



# Value Chain Analysis of Custard Apple in Rajasthan

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# EXECUTIVE SUMMARY

Rajasthan is one of the top ten custard apples growing states in our country. In Rajasthan, custard apple is mainly found in the forest areas of southern districts. But the total production and the production area is decreasing day by day.

The perishable nature of custard apple and the absence of any technology around its preservation, processing and value-addition make tribal forced to sell the fruit at throwaway prices. With processing technology and better marketing opportunities, there is a possibility to get a better price by converting it into frozen pulp or powder to be used in the catering, ice-cream and confectionary industries.

Village level collection centers are formed, where fair-pricing, grading of produce and payment to the producers are carried out. Produce is then taken to a central processing unit for value-addition. Processing technology involves manual scooping, mechanical deseeding through pulpers, blast-freezing using air-cooling systems. The product is then sold to institutional buyers through marketing.

To ensure that the tribal receive better prices for their produce the intervention involving value addition to the fruit before selling it in the market is required. The strategy of value addition on agricultural produce provides ample opportunity for revenue generation, employment generation and effective post-harvest management. The processing of raw fruit into various innovative products like pulp, powder, etc. promotes market acceptability and gives the products high economic value. It will also create the employment opportunities to tribal women in their own business venture. It will give the motivation to producer group members for manage their own resources and can be develop as the community based business model which can be replicate in whole district.

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### 1. Project Details

#### 1.1 About the Organization

Gramshree Foundation Trust is a non-profit organization registered in 2018, working with poor tribal families in Rajasthan with a vision to impact their lives through innovations.

Gramshree is promoted to establish an innovative marketing system to market the produce/products of the poor, empowering the poor, so that they can have direct access to the market which enable them to realize the optimum price of their produce. GramShree also provides services in the establishment of the community-led institution, SHG Federation and Producer Company. Services include capacity building of local cadre of NGOs and federation, vision building exercise for federation/PC. Also provides support to develop the business plan of the institution and handholding support for the execution of the business plan.

Gramshree is involved in the production of frozen custard apple and frozen Jamun pulp and its marketing to ice-cream manufacturers and the catering industry. Gramshree has been able to impact the lives of more than 2,500 tribal families in Rajasthan and Madhya Pradesh.

**Mission:** To establish, an innovative marketing system to market the produce /products of the poor, empowering the poor, so that they can have direct access to the market which enable them to realize the optimum price of their produce. Establishment of web-based online marketing platform for marketing of rural produce.

**Vision:** Ensure, the better price to farmers of their produce/products, through innovative marketing system & establishment of community-owned and run institution.

## 1.2 Project Scope

This project, 'Value Chain Analysis of Custard Apple in Rajasthan' was initiated to analyze the existing custard apple value chain in the Rajasthan, particularly in the southern part of the state. We also have to point out the key stakeholders in the chain, what are existing revenue generating opportunities for each stakeholder and what are their major deliverables. We also have to identify the shortcomings of the value chain and finally try to find out what can be probable solutions.

## 1.3 Objectives

- ✚ To understand how value addition has been done in custard apple.
- ✚ Identify the key actors in the value chain.
- ✚ To understand how tribal women, get benefited by the value chain.
- ✚ Identify the gaps in the chain and also provide some probable solutions.

## 1.4 Methodologies

We have collected most of the information from primary sources –

- 1) Custard apple processing units
- 2) Village collection centers
- 3) Tribal women
- 4) Village resources person

Remaining secondary data, we have collected from various online sources.

## 2. Introduction

The custard apple is the fruit of *Annona Squamosa*, the most widely grown species of *Annona* and a native of tropical climate in the Americas and West Indies. Spanish traders aboard the Manila galleons docking in the Philippines brought it to Asia.



Figure 1 Custard Apple

Locally known as “Sitaphal” in Hindi and Telugu, “Sharifa” in Punjabi and “Seethapazham” in Malayalam, the custard apple is also called sugar apple, cherimoya or sweetsop. These apples are typically heart-shaped or oval-shaped and can weigh up to 500gm. They have light tan or greenish quilted skin that turns brown as the fruit ripens. The flesh is particularly mellow and custard-like. The central core is also soft but has no flavor. The flesh contains several hard, black, oval seeds that are inedible and must be separated, making it difficult to eat elegantly.

Custard apple is an important dryland fruit of India. It is popular under its spontaneous spread in forests, wastelands, rocky slopes, and other uncultivated places. Its plants come up unattended in parts of Andhra Pradesh, Assam, Bihar, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, and Tamil Nadu as a scrub or hedge plant.

### 2.1 Nutrition & Health Benefits

Custard apple is synonymous with the chilly weather in India, being extensively used in desserts, such as kheers, milkshakes and ice creams, for its intense sugary flavor. Moreover, this delightful winter fruit offers some fabulous wellness incentives such as renewing skin texture, boosting vitality and managing diabetes. It supplies carbs for instant vigor. They are low in unhealthy or saturated fats and packed with beneficial dietary fibers. In addition, this exotic fruit comprises umpteen valuable nutrients and antioxidants like vitamin C, vitamin A, the B vitamins, iron, calcium, magnesium, phosphorus, zinc, copper, carotenoids and flavonoids. A 100-gm custard apple contains

## VALUE CHAIN ANALYSIS OF CUSTARD APPLE IN RAJASTHAN

**Nutrients**

1	Protein	1.7 gm
2	Fat	0.6 gm
3	Carbohydrate	25.2 gm
4	Food Energy	101 Kcal
5	Cholesterol	0 mg
6	Vitamin A	33 IU
7	Vitamin C	19.2 mg
8	Calcium	30 mg
9	Iron	0.71 mg
10	Magnesium	18 mg
11	Manganese	0.093 mg
12	Phosphorus	21 mg
13	Sodium	3 mg
14	Potassium	382 mg

*Table 1: Nutrients of Custard Apple*

Native to countries in South America and Asia, the custard apple tree holds the unique trait of being drought-resistant, sprouting even in extreme climates and rocky soils. This, coupled with its inherent nourishing components and innumerable advantages for well-being, make it a forerunner for tackling malnutrition and mineral deficiencies.

Other health benefits are –

**Provides Ample Energy:** With a high calorific value, custard apple provides the simple sugars glucose and fructose, for sustaining the body's energy requirements. Also, being rich in iron, it eliminates lethargy and cures anemia.

**Treats Skin Infections:** Custard apples are a treasure trove of skin-enriching elements, namely vitamin B5, vitamin C, vitamin A, zinc and copper. These work in synergy, to effectively heal acne, abscesses, allergies and other skin ailments.

**Possesses Anti-Cancer Properties:** Various scientific studies have proved that the acerogenin compounds in custard apple display cancer-reversing qualities. Including custard apples in the daily diet, thus, efficiently mends tumors and inflammation.

**Controls Diabetes Symptoms:** Apart from being a low glycemic index fruit, custard apples are bestowed with polyphenolic antioxidants. These vastly elevate insulin production and glucose absorption, thereby keeping diabetes in check.

**Enhances Brain Activity:** Custard apples are naturally endowed with vitamin B6, which stimulates the brain. It is hence useful for proper nerve signaling, increasing concentration, alleviating depression and uplifting moods.

**Improves Heart Function:** Comprising noteworthy levels of healthy unsaturated fats and omega-6 fatty acids, custard apples work wonders in reinforcing the cardiac system. Furthermore, these flavorsome fruits also relieve hypertension.

**Augments Immune System:** Blessed with abundant reserves of the powerful antioxidant vitamin C, custard apples flush out toxins and free radicals from within the body, besides shielding it from harmful external microbes and diseases.

**Improves Eye Health:** Sitaphal or custard apple is packed with generous amounts of vitamin A, as well as carotenoid antioxidants of lutein and zeaxanthin. These enrich blood circulation to the optic nerve and visual organelles, enhancing eyesight and reducing the chances of acquiring age-related macular degeneration (AMD), glaucoma and cataracts in old age.

**Ensures Smooth Digestion:** Rich in B vitamins, custard apples stimulate metabolism and guarantee the optimal conversion of food to energy. Moreover, the vast reserves of dietary fibres in this succulent winter bounty satisfy the appetite, prevent untimely and unhealthy cravings, as well as enable the unhindered passage of nutrients and uplift digestion processes.

Since custard apples are calorie-loaded fruits, they are useful for weight loss and energy metabolism only when eaten in moderation. Consuming too many of these fruits all at once can result in surplus body fat and unhealthy weight gain. Moreover, the skin and mainly the seeds of sitaphal contain toxic compounds that can lead to grave complications of redness, allergies in the skin and



damage to the eyes. Hence, the outer covering, as well as the seeds, must be carefully removed before consuming the tasty pulp of the custard apple, to avoid any side effects and reap its wonderful benefits for overall health.

### 2.2 Custard Apple Cultivation

Custard Apple is one of the finest fruits introduced in India from tropical America. It is also found in the wild form in many parts of India. It is cultivated in Andhra Pradesh, Maharashtra, Karnataka, Bihar, Orissa, Assam, and Tamil Nadu. Besides India, it is common in China, the Philippines, Egypt and Central Africa. The fruits are generally used as fresh, while some products or mixed fruits like custard powders, ice-creams are prepared from the fruits. Besides high nutritive value, it has also a high medicinal value.

