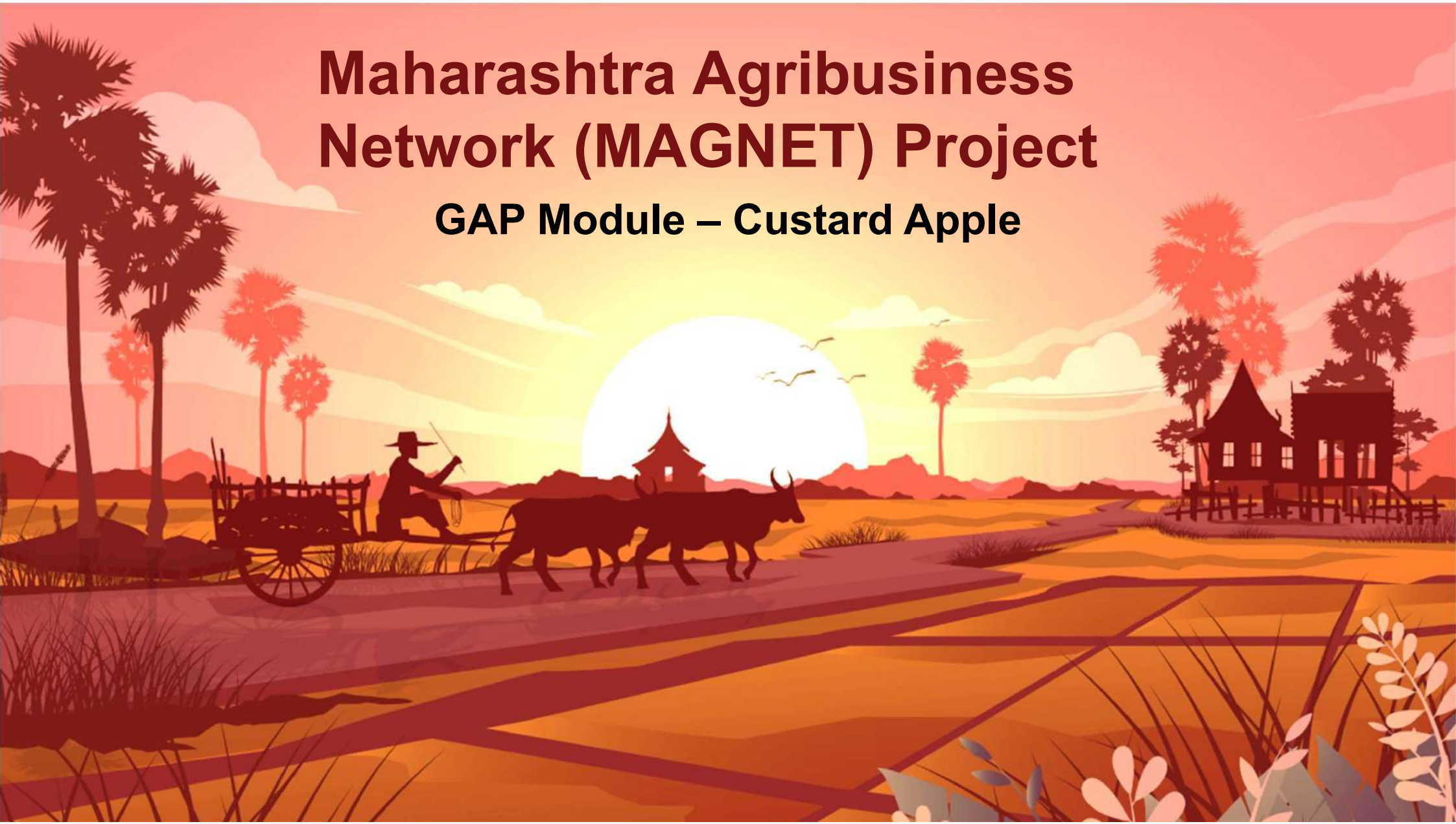
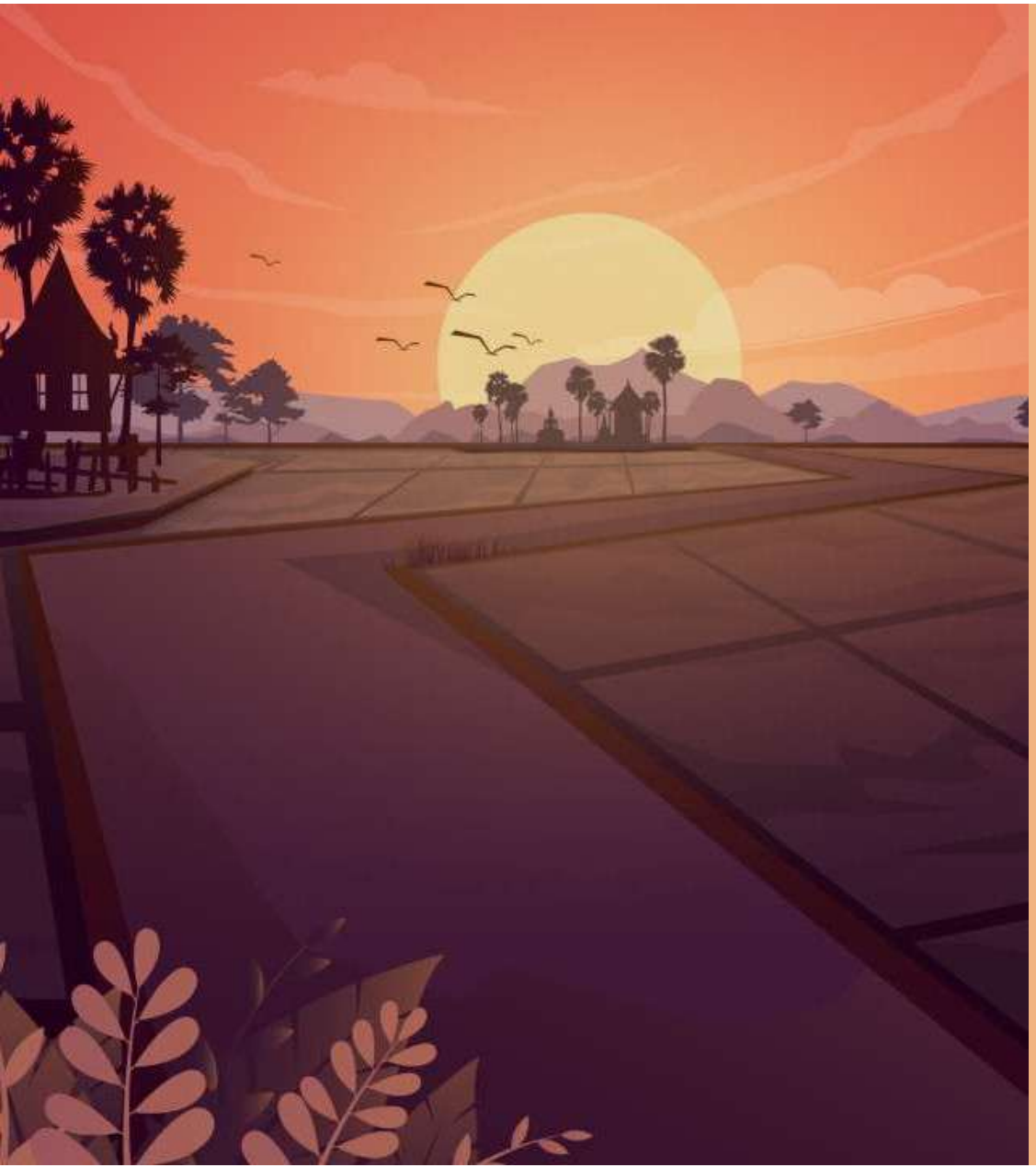
Maharashtra Agribusiness Network (MAGNET) Project

