

# India - centric cold Infrastructure

Introduce technology in modular fashion - pace infrastructure to the developing market.

Topic Focus: agri-base....



Creating a sensible cold-chain !

# Farmgate cold chain

- India's cold chain will remain nascent, unless challenges inherent are countered.
- Imported designs based on differing scales of operations cannot provide early viability.
  - Cater to the human backdrop.
  - Cater to low yield land holding.
  - Cater to & add affiliation with producers/farmers.
  - Cater to varied evacuation modes to market.
- Focus on saleable quality for domestic trade.
- If in-house experience limited go for modular designs.
- Keep storage close to market - move the young crop, do not store at production site (barring a few crops).
- Keep the facility 'green' and in tune with nature.

# Facility Design - Modular

- Each facility will be designed on *modular concept* allowing scope to expand and to cater to stake holders capacity.
- Each *module* will satisfy cold chain precooling and storage requirements.
- Produce specific equipment for other post harvest processes can be easily incorporated.
- As far as practicable, manual sorting and grading is utilised and space allowed for use for other varied produce.

## Modular Concept

# Design principles

- Module design driven by core/ basic opportunities on focus crop; add on opportunities to be used for improving utilisation of assets.
- Capacity must be modeled on peak demand/ utilisation - seasonality factors for calculating peak demand.
- Pre cooling to happen at initiating centers; three runs a day considered per pre cooler.
- Provision for one (and half) days storage at each centre; short duration of storage removes need for separate storage chambers.
- Configuration selection driven by desire for modularity as well as achieving minimum economies of scale.
- A menu of options (different configurations of facilities created) - catchment area wise decision to be based on F&V items and locations.

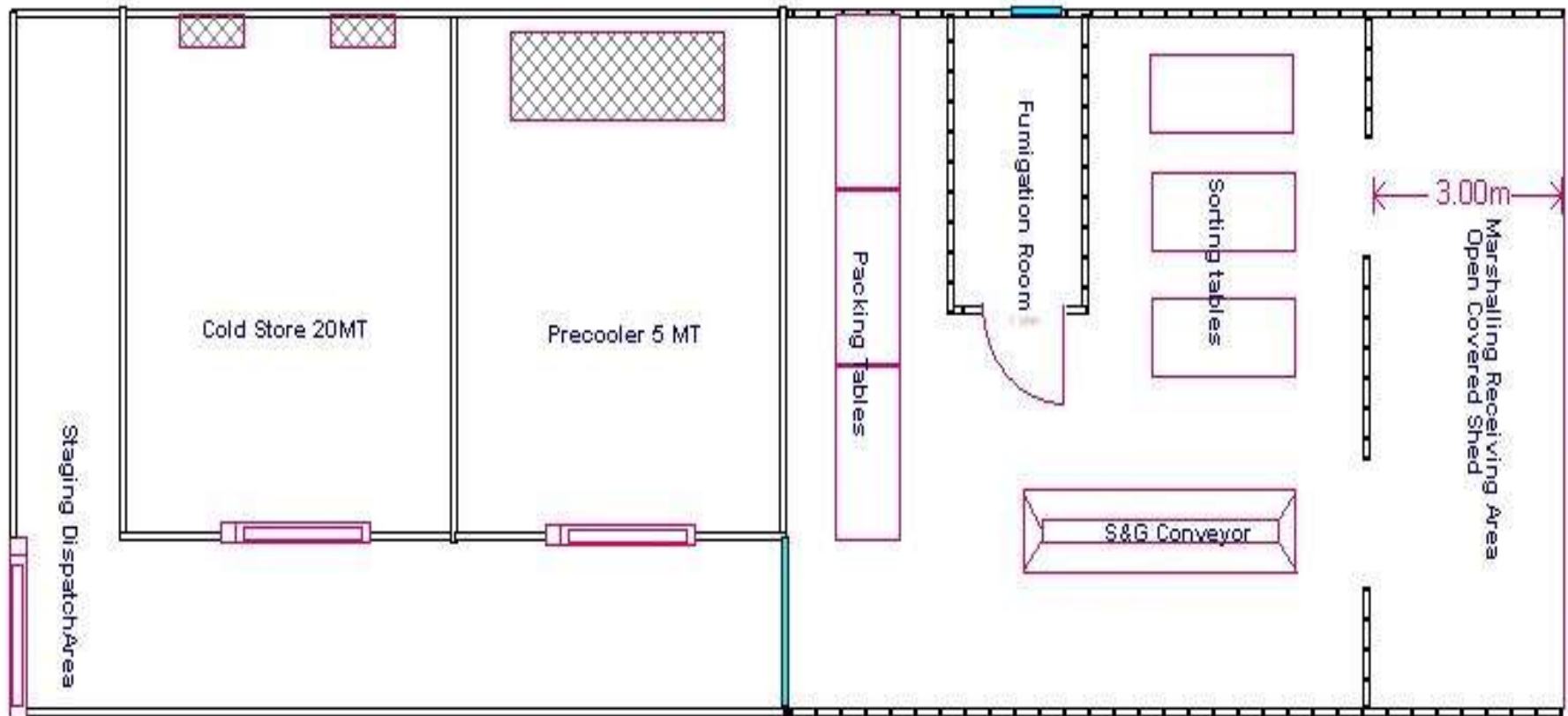
# Module Size - S&G Area

- Large provision for manual sorting and grading is recommended.
  - To offset electricity usage.
  - To take advantage of labor costs; and provide local employment.
- A Conveyor type sorting table for handling peak arrival loads is incorporated.
- Scope for further mechanised equipment installation can be provided.
- For High value crop like mango, a complete mechanised sorting line is advisable.

# Module Sizing - Packing Area

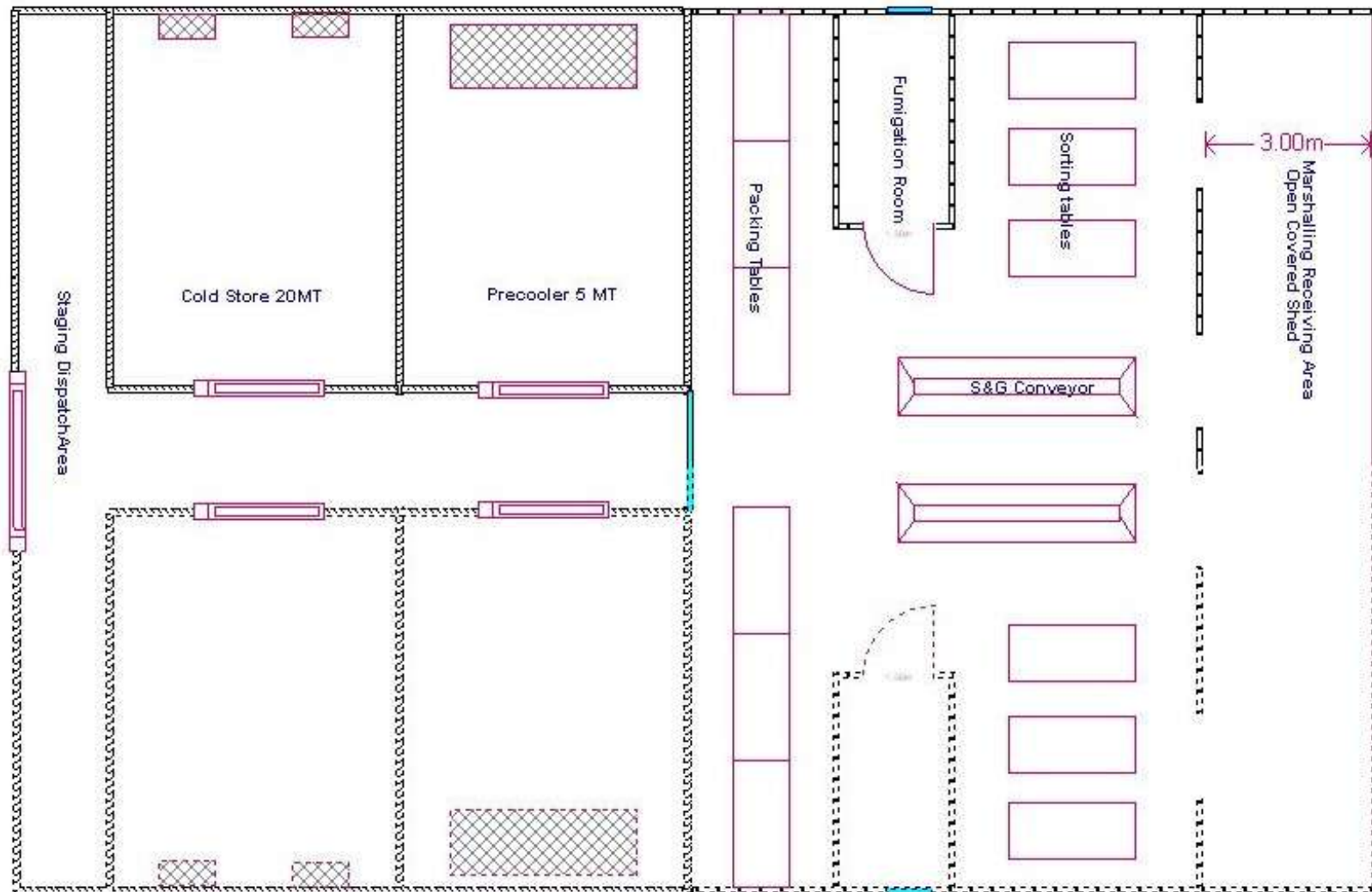
- For every module, calculated space for packers to be provided. Estimated time to pack 5MT will be 1 hr.
  - 10 mins for each 10 kg package.
  - 4 workers per table, 2MT per hour per table.
- Packing Tables of stainless steel and suitable design to be positioned (per module).
- In cases, as required, additional treatment areas (for fumigation, acid dip treatment, etc) to be provided.