**Climate:** All Annona are tropical in origin and grow well in a hot and dry climate with varying degrees of difference. Custard Apple requires a hot dry climate during flowering and high humidity at the fruit set. Flowering comes during the hot dry climate of May but the fruit set takes place at the onset of the monsoon. Low humidity is harmful to pollination and fertilization. The Custard Apple withstands drought conditions cloudy weather and also when the temperatures go below 15°C. Annual rainfall of 50-80 cm is optimum, though it can withstand higher rainfall.

**Soil:** The Custard Apple is not very particular about soil conditions and flourishes in all types of soils like shallow, sandy, but fails to grow if the subsoil is ill drained. It can grow well in deep black soils provided they are well-drained. A little salinity or acidity does not affect it but alkalinity, chlorine, poor drainage or marshy-wet lands hamper the growth and fruiting.

**Propagation:** Annona is commonly propagated by seeds. Recently some researchers have developed some techniques in vegetative methods and budding can be adopted for multiplication. The seedlings of local custard apple have proved a good rootstock for many improved varieties and hybrids. Seeds treated with 100 ppm for 24 hours germinate quickly and uniformly.

**Planting and Season:** Planting is done during the rainy season. The pits of 60x60x60 cm at spacing 4x4 or 5x5 or 6x6 depending on soil type are dug before monsoon and filled with a good quality FYM, single super phosphate and neem or Karanj cake under dry conditions and with drip irrigation system planting at 6x4 meters has given good growth and better fruit setting.

**Interculturing:** For good plant growth, weeding should be done to keep away the weeds. Intercropping with some legumes, peas, beans and marigold flowers are commonly taken by the growers. Normally, no crop is taken during winter as the plants go under rest.

**Irrigation:** In general, a Custard apple is grown as a rainfed crop, and no irrigation is given. However, for early and bumper harvest of the crop. Irrigation on flowering i.e. from May should be given till the regular monsoon starts. For better flowering and fruit set, mist sprinkling is better over flood or drip system of irrigation as it keeps to lower down the temperatures and to increase in the relative humidity.

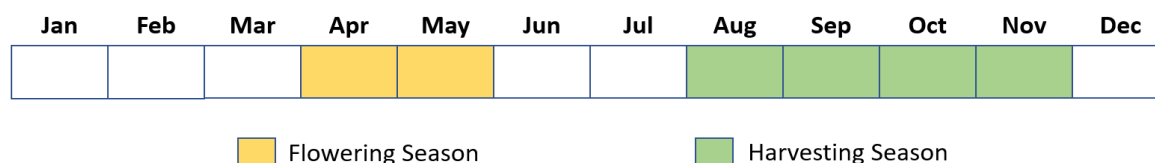
**Nutrition:** Generally, no manures or fertilizers are applied to a rainfed crop. However, for early and bumper harvest with a good keeping quality, the following dose is recommended to a full-grown tree. Biomeal .... 10 kg, 5:10:5 1 Kg. Ormichem micronutrient mixture 0.250 kg at the time of flowering and another dose of 10:26:26 or 19: 19: 19 mixture after fruit set. Foliar spray with 8:12:24:4 10 gm/lit, twice during fruit development.

**Plant protection:** Though the crop is hardy, it suffers from the following pests- Mealy bug, Scale insects, Fruit boring caterpillar. Leaf spot, Anthrac nose, Black stone, spraying with neem oil, Meenark, and some herbal preparation is recommended.

**Harvesting and yield:** The Custard apple is a climacteric fruit and harvested at the maturity stage when the fruit starts to change colour from green to its varietal colour shade. Immature fruits do not ripe. Swallowing some apical buds – showing inner pulp is also an indication of maturity. A grown tree yields above 100 fruits weighing 300 to 400 gm.

**Post-harvest handling:** The fruits do not withstand cold storage as well as handling after ripening. Firm but mature fruits can be kept at 6°C temperature for about a week but such fruits lose aroma and attractiveness and also develop some acidic taste.

## 2.3 Crop Calendar



In India, custard apple plant flowers from April to May and bears fruit between August to November.

## 2.4 Custard Apple Varieties

**Red Sitaphal:** Red Sitaphal is a Red Sugar-apple or sweetsop is the fruit of *Annona squamosa*, the most widely grown species of *Annona* and a native of the tropical Americas and West Indies. ... The hard, shiny seeds may number 20–40 or more per fruit and have a brown to black coat, although varieties exist that are almost seedless.



Figure 2: Red Sitaphal

**Barbados Seedling:** It is a late-season variety. These fruits have higher sugar content. Fruits have a green rind, orange-yellow margins.

**Balangir:** This variant is from the Mahboobnagar district of Andhra Pradesh. This is a green-skinned, medium-sized and high yielding variant.

**Kakarlaphad:** This high yielding variety is very sweet and crispy.

**Arka Sahan:** Arka Sahan is a hybrid variety of custard apple, created out of a cross combination of species of *Annona*, by two scientists of the Bangalore-based Indian Institute of Horticultural Research, S. H. Jalikop and P Sampath Kumar. It is made up of 75% Sitaphal and 25% Cherimoya. This variety is suitable for drought-prone areas.



Figure 3: Arka Sahan

**Tropical Sun:** This variety was recently released by the Australian Custard Apple Growers Association (ACAGA). It is suitable for the home garden and starts ripening at room temperature.

**African Pride:** African Pride is an artificial hybrid produced from a cross between the plants' Sugar Apple (*Annona Squamosa*) and Cherimoya (*Annona Cherimoya*). It is also known by the name Pineapple Sugar Apple. This semi-evergreen tree is grown mainly for the large, rounded to heart-shaped, bumpy fruits with a soft creamy white, edible pulp and inedible, toxic black seeds. The fruits bruise easily. The Custard Apple Tree is planted in subtropical or tropical regions across the world for culinary purposes.



Figure 4 African Pride

**Pink's Mammoth:** Mammoths are a large super sweet fruit that some growers hand pollinate at flowering to improve fruit shape. Fruits are large, ovoid, pulpy, delicious, greenish pink in colour with a smooth surface. The quality of the fruits is good but the tree bears fewer fruits.

**British Guinea:** These trees bear large fruits that are greenish. The fruits contain few seeds and have good quality. These fruits don't spoil even after a week of ripening.

**Island Gem:** This is an Australian variety. The fruit is very large in size, smooth surface, very large segments, very pulpy very delicious, few seeded, greenish white in color, pulp very sweet, excellent flavor, bearing is sparse fruits irregular in shape, keeps for about a week.

**Washington:** The colour of these fruits is greenish-white. The tree has a sparse bearing.

## 3. Market Overview

### 3.1 Global Scenario

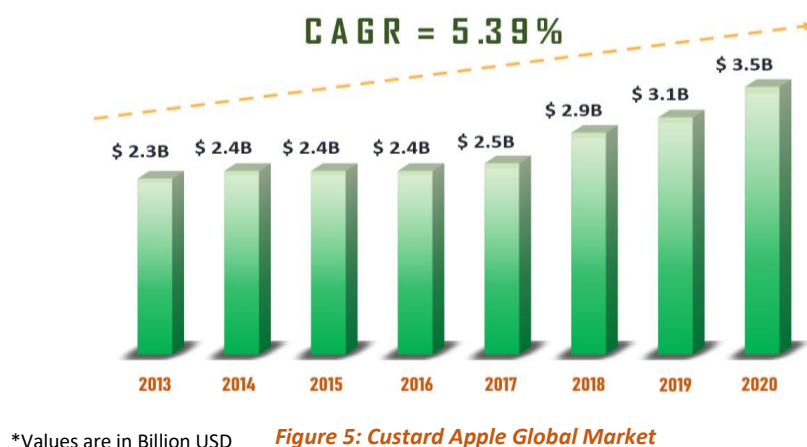


Figure 5: Custard Apple Global Market

From 2013 to 2020, in 8 years the global market of custard apple has risen from 2.3 billion USD to 3.5 billion USD on a CAGR 5.39% and it is expected to cross 5 billion USD by the year 2025. Canada is the leading the chart by generating more than 11% of the global custard apple exporting revenue followed by Poland, Chile, USA. India comes 27th by generating almost 1% of the revenue in the last eight years. The complete list of the top 10 exporting countries of custard apple from 2013-2020 in terms of revenue-generating has given below including India.