GAP Module – Custard Apple





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Introduction

- The custard apple, (genus Annona), has about 160 species of small trees or shrubs of the family Annonaceae.
- Custard apple (Annona squamosa) or sitaphal is a woody, semi-deciduous tree that grows unattended in the semi-arid zones of several south Indian states.
- Being a hardy fruit tree, custard apple thrives naturally in rocky terrain with shallow, gravelly, well-drained soils. A cross-pollinated crop, it has wide variations in forms and sizes of fruit as well as the colour of the pulp.
- A drought-tolerant crop, it can remain green and healthy even during protracted dry spells.

Family: Annonaceae
Scientific name: Annona reticulata

Maharashtra is the top producer

- Maharashtra leads the country in custard apple production, with 120880 tons, followed by Madhya Pradesh, Gujarat, Chhattisgarh and Andhra Pradesh.
- Together these five states account for over 80% of country's production of 387490 tons.
- In Gujarat it is grown mainly as a boundary crop and grows widely in the forests.

Indian Production of Custard Apple			
Production (000 Tonnes) (2021-22)			
Rank	**State**	**Production**	**Share(%)**
1	**Maharashtra**	**120.88**	**31.20**
2	Madhya Pradesh	86.62	22.35
3	Gujarat	73.50	18.97
4	Chhattisgarh	53.50	13.81
5	Andhra Pradesh	17.51	4.52
6	Telangana	16.13	4.16
7	Karnataka	7.26	1.87
8	Orissa	5.94	1.53
9	Rajasthan	4.60	1.19
10	Tamil Nadu	1.32	0.34
11	Others	0.23	0.06
	All India Total	**387.49**	**100**

Source: NHB/ Agriexchange.apeda.gov.in

Pimpari Dumala – the Custard Apple Village

- Though custard apple is grown widely in this region, the entire village of Pimpari Dumala, about 60 km from Pune, with about 250 households, has taken to growing Custard Apple as a commercial activity.
- The villagers compete among themselves to have a better harvest, while continuing to use organic methods of cultivation.
- In Pimpari Dumala, custard apple is grown using drip irrigation technique. The yield is around 12 tonne per acre, which is close to the national average.
- During the harvest season, each member of the family is engaged in picking, grading and packing the fruit in corrugated boxes, readying it for its journey either to Mumbai or Delhi.
- In 2017, the village produced around 3,000 tons of custard apple, dispatching around 180 tons to Delhi by air, between late September and November, receiving a handsome price of Rs 132 for a kilo.

Farmers of Pimpari Dumala, Tal.Shirur, Dist. Pune, Maharashtra

Varieties

Custard Apple Varieties

- NMK-01 (Golden) is considered the best quality hybrid for cultivation. It has fewer seeds, abundant pulp and rarely cracks when ripe with a long shelf life
- Some of the other varieties that are cultivated in Maharashtra include : Red Sitaphal, Balanagari, Washington and Purandhar.
- ICAR, Indian Institute of Horticultural Research, has developed
  - Arka Neelanchal Vikram – a high yielding hybrid that produces 69 fruits per tree with an average weight of 211 g, with a shelf life of 5.5 days.
  - Arka Sahan yields 12 tons per ha with 410 g weight per fruit, fewer seeds, high pulp yield and 6 days shelf life.