# Single Module - 20MT



Eg. Litchi

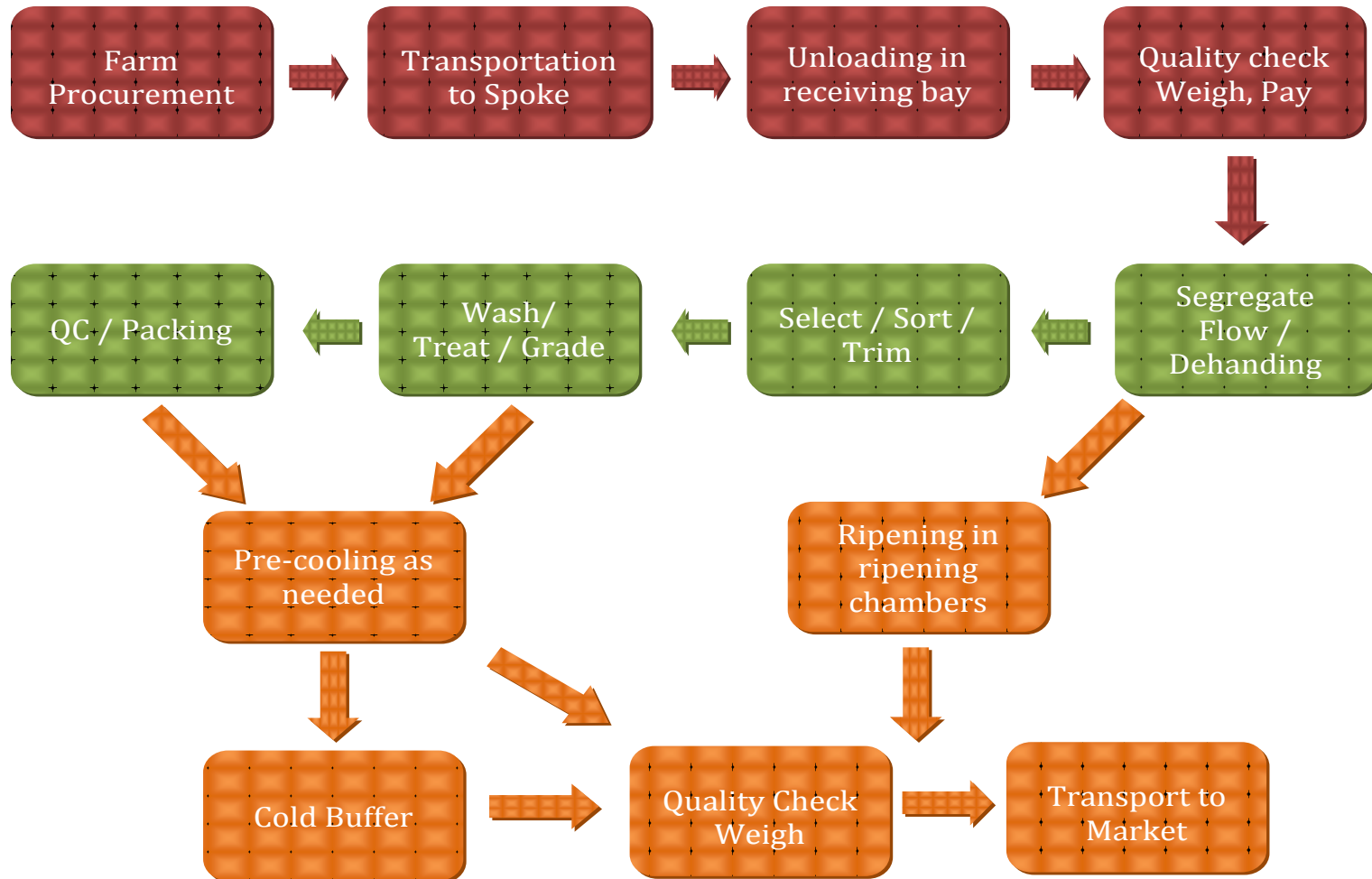
# Two Modules - 40 MT



# Modular Advantage

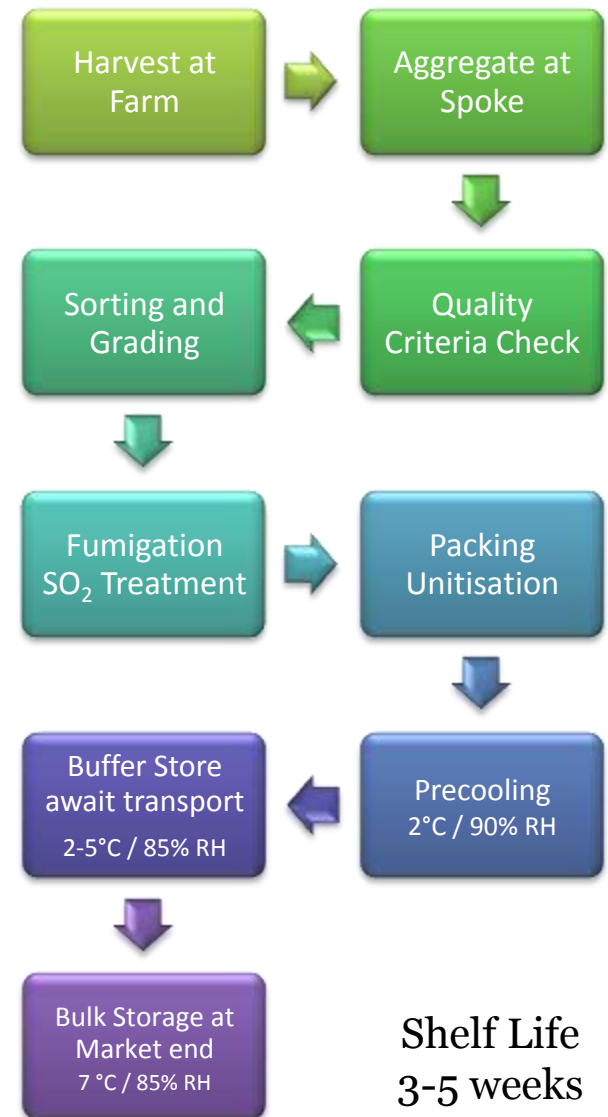
- **Facilitates Cold Chain Introduction**
  - Can be created with smallest module size, and be upgraded with increasing volumes.
  - Reduces initial capital cost during farmer integration and interface period.
  - Operational learnings from first module sets can be incorporated in subsequent additions.
  - Allows multiple user participation along catchment.
- **Multi Utility Use**
  - In overlap seasons, each module can function for independent produce types.
  - Segregation of produce and quality criteria facilitated.
  - Reduces risk of contamination and