#	Country	2013	2014	2015	2016	2017	2018	2019	2020	%
1	Canada	\$ 293.5 M	\$ 280.2 M	\$ 303.8 M	\$ 271.2 M	\$ 266 M	\$ 328.8 M	\$ 368.7 M	\$ 418 M	11.77 %
2	Poland	\$ 204.1 M	\$ 186.8 M	\$ 160.5 M	\$ 159.8 M	\$ 173.4 M	\$ 208.9 M	\$ 210.1 M	\$ 219.9 M	7.09 %
3	Chile	\$ 134 M	\$ 148.8 M	\$ 165 M	\$ 189.9 M	\$ 167.4 M	\$ 188.5 M	\$ 188.7 M	\$ 217.1 M	6.51 %
4	USA	\$ 176.7 M	\$ 192.3 M	\$ 161.9 M	\$ 164.7 M	\$ 158.7 M	\$ 153.9 M	\$ 166.9 M	\$ 170.9 M	6.26 %
5	Peru	\$ 58.8 M	\$ 75.6 M	\$ 115.9 M	\$ 107.3 M	\$ 117.9 M	\$ 168.1 M	\$ 169.9 M	\$ 220.1 M	4.81 %
6	Thailand	\$ 51.1 M	\$ 61 M	\$ 80.9 M	\$ 81.8 M	\$ 91.4 M	\$ 178.3 M	\$ 219.8 M	\$ 256.7 M	4.75 %
7	Netherlands	\$ 134.3 M	\$ 123.6 M	\$ 107.9 M	\$ 115.8 M	\$ 119.2 M	\$ 123.2 M	\$ 136 M	\$ 134.4 M	4.63 %
8	China	\$ 110.2 M	\$ 111.3 M	\$ 102.1 M	\$ 99.5 M	\$ 89.4 M	\$ 109.4 M	\$ 133.3 M	\$ 111.5 M	4.03 %
9	Mexico	\$ 60.6 M	\$ 63.8 M	\$ 126.4 M	\$ 98.5 M	\$ 86.9 M	\$ 96.5 M	\$ 122.8 M	\$ 133.9 M	3.67 %
10	Serbia	\$ 84.6 M	\$ 80.3 M	\$ 63 M	\$ 65.7 M	\$ 109.1 M	\$ 98.3 M	\$ 97.8 M	\$ 120.6 M	3.35 %
27	India	\$ 27.2 M	\$ 24.8 M	\$ 30.3 M	\$ 32 M	\$ 35.3 M	\$ 39.9 M	\$ 41.9 M	\$ 32 M	1.23 %

Table 2: Global Export of Custard Apple



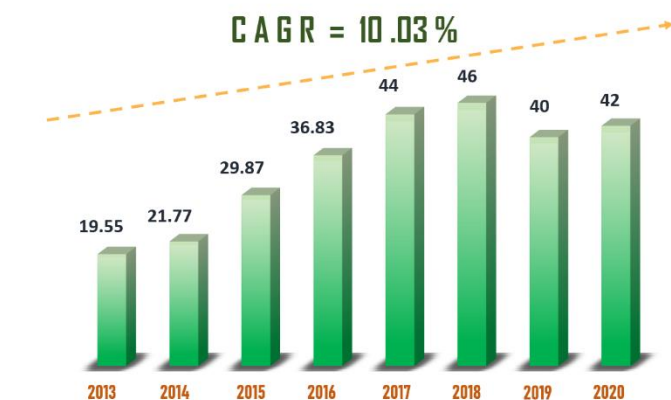
## VALUE CHAIN ANALYSIS OF CUSTARD APPLE IN RAJASTHAN

On the other hand, the USA is the leading importer of custard apple in the last eight years by importing 19% of the custard apple. Germany, China, France next come in the line. The top 10 list of importing countries from 2013 to 2020 has given below.

#	Country	2013	2014	2015	2016	2017	2018	2019	2020	%
1	USA	\$ 422 M	\$ 469.2 M	\$ 571.9 M	\$ 515.8 M	\$ 440.4 M	\$ 531.3 M	\$ 578.5 M	\$ 707.2 M	19 %
2	Germany	\$ 325.9 M	\$ 282.4 M	\$ 234.5 M	\$ 242.8 M	\$ 290.3 M	\$ 294.9 M	\$ 293.4 M	\$ 299.3 M	10.15 %
3	China	\$ 88.4 M	\$ 100.4 M	\$ 129.5 M	\$ 120.9 M	\$ 131.7 M	\$ 222.8 M	\$ 317.4 M	\$ 395 M	6.75 %
4	France	\$ 185.8 M	\$ 176.3 M	\$ 158.1 M	\$ 152.6 M	\$ 172.5 M	\$ 186 M	\$ 193 M	\$ 208.5 M	6.43 %
5	Japan	\$ 161.3 M	\$ 169.4 M	\$ 147.7 M	\$ 133.4 M	\$ 127.9 M	\$ 137.1 M	\$ 150.2 M	\$ 160.4 M	5.32 %
6	Canada	\$ 130.7 M	\$ 133.5 M	\$ 121.5 M	\$ 132 M	\$ 128.9 M	\$ 142.6 M	\$ 145.3 M	\$ 156.7 M	4.89 %
7	Netherlands	\$ 135.8 M	\$ 117.5 M	\$ 118 M	\$ 107.9 M	\$ 126.8 M	\$ 136.8 M	\$ 147.7 M	\$ 158.6 M	4.7 %
8	Australia	\$ 70.6 M	\$ 83.8 M	\$ 81 M	\$ 96.2 M	\$ 102.4 M	\$ 108 M	\$ 118.1 M	\$ 141.8 M	3.6 %
9	UK	\$ 68.6 M	\$ 77.9 M	\$ 80.5 M	\$ 100.1 M	\$ 108.5 M	\$ 114.1 M	\$ 108.8 M	\$ 123.3 M	3.51 %
10	Poland	\$ 65.2 M	\$ 60 M	\$ 70.1 M	\$ 77.2 M	\$ 97.6 M	\$ 117.2 M	\$ 108.8 M	\$ 127 M	3.24 %
72	India	\$ 436.7 K	\$ 735.3 K	\$ 323.2 K	\$ 378.1 K	\$ 685.7 K	\$ 1.9 M	\$ 1.6 M	\$ 595.2 K	0.03 %

Table 3: Global Import of Custard Apple

### 3.2 National Scenario



\*Values are in Thousand Ha.

Figure 7: Production Area in India



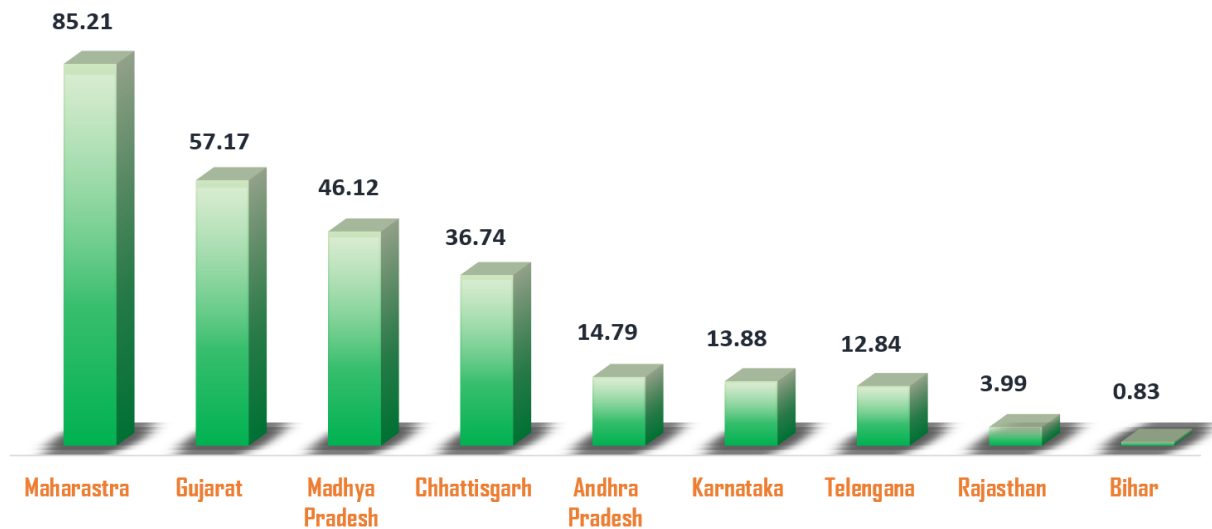
\*Values are in Thousand MT

Figure 6: Total Production in India

## VALUE CHAIN ANALYSIS OF CUSTARD APPLE IN RAJASTHAN

The total area of cultivation for custard apple has seen splendid growth in the last few years. From 2013 to 2020, the total area increases from 19.55 thousand Ha to 42 thousand Ha with a CAGR of 10%. In 2019, the number saw a little dip from 2018 data. But again in 2020, it is back on track.

The almost same thing happened with the total custard apple production in the country. In the last eight years, it has grown with a CAGR of 12.54%. Maharashtra is leading the way by producing almost 30% of India's total production followed by Gujarat, Madhya Pradesh, Chhattisgarh. Karnataka, Andhra Pradesh, Telangana, Rajasthan, Bihar are some other states hugely involved in custard apple production.



\*Values are in Thousand MT

Figure 8: State-wise Production of Custard Apple

The majority of the custard apple produces on the western belt of India, which is more than 50% of the total production. Maharashtra produces an average of 85.21 thousand MT in the last eight years and the number is still growing year after year. Pune is known as the hub of custard apple in India. Next comes Gujarat, Madhya Pradesh, Chhattisgarh, Andhra Pradesh, Karnataka, Telangana.