1	**Arka Neelanchal Vikram** A high yielding custard apple variety developed through clonal selection. It has high yield potential (69 fruits/ plant); fruit weight (211g); TSS (23.5◦ Brix), sugar/acid ratio of 53.8 and a long shelf life (5.5 days). It was released by SVRC, Govt. of Odisha in 2016. 
2	**Arka Sahan**  Average fruit weight is 410.0g.High TSS (30.0° B), fewer seeds (9seeds per 100g pulp), high pulp recovery (70.0%) and good shelf life (6 days). On an average, 12 tons of fruits can be harvested /ha. It requires assisted pollination for fruit set.

Balanagari – the preferred variety

- More than 50,000 farmers grow the Custard Apple in Buldhana, Bhandara, Gadchiroli, Solapur, Pune, Aurangabad, and Chandrapur districts.
- Most custard apple growers in the state grow the Balanagari variety, that gets its name from a village in Mahbubnagar district in Telangana.
- “Balanagari is the most preferred variety among custard apple growers due to its aroma and taste,” said Shyam Gattani, president of Maharashtra Sitaphal Growers Association.

NMK – 01 (Golden) variety

- Solapur-based innovative farmer and Chairman of the Pune's Custard Apple Producers Training & Research Board, Navanath Malhari Kaspate, a 11th grade drop out, has introduced the NMK 1 variety, known for its size. The yield, which can be as high as 12 tons per acre. According to researchers at Mohali-based National Agri-Food Biotechnology Institute, NMK-01 (Golden) was found to be superior to the Balanagari in taste and nutrition and importantly the Balanagri had 70+ seeds, the NMK-01 (Golden) barely 15.
- He has developed five other hybrid varieties — Anona-2, NMK-01 (Golden), NMK-02, NMK-03 and Finger Prints. He considers NMK-01 (Golden) to be his best - it has fewer seeds, abundant pulp and rarely cracks when ripe.
- Kaspate's 50 acre farm at Barshi happens to be the country's largest nursery devoted to sitaphal serving as a development and research centre too.

Hiren Kumar Bose in www.betterindia.com (Dec 18, 2019)

Climate

- Custard Apple is tropical in origin and grows well in hot and dry climate and range of temperatures.
- Custard Apple requires hot dry climate during flowering stage (month of May) and high humidity at fruit setting stage (onset of monsoon).
- Low humidity is harmful for pollination and fertilization.
- The plant can withstands drought conditions, cloudy weather and also temperatures lower than 15 C.
- Annual rainfall of 50-80 cm is optimum, though it can thrive in higher rainfall conditions.

Propagation

- Custard Apple crop is commonly propagated by seeds.
- Seeds are treated prior to sowing for 24 hours to hasten germination uniformly.
- In recent days vegetative methods and budding are being developed and adopted for multiplication.
- The seedlings of local custard apple plant has proved to be a good root stock and used in the development of improved varieties and hybrids.

Soil & Land Preparation

- Custard Apple crop is grows in a variety of soil conditions from soils such as shallow, sandy etc but fails to grow in water logged or ill drained soils.
- It can even grow well in deep black soils provided they are well drained.
- A little salinity or acidity in the soil does not affect it much.
- However alkaline soil hamper the vegetative growth and fruiting.

Spacing

- Planting is generally carried out during the rainy season.
- Pits of 60 x 60 x 60 cm are dug at a spacing of 4 x 4 or 5 x 5 or 6 x 6 m depending on soil type.
- The pits that are dug prior to monsoon are filled with good quality FYM, single super phosphate and neem or Karanja cake under dry conditions.
- With drip irrigation system plant spacing of 6 x 4 m gives good growth and better fruit setting.

Inter cropping

- For good plant growth, the weeding should be done to keep away the weeds.
- Intercropping with leguminous plants, peas, beans and meri gold flower are beneficial.
- Normally, no crop is taken during winter as the plants are resting.

Care of young orchard

- Any gap filling has to be done early.
- Any issue of water stagnation during first monsoon showers should be avoided.

Fertilizer/Nutrition

Generally, no manures or fertilizers are applied to rainfed crop. However, for early and bumper harvest with good keeping quality fertilizer/ nutrients are recommended for a fully grown tree as below:

- Biomeal
  - 10 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 setting.
- Foliar spray
  - with 8:12:24:4 10 gm/lit, twice during fruit development.
- Occasionally, zinc or iron or both deficiencies
  - can be taken care of by spraying chelated zinc or Ferrous.

Irrigation

- Custard apple is grown as a rainfed crop, and no irrigation given.
- However, for early and bumper harvest of the crop irrigation is needed.
- Irrigation on flowering i.e. from May should be given till regular monsoon starts.
- For better flowering and fruit setting, 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.

Pests and Diseases

Thought the crop is hardy, it still suffers from the following pests:

- Mealy bug
- Scale insects
- Fruit boring caterpillar
- Leaf spot
- Anthracnose
- Black stone.

