilities were primarily nonoperational and nearly empty of product; as stated previously, in most cases it was turned off. Management was advised to cycle the equipment often, according to manufacturer’s recommendations, and monitor and document this to ensure it would be effective at the beginning of the harvest season. The rooms should be cooled and humidified at least three days in advance of receipt of products to evaluate, measure, and react to equipment and atmosphere requirements and problems.

Refrigeration and humidity control devices are consistently in place in the facilities. However, a general lack of knowledge exists regarding how to use the equipment, including accuracy and re-calibration methods. Also, a general, perhaps cultural distrust of monitoring equipment was noted. Learning to trust temperature and humidity readings will take some time and would be facilitated by an understanding of the proper calibration techniques and subsequent benchmarking.

The largest concern is managements’ disregard of mechanical requirements and operational processes and preventive maintenance of mechanical equipment. The consultant was unable to confirm among the four facilities visited, a single refrigeration or humidity expert, nor anyone who has been trained in the maintenance and operation of refrigeration equipment. Further, there was no evidence to support that management would follow the consultant’s advice to send a technician for training. Routinely, it was



noted that the equipment was under warranty for 2-3 years, and until then, it would not be a concern. Further attempts to argue this point were unsuccessful.

Also of particular concern is the lack of documentation such as manufacturer’s specifications and operations and repair manuals. Nor were there any preventive maintenance plans or check lists available. This will require a remedy in the short term, lest significant mechanical breakdowns and ineffective operations will begin to occur when the equipment is subjected to normal operating loads.

The lack of replacement and spare parts to be stored for emergencies also needs to be addressed. All attendees of the presentation at the REAP office, as well as facilities visited were encouraged to develop a list of common replacement parts and spare parts that should always be stored and available immediately upon equipment malfunction emergencies. Refrigeration equipment can be quite sensitive and unforgiving with little to no redundancy in system design. When a part malfunctions, the unit often disengages, resulting in no refrigeration. Since it was noted that most spare parts are not readily available locally and that immediate replacement is uncommon, the adoption of a “spare parts shelf” becomes an operational necessity.

Lightning protection of building and equipment were not in evidence, and when questioned, management was consistently unable to verify its existence. The solid state design of most of the new refrigeration control equipment (control panels) is significantly susceptible to voltage spikes, especially spikes as significant as a lightning strike to the building. The buildings tend to be large, metal structures, with a relatively high amount of electrical use and consumption. It is strongly encouraged to add lightning protection to the buildings and the equipment.

1.6 BUSINESS MANAGEMENT

The science and application of business management practices is obviously an integral part of the successful operation of a cold storage facility. As noted in previous sections of this report, numerous areas for improvement exist in this arena. Owners and management are strongly encouraged to invest in training in the following disciplines related to the effective and profitable operation of a cold storage facility and related supply chain operations:

- Core Training Disciplines
 - Economics
 - Operations Management
 - Post-Harvest Handling
 - Refrigeration Equipment Repair and Maintenance
 - Humidification Equipment Repair and Maintenance
 - Energy Management
 - Rodent and Pest Control
 - Food Safety (HACCP)
- Additional Education Disciplines
 - Marketing
 - Produce Science and Harvesting Techniques
 - Building Repair and Maintenance
 - Material Handling Equipment Repair and Maintenance



A marked lack of knowledge in marketing was also observed. Facilities are empty, with equipment turned off, and no marketing efforts are being made to off-set the fixed costs of the business during the off season.

The consultant encouraged attendees of the REAP presentation to assess their local markets and economies for opportunities to store different products or provide services to markets other than the status quo local value chain. Examples such as ice-cream, fresh meat, frozen meat, dairy, as well as other cold storage intensive items were mentioned. Also, conducting an open house picnic for local and regional retailers, wholesalers, restaurants, hotels and other institutions was encouraged, if for no other reason than to announce to the local market that a new professional operation was available for short and long term needs. It was also encouraged to view the facility as an opportunity to create revenue streams from a variety of different vehicles, not only short-term cold storage of local fruits and vegetables. A primary example of unique marketing opportunities to be attempted is notifying local retailers that they now had the ability to buy in bulk when they were presented with volume discounts, and that they could store excess volume with the cold storage facility. Also, the concept of volume discounts for retailers or wholesalers who used the facility consistently were discussed. All of these ideas were delivered as “thinking outside of the box,” offering something new and better as there are no rules that must be followed when it comes to marketing.

