Sapota

Sapota is mostly consumed as fresh table fruit. Being a climacteric fruit, it undergoes rapid ripening changes within 5-7 days after harvesting, during which the fruit becomes soft, sweet, and develops excellent aroma with decline in *tannins*, *latex sapotin*, *aldehydes* and acidity. Owing to these rapid biochemical changes, the sapota fruits have very poor shelf-life as compared to many other climacteric fruits. Therefore, it is necessary to process the fresh sapota into different value added products to increase its availability over an extended period and to stabilize the price during the glut season. 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 Sapota – Direct to Market	Fresh sapotas with basic value add such as washing, sorting, and packaging
2	Sapota Pulp	Low grade sapotas can be processed to pulp and sold to B2B segment such as processors
3	Sapota Jam	The Sapota pulp can be mixed with sugar, citric acid, and preservatives to obtain jam which can be sold to consumers
4	Sapota Powder	Sapota slices can be dried and pulverized to get sapota powder which can be sold to B2B segment
5	Dehydrated Sapota slices	Sapota slices can be dehydrated using osmotic treatment and the sweetened slices sold directly to customers
6	Sapota candy	Sapota slices can be steeped in sugar syrup to get sapota candy which can be sold directly to end consumers and retail stores

Other business opportunities include sapota nectar, sapota cheese, sapota butter, sapota wine, sapota seed oil 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 Sapota – Direct to market

Sapotas have to be sold directly to market post harvesting with basic post-harvest value addition such as washing, sorting, and packing in corrugated fibre boxes. Due to cold sensitive nature of the fruit, bulk of the produce needs immediate disposal for table purpose and is handled at ambient climatic conditions causing considerable postharvest losses.

Technology	Type	Eligible for Matching Grant
Plastic Crates	Implement	Yes
Packhouse	Civil construction	Yes

Technology	Type	Eligible for Matching Grant
Conveyor Lines	Equipment	Yes
Bubble washer	Equipment	Yes
Sorting machine - Mechanical sorter (or) - Optical sorter	Equipment	Yes
Corrugated Fibre Board Boxes	Consumable	No

Process:

- Harvested sapotas should be arranged in crates at the field to minimize damage to the fruit
- At the packhouse, sapotas can be washed through a bubble washer to remove field dirt
- Washed sapotas 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, sapotas can be packed in corrugated fibre board boxes lined with polyethylene sheets. The fibre board boxes can be covered with shredded paper during transfer

Advantages:

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

Disadvantages / Challenges:

- Sapotas can face price crashes during glut. Due to the low shelf life and sensitivity to low temperatures, the fruits cannot be stored in cold storage for long time, due to which the sapotas have to be sold off immediately within the shelf life period

2 Sapota Pulp – Bulk sales

Growing health consciousness and other benefits of sapota such as nutrition values and sources are driving the sapota market. In addition, increasing disposable incomes, evolving lifestyle and adaption of organic food culture are supporting the growth of the Sapota pulp & juice market. The pulp can be sold, in bulk, to ready-to-serve sapota juice/sapota nectar manufacturers

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Fruit preparation - Peel removal - Seed removal	Manual	No

Technology	Type	Eligible for Matching Grant
- Slicing		
Fruit pulper	Equipment	Yes
Homogenization tank	Equipment	Yes
Pulp & Juice Pasteurizer Machine	Equipment	Yes
Pulp storage tank – Stainless steel tank	Equipment	Yes
Aseptic Bags	Consumable	Yes
Pulp filling machines	Equipment	Yes
Mild Steel Drums	Consumable	Yes

Pulping unit should be combined with above mentioned business opportunity. Lower grade sapota are suitable for pulping as better grades fetch higher market prices.

Process:

- Well ripened and washed '*Kalipatti'* sapotas need to be prepared manually. The seeds as well as the central white core were removed, after peeling and fruit pieces were chopped using a sterilized knife for pulping
- The sapota slices were passed through a fruit pulper for pulping. Sapota juice can be extracted by squeezing the pulp through a twofold muslin cloth
- The pulp and/or juice need to be homogenized to get uniform consistency and mixed with the required quantity of cane sugar and citric acid. The mixture needs to be heated up and 140 mg/kg of potassium meta-bisulphite nectar should be added to the pulp/ juice
- The pulp/ juice needs to be passed through a pulp & juice pasteurizer to kill any microbes before being stored
- The pulp is then sent to a sterilized stainless steel tank for storage. Pulp filling machines can be installed for packing the pasteurized sapota pulp into aseptic bags, which can be stored in MS drums for selling in bulk to industrial buyers in nutraceutical and food processing industries

Advantages:

- C and D grades fetch very low prices in open-market. Processing them into pulp provides better prices to the FPO
- Since sapota has low shelf life (owing to rapid biochemical changes) and is susceptible to damage in cold storage, value addition through processing is important for economic utilization of increased production of sapota. Conversion of sapotas into suitable value added products is the only alternative so that the farmers can get assured price for their produce all the time.