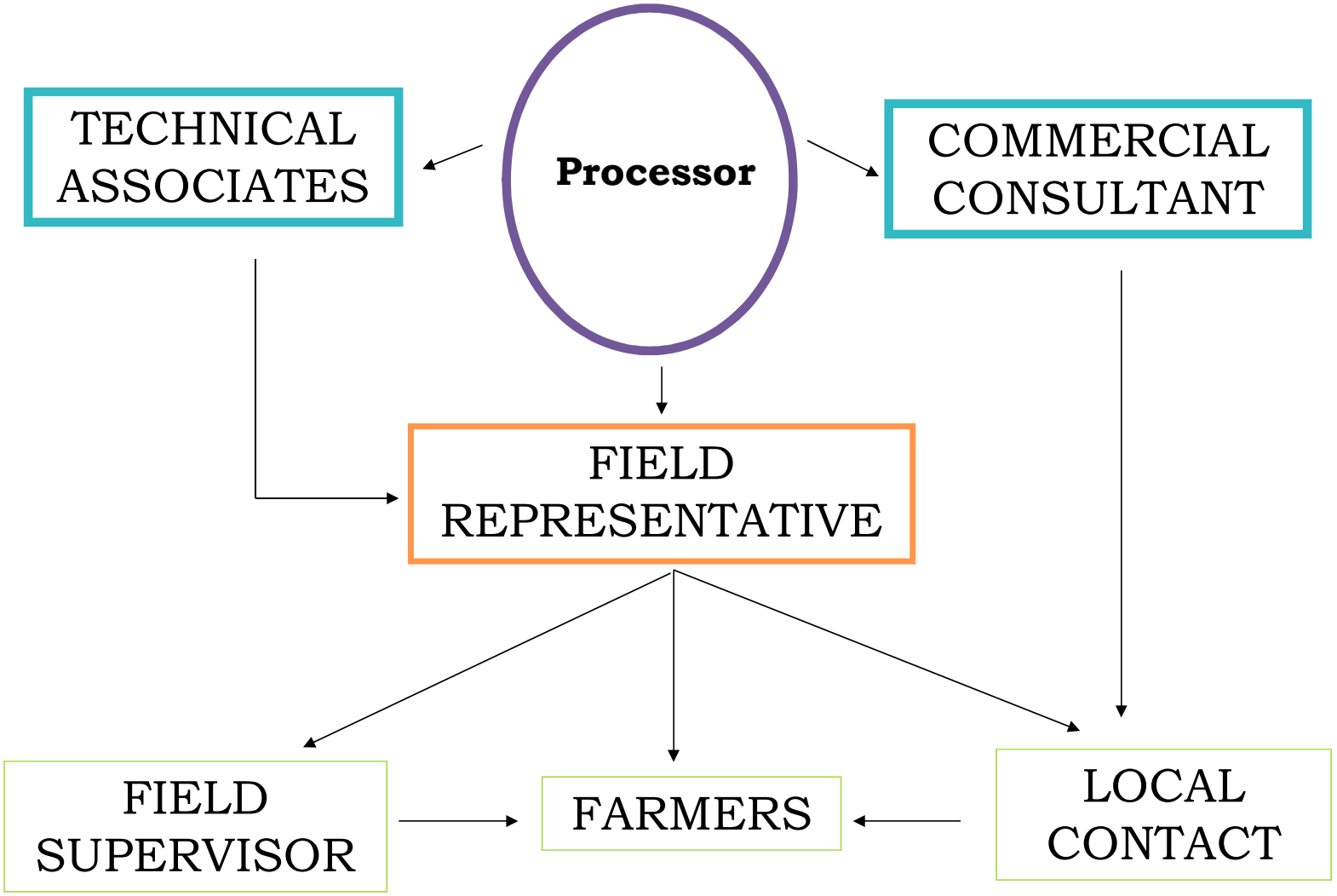
- Spraying with neem oil and some herbal preparations helps in control of many of the above problems.

Special practices

For uniform and early flowering and to check the flower and fruit drop and for enhanced fruit size, the following special horticultural practices are followed.

- Ethryl at 1000 ppm is sprayed a month after harvesting. It helps in defoliation of the deciduous Custard apple plant. This will facilitate uniform resting before the next season.
- Biocil at 1 ml per litre of water sprayed just prior to flowering helps in early and better flowering
- 10 to 20 ppm NAA is sprayed just prior to flowering to reduce the flower and fruit drop.
- 50 ppm GA + 5 ppm + 0.5 ppm cppu, foliar spray improves the fruit size and luster of the fruits

Backward Integration



Qualified agriculturists along with local partners co-ordinate all field activities

Crop Stage-wise Integrated Pest Management

Pre-Planting

- Common cultural practices
  - Carry out timely sowing.
  - Carry out field sanitation, rogueing
  - Destroy the alternate host plants of common pests and diseases
  - Apply manures and fertilizers as per soil test recommendations

Pre-Planting

Nutrients

- Dig pits (50 x 50 x 50cm) during summer season and keep them open (for controlling soil borne pests).
- Fill the pits with a mixture of top soil and farmyard manure in 1:1 ratio a fortnight before planting.

Weeds

- Cultivate the field before planting to destroy existing weeds in the field.
- Summer ploughing is helpful in destroying weeds seeds and rhizomes in the soil.
- Adopt stale seed bed technique

Pre-Planting

- Resting stages of diseases and pests and nematodes
- Cultural control
  - Dig the planting pit during summer season and keep it open for at least one month.
  - Soil solarization
  - Cover the pits with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks before sowing for soil solarization
    - This will help in reducing the soil borne pests.
- Apply neem cake @ 2 kg/pit.

Planting

- Common cultural practices
  - Use healthy, certified and weed free seeds.

- Nutrient
  - Carry out planting in rainy season at a distance of 4m x 4m.
  - Add Trichoderma and Mycorrhiza mixture @ 50 g per pit at the time of planting.
  - Apply 300 g of fertilizers mixture of urea, single super phosphate and muriate of potash in equal proportion in each pit.

Planting

- Weed
  - Remove existing weeds in and around the pits at the time of planting
  - Adopt mulching with organic or biodegradable material.

- Soil borne diseases and nematodes
  - Cultural control
    - Make a trench keeping the distance from the main stem as per the plant canopy width.
    - Apply neem cake @ 2 kg/ plant/pit

Important Natural Enemies of Custard Apple

- Parasitoids

Diachasmimorpha longicaudata

Fopius arisanus

Coccophagus lycimnia

Scutellista cynea

- Predators

Robber fly

Red ant

Ladybird beetle

Spider

Praying mantis

Black drongo

Insect Pests

Nutritional Deficiency Disorders

Zinc

Cause: Insufficient zinc available to the tree. Generally caused by high soil pH or high levels of soil phosphorus.

