

Sweet Lime

Sweet lime is widely consumed as fresh table fruit or as fresh juice at retail outlets. Processed sweet lime products are ready-to-serve sweet lime juice, sweet lime juice powder, etc. There are multiple business opportunities that are available to FPOs growing Sweet Lime. Some of the business opportunities that are suitable for FPOs are mentioned below and the technologies related to those businesses are detailed in this document.

S. No.	Business Opportunity	Brief description
1	Fresh sweet lime – Direct to market	Fresh sweet lime with basic value, add such as washing, sorting, and packaging.
3	Fresh sweet lime – Store and sell	Sweet lime stored for short-term to medium-term to sell at better prices during off-season or low market arrivals
4	Sweet lime juice – Bulk B2B sales	Low grade sweet limes processed to juice and sold to B2B segment such as processors, hotels

Other business opportunities include ready to serve sweet lime juice and sweet lime powder. These business opportunities are not detailed in this document as they may not be suitable for FPOs due to limited market potential due to low consumption, significant volume of sweet lime required year-round for business viability and difficulties in marketing due to competition. Similar to oranges, sweet lime can also be waxed. Since the shelf-life of sweet lime is 15-20 days, waxing does not fetch good premium pricing.

1 Fresh Sweet Lime – Direct to market

Sweet lime can be sold directly to market with basic post-harvest value addition such as washing, sorting, and packing in corrugated fibre boxes. Sweet lime have good shelf life, nearly 15-20 days, at ambient temperature.

Technology	Type	Eligible for Matching Grant
Packhouse	Civil construction	Yes
Dry storage	Civil construction	Yes
Washing - Nozzle-spray brush washer (or) - Bubble washer	Equipment	Yes

Technology	Type	Eligible for Matching Grant
Sorting and Grading - Mechanical sorter (or) - Optical sorter	Equipment	Yes
Packaging: - Automatic vertical packer in netlon mesh bags (or) - Manual packaging in corrugated fibre boards	Equipment (or) Manual process and Consumable	Equipment – Yes
Conveyor lines	Equipment	Yes
Plastic crates	Implement	Yes

Process:

- Harvested sweet limes should be arranged in crates at the field to minimize damage to the fruit
- At the packhouse, sweet limes can be washed either through a bubble washer or through a nozzle-spray brush washer to remove field dirt
- Washed sweet limes are then sorted either manually or through sorting machines. Low-cost mechanical sorters and high-cost optical sorters are available for sorting process
- Conveyor lines can be used for manual sorting and to move produce from one machine to another
- To prevent damage of produce during transportation, sweet limes can be packed in vented corrugated fibre boards boxes lined with polyethylene sheets
- Sweet limes can also be packed in netlon mesh bags through automatic vertical packers that bags the fruits as per required weights of packs
- Sweet limes can be stored in dry storages, while maintaining the relative humidity through a humidifier if required

Advantages:

- Sorting of sweet lime helps FPOs to sell them through appropriate channels and realize higher prices (A and B grades for retail consumption, C and D for processing)

Disadvantages / Challenges:

- Sweet lime is generally traded without sorting as per grade. Hence, high investment in optical sorters might not be feasible if there is no significant price gain due to sorting activity
- Unlike oranges, processing of sweet lime is limited making it difficult to market the lower grader sorted fruits

Additional process:

- Sweet limes can also be de-greened to enhance its physical appeal. De-greening can be done by passing ethylene gas. De-greening should be done only when absolutely necessary as it reduces shelf-life of the fruit

2 Fresh Sweet Lime – Store and sell

Sweet lime can be stored in cold storage for short-term to medium-term. Cold storages can be either be a combination of civil construction with refrigeration units or pre-fabricated container cold rooms. They can be stored at 6-7°C and relative humidity of 85-90% for up to 12 weeks.

