

CONCEPT NOTE
Pack House & Distribution Centre
Fresh Produce Handling

Basic Requirements

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PRELIMINARY CONCEPT NOTE

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Suggested Work Areas

1. Unloading/Receiving Bay (raised platform).
2. QC Area for each unloading bay.
3. Measurement/Weighing Area.
4. Sorting Area.
5. Grading Area/Machinery.
6. Dry store for Cross Dock goods (B-Grade onward dispatch).
7. Temporary Dump Area.
8. Dry Storing Area.
9. Vegetable Cleaning Area / Wash
10. Vegetable Processing Rooms (cut, net packing etc).
11. IQF (____/hr) and RTE Equipment (____ / hr).
12. Pre-Coolers (__ x __ MT).
13. Ripening Chambers (__ x __MT).
14. Cold Stores Area Chilled - __ MT.
15. Freezer Store Area - __ MT.
16. Dispatch cold ante-room
17. Dispatch Staging Area
18. Dispatch QC area
19. Loading Bay/Raise platform with seals with dock levelers.
20. Clean Crate Storage Area.
21. Dirty Crate Storage Area.
22. Crate Washing Area (Triple Wash).
23. Waste (dump) area (separate dispatch entry/exit).
24. Battery operated fork lift
25. Manual Pallet equipment
26. Water Treatment / RO plant.
27. Office
28. Cold Storage Monitoring Stations.
29. Service UPS Room for Computer.
30. Electrical Control Room.
31. Generator room total capacity ____KVA.
32. Gate Keeper Room (Inward GRN check).
33. Gate Keeper Room (Outward check).
34. Two Base wet pumps - Master sump tank.
35. Over flow tanks as required.
36. Covered Waiting shed for incoming trucks.
37. Effluent treatment Plant.
38. Sewage treatment Plant.
39. Quality Testing Laboratory.
40. Labour Rest rooms / Eating (Canteen) Facility.
41. Labour Shower room and toilets.
42. Material Handling Equipment Store.
43. Janitorial Equipment Stores.
44. Admin/Ops Supply Store.
45. Machinery Spare Parts Store.
46. Fumigation/Chemical Store.
47. Staff Locker/Change Rooms.



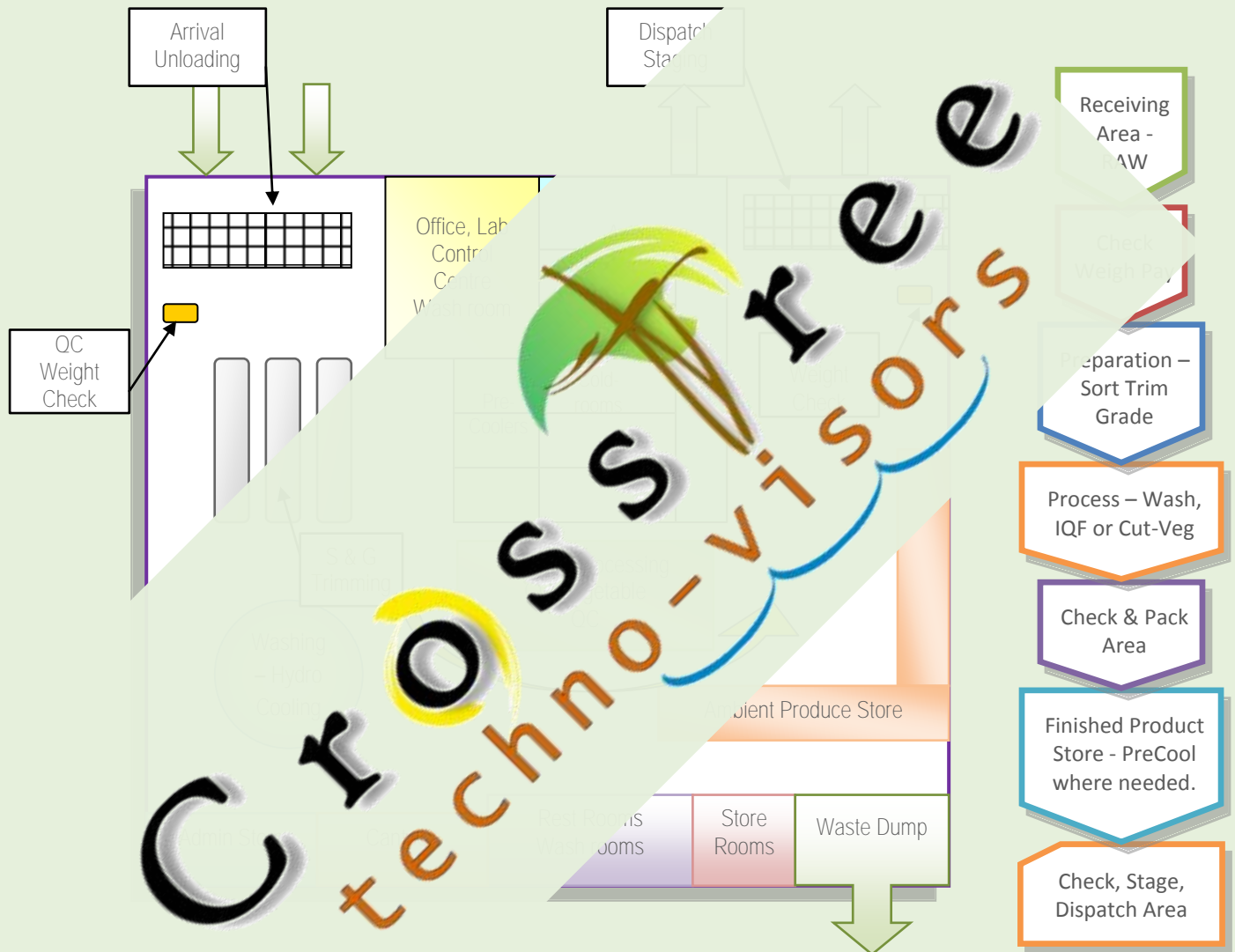
Planning and Design

The design of various facilities such as building, environmental features to be considered. Design should be able to handle produce daily and cater to a logical Flow of produce.