# Generic Product Flow



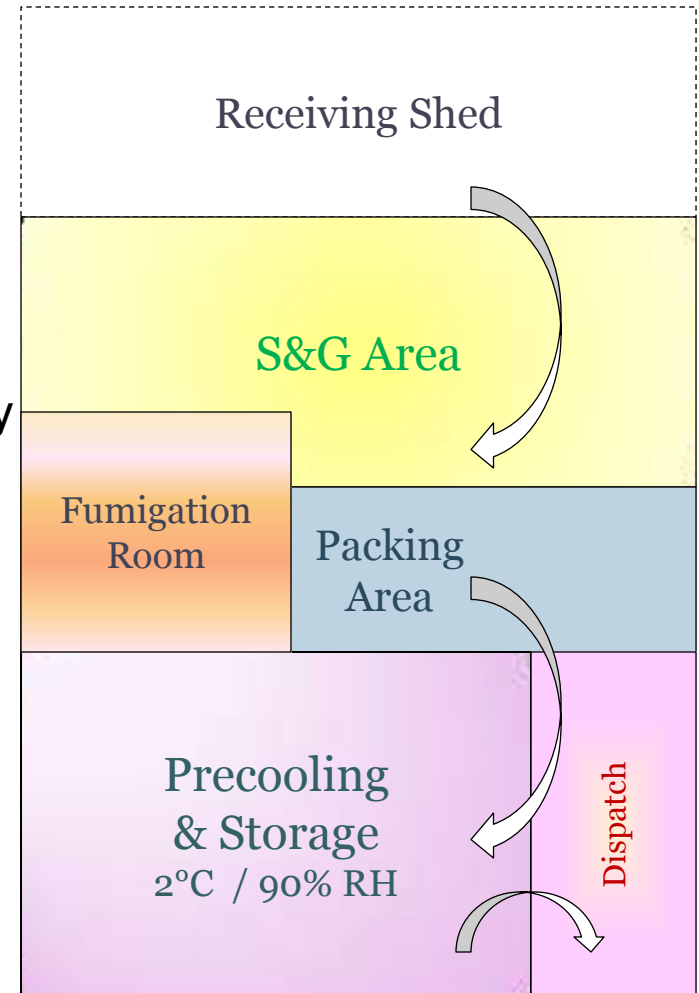
# Litchi Module

- Precooler 5MT; 2° C, 90% RH
- Cold Store 20 MT; 2-5° C, 85% RH
- S&G Manual & Conveyor Tables
- Fumigation Treatment Room
- Packing Area with Tables
- Module size from 20MT to 80MT per day (1x to 4x).
- Also suitable for handling **cabbage**, **cauliflower**, okra.
- For mango, added equipments required.



# Litchi Recommendations

- Manual sorting grading on conveyor belt or static tables.
- Fumigation room to have sulphur extraction; ventilation and scrubbing system.
- Create external Handling yard outside facility for banana handling and packing.
- Add one module with mango handling options.
- Note: Banana and Mango storage requires higher temp 12-14°C refrigeration)



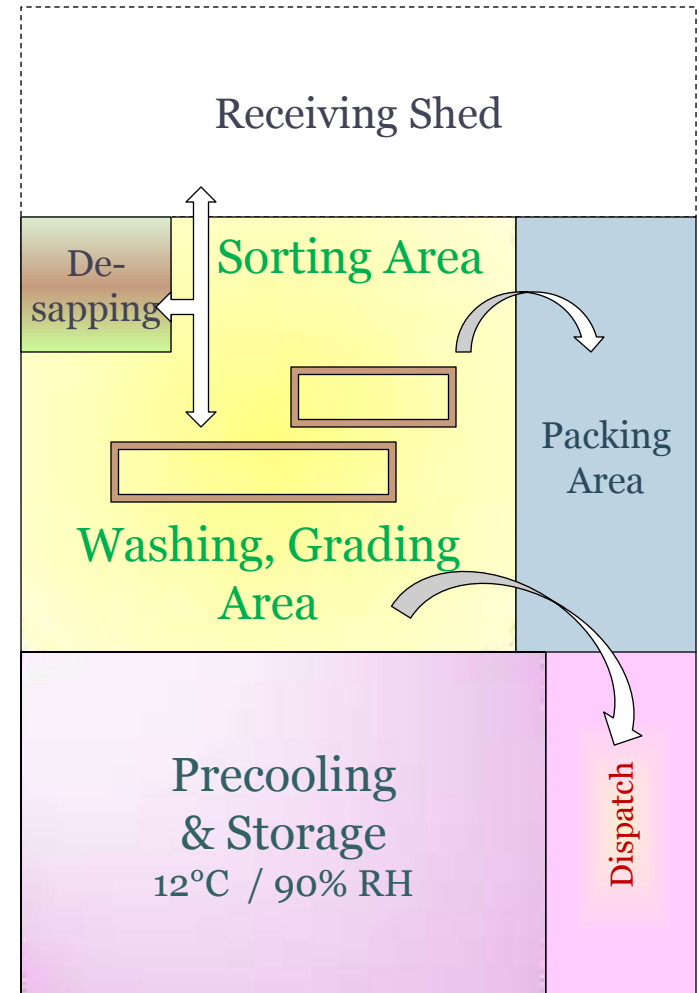
# Mango Module

- Precooler 5MT; 12 °C, 90% RH
- Store 20 MT; 12-15 °C, 85% RH
- Desapping Racks
- Washing Waxing Sizing Conveyor
- Boiler for Heat/Vapour Treatment.
- Packing Area with Tables
- Module size from 20MT to 80MT per day (1x to 4x).
- Module suitable for handling **Banana** also.