Personnel management, documentation and data management and control, budget forecasting and management, and product safety and control are also of significant importance to the business. These areas, though administrative in nature, are extremely important to the short and long term management. Documentation and data management and retention, provide the successful business person with the opportunity to review history, drive trends and locate potential future opportunities. For example, if proper receiving documentation were managed and maintained over time, specific abusers (shippers or farmers) of temperature or of product would become known through trending analysis. This would allow the business to address the situation directly with the abuser and work with them to fix the problem, and would provide the business with the financial impacts related to this specific farmer or shipper. In short, it would provide the business with the opportunity to save money by avoiding future problems.

Again education and training in these disciplines is strongly encouraged. Most of these disciplines appear to be in short supply as observed during the facility visits. Operations management is of significant importance to the business, as is the understanding of the value of energy efficiency, the knowledge of the costs of various components, exercises, movements, and commodities, and the complex nature of internal logistics and inventory management. As volumes and inventories continue to rise, so do the opportunities to leverage knowledge against inefficiencies, and to work toward increasing the margins between costs and revenues.

All the areas noted are of significant concern to business partners in the global market as new export opportunities arise. Tighter control of the business and a keener understanding of the business management provide the business owner and manager with the opportunity to compete for lower interest lending, demonstrate increased profitability to potential buyers, and reveal a new professionalism to investors or customers.



I.7 PRODUCT KNOWLEDGE

It should be noted that the cold storage operators seemed to intuitively understand that reducing temperatures as soon as possible after harvest was important, but many in the supply chain at the warehouse facility seem unwilling or ambivalent toward the concept. This is especially troubling because it is commonly understood in the industry that cooling the product immediately after harvest is the single most important factor in maintaining product value.

It is not only important to the profitability of the warehouse to understand the products it stores, but it is also very important for the warehouse manager to understand that cold storage and humidity management are designed to prolong the shelf life, quality and taste of the product. It is further necessary to understand the product, science, and interrelation with temperatures, humidity, ethylene gas, and a host of other factors in order to be successful at achieving the goals of cold storage: extending time for quality and saleable shelf life.

When this level of understanding and the training necessary to fulfill it has been reached, the business will undoubtedly be successful to its customers on each end of the supply chain. However, without this body of knowledge about each product the warehouse stores, it will never be able to adequately fulfill the expectations of the customers it serves.

I.8 VALUE ADDED SERVICES

Value Added Services are those services or offerings beyond the typical space for rent concept and are considered additional sources of revenue. Typical value added services include:

- Blast Freezing (meats)
- Hydro-cooling
- Precooling (excessive temperatures)
- Repackaging (from 1 large container to smaller retail sized containers)
- Washing, Waxing
- Sorting, Grading
- Stamping, Branding
- Packaging
- Processing (concentrates, dehydration, pre-packaged, ready-to-eat). This was observed at 2 locations.
- Lease of additional refrigeration equipment for farm-side pre-cooling
- Lease of material handling equipment for harvesting
- Consulting at the farm or customer level

As a general rule, if personnel, equipment, or services are available and not in use, an opportunity exists to provide these assets to others for a fee. This is generally considered a cost-mitigation technique, as most of these assets are fixed costs. They can also be leveraged as a marketing technique, providing the business with the opportunity to showcase its talents, equipment and expertise to the market and to become more valuable to the customer as a “problem solver” partner for them.