Flow of produce

Straight line movement of produce is desired so that cross contamination is avoided. The produce flow is represented below:

FIGURE 1 (GENERIC)



General layout

The various operations in a plant need, within reason, to be kept separate. Perishable raw materials should be kept separately. Packaging again should be separately stored and there should be some form of divided office area.

A separate hygienic facility to be provided for Cut-Veg process entrance and IQF area; Access through wash room, positive pressure inside the processing hall.

Administrative Space must include a quality and testing laboratory.

Toilets, if placed in the main building should be separated area. If be housed in a separate building.

For good hygiene, workers must have access to at least hand washing, or shower facilities with soap and clean towels. In-house laundry facility should be considered.

Surroundings

Landscaping is important consideration as shrubs, grass, and trees too close to the building can increase the chance of harborage of vermin. Trees and shrubbery should be no closer than 30 feet from the building, and grass coverings should end building walls. Further, a gravel buffer should be established between the building and plants. Under-laying the pea-gravel with poly is recommended.

Driveways leading to Receiving and Staging areas should be paved and sloped for drainage - asphalt is avoided to attract insects.

Lighting

Exterior Lighting ends to attract insects. These should be mounted on pref city walls with lights directed at doorways and movement areas.

Good lighting for general work to be provided. Note, under certain circumstances a rotating of a machine can appear to be standing still if its velocity matches the number of cycles of the mains electricity running a fluorescent (or incandescent lights for safety).

Sorting/Grading Facilities

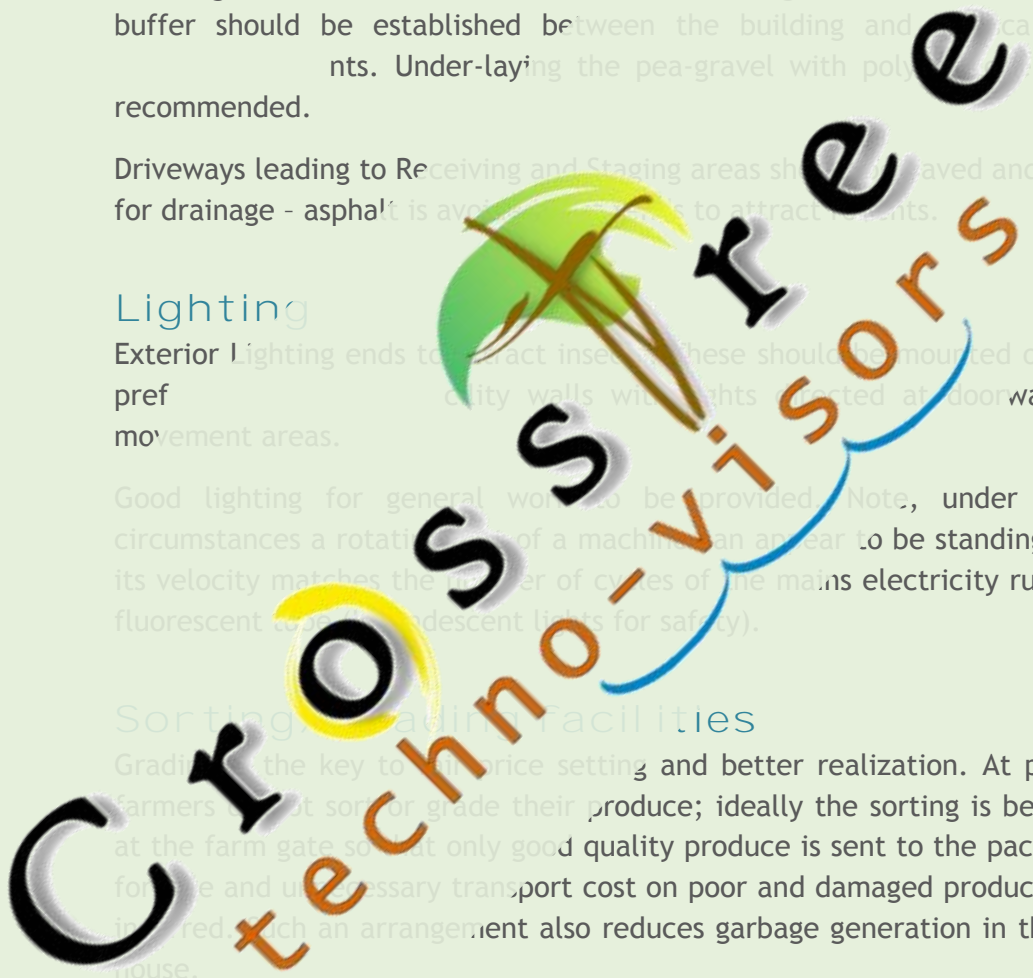
Grading is the key to price setting and better realization. At present, farmers do not sort or grade their produce; ideally the sorting is best done at the farm gate so that only good quality produce is sent to the pack house for sale and unnecessary transport cost on poor and damaged produce is not incurred. Such an arrangement also reduces garbage generation in the pack house.

However, it will take a while to motivate farmers to bring only sorted/graded produce to the pack house. The pack house will, therefore, set up own grading facilities as an enabler. grading line

MT per hour capacity is proposed.

There will also be provision to , which are incapable of being handled on mechanical graders.

Sorting , based sorters, Washing line will be installed.



PreCooling Facilities

Precoolers - Forced Draft type, are proposed. The pre-coolers to to minimize material after pre-cooling is applied. Chilled water washer/ graders for some produce.

Cold Storage

Chilled storages will be /product zones. The of fruits and vegetables will be stored in the cold . The cold storage will also be hired out to the wholesalers, buyers and sellers for storage of fruits and vegetables.

Frozen Cold Stores, will cater to frozen output from IQF line.

Dispatch/Loading Bay

The dispatch area should be designed so that it also incorporates the ante-chamber of cold stores. This will facilitate dispatch of cooler trucks and normal vehicles as needed.