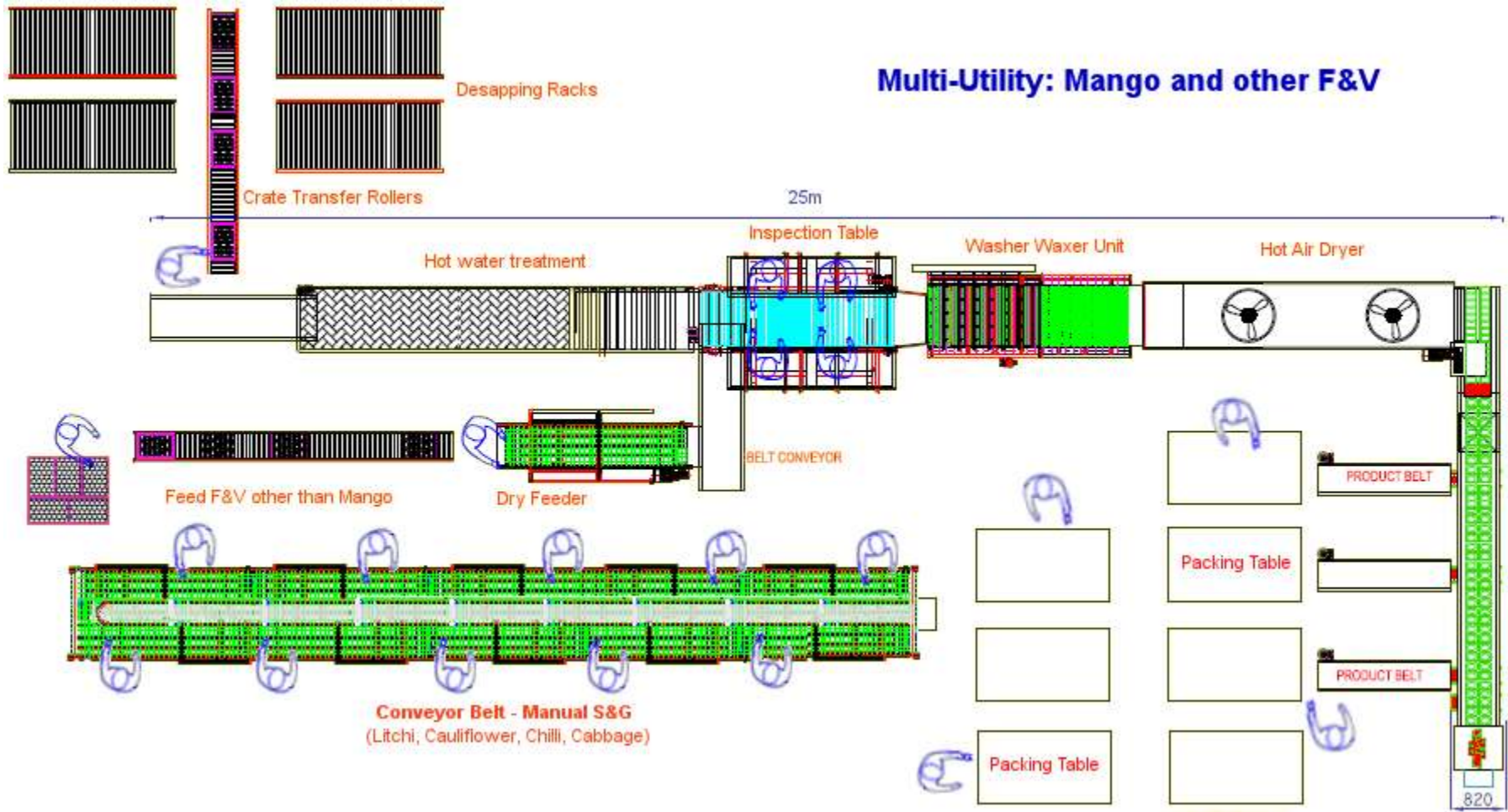


# Mango Recommendations

- Desapping racks can be added to existing litchi facility.
- Mango washing waxing grading line to be installed.
- For heat treatment solar thermal heaters with electric backup.
- Create external Handling yard outside facility for banana handling and packing.
- Note: Banana and Mango storage requires higher temp (12-14°C refrigeration) than litchi.



# Mango Line



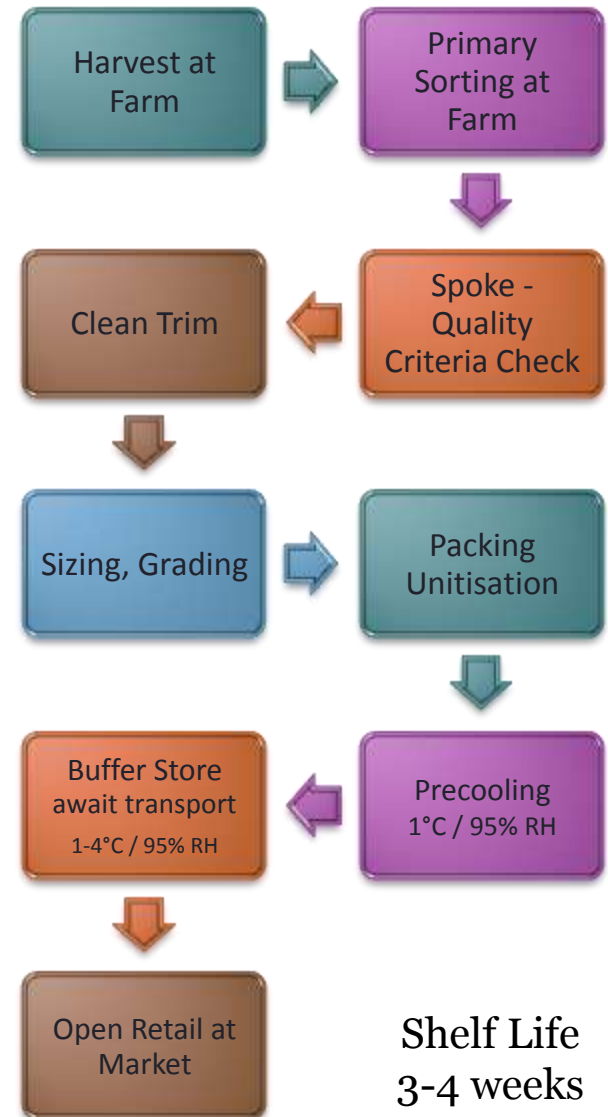
Including Equipment Examples for other F&V

# Cauliflower Module

- Precooler 5MT; 1 °C, 95% RH
- Store 20 MT; 1 - 4 °C, 95% RH
- Trimming, Grading Tables
- Packing Area with Tables
- Module size from 20MT per day (1x).
- Module suitable for handling

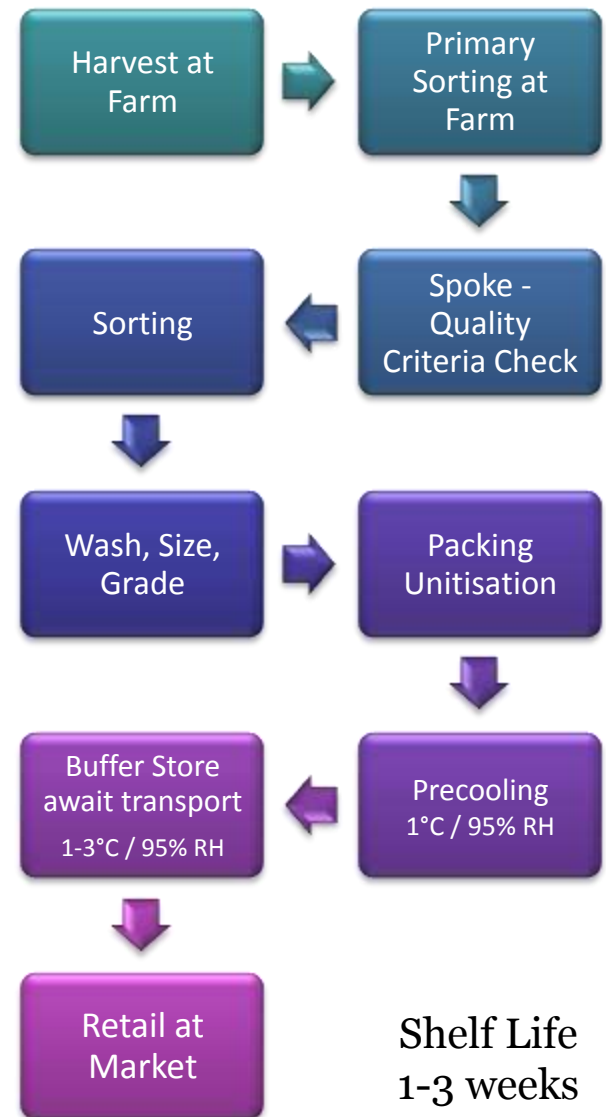
**Cabbage** , **Litchi** also.

- Module can be part of existing Litchi facility.