Identification notes: Affected leaves are yellow-green with green veins, smaller than usual, narrow and slightly distorted.

Treatment: Apply zinc to the ground under the tree. In severe cases, also spray chelated zinc onto the spring flush.

Prevention: Do annual leaf and soil analyses to monitor nutrient levels. Apply zinc to the ground under the trees annually according to leaf and soil analysis results.

Disorders:

1. Stone fruits:

Some fruits instead of attaining full size remain very small and become brown and dry up. These are known as stone fruits which are retained on tree for a long period. Competition among the developing fruits and high temperature are supposed to cause stone fruit formation.

2. Fruit cracking:

This usually happens from a heavy rainfall or irrigation after a prolonged dry spell. Evenly distributed irrigation schedule and constant and uniform moisture level in the soil will reduce this problem.

VIII. COMMON WEEDS

1. Horse purslane: *Trianthema portulacastrum* L. (Aizoaceae)

2.Black nightshade: *Solanum nigrum* L. (Solanaceae)

3. Common cocklebur: *Xanthium strumarium* L. (Asteraceae)

7. Mirid bug

8. *Scymnus coccivora*

9. Big-eyed bug

10. Earwig

11. Ground beetle

12. Pentatomid bug

13. Preying mantis

14. *Geocoris* spp.

15. Oligota spp.

16. *Orius* spp.

17. Hover fly

18. *Cryptolaemus montrouzieri*

19. Black drongo

20. Common mynah

Vegetative stages (1-5 years)

- Common cultural practices
  - Destroy crop debris
  - Avoid water logging
  - Avoid water stress
  - Enhance parasitic activity by avoiding chemical spray, when 1-2 larval parasitoids are observed
  - Custard apple bears flowers on current season growth and very rarely on older branches. The early completion of season is essential for the initiation of new growth. Therefore manual defoliation during the mid-summer is recommended.

Vegetative stages (1-5 years)

- Common mechanical practices
  - Use light trap @ 1/acre and operate between 6 pm and 10 pm
  - Install pheromone traps @ 4-5/acre for monitoring adult moths activity (replace the lures with fresh lures after every 2-3 weeks)
  - Erect bird perches @ 20/acre for encouraging predatory birds such as King crow, common mynah etc.

- Common biological practices
  - Conserve natural enemies through ecological engineering
  - Augmentative release of natural enemies

Vegetative stages (1-5 years)

- Nutrients
- Application of manures & fertilizers (per plant)
  - The bearing trees of Custard apple should be fertilized as follows during 2nd to 5th year

Vegetative stages (1-5 years)

- Nitrogen should be applied in the form of FYM and oil cakes each at 25% and the remaining 50% with chemical fertilizers.
- While P_2O_5 in the form of super phosphate and K_2O in the form of sulphate of potash
- Manures are applied in 2 to 3 equal doses i.e. first dose in December-January, 2nd done in June-July, 3rd dose in September, Potash application can be reduced if the soil is rich in this nutrient.
- Nitrogen containing fertilizers should be applied in three equal splits in January, July and November months; phosphorus containing fertilizers in two splits in January and July months and Potassium containing fertilizers may be applied as singly dose in January.

Vegetative stages (1-5 years)

- Adopt ring method of fertilizer application.
- A mixture of zinc sulphate 0.5%, manganese sulphate 0.2%, boric acid 0.1%, urea 1% and lime 0.4% has to be sprayed two or three times in a year to control chlorosis in leaves.
- Intercrops
  - During pre bearing period short growing crops like groundnut, ragi, bajra wheat, pulses and vegetables (except solanaceous crops) can be profitably grown in the inter spaces.
  - In the bearing orchards green manure crops like sunhemp, green gram, cowpea etc., are raised and incorporated into the soil during the monsoon period.

Vegetative stages (1-5 years)

Weeds

- Timely Interculture and hand weeding should be done with hand tools for initial 5 years.

Mulching

- After weeding and manuring, application of dry-leaf mulch or paddy husk to a thickness of 8 cm in the basin keeps down the weed growth and decreases the number of irrigations, and improves the fruit quality.
- In the initial years of planting, intercrops like groundnut, minor millets, linseed and gram should be grown.

Vegetative stages (1-5 years)

Mealy bug

- Cultural control
  - Collect and destroy the mealy bug infested leaves, twigs and fruits.
  - Flooding of orchard with water in the month of October kill the eggs.
  - Ploughing of orchard in November.
  - Avoid plant stresses - healthy plants are much less susceptible to attack
- Biological control
  - Release Cryptolaemous montrouzieri beetles @ 10/tree or @ 30 larvae/plant twice at 15 days interval.
  - The Coccinellid Menochilus (Chilomenes) sex maculatus (F) is a predator of the nymphs and adults, and the Hymenopterous parasite Anaysis alcocki (Ashm.) Anagyrus dactylopii and Aenasius advena are three parasitoids on mealy bugs.
  - Release of coccinellid Scymnus coccivora @ 10 beetles /tree or @ 30 larvae/plant is a good predator of both nymphs and adults.

Vegetative stages (1-5 years)

Scale insect

- Cultural control
  - Collect and destroy damaged leaves
  - Apply well rotten sheep manure @ 4 t/ acre in two splits or poultry manure in 2 splits
  - Control ants and dust which can give the scale a competitive advantage.
- Biological control
  - Field release of ladybird beetle
  - Spray dormant oil in late winter before spring.
  - Spray horticultural oil, if needed, year round.