Some produce will move dispatching cold rooms.

Walls and General Internal Finish

All internal walls to be smooth finished in production areas to allow for level of smooth 4 feet is preferred. Selected areas should be ceramic tiled (for example behind sinks where machinery will cause considerable product splashing).

Pest Control

Attention to be given to preventing the flying insects through gaps/openings in the structure - deploy air curtains and screens.

Standard Pest control measures (fly traps, rodent traps, etc to be deployed).

Ventilation

Food processing operations generate heat and is essential; control odours, control ambient temperature and control humidity.

If the direction of prevailing winds in low openings covered with a sandwich of metal and nylon mesh are

The Floor

Wet processes will be involved; the floor be made of good quality which slopes to a el. This means that at the end of the day the whole d naturally to a central point. The drainage channel should be fitted with a

grating that can be easily removed for internal cleaning of the drain. The point where the drain exits from the building will require special attention and will

The joint between the sloped production floor provides a point for dirt to lodge.

Floor should be tiled, antiskid surface hygienically.

In forklift movement areas, account for

Floors could be marked with so that the location of goods can be thus enabling quick retrieval.

Electricity

All electric points should be placed at high level as the plant is able to be hosed down frequently. Ideally waterproof outlets should be used.

Energy Saving

All cold room doors will be insulated to retain cold energy loss during door openings. These doors should be closed to another controlled temperature area to benefit from partial cooling.

All air purge systems will discharge (outgoing cool air) onto other equipment that traditionally use cooling water (compressors/condensers). Cooling water tanks

used for cooling the machinery.

Compressors will be placed in a well to benefit from

Incoming ventilation will be supplied through the air handling unit and not directly into the space.

Insulated water tanks to take advantage of inherently cool well water.

Water Treatment Plants

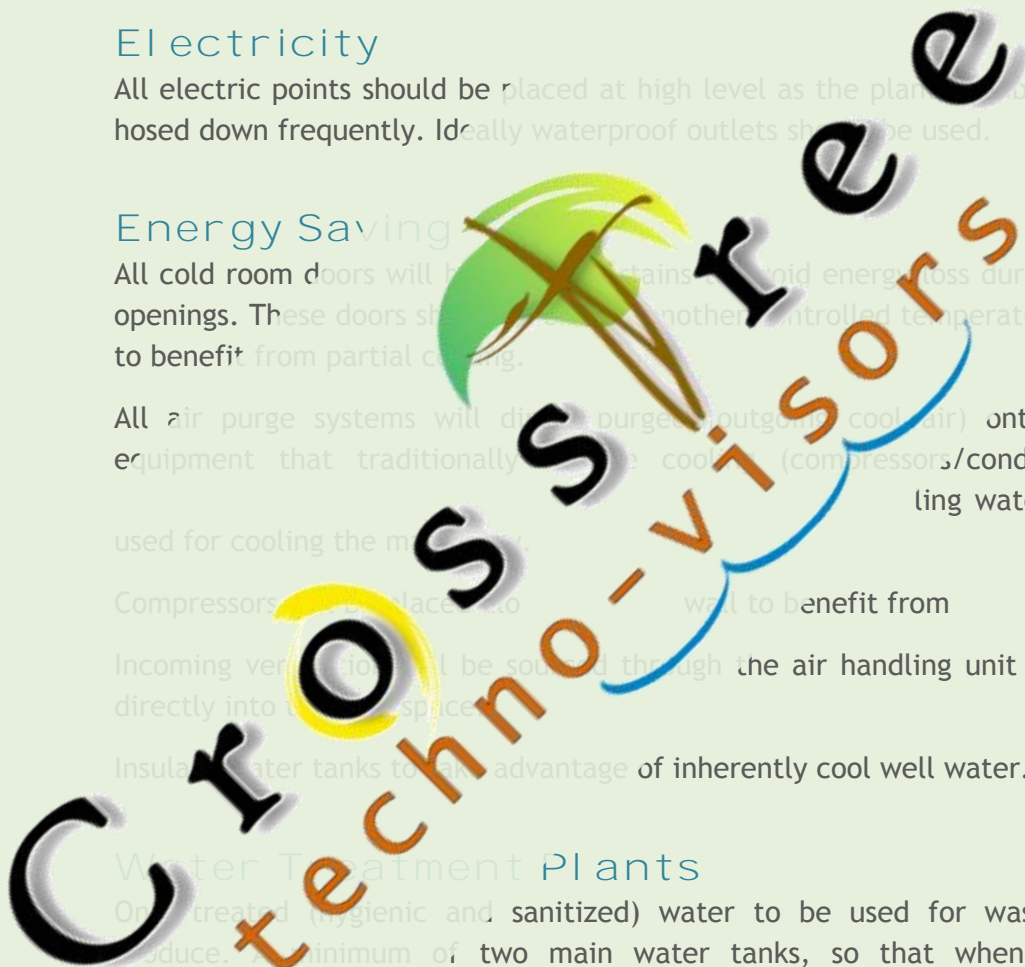
Only treated (hygienic and sanitized) water to be used for washing of produce. Minimum of two main water tanks, so that when

System will be utilised. Recycling of water will be done to optimise use and minimise wastage.

Crates/Bins Washing

Maintenance and cleanliness will be the hallmark of the new packhouse; conditions also determine the shelf life

dead 'left-overs' in the crates will therefore be removed at regular intervals.



Dirty crates

for this purpose. Clean crates will be segregated from dirty crates in a separate store.

Effluent treatment plant (ETP)

Sewage treatment or domestic wastewater treatment plant would be for removing

water would be drained into an open pond or used for recharging ground water.

Strategic fit of Pack House

- The proposed Packhouse cum distribution centre (PHDC) will be equipped to receive, process and dispatch fresh fruits and vegetables, daily. The processing, washing, dressing and minimal processing cutting and other post harvest treatments. The pack house will also be constructed for ripen banana, papaya, mangoes etc.

