# Cold Chain Management Certificate Program Plan

## GCCA Cold Chain Management Workshop Focus

Fruits and Vegetables

Cut Flowers and Nursery Products

Processed Meats and Marine Products

Ice Cream and Dairy Products

Medicines & Vaccines

## Potential Audience

Cold Storage Industry Personnel

Transport Company Personnel

Seaport/Airport shipping Personnel

Packinghouse/Packaging Personnel

Fresh Produce Retailing or Food Service Company Personnel

Education/Extension Personnel

Representatives of the Key Agencies

**Technical Training Modules, Topics, and Learning Objectives**

**Introduction: Global Cold Chain Overview**

### Module 1: Post harvest Technology for Handling Fresh Fruits and Vegetables.

* Overview of basic postharvest handling practices from harvest to the consumer
* The relationship between Maturity and Quality, use of Maturity Indices
* Packinghouse operations-- effects on postharvest shelf life
* Respiration rate of fruits, vegetables and cut flowers – temperature effects and senescence
* Transportation practices – road, train, sea and air
* Concerns of importers/exporters sending fresh produce to global markets

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| Module 1 Working Group Exercises: Calculation of potential storage life for selected commodities based upon various cold storage and ambient temperatures and the associated respiration rates; Calculation of the costs and benefits associated with a change in selected postharvest handling practices. |
| Module 1 Demonstrations/Displays: Tools for measuring maturity indices; Packages designed for protection and proper pre-cooling; Effects of temperature (0, 10 and 20 C storage for 1 week) on postharvest life (visual appearance, overall quality characteristics, decay rates, market value). |

#### Learning objectives:

* The participants will be able to explain how the basic characteristics of different types of food products will determine their potential storage life and recommended storage conditions;
* The participants will gain an appreciation regarding how the interval between harvest of local produce or unloading of imported produce and pre-cooling can influence storage quality, shelf life, and market value of perishable fruits and vegetables;
* Participants will be able to calculate the costs and benefits associated with making changes in their post harvest handling practices.

### Module 2: Food Safety Issues and Practices and the Cold Chain.

* Microbes associated with foods and organic materials—contamination problems, microbial growth on and in foods, food spoilage issues
* Effects of low temperature on microbial growth
* Overview of Bio-technology, Pharmaceutical products and the importance of the cold chain---Bio-Pharming and genetically modified (GM) foods
* Overview of Food Safety Issues and the Cold Chain
* Food safety hazards—physical, chemical and biological
* Food borne diseases—low temperature food pathogens
* Good Manufacturing Practices (GMP) for cold stored foods
* HACCP for low temperature storage
* Looking to the future: Global markets and food safety issues

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| Module 2 Working Group Exercise: calculation of microbial loads (counts) on selected products after selected periods of time at 0 10 and 20 C. |
| Module 2 Working Group Exercise: Practice performing a simplified HACCP analysis for their operation. |
| Module 2 Demonstrations/Displays: Tools and illustrations used for monitoring and measuring factors related to food safety. |

#### Learning objectives:

* The participants will be able to classify foods according to their pH and explain how food constituents and the characteristics of different types of foods will affect their predicted spoilage rates;
* The participants will gain an understanding of how microbiological growth rates and associated food spoilage rates are affected by temperature;
* Participants will be able to identify specific potential food safety hazards.
* Participants will gain awareness of how low temperature food pathogens (a source of food borne diseases) must be prevented from entering the food chain beginning from the farm level, and maintained through cold storage, transportation, and distribution in order for food distribution businesses to be sustainable.
* Participants will be able to perform a simplified HACCP analysis of their own cold chain operations.

### Module 3: Refrigeration and Cold Storage Management Practices.

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| * Refrigeration, relative humidity and vapor pressure * Thermal characteristics of cold storage structures * Selection of appropriate refrigeration/freezing units (BTU and refrigerants) * Measuring and monitoring temperatures in the cold store * Minimizing temperature fluctuations |
| * Efficient methods for pre-cooling and cold storage—comparisons of room cooling, forced air cooling, use of ambient or modified atmospheres, high relative humidity. * Storage conditions recommended for selected commodities * Special considerations for tropical/sub-tropical fruits and vegetables, temperate fruits/vegetables * Special considerations for apples, grapes, potatoes, onions, edible nuts * Special considerations for cold storage of meats, seafood products, dairy products * Special considerations for pharmaceutical/bio-tech products |
| Module 3 Working Group Exercises:  Practice the calculation of refrigeration and freezing loads for various products, storage rooms and temperature zones; |
| Module 3: Demonstrations/Displays: Temperature compatibility charts; Temperature measuring tools and devices (handheld digital probe, automated monitoring systems). |