Vegetative stages (1-5 years)

- **Anthracnose**
  - Cultural Control
    - Prune dead twigs before flowering, and remove infected fruit and dead leaves regularly.
    - Leaf and soil analysis should be done to maintain adequate nutrient concentration in plants particularly calcium and nitrogen
    - Avoid planting susceptible varieties.

- **Leaf spot(S)**
  - Cultural control
    - Collect and burn the infected plant parts to minimize the spread of the disease.
    - Increase air circulation by proper training and pruning.

Flowering and Fruiting

- **Nutrient**

Bearing trees of Custard apple should be given

N	250 g
P_2O_5	125 g
K_2O	125 g

*per plant before the commencement of rainy season

6th year onwards (per plant) -

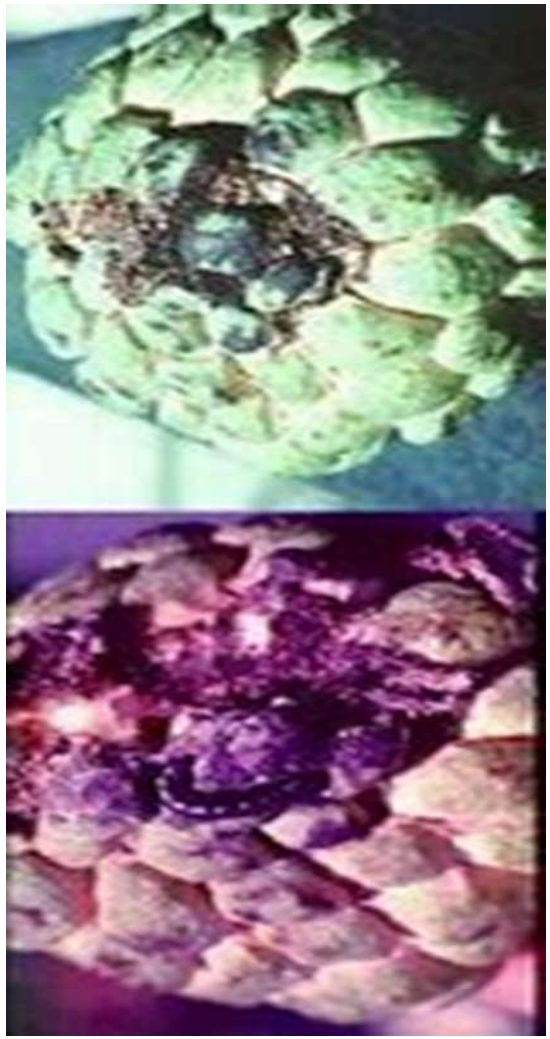
FYM	30 Kg
N	600 g
P	2500 g
K	1200 g

Flowering and Fruiting

- **Weeds**
  - Remove weeds from basins around the trees by hand weeding followed by mulching with organic materials.
  - Control weeds between rows by shallow cultivation and grow the cover crops as mentioned in vegetative stage.

Flowering and Fruiting

- **Fruit borer/ Fruit boring caterpillar**
  - Cultural control
    - Collect and destroy affected fruits.
  - Physical Control
    - Adopt bagging of fruits.
  - Biological control
    - Use of braconid parasitoids (Apanteles spp.) to parasitize larvae



Flowering and Fruiting

- **Fruit fly**
  - Cultural Control
    - Collect fallen infested fruits and destroy them.
    - Provide summer ploughing to expose the pupae.
  - Physical control
    - Immersion of fruits in hot water (45 to 47°C) for 60 minutes to kill eggs and maggots
    - Use 10 traps per acre of methyl eugenol.
  - Biological control
    - Field release of natural enemies Opius compensates and Spalangia Philippines.

Flowering and Fruiting

- **Scale insect**
  - Cultural control
    - Collect infested plant parts and destroy them
    - Apply well rotten sheep manure @ 10 t/ha in two splits or poultry manure in 2 splits
    - Control ants and dust which can give the scale a competitive advantage
  - Biological control
    - Field release of Vadalia and Australian ladybugs
    - Spray dormant oil in late winter before spring.

Flowering and Fruiting

- **Diseases**

  Cultural control

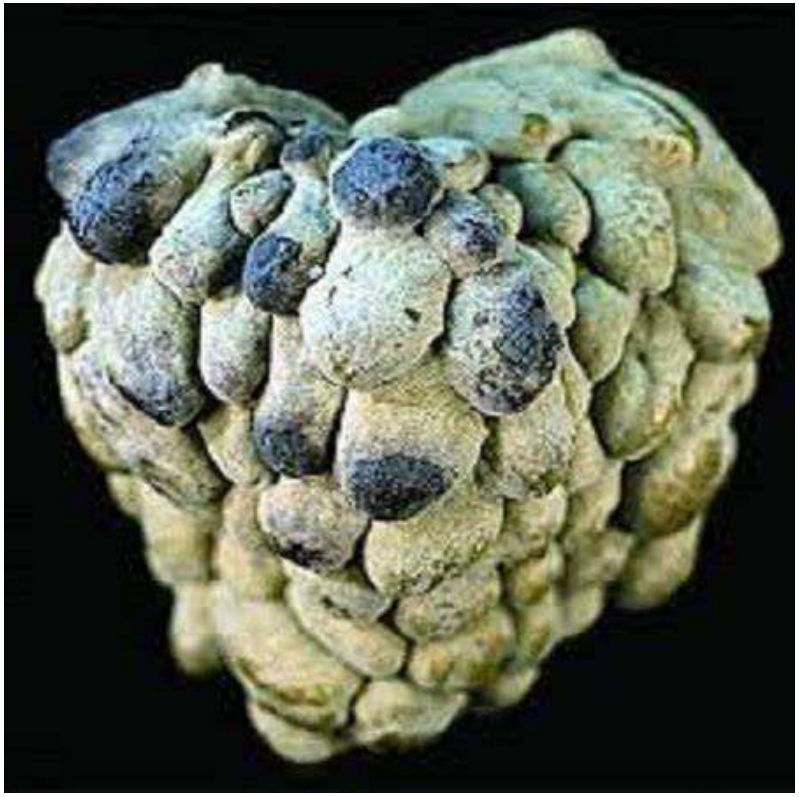
  - Mulch under trees to reduce soil splash
  - Remove dead twigs and mummified fruit each season
  - Prune tree skirts to 50 cm above the ground.
  - Regularly monitor fruit for infection during the season so that spraying can start before fruit diseases get too severe.