- The produce from the farm brought to the central pack house to undertake post harvest operations like sorting, grading, pre cooling, storage and packing. Where appropriate infrastructure is to be set up.

- Consumer packs will eventually come and are expected to evolve during next 2-3 years as per demand in the market place. Presently, the configuration of various facilities

types of produce are met in the planning the design should permit expansion to add consumer packaging system and capacity enhancement in modular manner.

Cold storage will be set up to meet short term storage requirements to regulate supply and temporary storage of excess produce.

Types of products to be handled

- Seasonal fruits
- Seasonal vegetables
- Leafy vegetables
- Hard SKU's

Seasonality and Produce flow

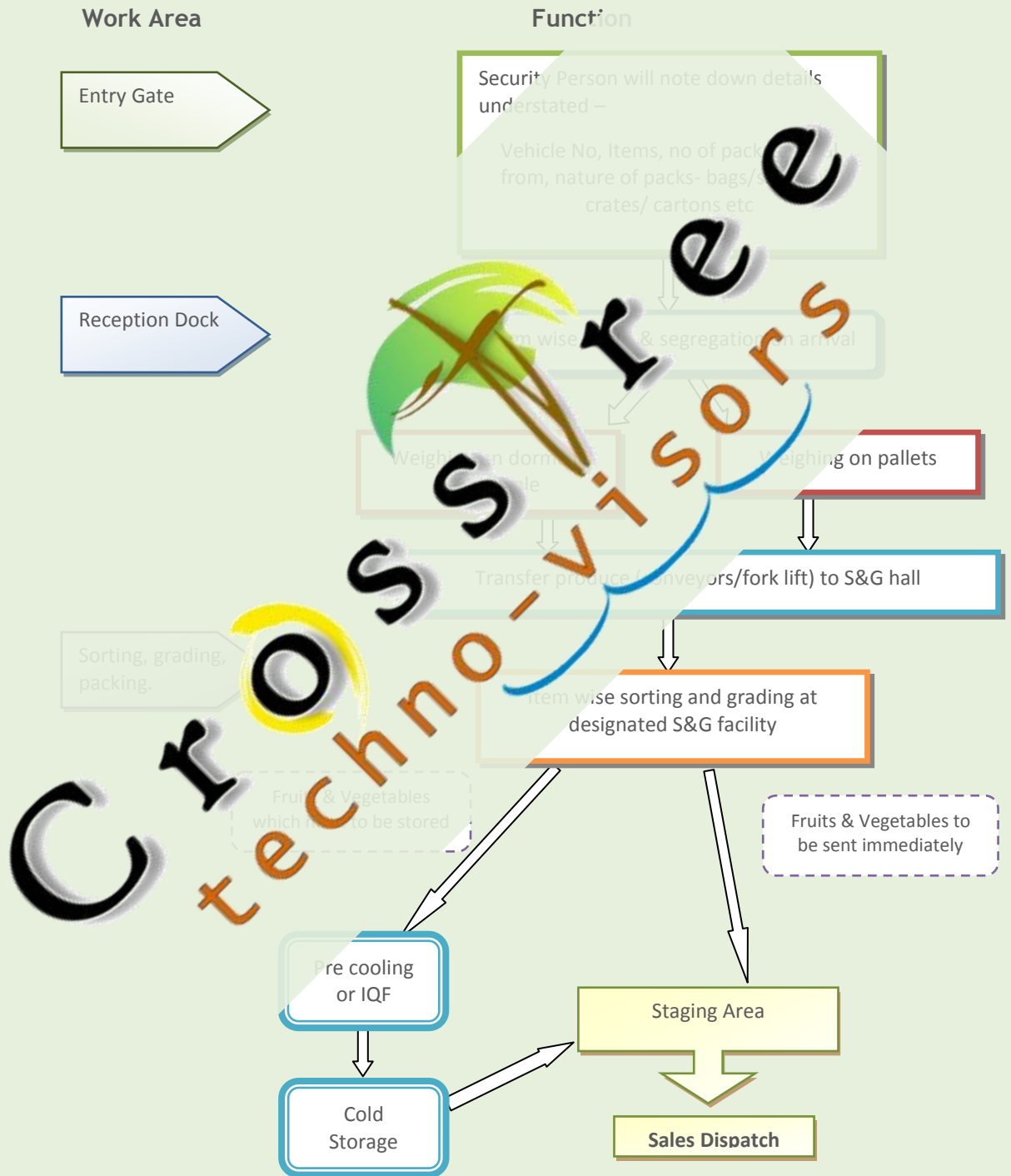
- Total production to be handled has been estimated at 100 MT

vegetables will be received from longer distances. There will be continuous flow of produce throughout the year.