Learning objectives:

* The participants will be more aware of the characteristics of cold storage facilities and how to better manage temperature within the structure;
* Participants will be able to classify different types of products by their “best storage temperatures;”
* Participants will be able to calculate refrigeration and freezing loads for various products, storage rooms, and temperature zones;
* Participants will be able to calculate the times required for pre-cooling selected commodities using forced air cooling, given varying initial and desired temperatures;

Module 4: Cold Chain Management for the Foods and Fresh Produce Industries**.**

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| * Overview of the Management of Cold Storage Facilities * Pallet layout and stacking options—benefits of standardization of palletization * Flexible storage systems and racking options—direct access versus mass storage * Produce and temperature traceability |
| * Management of transport vehicles and loads —fast-loading devices, air distribution/air renewal rates, cleaning and maintenance of vehicles and equipment. * Energy management for reducing costs and improving profits * Risk management issues and methods * Speed versus Safety—worker safety issues * Human resource management and training issues |
| Module 4: Demonstrations/Displays: Temperature recording devices used during transport; Documentation worksheets for traceability. |

Learning objectives:

The participants will become aware of some of the many options for improved organization and improved logistics for handling product within a cold storage facility;

* + - * Marketing at Business & Sector levels – Kent develops
        + Basics of SME Marketing
        + Sector Marketing
        + Regional/CoOp Marketing
        + Country wide Branding

### Module 5: Marketing for Cold Chain

* Overview of small and medium enterprise marketing
* Particpants will begin the process of sector marketing
* Discussion of different types organziaitions: community based organization, cooperatives, associations, alliances, or local equivilent

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| Module 5 Working Group Exercise: Teams of participant will develop a crop specifc marketing paln |
| Module 5 Working Group Exercise: Small groups will weigh the pros and cons of the different orgnaizaityon structures. |
| Module 5 Demonstrations/Displays: Sample marketing plan and posters on different organizational features and benefits |

#### Learning objectives:

* The participants will be able to idenfity strong and weak markets segments and develop the basis of their marketing;
* The participants will gain an understanding of the potential for sectors and markets that could be potential business opportuintes;
* Participants will be able to identify types of organizational structures that could aid them in the growth of their business.
* Participants will be able to developed a simplified marketin plan for their own cold chain operations.

### Module 6: Wholesale and Retail Cold Chain.

* Effects of temperature abuse at the point of sale
* Overview of effective presentation of product: layout, display, signage
* Overview of Retail Food Safety Issues
* Looking to the future of local markets and food safety issues

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| Module 6 Working Group Exercise: Mapping the customer experience at a wholesale market and other retail. |
| Module 6 Working Group Exercise: Develop improvement plan for reducting tempuerure abuse, increasing sales and increasing food safety awareness. |
| Module 6 Demonstrations/Displays: Tools and illustrations used for monitoring and measuring factors related to tempurtuer abuse, presentations and food safety. |

#### Learning objectives:

* The participants will be able to identiry the signs of tempruerat abuse at the wholesale / retail level and explain the affect on sales;
* The participants will gain an understanding of different presentation techniques;
* Participants will be able to identify specific patterns in the local market for wholesale / retail sales.
* Participants will be able to develope a simplified plan for improvement cold chain operations at the wholesale / retail level

### Module 7: Transportation and Logistics.

* General understanding about the critical issues and concepts involved in moving perishable loads
* Participants will learn about proper loading practices for perishable items moving in and out of refrigerated storage facilities
* Effects of tempurture abuse once product is in transit.
* Discuss the ways to maximize effeincely and profiatblity in cold chain transport

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| Module 7 Working Group Exercise: Participants will practice proper loading techniges for various size transport. |
| Module 7 Working Group Exercise: Small groups will devise logistic plans that will include collection of product, transportion of product to packhouse or storage and retail distrubiton. |
| Module 7 Demonstrations/Displays: Various size transportion suitable to local conditions plus product to be loaded and unloaded. |

#### Learning objectives:

* The participants will gain an understanding of the importance of tempurture control during the transportation of product;
* The participants will be able to identiry the signs of temperature abuse at critical points along the value chain;
* Participants will be able to describe the process for documenting temperature abuse for product in transit.