Opportunities to provide value added services will grow as the market and economy of Georgia continue to increase in the food supply chain sector. Those businesses that are prepositioned in the



market place, and who have the requisite knowledge, equipment, materials, and ability to succeed, along with the drive to fulfill niches of opportunity for potential customers, will be poised to capitalize on these opportunities.



2 WORKSHOP

The cold storage operations workshop was conducted in one half day presentation at the REAP office in Tbilisi. The workshop was a lecture format, driven by power point presentations by the consultant, Pat Hughes, and local expert Zviad Bobokashvili. It was broken down into two components: Operations Management and Product Understanding. Approximately 12 attendees participated in addition to REAP staff members.

In addition to the two components listed and their various subcomponents, there was an open forum final wrap up and question and answer period, which produced a lively debate on the needs for the various operational issues noted in the presentation.

Trainings and knowledge transfer opportunities should continue to be a leading deliverable service of REAP and its partners and affiliates.



3 RECOMMENDATIONS

The cold storage owners/operators need to advance their thinking with regard to the cold storage buildings. Initially, they invested in the facilities under the assumption that it would provide a quick fix to prolong shelf life and round out seasonality without considering the parallel investment in operations and facilities management expertise. This provides opportunities for the Georgia REAP project for future cold chain interventions.

One opportunity is to work with REAP’s Component 2 team and their approach (under the work of Peter Boone) to leverage the money from premium retailers to support the idea of teaching a select group of cold chain practitioners how to develop a premium grade of domestic product that can be branded with the “REAP” or “Georgia” brand, and sold only in premium value chains to the supporting retailers.

The idea of promoting a premium value chain serves to two beneficial purposes:

1. It serves as financial pull for cold storage operators to spend the time, money, and resources to remedy their operations.
2. Once it is established, it will serve as a benchmark for others to aspire.

GCCA/WFLO can support Georgia REAP in this support this by:

- Developing a workshop aimed at identifying cold storage companies who are not only interested, but who demonstrate the buy-in and commitment to be included.
- Working with the REAP team to provide detailed, technical assistance to help each company achieve these higher operating standards.
- Providing expertise during in-country assignments to monitor and follow up with cold storages on their capacity building plans.
- Aiding the REAP team in the selection of the companies who will be allowed to participate in the value chain.
- Working with REAP to establish a model cold storage where trainings for other grantees and operators can take place. This model cold storage can be linked to a nearby orchard or a REAP Demonstration Plot to show not only best cold store management practices but also to showcase best postharvest handling and transportation practices from field to cold store.
- Continuing to provide hands-on support to the cold chain during the harvest and storage season to ensure they can quickly and effectively address problems.
- Meeting with retailers and cold store providers during in-country assignments to provide recommendations to ensure cold storage operators are and continue to meet the requirements of the buyer.

An additional point for consideration would be the establishment of a REAP cold chain practitioner certificate. Specifics can be developed, but it is anticipated that ultimately, it will culminate from classroom and field work training (at the demo plot). Typical courses take place over 4 days with a 5th day for wrap up and awards.

It is recommended that the coursework include the following:

- Product Handling prior to Storage (Cleaning, Sorting, Packaging, other Value Added Processes)
- Pre-Cooling and proper stacking/boxing



- Cold Storage Operations, including environment, product, and building monitoring, testing, and measuring
- Transportation
- Routine Repair and Maintenance of typical equipment

Various operations certifications can be provided after various levels of training have been met.

In addition to the above, specific recommendations were developed based upon the cold storage operations reviewed, the information gained, and the analysis resulting from the surveys suggests. Numerous new, functional and effective facilities are available for use leading up to the approaching harvest season; however specific operations, product, equipment and adjacency component education needs remain.

To this end, the following recommendations are presented as an opportunity to continue to educate, reform, and raise the level of care, standards, efficiency and profitability among the cold supply chain, primarily the cold storage operations.

3.1 INTENSIVE TARGETED TRAINING

Develop numerous necessary and helpful cold storage plain language guides, including outlining specific “Do’s and Don’ts” with regard to handling and storage of various products.