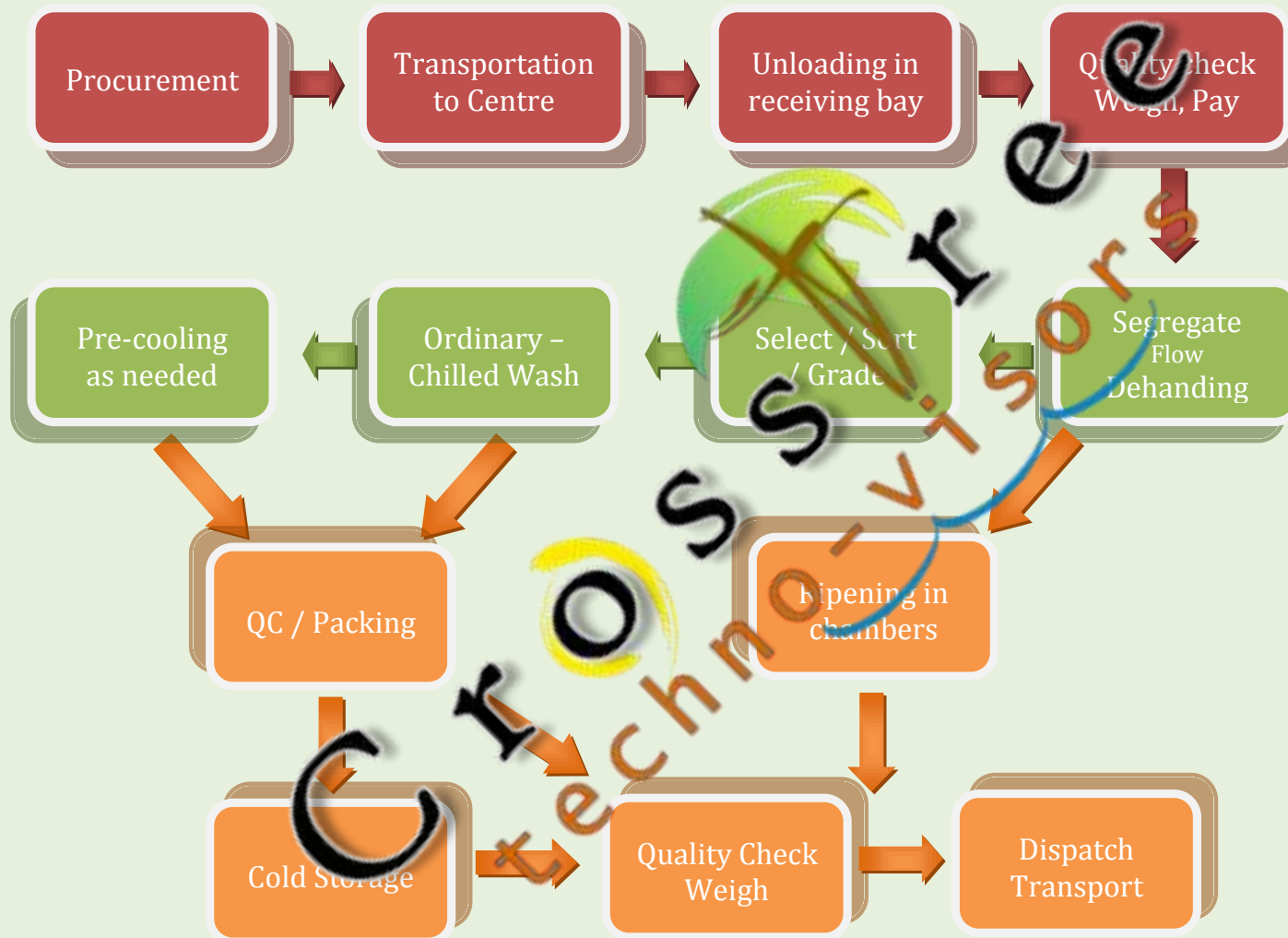
- Only strategic produce will be stored to take is proposed.

- The peak handling is estimated at about 40% higher than the daily average.
- Produce that can be cross-docked with minimal handling and those with lower shelf life will be dispatched on the same day as arrival.

Pack House Operations



BASIC PRODUCT FLOW, FRESH PRODUCE



ANNEXURE-I

LIST OF VEGETABLES

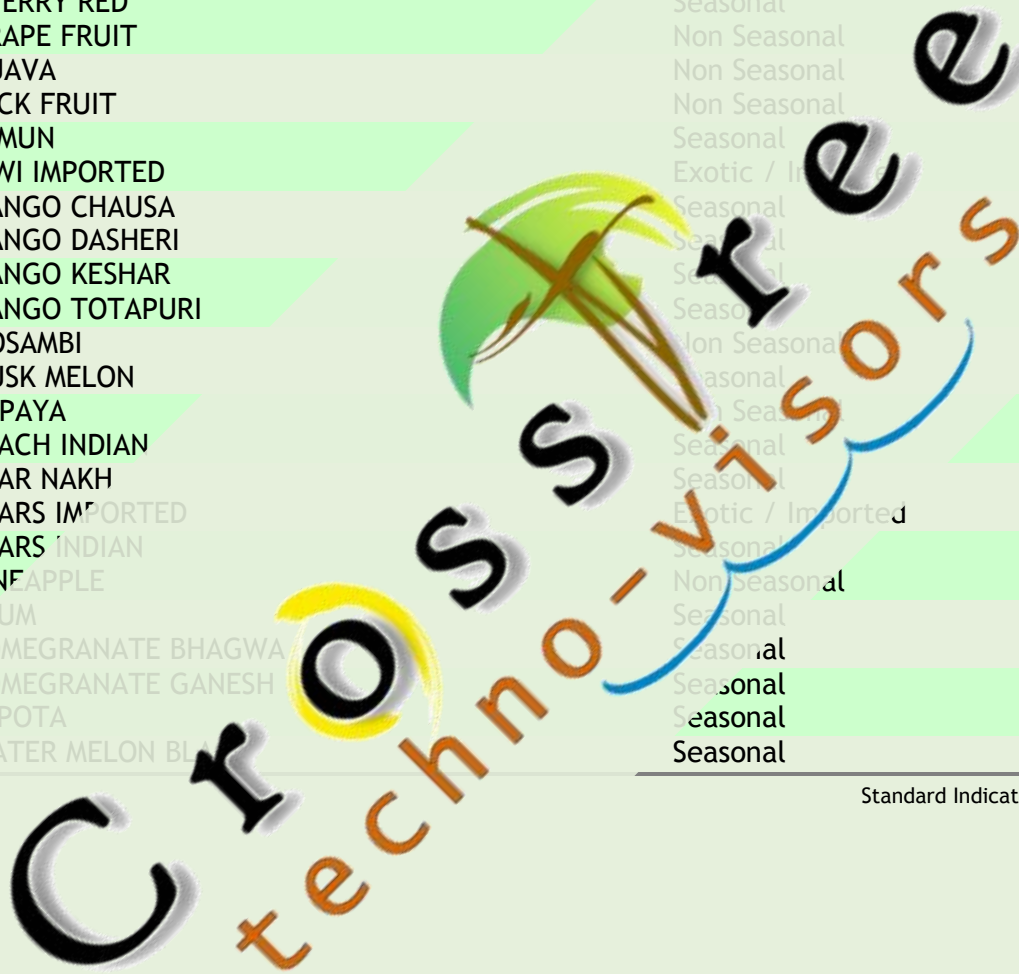
Vegetable Name	Category	Vegetable Name	Category
ARVI	Non Leafy	GARLIC INDIAN	Non Leafy
BABY CORN	Exotic	CUCUMBER SMALL	Gourds
BABY CORN PEELED	Exotic	CUCUMBER HYBRID	Gourds
BABY POTATO	Non Leafy	GINGER	Non Leafy
BANANA FLOWER	Exotic	BOTTLE GOURD	Gourds
BANANA RAW	Non Leafy	GREEN CAPSICUM	Non Leafy
BANANA STEM	Non Leafy	GROUNDNUT FRESH	Non Leafy
BASIL	Exotic	RIDGE GOURD	Gourds
BEET	Non Leafy	LEMON	Leafy
BRINJAL BLACK BIG	Non Leafy	LOCAL BEANS	Non Leafy
BRINJAL GREEN	Non Leafy	OKRA	Non Leafy
BRINJAL LONG GREEN	Non Leafy	ONION PR	Non Leafy
BRINJAL NAGPURE	Non Leafy	RAW MANGO	Non Leafy
BROCCOLLI	Exotic	SMALL GOURD	Gourds
BRUSSELS SPROUTS	Exotic	WATER GOURD	Gourds
CABBAGE RED	Exotic	WINTER GOURD	Gourds
CABBAGE REGULAR	Non Leafy	CH GOURD	Gourds
CARROT OOTY	Non Leafy	CHITS	Non Leafy
CAULIFLOWER	Non Leafy	SWEET CANE SECES	Non Leafy
CELLERY	Exotic	SWEET CORN INDIAN	Non Leafy
CHERRY TOMATO	Exotic	PARVA	Gourds
CHILLI GREEN	Non Leafy	IMPKINUSCO	Gourds
CHILLI HYBRID	Non Leafy	TOMATO GREEN	Non Leafy
CLUSTER BEANS	Non Leafy	TOMATO HYBRID	Non Leafy
COCCINIEA	Non Leafy	TOMATO PR	Non Leafy
COCONUT	Non Leafy	POTATO	Staples
COLOURED CAPSICUM	Exotic	ONION	Staples
DRUMSTICK	Non Leafy	CORRIANDEER	Leafy
FRENCH BEANS	Non Leafy	ONION SAMBHAR	Staples
GARLIC CHINESE	Exotic	ONION WHITE	Staples
LEMON GRASS	Exotic	PALAK	Leafy
LETTUCE BERBERG	Exotic	METHI BIG	Leafy
LETTUCE LEAFY	Exotic	SPRING ONION	Leafy
PAPRIKA	Exotic	CURRY LEAF	Leafy
SAGE	Exotic	MINT LEAVES	Leafy
SPINACH	Exotic	RADDISH RED	Leafy
YAM	Exotic	AMARANTHUS RED	Leafy
ZUCCHINI GREEN	Exotic	DILL LEAVES	Leafy
		CHAWLI	Leafy