From the global market, India generates nearly 2% by exporting custard apples. In the last eight years, the total revenue from export has increased from 27.2 million USD to 32 million USD with a CAGR of 2%. Till 2019, the number kept increasing but in 2020, the number took a huge toll because

## VALUE CHAIN ANALYSIS OF CUSTARD APPLE IN RAJASTHAN

of the COVID-19 pandemic by decreasing from 42 million USD to 32 million USD. The majority of the product goes to Saudi Arabia, Netherlands, USA and United Arab Emirates. On the other hand, India also imports custard apples from other countries. Netherlands, China, Canada, Belgium are some countries from where custard apples come to India. A list of both exporting countries and importing countries are given below.

#	Country	2013	2014	2015	2016	2017	2018	2019	2020	%
1	Saudi Arabia	\$ 16.2 M	\$ 12.9 M	\$ 16.3 M	\$ 16.4 M	\$ 14.5 M	\$ 14.2 M	\$ 14.9 M	\$ 8.7 M	43.32 %
2	Netherlands	\$ 2.1 M	\$ 2.1 M	\$ 3.7 M	\$ 3.1 M	\$ 2.9 M	\$ 5.3 M	\$ 6.1 M	\$ 4.5 M	11.31 %
3	USA	\$ 430.3 K	\$ 458.2 K	\$ 725.5 K	\$ 1.4 M	\$ 1.8 M	\$ 5.7 M	\$ 6.1 M	\$ 5.7 M	8.47 %
4	UAE	\$ 1.3 M	\$ 1.4 M	\$ 1.6 M	\$ 2.5 M	\$ 2.9 M	\$ 2.2 M	\$ 1.8 M	\$ 1.1 M	5.62 %
5	Belgium	\$ 629.9 K	\$ 903.8 K	\$ 1.1 M	\$ 798.7 K	\$ 3.3 M	\$ 1.5 M	\$ 1.8 M	\$ 1.3 M	4.34 %
6	UK	\$ 618.1 K	\$ 699.2 K	\$ 1.2 M	\$ 1.5 M	\$ 1.6 M	\$ 2 M	\$ 1.5 M	\$ 1.5 M	4.03 %
7	Germany	\$ 800 K	\$ 812.7 K	\$ 755.4 K	\$ 895.2 K	\$ 1.4 M	\$ 2.6 M	\$ 2 M	\$ 1.2 M	3.97 %
8	Poland	\$ 40.1 K	\$ 494.7 K	\$ 147.6 K	\$ 431.8 K	\$ 410.9 K	\$ 704 K	\$ 1.1 M	\$ 1.26 M	1.89 %
9	France	\$ 187 K	\$ 378.9 K	\$ 340.9 M	\$ 365.4 K	\$ 767.4 K	\$ 1 M	\$ 1.2 M	\$ 521.5 K	1.81 %
10	Australia	\$ 87.9 K	\$ 179.1 K	\$ 362.1 K	\$ 414.6 K	\$ 247.4 K	\$ 543.8 K	\$ 763.8 K	\$ 990.5 K	1.66 %

Table 4: Export of Custard Apple from India

#	Country	2013	2014	2015	2016	2017	2018	2019	2020	%
1	Netherlands	\$ 1.5 M	\$ 844 K	\$ 1.3 M	\$ 88 K	\$ 31.2 K	\$ 66.7 K	\$ 61.5 K	\$ 158 K	19.08 %
2	China	\$ 210.6 K	\$ 496.8 K	\$ 1.4 M	\$ 24.5 K	\$ 135 K	\$ 93.6 K	\$ 181.1 K	\$ 23.4 K	17.77 %
3	Canada	\$ 713 K	\$ 61.4 K	\$ 93.1 K	\$ 75 K	\$ 41.5 K	\$ 11.1 K	\$ 35.2 K	\$ 70.9 K	16.78 %
4	Belgium	\$ 27.1 K	\$ 42.2 K	\$ 100.1 K	\$ 52.5 K	\$ 90.7 K	\$ 225 K	\$ 143.6 K	\$ 127.4 K	12.32 %
5	Vietnam				\$ 400 K		\$ 66.4 K	\$ 180.3 K	\$ 12.4 K	10.04 %
6	USA		\$ 80.6 K	\$ 85.7 K	\$ 95.9 K	\$ 214.8 K	\$ 36.9 K	\$ 33.2 K	\$ 17.4 K	8.6 %
7	Indonesia						\$ 283.3 K	\$ 31.2 K	\$ 32.3 K	5.28 %
8	Turkey					\$ 4.3 K		\$ 179.4 K	\$ 95.3 K	4.25 %
9	Poland	\$ 8.3 K			\$ 31.1 K	\$ 82.2 K	\$ 83.3 K	\$ 20.3 K	\$ 27.2 K	3.84 %
10	South Korea								\$ 16.6 K	0.25 %

Table 5: Import of Custard Apple to India

India's custard apple market is still limited in size. The main consumers of the custard apple are from the western and southern regions. The market is also not fully integrated. It requires time and patience to spread the market all over the country.

## 3.3 State Scenario



Figure 9: Production Area in Rajasthan

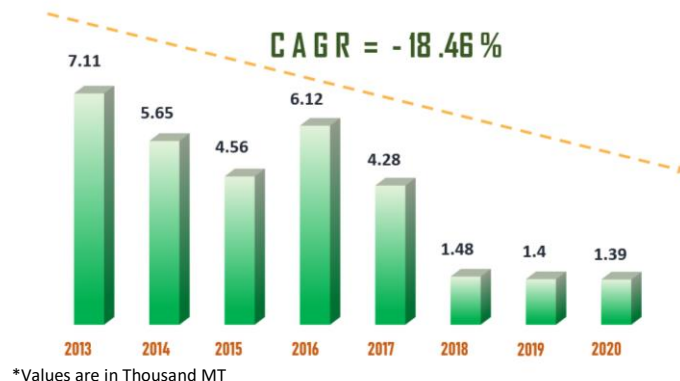


Figure 10: Total Production in Rajasthan

Rajasthan is one of the leading producers of custard apples in the country. In India, the total area under custard apple was 42 thousand hectares which led to the production of 349 thousand MT. Whereas Rajasthan had an area of 192.65 hectares (0.45%) and production of 1321.49 MT (0.4%) under custard apple till 2020, which signified that Rajasthan holds an important role in the area and production of custard apple.

It is of great importance for tribal of the state as it widely grows in tribal belts of Rajasthan which includes areas of Udaipur, Chittorgarh, Jhalawar, Dungarpur, Bhilwara and Rajsamand districts.

During 2019-20, Udaipur district was having the highest area of 109 hectares with the production of 525 MT of custard apple. Chittorgarh district was leading in terms of production of custard apple with a total area of 79 hectares and 746 MT of production of custard apple. It meets the economic needs of the tribal population who are dependent on its marketing. But both production and area under cultivation are significantly decreasing over the years. In the last eight years, the total area under production and total production has decreased by -17.32% and -18.46% CAGR respectively.

### 4. Mapping the Value Chain

Due to the perishable nature of custard apple tribal collect the custard apple and sell them on roadsides at varying prices depending upon the time of sale. In the morning hours of the custard apple season, the fruit was sold at 20 or 25 per Kg, whereas in the same evening prices were reduced to nearly half. This huge variation in prices depicts the highly perishable nature of the fruit. Therefore, there is a need to make tribal people who are collecting custard apples from forest areas acquainted with processing and marketing practices which further would lead to higher output, employment and profit for years.

And also, the global custard apple fruit pulp demand extended size of 120 million USD in 2020 and is predicted to gain over 160 million USD by 2026. There is a rise in the consumption of custard apple fruit pulp because of the change of preference of the buyers toward healthful consuming patterns. Buyers prefer nutrition merchandise that is prepared using real and organic raw materials rather than artificial seasoning. This component majorly rides the expansion of the custard apple fruit pulp market. Also, custard apple fruit pulps have a higher shelf life as compared to the fruit's raw form, which hence operates at lesser transport and storage costs for factories. The rise in exports is resisting pace with the development in worldwide Custard apple fruit pulp. Worldwide custard apple production, in roll, is improving at a faster rate. A rise in consumption of custard apple fruit products coupled with an increasing preference for normally sweet fruit-based ingredients is predicted to drive the growth.

This fruit can be processed into various value-added products such as ice creams, faluda, squashes, shrikhand, basundi, shakes. Investment in processing into value-added pulp and various other products will greatly reduce the waste experienced especially during the season of glut.

The entire value chain of custard apple has five major components, 1) Procurement, 2) Processing, 3) Storing, 4) Marketing and 5) Consumption.