Disadvantages / Challenges:

- Since the pulp is sold in bulk form in the B2B market, the margin realized by the FPO may be low

- Pulping process requires significant investment. FPO should ensure high utilization of the equipment for break-even and profitability

3 Sapota Jam

Growing health consciousness and other benefits of sapota such as nutrition values and sources are driving the sapota market. In addition, increasing disposable incomes, evolving lifestyle and adaption of organic food culture are supporting the growth of the Sapota jam market. The jam can be sold in the B2C market to the end consumers, either through direct marketing or through retailers.

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Fruit preparation - Peel removal - Seed removal - Slicing	Manual	No
Fruit pulper	Equipment	Yes
Homogenization tank	Equipment	Yes
Jacketed Kettle–Heating and Mixing	Equipment	Yes
Semi-automatic filling machine	Equipment	Yes
Boiler	Equipment	Yes

Jam making unit should be combined with the business opportunity mentioned first. Lower grade sapota are suitable for jam making as better grades fetch higher market prices.

Process:

- Well ripened and washed '*Kalipatti'* sapotas need to be prepared manually. The seeds as well as the central white core were removed, after peeling and fruit pieces were chopped using a sterilized knife for pulping
- The sapota slices were passed through a fruit pulper for pulping.
- The pulp needs to be homogenized to get uniform consistency and mixed with cane sugar in 1:1 ratio.
- The sweetened pulp is then transferred to the jacketed kettle where it is heated, and citric acid is added @ 0.5% of finished product. The mixture needs to be heated up till the desired level of TSS is achieved.
- Sodium benzoate at 200 ppm of finished product nectar should be added to the finished product
- The jam, thus prepared, was filled into wide mouth pre-sterilized glass bottles of 200 g capacity using a semi-automatic filling machine, closed air-tight and stored at a cool and dry place.

Advantages:

- C and D grades fetch very low prices in open-market. Processing them into jam provides better prices to the FPO
- Since sapota has low shelf life (owing to rapid biochemical changes) and is susceptible to damage in cold storage, value addition through processing is important for economic utilization of increased production of sapota. Conversion of sapotas into suitable value added products is an alternative for farmers to get assured price for their produce all the time.

Disadvantages / Challenges:

- The jam must be stored in proper conditions, otherwise there is a chance of physiological changes, such as slight decrease in moisture and tannin content, increase in acidity, TSS, reducing and total sugars after 90 days of storage
- Jam making process requires significant investment. FPO should ensure high utilization of the equipment for break-even and profitability
- Sapota Jam has limited market. FPO needs to find the right buyers for the product. Localized direct B2C marketing can be done if investments is made on established trade channels

4 Sapota Powder

Sapota slices can be dried and ground to get sapota powder which can be used in the preparation of ice-cream, shakes, smoothies, and as a flavoring agent. It can be used in HoReCa industry as an ingredient for preparation of "fruit cocktails". Sapota powder also has antioxidant and antimicrobial properties which can be used as a preservative in food processing industries (e.g., pork patties).

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Fruit preparation - Peel removal - Seed removal - Slicing	Manual	No
Dryer - Tunnel dryer (or) - Tray dryer	Equipment	Yes
Pulverizer	Equipment	Yes
Vibratory Sieve	Equipment	Yes
Form-fill seal packaging	Equipment	Yes

Sapota powder manufacturing unit should be combined with the business opportunity mentioned first. Lower grade sapota can be used for powder making while better grades can be sold to market for higher prices.

Process: Sapota powder can be prepared in 2 ways – drying sapota slices and pulverizing them; or drying of the residue left during sapota juice extraction and grinding the same.