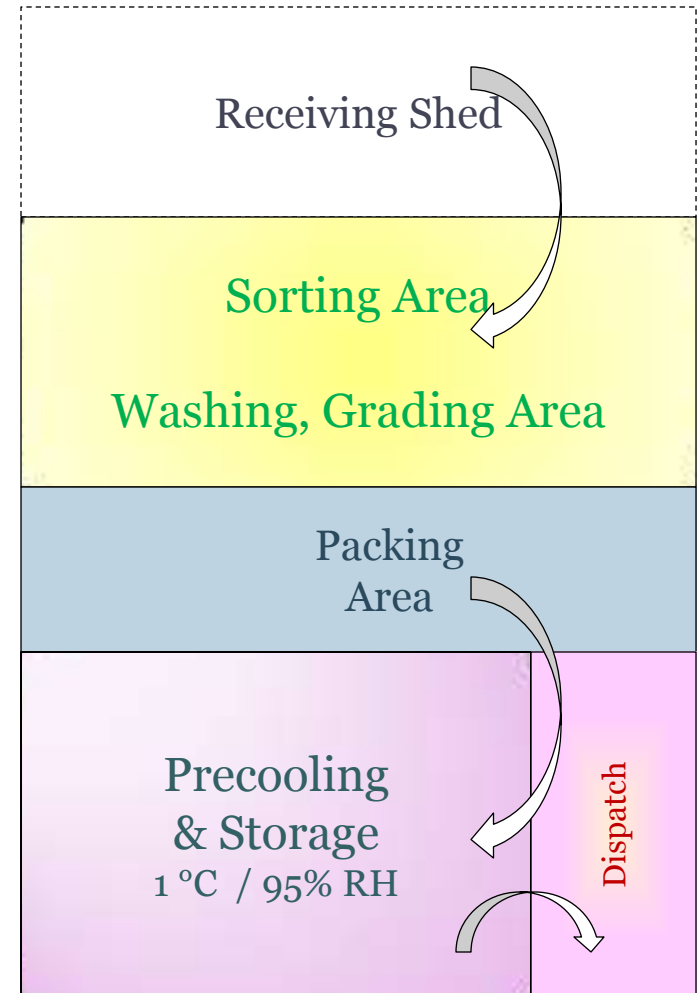
# Chilli Module

- Precooler 5MT; 2 °C, 95% RH
- Store 20 MT; 1 - 3 °C, 95% RH
- Sorting and Grading area.
- Washing Area.
- Packing Area with Tables
- Module size 20MT per day (1x).
- Module can be part of **Cabbage, Cauliflower**, facility.

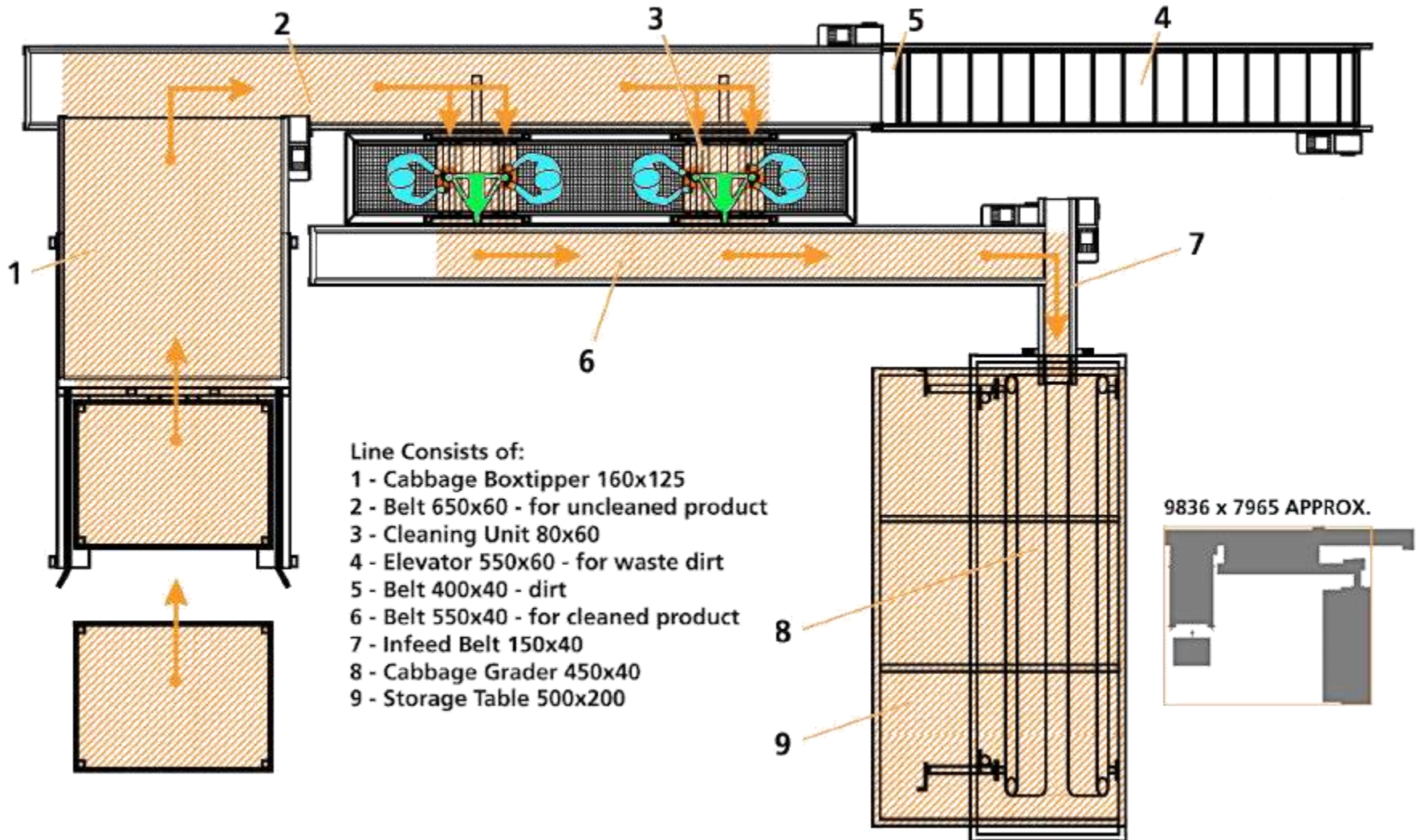


# Greens Recommendations

- Minimal process requirement.
- Preliminary cold wash and packing required.
- Can be incorporated in existing litchi facility.
- Create external Handling yard outside facility for banana handling and packing.
- Other products can also cross-dock bypassing cold chain.