Technology	Type	Eligible for Matching Grant
Packhouse	Civil construction	Yes
Washing - Nozzle-spray brush washer (or) - Bubble washer	Equipment	Yes
Sorting and Grading - Mechanical sorter (or) - Optical sorter	Equipment	Yes
Conveyor lines	Equipment	Yes
Manual packaging in vented corrugated fibre boards boxes	Manual process	Yes
Plastic crates	Implement	Yes
Pre-cooling chambers	Equipment	Yes
Cold storage - Container cool rooms (or) - Cold storages	- Equipment (or) - Civil Construction	Yes
Reefer trucks	Equipment + vehicle	Yes

Process:

- Harvested sweet limes should be arranged in crates at the field to minimize damage to the fruit
- At the packhouse, sweet limes can be washed either through a bubble washer or through a nozzle-spray brush washer to remove field dirt
- Washed sweet limes are then sorted either manually or through sorting machines. Low-cost mechanical sorters and high-cost optical sorters are available for sorting process
- Conveyor lines can be used for manual sorting and to move produce from one machine to another
- Sweet limes can be packed in vented corrugated fibre board boxes for further cold storage

- Sweet limes should be pre-cooled by forced air cooling before cold storage. Pre-cooling chambers should be set-up in cold storage facility
- Cold storage can either be pre-fabricated container cold room or regular cold storages (civil construction fitted with refrigeration system)
- Pre-cooled sweet limes are stored at required temperature in cold storages while maintaining humidity. In case the cold storages are not equipped to control humidity, humidifiers can be installed
- Many container cold rooms come with pre-cooling facility. In such cases, separate setting up of separate pre-cooling chambers are not required
- Post cold storage, sweet limes are suggested to be transported through reefer trucks to maintain the table shelf-life of the fruit

Advantages:

- Cold storage enables FPOs to storage produce and sell them during off-season / market prices are favorable
- In case of exports to long distance, such as middle eastern countries, pre-cooling and reefer trucks are required till the produce is loaded to containers in port

Disadvantages / Challenges:

- Cold storages require significant initial investment and grid-powered cold storages have high operational cost. The increase in market prices may not be able to compensate for the storage cost incurred if the price increase is not significant
- FPO should have high utilization of high-cost equipment like optical sorters and cold storages

3 Sweet lime juice – Bulk B2B sales

Sweet lime is consumed widely in the form of juice. Though it is usually consumed as fresh juice, consumption of ready-to-serve Mosambi juice is increasing. Manufacturing sweet lime juice and selling it in bulk requires minimal investment as it does not need to be processed to suit end consumer consumption. The juice can be sold to ready-to-serve sweet lime juice/concentrate manufacturers or to hotels / restaurants.

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Screw-type juice extractor	Equipment	Yes
Settling tank	Equipment	Yes
Filter press	Equipment	Yes
Storage tank	Equipment	Yes

Sweet lime juice unit should be combined with the equipment suggested in any one of the above two business activities. This is because, only sweet lime that are of C and D grade should be utilized for processing to juice. Grade A and B sweet limes fetch higher prices as they are consumed as table fruit.

Process:

- Sweet limes can be peeled manually
- Peeled sweet limes are fed into a juice extractor, post which the juice is collected in a settling tank
- Suspended solids are removed through the settling tank
- Filter press can be used to further remove small, suspended solids and get fine juice
- Juice is collected in storage tank from which it is packed in suitable packs as required by buyer
- Feed pumps can be used to move juice from one machine to another

Advantages:

- C and D grades fetch very low prices in open-market. Processing them into juice provides better prices to the FPO

Disadvantages / Challenges:

- Sweet lime is consumed mainly as table fruit or as home/shop-made freshly squeezed juice. The demand for sweet lime juice is limited, which in turn may lead to difficulties in marketing of the produce
- Sweet lime juice immediately develops bitterness post juicing, making it difficult to store (even for few hours) and marketed
- Utilization of equipment would be challenge as most Mosambi is consumed fresh (or fresh juice) and not in processed form