A) Drying sapota slices and pulverizing them

- Well ripened and washed '*Kalipatti'* sapotas need to be prepared manually. The seeds as well as the central white core were removed, after peeling and fruit pieces were chopped using a sterilized knife for slicing
- The sapota slices were passed through a tunnel or tray dryer to dehydrate the slices
- The dehydrated slices are then ground into a fine powder using Pulverizer. The ground sapota slices are then passed through a vibratory sieve to separate any unwanted debris
- The powder is then packed in pouches using a form-fill seal packaging

B) Drying the residue from sapota juice extraction and grinding them

- The residue during the sapota juice extraction is dried in a tray dryer and ground into a fine powder using Pulverizer
- The ground sapota residue is then passed through a vibratory sieve to separate any unwanted debris

Advantages:

- C and D grades fetch very low prices in open-market. Processing them into powder provides better prices to the FPO and increases the shelf life of sapota
- Since sapota has low shelf life (owing to rapid biochemical changes) and is susceptible to damage in cold storage, value addition through processing is important for economic utilization of increased production of sapota. Conversion of sapotas into suitable value added products is an alternative for farmers to get assured price for their produce all the time

Disadvantages / Challenges:

- Direct B2C sales through online channels is challenging, as it will require investments for marketing and competing with established brands
- Market potential for Sapota powder is limited due to low consumption. Finding B2B buyers or direct consumers would be challenging

5 Dehydrated Sapota Slices

Sapota slices can be dried and ground to get sapota powder which can be used in the preparation of ice-cream, shakes, smoothies, and as a flavoring agent. It can be used in HoReCa industry as an ingredient for preparation of "fruit cocktails". Sapota powder also has antioxidant and antimicrobial properties which can be used as a preservative in food processing industries (e.g., pork patties).

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Fruit preparation - Peel removal	Manual	No

Technology	Type	Eligible for Matching Grant
- Seed removal - Slicing		
Dryer - Tunnel dryer OR - Tray dryer	Equipment	Yes
Form-fill seal packaging	Equipment	Yes

Dehydrated sapota slices manufacturing unit should be combined with the business opportunity mentioned first. Lower grade sapota can be used for slices making while better grades can be sold to market for higher prices.

Process:

- Well ripened and washed '*Kalipatti'* sapotas need to be prepared manually. The seeds as well as the central white core were removed, after peeling and fruit pieces were chopped using a sterilized knife for slicing
- The sapota slices were passed through a tunnel or tray dryer to dehydrate the slices
- The dehydrated slices are then packed in pouches using a form-fill seal packaging machine

Advantages:

- C and D grades fetch very low prices in open-market. Processing them into dehydrated slices provides better prices to the FPO and increases the shelf life of sapota
- Since sapota has low shelf life (owing to rapid biochemical changes) and is susceptible to damage in cold storage, value addition through processing is important for economic utilization of increased production of sapota. Conversion of sapotas into suitable value added products is an alternative for farmers to get assured price for their produce all the time

Disadvantages / Challenges:

- Market potential for Sapota slices is limited due to low consumption. Finding B2B buyers or direct consumers would be challenging

Additional process:

- The sapota slices can also be osmotically dehydrated in an osmotic agent (preferably a concentrated sugar syrup/ solution). The osmo-dehydrated slices can be packed in polypropylene-laminated pouches

6 Sapota Candy

Sapota can be sweetened and sold off as candy to the end consumers.

Technology	Type	Eligible for Matching Grant
Shed for unit	Civil construction	Yes
Fruit preparation - Peel removal - Seed removal - Slicing	Manual	No
Blanching machine	Equipment	Yes
Stainless Steel tank	Equipment	Yes

Sapota candy manufacturing unit should be combined with the business opportunity mentioned first. Lower grade sapota can be used for candy making while better grades can be sold to market for higher prices.

Process:

- Well ripened and washed '*Kalipatti'* sapotas need to be prepared manually. The seeds as well as the central white core were removed, after peeling and fruit pieces were chopped using a sterilized knife for slicing
- The sapota slices are washed and blanched in boiling water for 5 minutes
- The blanched sapota slices are steeped in sugar syrup of 40% TSS for about 24 hrs. The pieces are drained and steeped again in syrup whose strength is increased by 10% TSS for 24 hrs. This process is repeated every 24 hrs. Until it reached the desired concentration of recipes, slices are steeped in this concentration for a week, when the slices are dried and kept in a cool place
- The sapota candy is packed in 250g polythene pouches ready to be sold

Advantages:

- C and D grades fetch very low prices in open-market. Processing them into sapota candy provides better prices to the FPO and increases the shelf life of sapota
- Since sapota has low shelf life (owing to rapid biochemical changes) and is susceptible to damage in cold storage, value addition through processing is important for economic utilization of increased production of sapota. Conversion of sapotas into suitable value added products is an alternative for farmers to get assured price for their produce all the time

Disadvantages / Challenges:

- Market potential for Sapota slices is limited due to low consumption. Finding B2B buyers or direct consumers would be challenging