3.2 PEAK SEASON OPERATIONAL ANALYSIS & REVIEW

Aid the grantees in sourcing, pricing and procuring necessary equipment for the warehouses, including consumable products such as plastic strip curtains for the doorways, pre-cooling fan equipment, ethylene scrubbing equipment, sanitation products, and environmental measuring instruments, such as hygrometers, ethylene meters, and thermometers, paying close attention to sourcing instruments which can be re calibrated or replace easily.

3.3 COLD SUPPLY CHAIN PILOT PROGRAM

Select a test plot cold storage warehouse to support improvements working through the technical experts including staff. The ultimate goals are to increase the value of the products stored, increase the shelf life for the retailers, and possibly increasing the earning potential for farmers interested in learning how they can help increase product value with low and no-cost processes.

Direct, hands-on, and practical training to cold storage management and select technical personnel should be delivered to GFC Gurjaani or another facility. Specifics to be trained on shall include:

- Basics of Receiving and Sorting
- Basics of Pre-Cooling (including operation of an actual pre cooling unit)
- Basic of Refrigeration Equipment and Controls
- Basic of Humidification Equipment and Controls
- Basics of Monitoring & Control of Temperature, Humidity, Ethylene
- Basics of Standard Sanitation Operating Procedures (SSOP)



- Basics of Understanding the Product in your Care

3.4 COLD SUPPLY CHAIN PILOT PROGRAM TRAINING

Conduct a workshop(s) at the test plot facility providing cold storage management operational processes training, as well as product handling, storage recommendations, mechanical systems recommendations, and human resource needs. Include safe handling and application of products for rodent control, and preservation of products in the workshop(s).

3.5 MARKETING PROGRAMS CONSULTANCY

Develop a team marketing plan that brings HRI, premium brand retailers, and select cold chain practitioners together to create a premium brand domestic fruits and vegetable value chain.

3.6 SOURCING MONITORING DEVICES

The REAP management team can serve as a constant team leader or project manager to help the grantees stay on schedule with the progress they should be working on, and be of help when particular assistance is needed.



APPENDIX I

The following is a list of documents left with the Georgia REAP team in-country.

Document Name	Type
Cold Chain Equipment List-Georgia	XLS
Fresh Plus Ethylene Scrubber Quotation	PDF
Fresh Plus Final Brochure	PDF
Hydro fogger Mini fogger Owner’s Manual	PDF
REAP Gantt Chart	PDF
Hughes Final Cold Storage Operations Training Program	PPT
Equipment Maintenance Checklist	XLS
Fruits in Storage Profit Margin Estimates(GEO)	XLS
Master Cella User Manual Russian	PDF
Master Cella User Manual English	PDF
Maximizing Profits in Cold Storage	PPT
NEB-6500-Instruction-Manual	PDF
Short Term Compatibility Chart portrait	XLS
Cold Storage Operations Management-Checklist-Hughes I	DOCX
Cold Storage Operations-Common Concerns-Probable Causes-Hughes	DOCX
Cold Storage Operations-Receipt of Product-Hughes	DOCX
Sanitizing and Cleaning Index Example	XLS
Apple Fuji	DOCX
Apple Gala	DOCX
Apple Golden Delicious	DOCX
Apple Granny Smith	DOCX
Apple Red Delicious	DOCX
Apricot	DOCX
Bush berries	DOCX
Cabbage	DOCX
Cucumber	DOCX
Dried Fruits and Nuts Recommendations	DOCX
Dried Fruits and Nuts Parameters	DOCX



Grape	DOCX
Herbs	DOCX
Kiwifruit	DOCX
Lemon	DOCX
Onion-dry	DOCX
Onion-green	DOCX
Orange	DOCX
Peach and Nectarine	DOCX
Persimmon	DOCX
Plum	DOCX
Pomegranate	DOCX
Potato	DOCX
Sweet Cherry	DOCX
Tangerine	DOCX
Tomato	DOCX
Garlic	DOCX