Standard Indicative List Only

LIST OF FRUITS

FRUIT NAME	CATEGORY
APPLE FUJI	Exotic / Imported
APPLE GRANNY SMITH	Exotic / Imported
APPLE NEW ZEALAND	Exotic / Imported
APPLE WASHINGTON	Exotic / Imported
AVACADO	Non Seasonal
BANANA RED	Non Seasonal
BANANA ROBUSTA	Non Seasonal
BANANA YALLAKI	Non Seasonal
CHERRY RED	Seasonal
GRAPE FRUIT	Non Seasonal
GUAVA	Non Seasonal
JACK FRUIT	Non Seasonal
JAMUN	Seasonal
KIWI IMPORTED	Exotic / Imported
MANGO CHAUSA	Seasonal
MANGO DASHERI	Seasonal
MANGO KESHAR	Seasonal
MANGO TOTAPURI	Seasonal
MOSAMBI	Non Seasonal
MUSK MELON	Seasonal
PAPAYA	Non Seasonal
PEACH INDIAN	Seasonal
PEAR NAKH	Seasonal
PEARS IMPORTED	Exotic / Imported
PEARS INDIAN	Seasonal
PINEAPPLE	Non Seasonal
PLUM	Seasonal
POMEGRANATE BHAGWA	Seasonal
POMEGRANATE GANESH	Seasonal
SAPOTA	Seasonal
WATER MELON BL	Seasonal

Standard Indicative List Only



Post Harvest Cooling

Proper postharvest cooling will:

- Suppress respiratory activity and enzymatic degradation (softening).
- Slow or inhibit water loss (wilting).
- Slow or inhibit the growth of decay-producing microorganisms (molds and bacteria).
- Reduce the production of ethylene or minimize the commodity's reaction to ethylene.

In addition to protecting quality, postharvest cooling enhances marketing flexibility by making it possible to market fruits, vegetables, and flowers at more optimum times.

Field heat removal method choices depend on several factors, including:

- Temperature of commodity when harvested.
- Nature of the commodity(ies); type of product (e.g., leafy greens, flowers, fruit) respiration rate(s), cooling requirements, lowest safe temperature, tolerance of exposure to water. (Typically, the exception comes with garlic, zucchini, summer squash, hard squash, and winter squash. In general, all other crops can be washed by either spraying or dunking to remove soil and/or reduce "field heat").
- Product packaging requirements; Boxes or bag, because packaging materials and design configuration affect method and rate of cooling.
- Product flow capacity; Volume of commodity which must be handled per unit of time will determine the appropriate methods of cooling method and systems.
- Mix of commodities; Compatibility depends on their nature with regard to sensitivity to odors and ethylene.

Common Cooling Systems

- **Room cooling:** Produce is raised in an insulated room equipped with refrigeration units. This method can be used with most commodities, but is slow compared with other options. A room used to cool produce, a larger unit is needed. Containers should be stacked so that cold air can circulate around them, and constructed so that it can move through them.
- **Forced-air cooling:** Fans are used in conjunction with a cooling room to pull cold air through packages of produce. Although the cooling rate depends on the temperature and the rate of air

as the desired product temperature is reached. To avoid over-cooling and dehydration of produce, do not operate forced-air fans after the produce has been cooled to its optimum temperature.