Flowering and Fruiting

- **Diplodia rot**

  Cultural control

  - Use mulching under trees to reduce soil splash
  - Remove dead twigs and mummified fruits
  - Maintain proper plant canopy to reduce the high humidity by appropriate pruning and training.
  - Prune trees 50 cm above the ground.



Flowering and Fruiting

- **Black canker**

  Cultural control

  - Use mulching under trees to reduce soil splash
  - Regularly monitor the diseases and remove dead twigs and mummified fruits
  - Follow proper plant canopy by appropriate pruning and training
  - Prune trees 50 cm above the ground.

Flowering and Fruiting

- **Spiral nematode (Helicotylenchus sp.) Stunt nematode (Tylenchorhynchus sp.)**
  - Cultural control
    - Fallow, flooding and deep summer ploughing
    - Timely planting, manuring and irrigation
    - Use cover crops, antagonistic crops, trap crops
    - Follow crop rotation
    - Grow resistant/tolerant varieties
  - Physical control
    - Practice soil solarization
  - Phytosanitary measures
    - Follow International/ Domestic regulatory measures

Post Harvest Management

Key Post harvest practices

- The custard apple fruits are considered to be mature and reach their harvesting point when the skin changes colour and when the segments spread far apart, exposing a creamy yellow skin. At this point they have reached their ‘consumption point’.
- Foam sheet was found to be the best packaging materials for custard apple fruits during transportation for long distance to avoid loss in mass of the fruits, reduction in hardness of the fruits and variation in colour.
- They mature at irregular intervals over a period of 3 months, so that picking every other day or so is obligatory.

Harvesting and yield

- The Custard apple is a climacteric fruit and harvested at the maturity state 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 were grown tree yield above 100 fruits weighing 300 to 400 gm.
- The season of harvest is from August to October.

Production of Quality fruits for exports

Important things to do to

- Produce best quality fruit
- Harvest at ideal moment, depending on the end use
- Cool fast with all means
- Maintain or transport at the lowest possible temperature
- Do not expose to lower than safe temperature
- Proper packing and packaging
- Avoid mechanical/ physical injury
- Reduce ethylene production
- Control diseases

Handling of freshly harvest Custard Apple

Harvested custard apples waiting to be graded

Maturity Indices

- Moment of harvest
  - very important
  - Fruit harvested before attaining physiological maturity will not ripen properly and remain less sweet
  - Fruit harvested late will not sustain handling and will have short life
  - Fruit can ripen after harvest (climacteric)
- Purpose
  - Harvesting according to market - local, far away, export markets, processing etc
  - Primary maturity index of Annona: Changes of skin color from dark green to light green or greenish-yellow
- Other indicators
  - Full size, appearance of cream color between segments on the skin, increased surface smoothness of the separate fruit carpels, initial cracking in carpels

Safety measures

- At the time of harvest
  - Harvest fruits when they have developed full bright color for the variety, but while they are still firm to touch. At this stage, the seeds will be young, white, and tender and the flesh firm and white.
  - As the fruit passes the prime stage for eating and becomes over-mature, the fruit surface becomes dull, the seeds harden and darken, and the flesh becomes spongy.
  - Prompt picking stimulates fruit set and increases yields.
  - Fruits can be snapped from the plant, but less damage usually occurs if they are clipped with a sharp knife or scissors.

Safety measures

- A short piece of stem should be left attached to the fruit.
- Handle the fruit carefully to avoid damage, wipe it to give a clean, bright appearance.
- Staking of plants may be necessary to prevent branches touching the ground later in the season as the number and size of the fruits increase.
- Rain, wind and irrigation can cause the branches to break or droop.
- Avoid fruit touching the ground as it may spoil the fruit.

Grading at farm level

During post-harvest storage

- Fruit must be carefully handled in order to prevent bruising and wounding.
- Harvested fruit must not be exposed to direct sunlight, but should be kept under shade.
- Harvested fruit must be collected in clean and dry plastic crates.
- Defective fruits, i.e., those that are diseased, mechanically damaged and not marketable must be separated out.

Grading at farm level

- Fruits must be cleaned by wiping or brushing.
- They must not be immersed in water as the corky fruit peel can retain moisture.
- Fruits must be transported during the cooler part of the day, in well ventilated plastic crates under clean and dry conditions.
- Wetting of fruit during transportation must be avoided.
- Fruit must be transported as quickly as possible to the final destination, to prevent spoilage.
- Fruit destined for export must be packed in cardboard cartons lined with shredded paper to protect against injury.

