

Pomegranate

Pomegranate is mostly consumed as fresh table fruit. Although there is scope for the FPOs in carrying out value addition activities in pomegranate, such as extraction of arils (IQF) and preparation of pomegranate juice. 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 Pomegranate – Direct to Market	Fresh pomegranates with basic value add such as washing, sorting, and packaging
2	Fresh Pomegranate – Store and sell	Pomegranate can be stored for short-term to medium-term to sell at better prices
3	Pomegranate Aril Extraction and IQF Aril sales	Pomegranate arils can be extracted, and frozen arils can be exported or sold domestically through retailers
4	Pomegranate Juice	Pomegranate juice can be extracted from the arils and sold
5	Pomegranate Virgin Seed Oil	Oil can be used from the pomegranate seeds, a bi-product from juice extraction process

Other business opportunities include ready-to-serve pomegranate juice, sparkling pomegranate wine, pomegranate seed based mouth freshener, pomegranate cookie etc. These business opportunities are not detailed in this document as they may not be suitable for FPOs due to high investment costs, significant volume of pomegranate required around the year for business viability, difficulties in marketing due to competition, unsuitability of varieties grown in Maharashtra, etc.

1 Fresh Pomegranate– Direct to market

Pomegranate can be sold directly to market post harvesting with basic post-harvest value addition such as washing, sorting, and packing in corrugated fibre boxes

Technology	Type	Eligible for Matching Grant
Plastic Crates	Implement	Yes
Foam layers	Consumable	No
Packhouse	Civil construction	Yes
Conveyor Lines	Equipment	Yes
Washer - Nozzle-spray brush washer (or) - Bubble washer	Equipment	Yes
Sorting machine	Equipment	Yes

Technology	Type	Eligible for Matching Grant
- Mechanical sorter (or) - Optical sorter		
Pre-cooling chamber	Equipment	Yes
Corrugated Fibre Board Boxes	Consumable	No
Reefer Truck	Vehicle + Equipment	Yes

Process:

- Harvested pomegranates should be arranged in crates at the field to minimize damage to the fruit
- The harvested pomegranates should ideally be pre-cooled using a precooling chamber to bring down the temperature to around 7°C to minimize any loss immediately post-harvest
- At the packhouse, pomegranates can be washed either through a bubble washer or through a nozzle-spray brush washer to remove field dirt
- Washed pomegranates 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, pomegranates can be packed in corrugated fibre boards boxes lined with polyethylene sheets

Advantages:

- Sorting of pomegranates helps FPOs to sell the pomegranates through appropriate channels and realize higher prices (A and B grades to retailers and exporters, C and D grades to processors)

Disadvantages / Challenges:

- Pomegranates can face price crashes. In such cases having no storage facility can lead to selling the produce at low prices

2 Fresh Pomegranate– Store and sell

Pomegranates can be stored in controlled atmosphere upto 2–3 months. Pre-fabricated controlled atmosphere storage rooms can be used to store pomegranates for later sales when the market scenario improves. The recommended storage conditions for storing 'Bhagwa' variety of pomegranate (the major variety cultivated by the Marathi farmers) are – 5 °C, >92% Relative Humidity (RH) and 2% O₂ + 3% CO₂.

Technology	Type	Eligible for Matching Grant
Plastic Crates	Implement	Yes
Foam Layers	Consumable	No
Packhouse	Civil construction	Yes

Technology	Type	Eligible for Matching Grant
Conveyor Lines	Equipment	Yes
Washer - Nozzle-spray brush washer (or) - Bubble washer	Equipment	Yes
Sorting machine - Mechanical sorter (or) - Optical sorter	Equipment	Yes
Pre-cooling chamber	Equipment	Yes
Controlled Atmosphere Storage	Equipment	Yes
Corrugated Fibre Boxes	Consumable	No
Reefer Truck	Vehicle + Equipment	Yes

Process:

- Harvested pomegranates should be arranged in crates at the field to minimize damage to the fruit
- At the packhouse, pomegranates can be washed either through a bubble washer or through a nozzle-spray brush washer to remove field dirt
- Washed pomegranates 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
- The washed and graded pomegranates can be pre-cooled to about 6 °C using pre-cooler before being shifted to a controlled atmosphere chamber for storage (upto 2 – 3 months or until market scenario improves)
- To prevent damage of produce during transportation, pomegranates can be packed in corrugated fibre boards boxes lined with polyethylene sheets

Advantages:

- Sorting of pomegranates helps FPOs to sell the pomegranates through appropriate channels and realize higher prices (A and B grades to retailers and exporters, C and D grades to processors)
- The pomegranates can be stored when the FPOs don't find any buyers or when the market prices are low, without the produce getting spoilt

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
- Pomegranate harvest is seasonal. This might affect the utilization of pre-cooling, cold storage, and reefer truck facilities

3 Pomegranate Arils

Pomegranate arils can be extracted either manually and packed in *punnets* and marketed, although the shelf life reduces which needs to be addressed. Arils can either be sold immediately (post-extraction) at the local level or the FPOs can carry out '**Individual Quick Freezing**' (IQF) of the arils and sell to distance – markets or export the same to European markets.