## VALUE CHAIN ANALYSIS OF CUSTARD APPLE IN RAJASTHAN

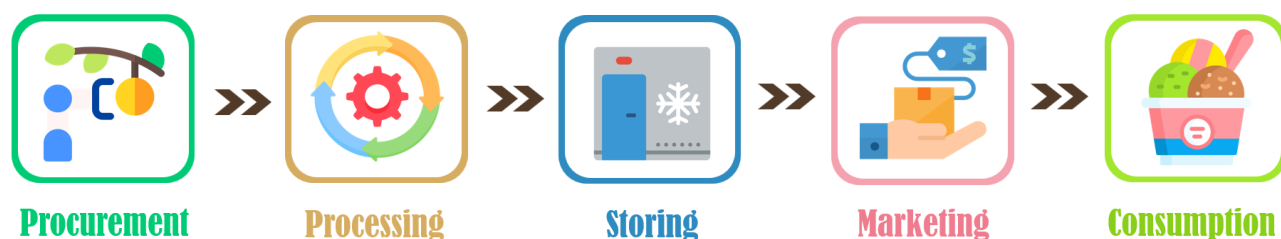


Figure 11: Value Chain Components

### 4.1 Actors in the Value Chain

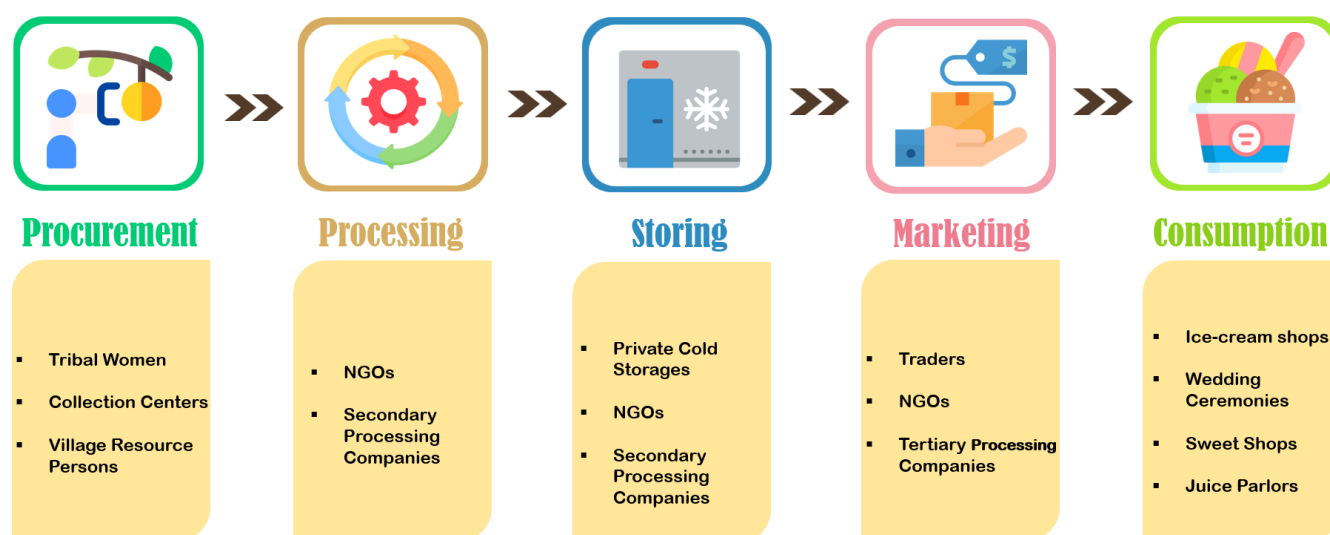


Figure 12: Actors in the Value Chain

There are three procurement sources, either from the Village Resource Persons (VRP) or from Village Collection Centers (VCC) or sometimes directly from the tribal farmers. VRPs act as middlemen, who buy fruits from the tribal farmers and further sell to the fruit retailers or the processors for pulp production. Whereas, VCCs are units established by the organizations in the villages, where farmers can directly sell their fruits.

Pulp is produced by the local NGOs and the other secondary processing companies in the area. These organizations can also store the pulp in a limited capacity. Otherwise, they have to shift it to cold rooms.

Processors can directly sell the pulp to the consumers or they have to sell via traders. On the other hand, tertiary processing companies, like ice-cream manufacturers, alcohol & beverage companies buy pulps from either processors or traders and make other value-added products.

### 4.2 Value Addition

In every step of the value chain, different value proportions are added to the process. Value addition processes of each step are given below.

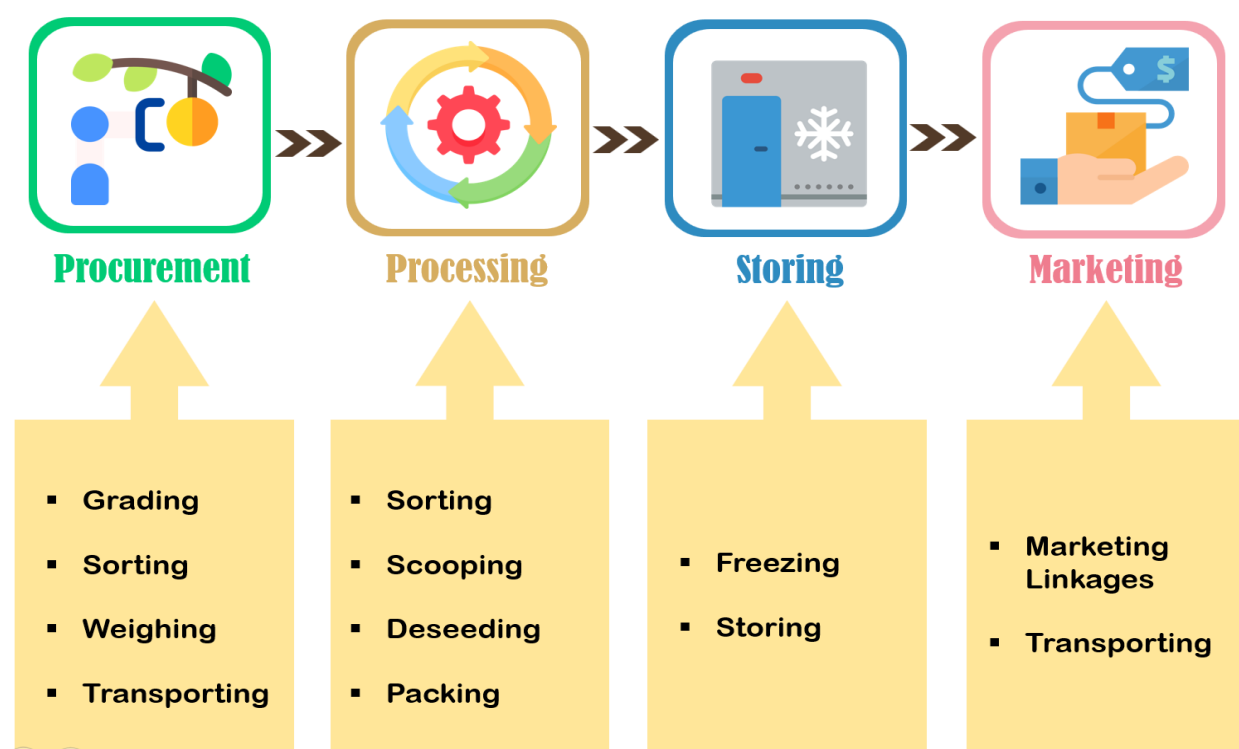


Figure 13: Value Addition

**Procurement:** Gramshree formed VCCs (Village Level Collection Center) in the villages with dense plants of custard apple after thorough discussions in SHGs, clusters and federations. All the women of those villages got orientation and training about the plucking, grading, and weighing of the raw fruits. These collection centers are run and managed by the clusters (village level institutions of SHG women) of the respective villages. The weighing, grading, and loading-unloading of the crates

are done by the SHG women at the centers. A Collection Center In-charge (woman) is appointed at each collection center for record-keeping and coordination with the route in charge. The rate of raw custard apple is based on the grading of the fruit which is almost double the price the other agents give. The quantity of total raw fruits to be collected at all VLCCs has to be restricted based on the daily intake capacity of the processing unit. Before procurement of fruit, there are four steps to follow –



*Figure 14: Procurement Steps*

- **Grading:** Grading has been done when tribal sell the fruits to the resource person or the processor and according to the grade of the fruit they get paid. According to the weight of fruits, we can divide fruits into two categories. 'Grade A' fruits weigh more than 250 gm and 'Grade B' fruits weigh less than 250 gm.
- **Sorting:** 'Sorting' means segregation of raw fruits, ripened fruits and wastages. It can be done either in the procurement centers or in the processing units before the start of the processing. Once sorting is completed, only ripened fruits go to the processing. Raw fruits are again covered by the sacks till it gets ripened because of the heat.
- **Weighing:** The fruits are collected in crates from all centers in a loading vehicle while measuring the weight of the fruits. Each crate consists of an avg of 20 kgs.
- **Transporting:** Finally, it was brought to the processing unit on the same day to avoid any damage from over-ripening.

**Processing:** The whole processing can be divided into 4 steps –



*Figure 15: Processing Steps*

- **Scooping:** Custard apples become very soft after ripening, so careful handling is needed. As the fruit ripened, it comes to the scooping area, where women with gloves, masks and caps on their heads scooped the seeded pulp from the fruits.
- **De-seeding:** During the De-seeding process seeds are removed from the pulp by hand or with the help of a seed removal machine.
- **Packing:** After the pulp is processed and quality checked, it's time to weigh the pulp and pack. Before packing, Potassium Meta Bi Sulphite is mixed as a preservative in a 1:1000 ratio.