- **Hydro-cooling:** Dumping produce into cold water, or running cold water over produce, is an efficient way to remove heat, and can serve as a means of cleaning at the same time. In

for berries, potatoes to be stored, sweet potatoes, bulb onions, garlic, or other commodities that cannot tolerate wetting.

Water removes heat about five times faster than air, but is less energy-efficient. Well water is a good option,

If hydro-cooling water is recirculated, it should be chlorinated to minimize disease problems.

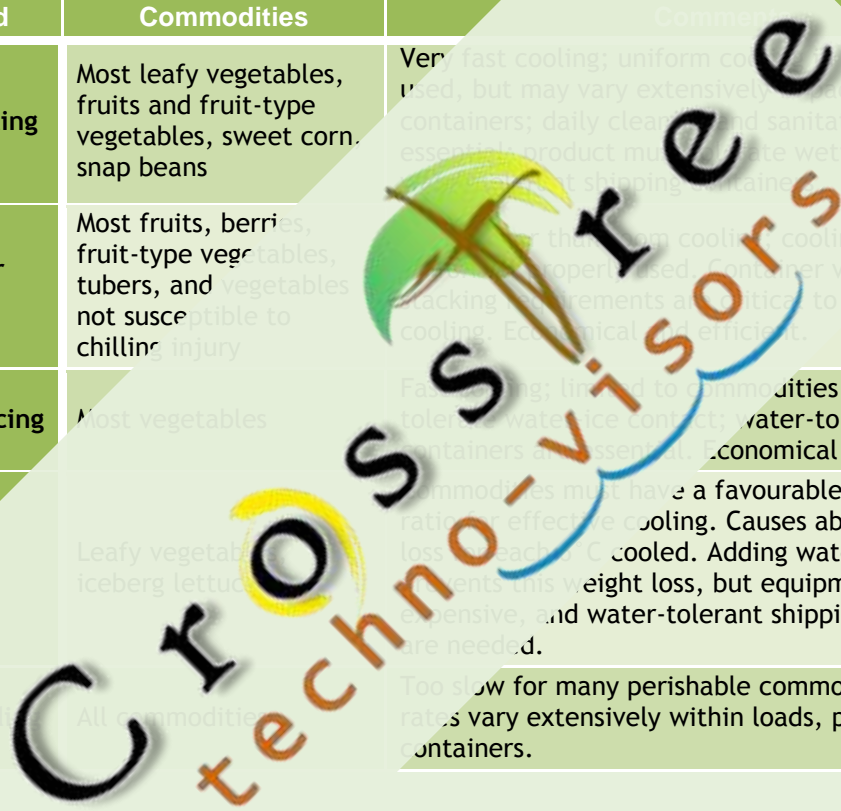
- **Icing:** Icing is particularly effective on dense products and palletized packages that are difficult to cool

is injected into packaged produce through vents or handholds. Icing methods work well with high-respiration commodities such as sweet corn and broccoli. One Kg of ice will cool about three Kgs of produce from 30° C to 4° C.

- **Vacuum cooling:** Produce is enclosed in a chamber in which a vacuum is created. As the vacuum pressure increases, water within the plant evaporates and removes heat

cooling. This is the most cost-effective and rapid method of cooling. The primary drawback to this is the cost of the vacuum chamber system.

Method	Commodities	Comments
Hydrocooling	Most leafy vegetables, fruits and fruit-type vegetables, sweet corn, snap beans	Very fast cooling; uniform cooling. If properly used, but may vary extensively. Palletized shipping containers; daily cleaning and sanitation measures essential; product must tolerate wetting; need water-tolerant shipping containers.
Forced-air cooling	Most fruits, berries, fruit-type vegetables, tubers, and vegetables not susceptible to chilling injury	Very fast cooling; uniform cooling. Cooling rates very fast if properly used. Container venting and stacking arrangements are critical to effective cooling. Economically efficient.
Package-icing	Most vegetables	Fast cooling; limited to commodities that can tolerate water-ice contact; water-tolerant shipping containers are essential. Economical and efficient.
Vacuum cooling	Leafy vegetables, iceberg lettuce	Commodities must have a favourable surface-to-mass ratio for effective cooling. Causes about 1% weight loss for each °C cooled. Adding water during cooling prevents this weight loss, but equipment is more expensive, and water-tolerant shipping containers are needed.
Room cooling	All commodities	Too slow for many perishable commodities. Cooling rates vary extensively within loads, pallets, and containers.



ANNEXURE-II

Recommended Precooling Methods for Commonly Grown Vegetables and Fruits.*

Vegetable	Precooling method
Asparagus	Hydro-cooling, Package icing
Beans, snap	Room cooling, Forced-air cooling, Hydro-cooling
Beets	Room-cooling
Broccoli	Package icing, Forced-air cooling, Hydro-cooling
Brussel Sprouts	Hydro-cooling, Vacuum, Package icing
Cabbage	Room cooling, Forced-air cooling
Carrots	Hydro-cooling, Package icing, Room cooling
Cauliflower	Hydro-cooling, Vacuum
Chinese Cabbage	Hydro-cooling, Room cooling, Forced-air cooling
Corn, sweet	Hydro-cooling, Package icing, Vacuum
Cucumber	Forced-air cooling, Hydro-cooling
Eggplant	Room-cooling, Forced-air cooling
Garlic	No precooling needed
Greens	Hydro-cooling, Package icing, Vacuum
Herbs	Room-cooling
Lettuce	Hydro-cooling, Package icing
Melons	Hydro-cooling, Package icing, Forced-air cooling
Okra	Room-cooling, Forced-air cooling
Onions	No precooling needed
Onions, green	Hydro-cooling, Package icing
Oriental vegetables	Package icing
Peas	Forced-air cooling, Hydro-cooling
Peppers	Room-cooling, Forced-air cooling
Potato	Room-cooling, Forced-air cooling
Pumpkin	No precooling needed
Radish	Hydro-cooling, Package icing
Rhubarb	Room cooling, Forced-air cooling
Spinach	Hydro-cooling, Package icing
Squash, summer	Forced-air cooling, Room cooling
Squash, winter	No precooling needed
Sweet Potato	No precooling needed
Tomato	Room cooling, Forced-air cooling
Turnip	Room cooling, Hydro-cooling, Vacuum, Package icing
Watermelon	No precooling needed
Fruits	
Apples	Room cooling, Forced-air cooling, Hydro-cooling
Apricots	Room cooling, Hydro-cooling
Berries	Room cooling, Forced-air cooling
Cherries	Hydro-cooling, Forced-air cooling
Grapes	Forced-air cooling
Nectarines	Forced-air cooling, Hydro-cooling
Peaches	Forced-air cooling, Hydro-cooling
Pears	Forced-air cooling, Room cooling, Hydro-cooling
Plums	Forced-air cooling, Hydro-cooling