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Aril Extractor Unit <ul style="list-style-type: none"> - Pomegranate fruit breaking unit - Power transmission and drive unit - Collection trays where separated arils and extraneous matters are received - Vibrating Sieve unit 	Equipment	Yes
Aril washing unit - Nozzle-spray brush washer	Equipment	Yes
Vibrating Shaker	Equipment	Yes
Freezing unit (Individual Quick Freeze or IQF)	Equipment	Yes
Automated packaging line	Equipment	Yes

Aril extraction unit should be combined with equipment suggested in the above two business opportunities.

Process:

- The washed pomegranates are then passed through the industrial aril extraction unit (developed by CIPHET) for extracting the pomegranate arils
- The extracted arils are then thoroughly washed to remove any debris (during the aril extraction process) using a nozzle – spray brush washer
- The washed arils need to be dewatered for removing the extraneous water before being frozen. The washed arils are, thus passed through a vibrating shaker
- The dewatered arils are then frozen using an IQF freezer before being sent to an automated packing line where the frozen arils are packed in punnets. The packed frozen arils are then stored in cold room

Advantages:

- The extracted arils can fetch higher price in the market when sold directly to the consumers under the FPOs own brand or exported to European markets where there is demand for extracted arils

Disadvantages / Challenges:

- The aril extraction unit and IQF freezing equipment require significant initial investment
- FPO should maintain good utilization of the unit to breakeven and get profits on the product sold

4 Pomegranate Juice Extraction

Growing health consciousness and other benefits of pomegranate such as nutrition values and sources are driving the pomegranate market. On the other hand, increasing disposable incomes, evolving lifestyle and adaption of organic food culture are supporting the growth of the Pomegranate juice market. The juice can be sold, in bulk, to ready-to-serve pomegranate juice/concentrate/squash manufacturers or to hotels / restaurants or directly to end - retailers and consumers.

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Aril Extractor Unit <ul style="list-style-type: none"> - Pomegranate Fruit breaking unit - Power transmission and Drive unit - Collection Trays where separated arils and extraneous matters are received - Vibrating Sieve unit 	Equipment	Yes
Hydraulic Press	Equipment	Yes
Filter Press (Plate and Frame Filtration unit)	Equipment	Yes
Shell and tube pasteurizer	Equipment	Yes
Semi-automatic filling machines	Equipment	Yes

Pomegranate juice extraction unit should be combined with equipment suggested in the first two business opportunities.

Process:

- The washed pomegranates are then passed through the industrial aril extraction unit (developed by CIPHET) for extracting the pomegranate arils
- The extracted arils are then passed through a hydraulic press with clothe filter to get the juice.
- The coarse pomegranate juice is further refined by passing through a plate and frame filtration unit. The bi-product seeds can be used for extracting of the virgin pomegranate seed oil and preparation of cookies and other confectionery items
- The refine pomegranate juice is pasteurized by passing through a shell and tube pasteurizer to kill microbes and preserving the pomegranate juice
- The juice can be packed in bottles (glass/ HDPE) with the help of semi-automatic filling machines. The FPO can put their own label and market the pomegranate juice

Advantages:

- C and D grades fetch very low prices in open-market. Processing them into juice provides better prices to the FPO
- Broken pomegranate seeds, a bi-product of the process, can be monetized giving additional revenue to the FPO

Disadvantages / Challenges:

- Juice extraction unit require significant investments. FPO should have high utilization of the equipment to break-even and get profits
- Selling directly to consumers requires investments in marketing and establishing trade channels (supply chain for products to reach retailers)
- Competition from established players

5 Pomegranate Seed Oil extraction

Pomegranate seeds are a bi-product in the manufacturing of pomegranate juice. Virgin pomegranate seed oil is widely used in nutraceutical/ pharmaceutical and cosmetic industries. The seed oil has potential markets in Europe and Middle-East. The high omega 5 Fatty Acid (Punicic acid) levels in Pomegranate Seed Oil has strong anti-inflammatory and anti-aging properties by helping to fend off free radicals.

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Cold Press Oil machine	Equipment	Yes
Collection tank – Stainless steel tank	Equipment	Yes

Seed oil extraction unit should be combined with juice extraction unit as pomegranate seeds are a by-product of the juice making process.

Process:

- After extracting the juice from the arils, the seeds are transferred to the cold press oil machine, which extracts oil from the seed (~25% oil content in pomegranate seed).
- The oil is collected in a stainless steel collection tank for further usage, as and when required.

Advantages:

- Since it is processing of a by-product, the input cost is negligible. This results in high margin
- The oil cake can be used in the preparation of pomegranate cookies which can be sold directly to the end consumers, leading to additional income for the FPOs

Disadvantages / Challenges:

- Limited market for pomegranate seed oil. FPOs should find right buyers for the product
- Low utilization of equipment as seeds are a by-product of juice making process. Low quantity of seeds available with FPO for processing