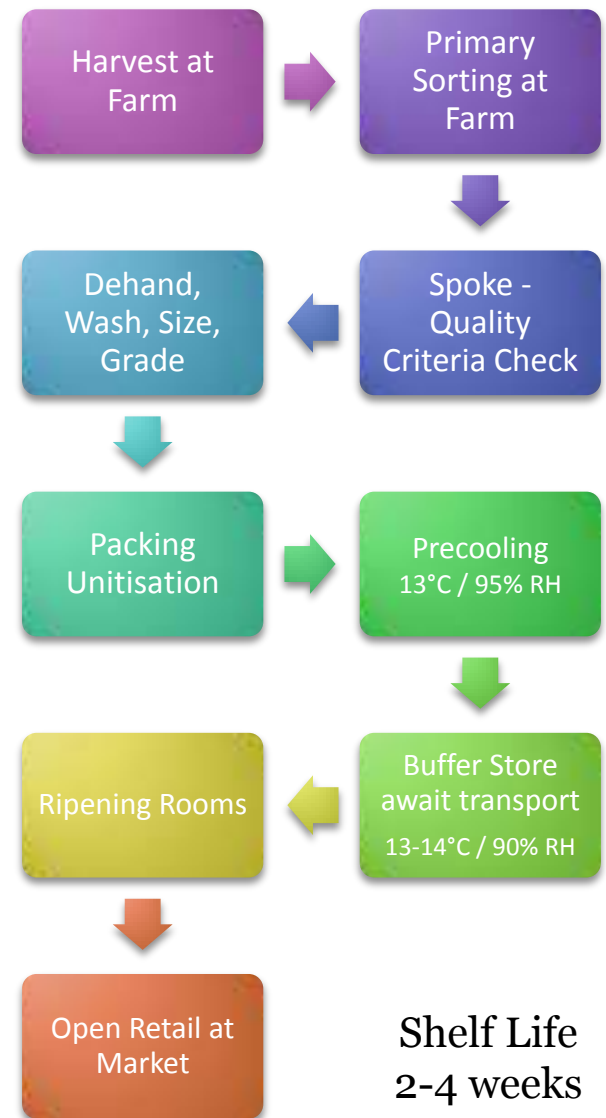
# Cabbage Line



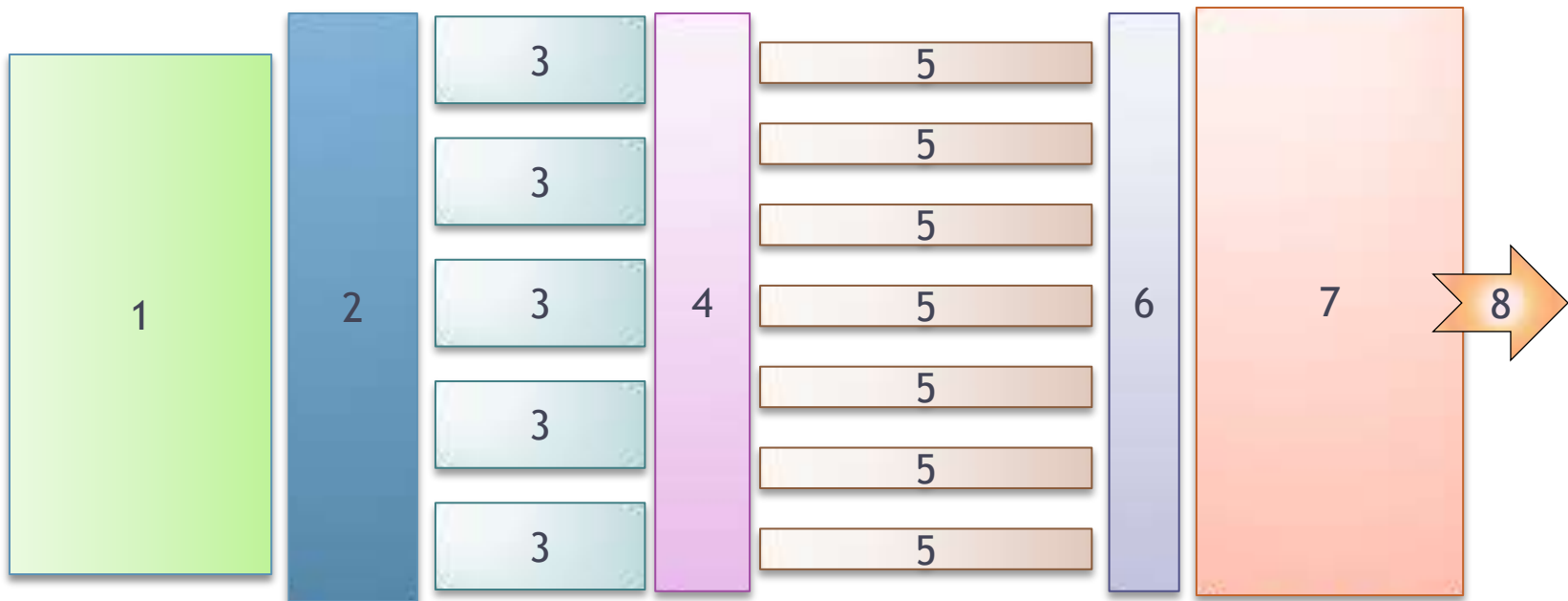
**Cabbage Line - 2 Cleaning Units plus Grader**

# Banana Module

- Precooler 5MT; 13° C, 95% RH
- Store 20 MT; 13 - 14° C, 95% RH
- Dehanding and Grading area.
- Washing Area (if required).
- Packing Area with Tables
- Module size from 20 to 80MT per day (1x to 4x).
- Module can be part of **Mango** facility.