ANNEXURE-III

Compatible Fresh Fruits and Vegetables During 7 Day Storage

Groups 1A & 1B

Group 2

Group 3

32-36°F, 0-2°C, 1A: 90-98% rh, 1B: 85-95% rh

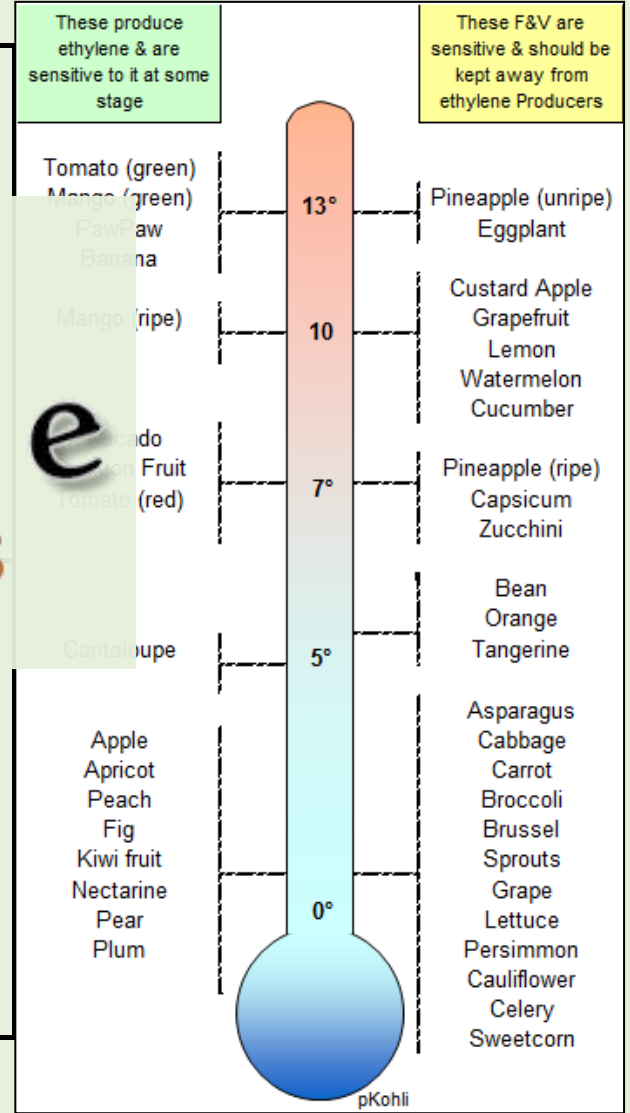
45-50°F, 7-10°C & 85-95% rh

55-65°F, 13-18°C & 85-95% rh

Vegetables

Fruits

<p>alfalfa sprouts amaranth* anise* artichoke arugula* asparagus* baby bean sprouts beans; beet Belgian endive* bok broccoflower* broccoli* Brussels sprouts* cabbage* carrot* cauliflower* celeriac celery* chard* Chinese cabbage*</p>	<p>Chinese turnip choy* collard* corn;sweet, cut vegetables daikon* endive*-chicory escarole* fava, fennel* garlic greens* herbs* (not basil) horseradish kailan kale* kohlrabi leek* lettuce* mint*</p>	<p>mushroom mustard onion* parsley* parsnip pea* radicchio* radish rhubarb rutabaga salsify scorzoneria shishito squash; winter sweet pea* swiss chard* waterchestnut watercress</p>
<p>apple^e apricot^e avocado, ripe^e Barbados blackberry blueberry boysenberry caimito cantaloupe^e cashew apple cherry coconut currant Fresh cut fruits^e date dewberry</p>	<p>elderberry fig gooseberry grape kiwifruit*^e loganberry longan loquat lychee nectarine peach pear: (Asian & European) persimmon* plum plumcot pomegranate</p>	<p>prune quince raspberry strawberry tangerine carambola cranberry crenshaw custard apple^e durian feijoa granadilla grapefruit* guava^e Juan Canary melon^e kumquat lemon*</p>
<p>alfalfa sprouts amaranth* anise* artichoke arugula* asparagus* baby bean sprouts beans; beet Belgian endive* bok broccoflower* broccoli* Brussels sprouts* cabbage* carrot* cauliflower* celeriac celery* chard* Chinese cabbage*</p>	<p>Chinese turnip choy* collard* corn;sweet, cut vegetables daikon* endive*-chicory escarole* fava, fennel* garlic greens* herbs* (not basil) horseradish kailan kale* kohlrabi leek* lettuce* mint*</p>	<p>mushroom mustard onion* parsley* parsnip pea* radicchio* radish rhubarb rutabaga salsify scorzoneria shishito squash; winter sweet pea* swiss chard* waterchestnut watercress</p>
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* Products marked with an asterisk are sensitive to ethylene damage. ^eEthylene producer
• Ethylene level should be kept below 1 ppm in storage area.