All the stages of processing from scooping the pulp with seeds to the hardening of packaged pulp are to be completed instantly in a very short time to avoid any bacterial growth in the pulp.

**Storing:** After packaging the pulp, it needs to be stored. But before that, we have to freeze the pulp as quickly as possible to increase the shelf life of the product. At first, the pulp needs to be put in a hardener at -30°C for 10 to 12 hrs. This process will completely freeze the pulp. The next morning, the frozen pulp shifted to freezers temporarily, which maintains a temperature of -18°C. Finally, once all the freezers get full, the products are transferred to cold storage.

**Marketing:** The processors sell the custard apple pulp either to traders or the tertiary processors or directly to the customers. The products are used to pack in thermocol boxes so that the temperature of the frozen pulps get maintained. Sometimes, also refrigerated vans are used to transfer the pulps from one place to another.

## 4.3 Product Flow

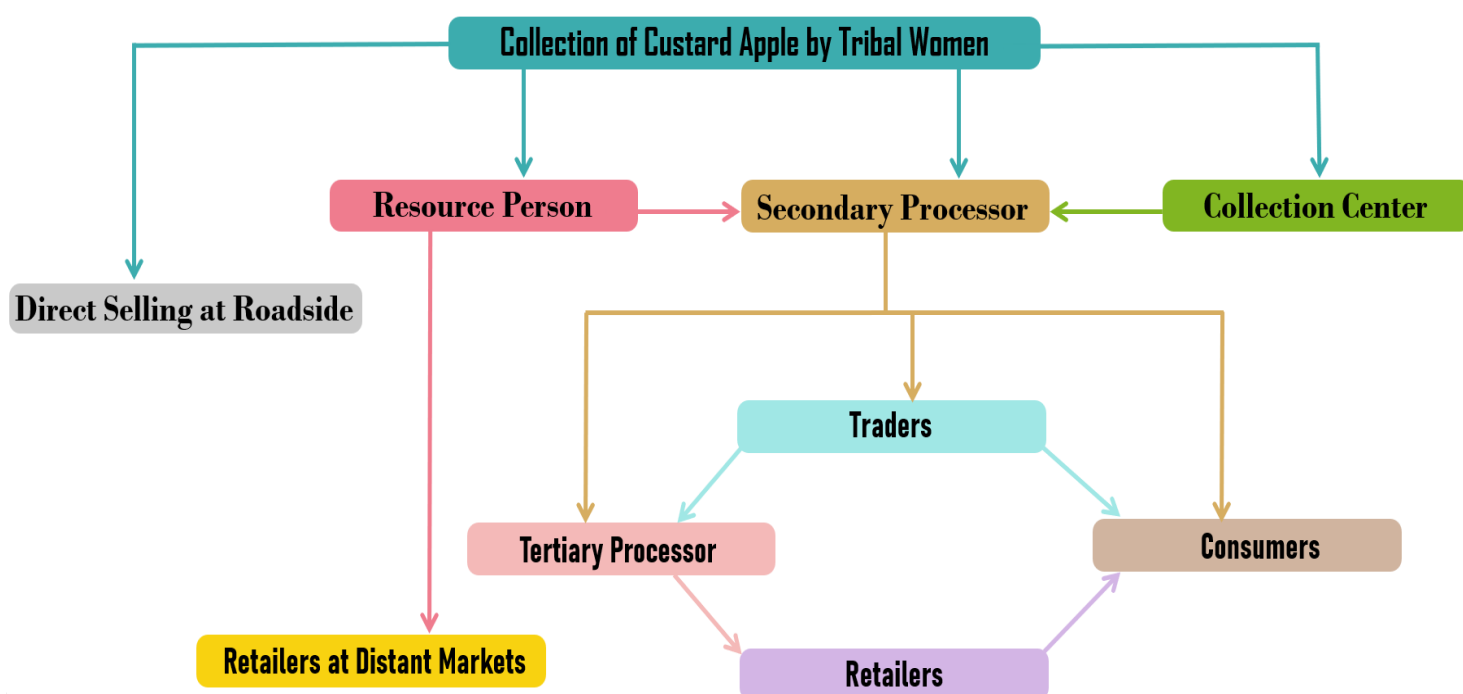


Figure 16: Flow of Custard Apple

In Rajasthan, tribal women collect custard apples from the forest area and they can either directly sell fruits at the roadside or to the resources persons or they sell to the village collection centers or sometimes they sell directly to the processors.

Resource persons sell the fruit to the fruit retailers from the different markets (Udaipur, Delhi, Rajkot, Surat) or sell to the processors to make custard apple pulp.

Fruits from the collections centers also come to the processing units.

Secondary Processors sell the produced pulp to traders or the tertiary processors (Ice cream companies, chocolate companies) or they sell to customers at wedding ceremonies.

Tertiary processors buy the pulp and make further value-added products, like Ice-cream, Milkshake, Beverages. These products reach the consumers via retailers.



### 4.4 Marketing Channels

The value chain offers two types of products to the market, either raw fruit or processed pulp.



**For raw custard apple, there are 2 subchannels –**

- Farmers → Consumers (At roadside selling)
- Farmers → Resource Person → Retailers → Consumers



**For custard apple pulp, there are 6 subchannels –**

- Farmers → Resource Person → Secondary Processors → Consumers
- Farmers → Resource Person → Secondary Processors → Traders → Consumers
- Farmers → Collection Centers → Secondary Processors → Consumers
- Farmers → Collection Centers → Secondary Processors → Traders → Consumers
- Farmers → Collection Centers → Secondary Processors → Traders → Tertiary Processors → Retailers → Consumers
- Farmers → Collection Centers → Secondary Processors → Tertiary Processors → Retailers → Consumers

## 4.5 Cost of Production

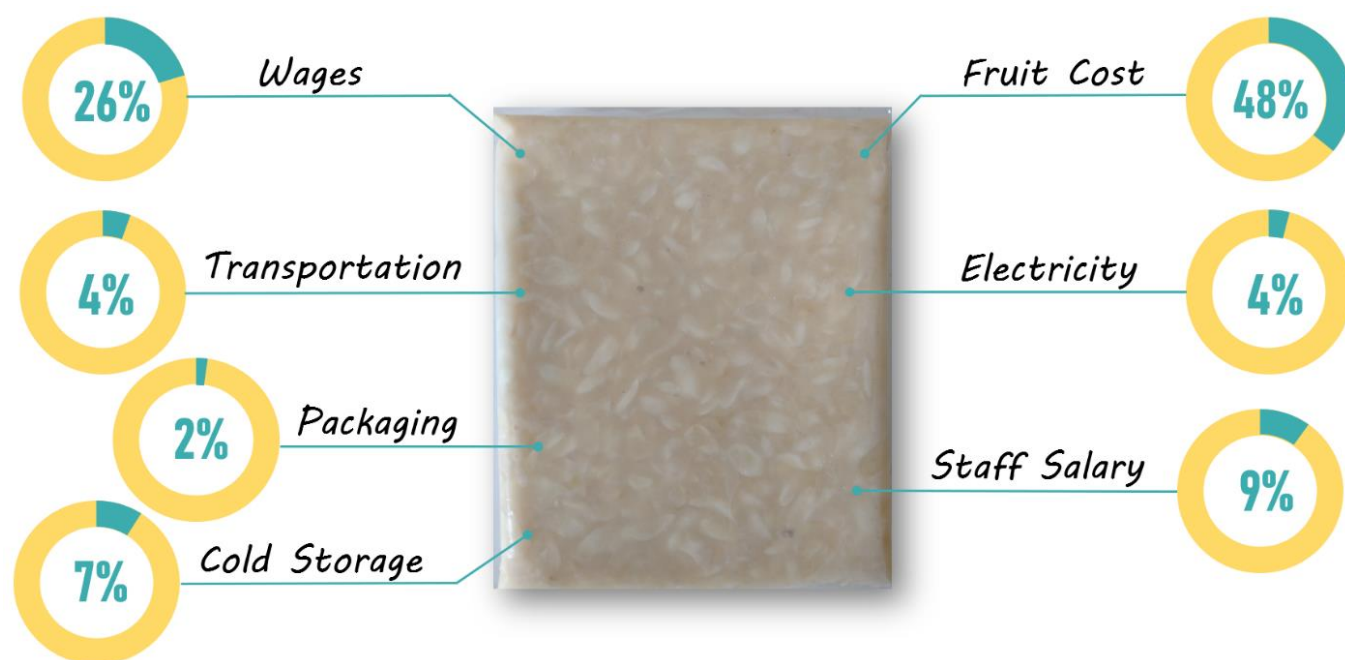


Figure 17: Cost of Custard Apple Pulp Production

In an ideal scenario, to produce 1 kg of custard apple pulp, it costs around Rs. 110-120. Maximum of that (almost 75%) goes to the procurement of raw fruits and the wages of the tribal women in the processing unit. Almost 10% goes to the staff, who look after the entire processing and they also ensure the quality of the pulp. Other costs are cold storage charges (7%), electricity (4%), transportation (4%), packaging (2%).