# Banana Packshed

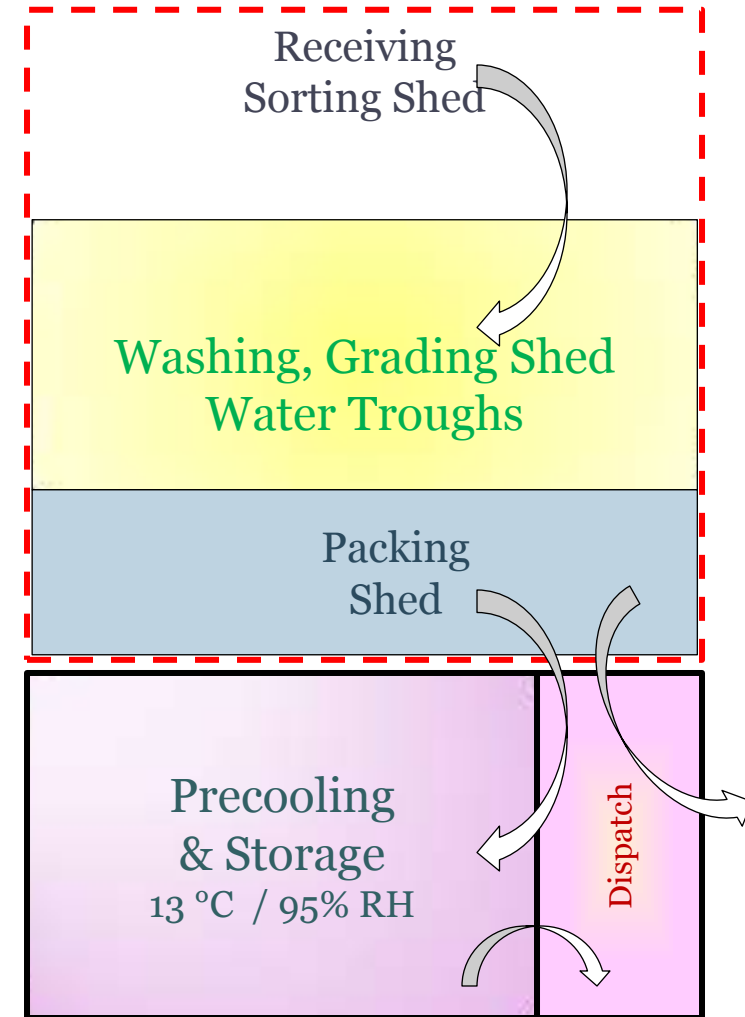


1. Receiving Area
2. Dehanding Tank
3. Flotation Tank
4. Air Brush, Weighing
5. Retail Packing, Stickers

6. Box inspection
7. Palletisation Area
8. Dispatch - precooler; market or ripening

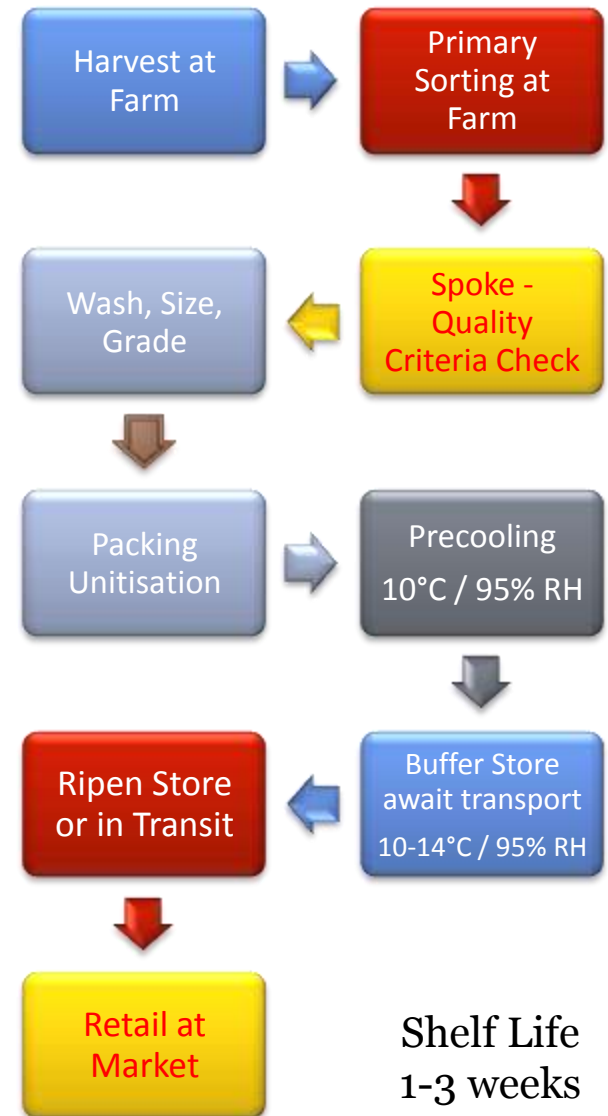
# Banana Recommendations

- External Handling yard for grading, washing, packing.
- Fast packing process time critical.
- Non cold chain material can bypass cold facility.
- Easy to incorporate with other mild chill facility, eg mango.
- Can be used to supply local markets with preliminary grading.



# Tomato Module

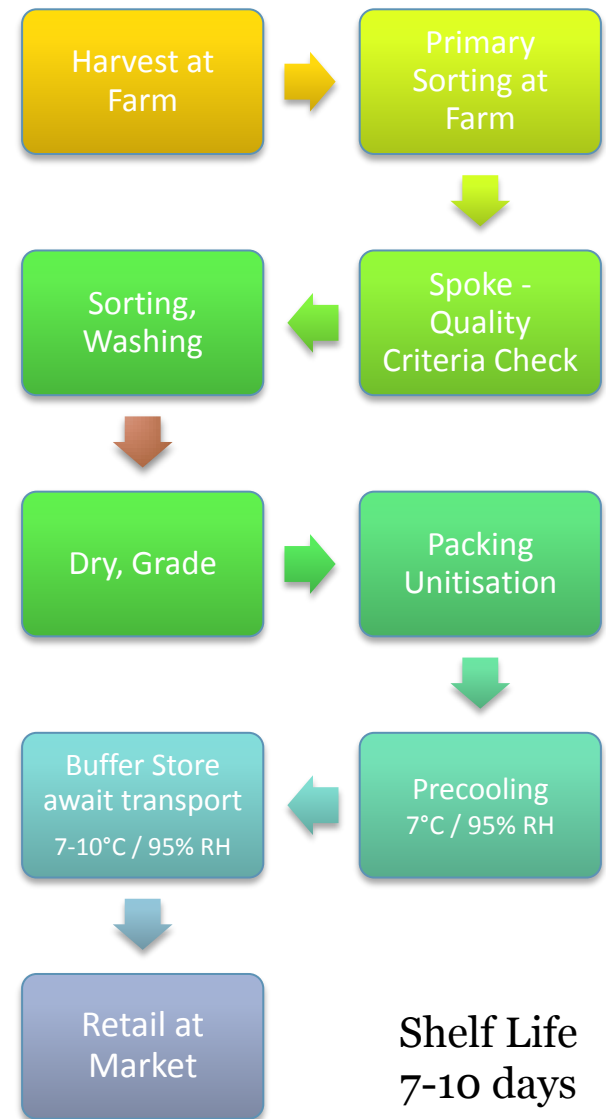
- Precooler 5MT; 10° C, 95% RH
- Store 20 MT; 10 - 14° C, 95% RH
- Sorting and Grading area.
- Washing Area.
- Packing Area with Tables
- Module size 20MT per day (1x).
- Module can be part of **Mango,**  
**Banana** facility.
- No optical grading system advised due market dynamics.



Shelf Life  
1-3 weeks

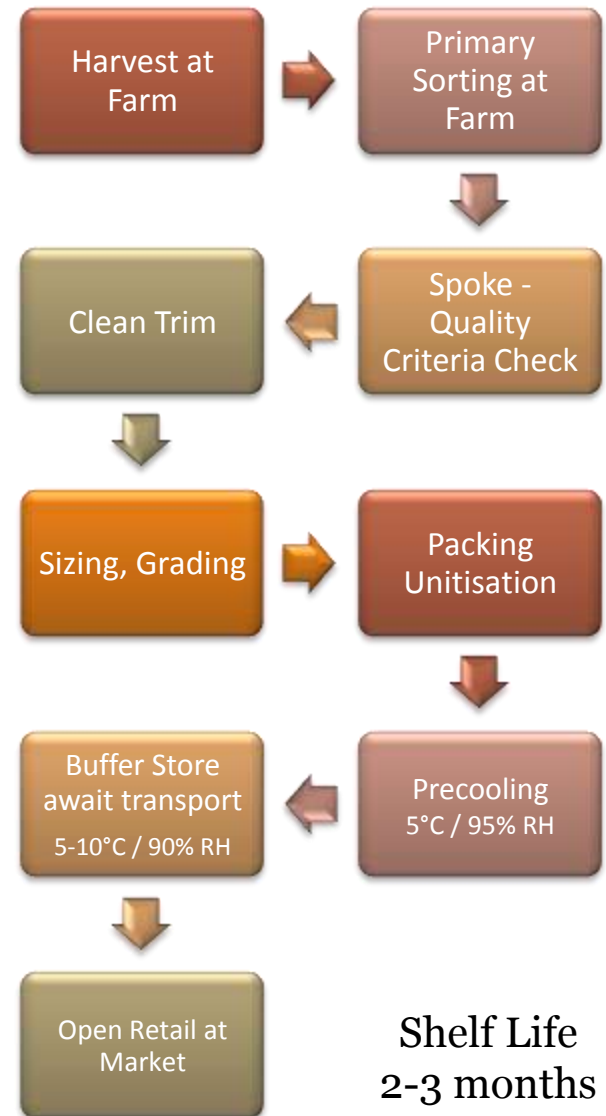
# Okra Module

- Precooler 5MT; 7° C, 95% RH
- Store 20 MT; 7 - 10° C, 95% RH
- Sorting Conveyor or Manual Tables.
- Grading and Packing Area.
- Module size 20MT per day (1x).
- Module can be part of **Mango** facility.