Storage

- Ambient conditions.
  - For temporary storage under ambient conditions, fruit must be stored in a cool, dry place with adequate ventilation.
- Cool storage/ Cold Chain
  - The fruits can be transported and stored at 13–15 °C and a relative humidity 85–90%
  - Firm but mature fruits can be kept at 6 C temperature for about a week but such fruits loose aroma and attractiveness and also develop some sipid taste

Complement to Cold Chain: Ethylene Inhibitor

- **Potassium permanganate**
  - Commercially very much used. Ease of use.
  - Very effective in inhibiting the action of ethylene and delay ripening
  - Need to be tried out first by researchers before commercially used for custard apples

- **Smart fresh: 1-methylcyclopropene (1-MCP)**
  - Commercially very much used. Ease of use.
  - Required in very low concentrations, in a closed space
  - Very effective in inhibiting the action of ethylene and delay ripening
  - Need to be tried first by researchers before commercially used for custard apples

Complement to Cold Chain: Ethylene Inhibitor

- Lower oxygen and increase carbon dioxide levels in storage atmosphere
- Ideal:
  - 3-5% oxygen + 5-10% Carbon dioxide
- Longer postharvest life, up to 4 weeks:
  - Delay ripening, firmness retention
- Environment in the storage room or in a package is modified for enhanced storage life
- Less than 1% oxygen or higher than 15% carbon dioxide: harmful

Compliment: Others

- Waxing:
  - Carnauba wax, effective on cherimoya
- Packaging:
  - With polyethylene liners
  - Maintain high humidity atmosphere
  - Develop modified gas atmosphere

Processing and Exports

Products

- Custard apple is valued as a highly nutritive food and a rich source of vitamins and minerals.
- Its great taste and rich aroma is liked by all.
- The fruits are sold as fresh or as seasonal table fruit.
- Some products like custard apple powder, ice-creams etc are prepared from the pulp.
- It also has applications in medicine.
  - Unripe fruits, seeds, leaves and roots are used in medicinal preparations.

Products

Jam	50% custard apple pulp
Toffee	55% custard apple pulp
Milk shake	Buffalo milk & Custard Apple Pulp ratio - 90:10
Ice-cream	15%- Custard apple pulp and 15%- sugar
Low fat ice-cream	15% pulp, 15% sugar, 10% fat in different combination, ascorbic acid 0.3%
Alcoholic beverages	Fruit wine - Alcohol percentage in distillate -8.2%
Fermented beverage	using Saccharomyces cerevisiae (NCIM 3282) yeast

Nutritional data of Custard Apple Fruit Juice

Some possible value added products

1. Frozen pulp
2. RTS beverage and
3. Jelly
4. Jam
5. Toffee
6. Milk Shake
7. Flavoured Yogurt
8. Alcoholic Beverages

Composition	Value
Protein	4.48%
Fat	1.56%,
Crude fibre	7.53%
Carbohydrate	10.52%
Food energy	74.04 Kcal
Invert sugar	161.84
Fructose	167.27 mg/100g
Hydrated maltose	268.13 mg/100g
Vitamins A	16.63 µg/100 g R.E.
Vitamins C	43.38 mg/100 g
Fixed acidity	0.023%
Volatile acidity	0.004%
Total solid	27.25%
Soluble solid	10.00%

Exports of Custard Apple from India

- India exports custard apple to 19 countries and territories.
- The combined value of total export is 0.24 USD million (approx.19.2 crore rupees)

Top countries for Custard Apple export from India (2020-21)	
Country	Value (USD Million)
United Arab Emirates	0.15
Oman	0.04
Kuwait	0.02
Qatar	0.02
Bangladesh	0.01

Custard Apple Export trends from India

Year	Export Value (USD Million)
2009	0.42
2010	0.22
2011	0.36
2012	0.61
2013	0.76
2014	1.15
2015	1.15
2016	1.09
2017	1.06
2018	1.07
2019	1.14
2020	0.24

Exports of Custard Apple from India

Trends in Export of Custard Apple from India	
Year	Value (USD Million)
2009	0.42
2010	0.22
2011	0.36
2012	0.61
2013	0.76
2014	1.15
2015	1.15
2016	1.09
2017	1.06
2018	1.07
2019	1.14
2020	0.24

Top Exporting Hub/ Port in India	
Port	Value (INR Million)
Bombay Air Cargo	8.231
Hyderabad Air Cargo	0.409
Sabarmati Icd	0.007
Jaipur	0.004
Cochin Air Cargo	0.001

Top Exporters

Top Exporter countries	
No	**Country**
1	Canada
2	Thailand
3	Peru
4	Poland
5	Chile
6	United States
7	Mexico
8	Netherlands
9	Serbia
10	Malaysia

Different value addition options

Different value addition options

Important Notice:

The information on performance of recommendations given in this handbook holds good only when used under optimum conditions. Their performance may either change in due course of time due to several factors or can vary under different systems of management. Mishandling/negligence of the user can also result in damage/loss/non reproducibility of results.

The user is advised to contact their nearest KVK and refer to the latest Ad-hoc list for information on banned chemicals and other nationally-issued directives.

महत्वाची सूचना:

या हँडबुकमध्ये दिलेल्या शिफारशींच्या कामगिरीची माहिती इष्टतम परिस्थितीत वापरली जाते तेव्हाच चांगली राहते. त्यांची कार्यक्षमता एकतर अनेक कारणांमुळे योग्य वेळी बदलू शकते किंवा व्यवस्थापनाच्या वेगवेगळ्या प्रणालींमध्ये बदलू शकते. वापरकर्त्याच्या चुकीच्या हाताळणी / निष्काळजीपणामुळे परिणामांचे नुकसान / पुनरुत्पादन न होणे देखील होऊ शकते. वापरकर्त्यास त्यांच्या जवळच्या केव्हीकेशी संपर्क साधण्याचा आणि प्रतिबंधित रसायने आणि इतर राष्ट्रीय-जारी निर्देशांच्या माहितीसाठी नवीनतम तदर्थ यादीचा संदर्भ घेण्याचा सल्ला देण्यात आला आहे.

Thank You

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