The product sold to the customers around Rs. 160-180. The selling price fluctuates because of the law of supply and demand. If production decreases in any year, price increases drastically. But, various big processors and traders from Pune dictate the price most of the time, because Pune is known as the hub of custard apple in India for a large amount of custard apple production. So, processors from other regions had to match the selling price to compete in the market.

## 4.6 Flow of Values & Benefits

Particulars	Collectors	Resource Person	Processors	Traders
Selling Price	40	60	180	200
Marketing Cost		8	110	6
Marketing Margin		20	120	20
Net Margin		12	10	14
Collector's Share				20%

*Table 6: Flow of Values & Benefits*

On average it requires 4 kg of custard apple fruit to produce or 1 kg of custard apple pulp. The price farmers get for 1 kg of fruit is 10 INR. So, to produce 1 kg of pulp collectors or the tribal women get  $(10 \times 4) = 40$  INR from the resource person.

To procure fruits from the tribal, resource persons have to incur certain costs (transportation cost, fruit ripening cost). It is around Rs.2/kg of fruit. So, for 4 kg of fruit, it will be  $(2 \times 4) = 8$  INR.

They further sell fruits to the processors for Rs. 15/kg. That becomes  $(15 \times 4) = 60$  INR, which they get from the processors.

It costs about 110 INR to make 1 kg of processed pulp by the processor and they sell that to the traders at 180 INR. Traders buy pulps from different processors and sell to customers around 200 INR/kg.

Finally, the collector's share is  $(200/40) \times 100\% = 20\%$

### 4.7 By-product Value

According to Food and Agriculture Organization of the United Nations (FAO), about 1.3 billion tons of foods are wasted worldwide each year, which accounts for one-third of total food industry production. Allied to this fact, the custard apple fruit processing industry deals with a large percentage of by-products, such as peel, seeds, and bagasse, which increase the proportion of residues at the end of processing.

**Bagasse:** Currently, the fruit processing industry generates a high volume of waste in fruits that have not reached a quality standard for consumption or by-products generated throughout the production process. To reduce this waste, mitigating measures, such as reuse in food formulations, have been proposed. In this work the custard apple bagasse flour (CAB) was produced and incorporated into cookie formulations in different proportions (5 to 50%) evaluating its acceptability. The CAB flour was characterized by physicochemical analysis, proximate composition, mineral analysis, determination of the phenolic content, and antioxidant capacity. The results of the physicochemical and proximate characterizations show that the processed flour presents values and specifications suitable for food formulations. The mineral composition of the CAB flour responds to more than 20% of the daily intake of nutrients, highlighting the Cu, Fe, Mn, Zn, Ca, and Mg.

**Seeds:** More than 30% of total fruit's weight covered by the seeds. These seeds can be used for insect Repellent, pesticide & weedicide, pharmaceutical Usage, biogas Production. Forrest Department also buys the seeds for the replantation.

Though, custard apple seeds are quite toxic in nature and accidental consumption can cause miscarriage as they are mildly poisonous.

**Peel:** After extraction of the pulp the remaining peel can be used for various purposes. It is used as a fuel in local brick and other industries. It is also mixed with cow dung to prepare fertilizers.

### 5. SWOT Analysis

SWOT analysis of custard apple value chain to evaluate strengths, weaknesses, opportunities and threats in the process is shown below.

#### 5.1 Strengths

- Low cost of production
- Low labour cost
- The suitable climate of Southern Rajasthan
- The growing market of the product

#### 5.2 Weakness

- Custard apple production naturally found in a limited area
- Tribal does not undertake its cultivation
- Lack of market information
- Lack of expertise
- Lack of infrastructure/ storage units
- Lack of capital
- Unorganized market channels
- High transportation cost

### 5.3 Opportunities

- Reduction in post-harvest losses
- High product value
- High by-product value
- Longer shelf life
- Well organized structure for storage
- Employment Generation in processing units.

### 5.4 Threats

- Climate change
- Non-availability of funds for setting up processing units in the area
- Inconsistent Government policies
- Lack of competitiveness in the market.

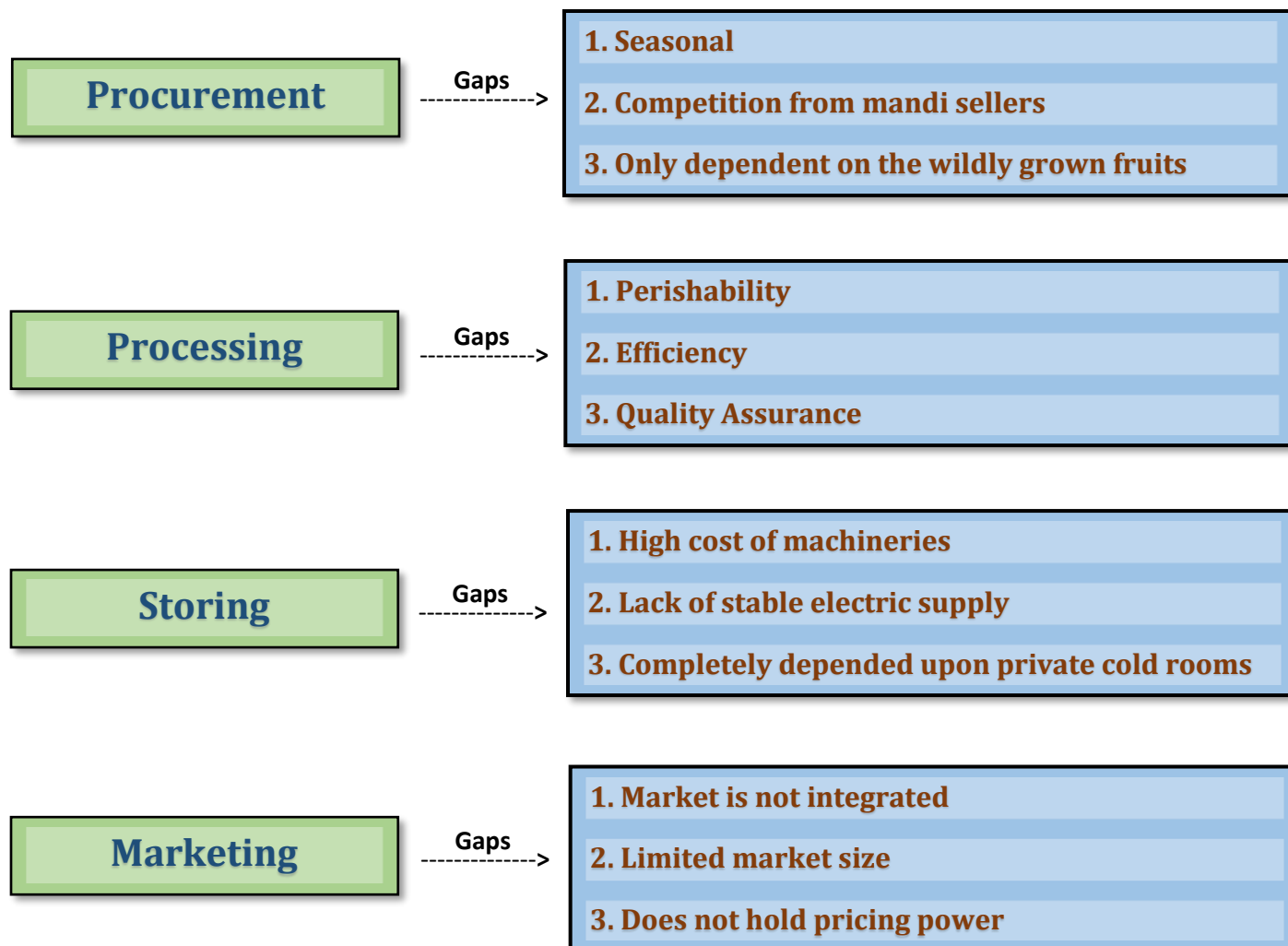
There are various threats and weaknesses as enlisted mentioned above that are hampering the development of the value chain of this precious fruit. Custard apple is the gift of nature to the tribal as it grows wildly without much investment and climatic conditions of the Southern Rajasthan also make it favorable to grow over there.

Therefore, there is a need to focus upon the strengths and opportunities provided by the value chain to uplift the socio-economic status of the tribal of the area. Particularly, interventions and policies must be introduced in such areas where custard apple cultivation is undertaken or the tribal are mainly dependent on its collection from forest areas for their livelihood.



## 6. Gaps in the Value Chain

Gaps are the shortcomings in the value chain. There are multiple gaps identified in each stage discussed below.