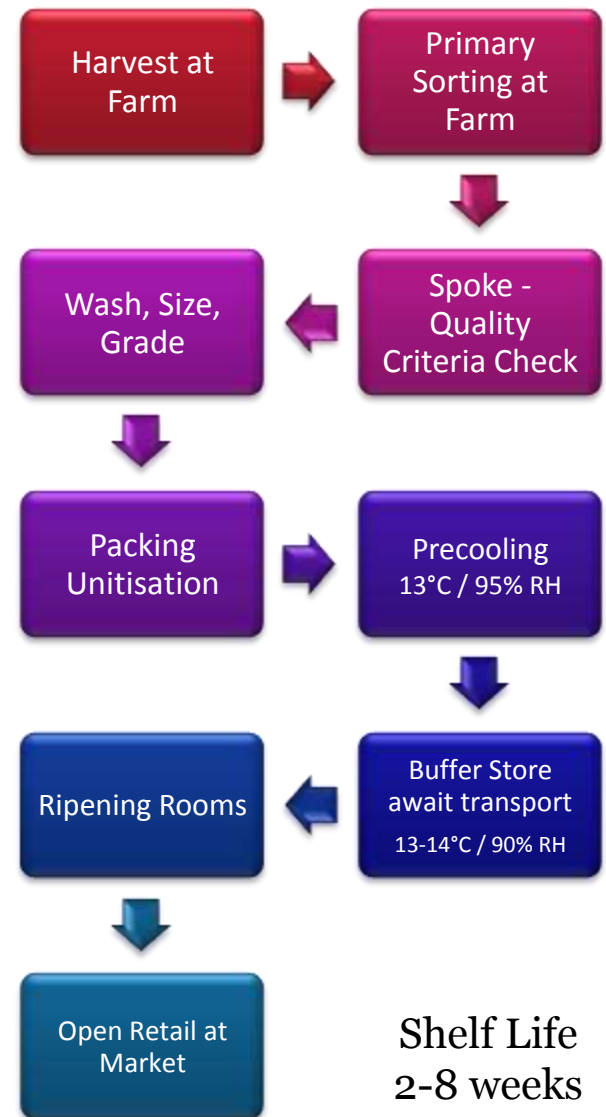
# Pomegranate Module

- Precooler 5MT; 5 °C, 95% RH
- Store 20 MT; 5-10 °C, 90-95% RH
  - Can be stored for 2 months.
  - Season Arbitrage possible with larger on site storage.
- Washing Waxing Sizing Conveyor
- Packing Area with Tables
- Module size from 20MT to 40MT per day (1x to 2x).
- Module suitable for handling **Tomato** also.



# Grapes Module

- Precooler 5MT; 0° C, 95% RH
- Store 20 MT; 0 - 4° C, 95% RH
- Packing Area with Tables
- Module size from 20 to 80MT per day (1x to 4x).
- Large export potential, cold chain critical.
- Good supply chain management required in immediately post harvest.



# Operations and Design

- Keep local human flavor in mind when providing working space.
- Sufficient appended waste handling area to be incorporated.
- Solar heat used during winter months or for blanching requirements where needed.
- Apply basic food safety designs to keep hygienic conditions.
- Plan to stage each custody change procedure.
- Effluent water should be utilised for sanitation or for ground water recharging.
- Understand HACCP needs & incorporate controls in the infrastructure layout.
- Waste recycling into compost or other uses.
- Receiving will not be in unitised loads, leave sufficient design leeway for myriad incoming types.
- Plan for power cycling to optimise operating costs.

# Core Equipment List

Equipment	Type	Remarks
Precoolers	0-5 °C, 5-15 °C, 0-15 °C	5 MT, Forced Air, High Humidity
Cold storage	As above	20 MT, High Humidity
Conveyor System	2 MT and 5 MT per hour	Belt with separator sections
SS Tables	Sorting and Packing	
Mango Line	5 MT per hour capacity	
Power Generators	50Kva, 75Kva, 125 Kva	
Material Handling Equip	Trolleys, pallet handlers	
Water Tanks, Plumbing	Dual for EOD process	3000L, or more.
Water Heaters	Solar or Electric	
Testing Lab	Quality Assurance	
Open Shed	Mini Auction and cross dock	To cater to local market and off seasons

# Focus Crops

	Opportunity	Selection process/ rationale
Basic business opportunities	1 Categories with opportunity to expand availability in non season periods	F&V items where harvest season is restricted (1-4 months)
	2 Categories where with opportunity to expand consumer base across regions	Where production base is restricted – 3 to 4 states account for 80%
Add on opportunities	3 Categories with large export potential	Highly traded F&V items where India's share of world export is significantly less than India' share of world production + leading export categories

1. Radius of coverage (catchment area per centre)- 1 to 2 hrs (20 to 40 Kms).
2. Variations to optimize locations basis separation between two catchment centers or increase handling capacity of center.
3. Location and distance to railheads or other efficient transport means.

# Key challenges & mitigation

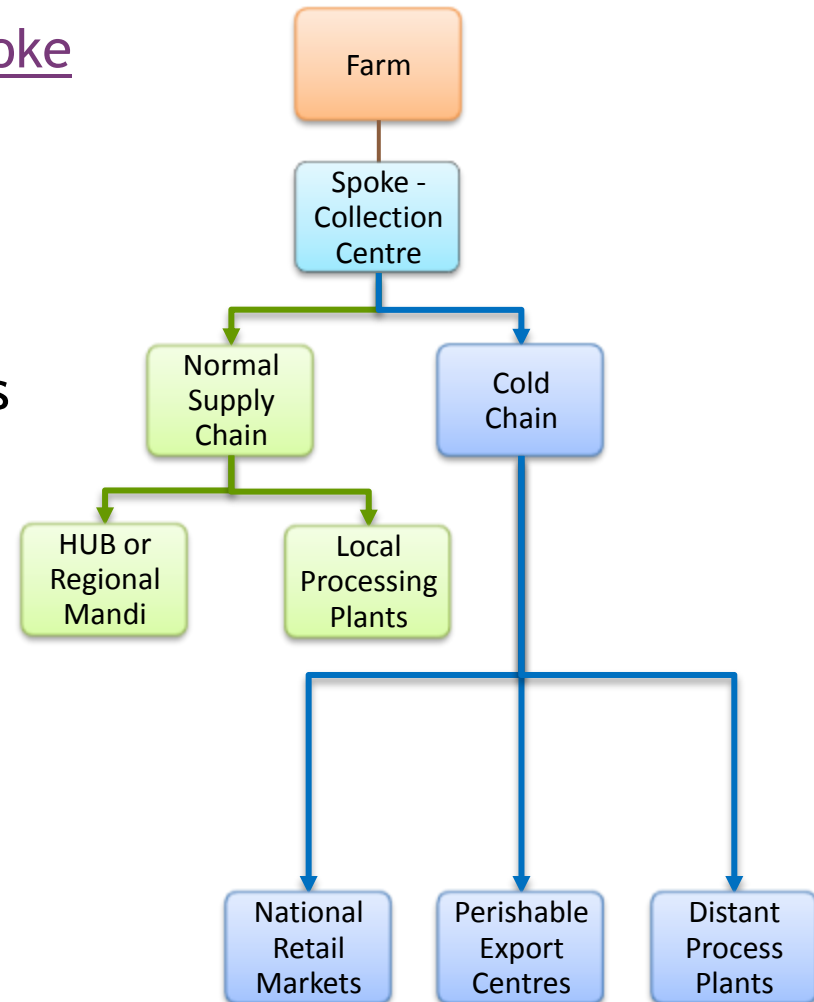
Key challenge	Suggested mitigation
Underutilization of asset	Farmer management (detailed separately).
Utilising F&V rejections	
Asset being sub scale	Configuration to be designed for initial viability; not included in config decisions; Module add-ons possible.
Managing wastage	Pre cooler + contingency storage. Grading and sorting processes .
Transportation management	3 PL management; partner with players; acquisition. Peak season may require ~300 reefer trucks (10 T)/ day or ~1500 overall.

- Accept quality deficient produce to pass through for local mandi sales.
- Associations with large farmers and via them also attract the smaller farm holders.
- Defined procurement process and guidelines - overall as well as location specific.
- Arrange for crop to be picked up from farm in mobile vans (after quality checks) and ease the logistics for the farmers
- Speedy and transparent (cash??) payments to produce accepted on quality.
- Alliances with reefer transport companies.
- Include railways in project scope.

# Modified Hub Spoke

## Cater Two Supply Chains - from Spoke

- **COLD Supply Chain**
  - Spoke as originator of cold supply chain.
  - Spoke as supplier to process plants.
- **Normal GREEN Chain**
  - Spoke as aggregator for mandis.
  - Spoke as aggregator for processors.



Email: [Contact@Crosstree.info](mailto:Contact@Crosstree.info) Cell: +91-9990399-638

**THANK YOU**



Helping link the Farm-to-Fork