## 7. Possible Interventions

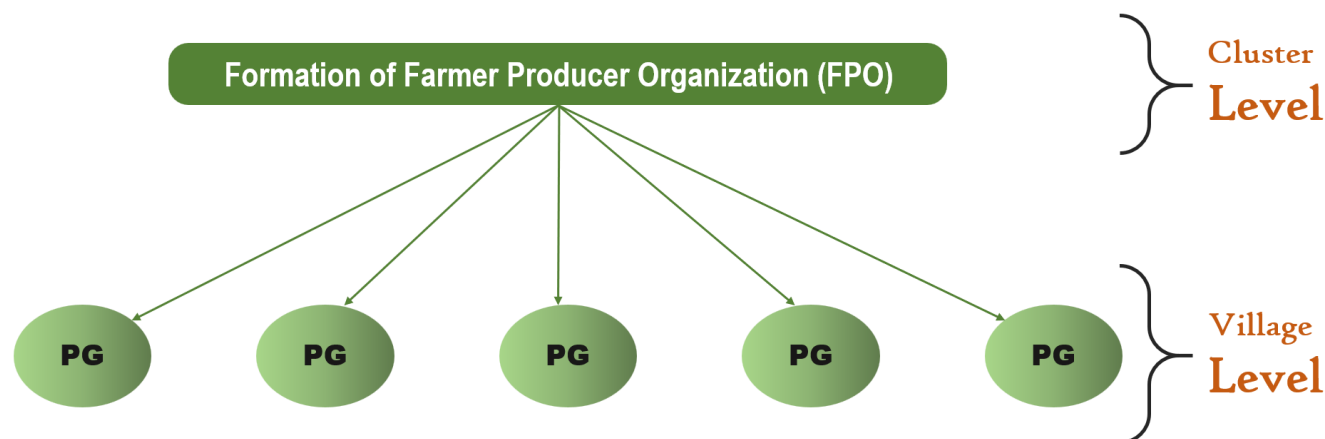


Figure 18: Formation of FPO

### 7.1 Establish New Collection Centers

Usually, all the processing units are heavily dependent upon the resource person for the supply of the fruits. But they are not always reliable suppliers. If there is a huge demand from outside markets, they tend to sell the fruits to them instead of the local processors. Because these outside retailers procure fruits and sell at mandis (Delhi, Jaipur etc.) at a higher price. So that they can afford to pay a higher price to the resource persons for the fruits.

Instead of relying on resource persons, there is a need to locate custard apple hotspots in nearby areas and established collection centers. So that processors can directly procure from resource centers and also tribal can also sell the fruits there at the right market rate.

### 7.2 Efficient Human Resource

Custard apple is a highly perishable fruit. After extracting the seeded pulp from the fruit, it takes only 3 to 4 hours to start to perish. Apart from that, there is always a possibility of entering

unwanted materials (dust, insects) into the operations. That's why skilled human resources are required in the processing units.

Training should be provided to the producer groups about how to do sorting, grading, scooping, deseeding, packing. Also, every year training should be provided on "Good Hygiene Practices" before the state of processing season. This will help the processors to get the efficient human resource, quality of the product will be assured and also tribal women will get employment opportunities.

### 7.3 Credit Financing

To set up a custard apple pulp processing unit and carry out all the operations substantial amount of credit is required. To meet working capital requirements, infrastructure development and other needs FPO need affordable and reliable sources. The lifecycle of an FPO is broadly categorized into three stages and needs are also different in each stage.



*Figure 19: Stages of Financing for FPOs*

At the initial stage, the financial need of the FPOs revolves around the cost of mobilizing farmers, registration cost, cost of operations and management, training, exposure visits etc. Accordingly, the agencies engaged in the promotion of FPOs require grant support to set up FPOs, take them through the various systems and processes, including most importantly governance, for self-management. NABARD has been financing FPOs since 2011 under the Producer Organization Development Fund (PODF). Before the setting up of PODF, NABARD was funding producer collectives under the Umbrella Program for Natural Resources Management (UPNRM).

During the growing stage, through the 'Equity Grant Scheme', SFAC tries to enhance the equity base of the farmer companies and improve their creditworthiness. Getting working capital funding from banks and other financial institutions becomes easier for companies with a larger equity base. The equity grant will match the contribution of members of the farmer company with a cap of ₹10 lakh INR, given in two tranches.

FPCs can get a collateral-free loan of up to ₹1 crore from financial institutions. Under the Credit Guarantee Fund Scheme, SFAC offers a cover of 85% of the loan amount extended by a bank (or other eligible lending institution as decided by the SFAC board), up to a maximum of ₹1 crore. To be eligible for the scheme, the number of individual members in the FPC should not be less than 500. A minimum of 33% of shareholders of the company should be small, marginal and landless tenant farmers.

Funding support aside, SFAC also pays for office/administrative expenses and the CEO's salary of FPCs for three years (from the time of registration of the company).

### 7.4 Marketing Linkages

Rajasthan is known for being one of the popular venues for the destination wedding and almost 70% – 75% of the pulp purchased by the catering services via traders or directly from the processors (less than 10%) to make 'Basundi', which is a popular dessert in the western region of India. Remaining of the pulp is purchased by tertiary processors to make ice creams, milkshakes, chocolates etc.

Traders play an important role to bridge the gap between processors and consumers. But this also leads to minimizing the profitability of the processors and customers also have to pay more for the product.

One probable solution can be direct selling to caterers and tertiary processors like Havmor, Naturals, who have a strong presence in the domestic markets. But for that product quality should be maintained properly. This can lead to maximizing the profitability for all the players in the chain and consumers will also get quality products at the right price.

## 8. Summary of the Value Chain Analysis

#	Particulars	Procurement	Processing	Storing	Marketing
1	Activities	<ul style="list-style-type: none"> <li>✓ Grading</li> <li>✓ Sorting</li> <li>✓ Weighing</li> <li>✓ Transportation</li> </ul>	<ul style="list-style-type: none"> <li>✓ Sorting</li> <li>✓ Scooping</li> <li>✓ Deseeding</li> <li>✓ Packing</li> </ul>	<ul style="list-style-type: none"> <li>✓ Freezing</li> <li>✓ Storing</li> </ul>	<ul style="list-style-type: none"> <li>✓ Sell to the traders</li> <li>✓ Sell to tertiary processors.</li> <li>✓ Direct sell to consumers.</li> </ul>
2	Processes	<ul style="list-style-type: none"> <li>✓ Procure fruits from resource person.</li> <li>✓ Procure fruits from collection centers.</li> <li>✓ Directly buy from tribal.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Sorting, scooping, deseeding, packing by the tribal women working in the processing unit.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Freezing the pulp in hardener at -30°c for 10-12 hours.</li> <li>✓ Storing frozen pulps in freezers at -18°c.</li> <li>✓ Transport pulps to cold storage and store there.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Sell the pulp to traders of the outside market (Surat, Rajkot etc.) in thermocol boxes.</li> <li>✓ Selling of pulp to the consumers of nearby areas in refrigerated vans.</li> </ul>
3	Gaps	<ul style="list-style-type: none"> <li>✓ Seasonal</li> <li>✓ Competition from mandi sellers.</li> <li>✓ Only dependent on the wildy grown fruits.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Perishability</li> <li>✓ Efficiency</li> <li>✓ Quality Assurance</li> </ul>	<ul style="list-style-type: none"> <li>✓ High cost of machinery.</li> <li>✓ Lack of stable electric supply.</li> <li>✓ Completely depended upon private cold rooms.</li> </ul>	<ul style="list-style-type: none"> <li>✓ The market is not integrated.</li> <li>✓ Limited market size.</li> <li>✓ Does not hold pricing power.</li> </ul>
4	Possible Interventions	<ul style="list-style-type: none"> <li>✓ Locate custard apple hotspots in nearby areas and establish collection centers.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Provide training to the producer groups about sorting, scooping, deseeding, and packaging of the pulp.</li> <li>✓ Make them understand the importance of 'good hygiene practices.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Avail credit under 'Equity Grant Scheme' by the SFAC up to 10 lakhs.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Bypassing the traders and directly selling the pulps to the consumers or the tertiary processors.</li> </ul>

Table 7: Summary of Value Chain Analysis



## 9. Appendix

### Appendix 1: Photos



Sorting



Weighing



Fruit Ripening



Scooping



Deseeding



Packaging



Pulping Machine



Freezer



Hardener



Refrigerated Van



Custard Apple Pulp



Custard Apple Seeds



Custard Apple Peel



Basundi



### Appendix 2: References

- <https://www.ceicdata.com/en/india/production-of-horticulture-crops-in-major-states-fruits-custard-apple/production-horticulture-crops-fruits-custard-apple>
- <https://scroll.in/article/873374/in-drought-hit-maharashtra-one-village-has-found-prosperity-in-custard-apples#:~:text=Maharashtra%20leads%20the%20country%20in,Pradesh%2C%20Telangana%20and%20Tamil%20Nadu.>
- <https://www.agrifarming.in/custard-apple-farming>
- <https://www.rajras.in/custard-apple-new-variety-debuts-rajasthan/>
- <https://www.tridge.com/intelligences/custard-apple/import>
- <https://www.healthline.com/nutrition/cherimoya>
- [https://hort.purdue.edu/newcrop/morton/custard\\_apple.html](https://hort.purdue.edu/newcrop/morton/custard_apple.html)
- <http://www.custardapple.com.au/Info-Pages/the-custard-apple.html>
- [https://en.wikipedia.org/wiki/Custard\\_apple](https://en.wikipedia.org/wiki/Custard_apple)

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