Why Grow the Jackfruit Tree?

Jackfruit tree is a multipurpose tree. It is a source of food and nutrition, timber and fire-wood, medicinal extracts, and fodder for livestock. It is a potential source of economic return for rural people.

1. For nutritious food



A ripe fruit

- Pulp of young unripe fruit: cooked as a vegetable, pickled or canned, or frozen and kept at –20°C for up to a year.
- Pulp of ripe fruit: eaten fresh or made into chutney, jam, jelly, candies and paste, or preserved by drying.
- Pulp used to flavour ice cream and beverages, reduced to concentrate or powder, and used for preparing drinks.
- Seeds: eaten boiled, roasted or dried and salted as table nuts, or ground to flour and blended with wheat flour for baking.



Bulbs or fruitlets

2. For traditional medicinal uses

- **Flowers:** crushed and used to stop bleeding in open wounds.
- **Ripe fruit pulp:** acts as a laxative.
- **Rags** (non-edible portion of ripe fruits): used in treatment of dysentery.
- **Seeds:** extract helps digestion, used in treatment of diarrhoea and dysentery.
- **Leaves:**
  - Extract of leaves and latex treats asthma, prevents ringworm infestation, and heals cracking of feet.
  - Tea made with dried and powdered leaves is taken to relieve asthma.
  - Heated leaves can treat wounds, abscesses and ear problems, and relieve pain.
  - Infusion of mature leaves and bark is used to treat diabetes and gallstones.
- **Bark:**
  - Extract from bark aids digestion, and helps treat dysentery and the release of the placenta after calving in cows.
  - Ashes produced by burning bark can cure abscesses and ear problems.

Many parts of the tree are used for medicinal purposes. However these have not been clinically tested and a medical practitioner must be consulted.

3. Ecological and environmental value

- Provides perennial cover, reducing the impact of raindrops and providing shade.
- Serves as a wind break, such as in a homestead situation.

BENEFITS

1a

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4. For income

- Bears fruit every year and provides a steady source of income.
- Young fruits can be sold as vegetables, bringing early income before the peak fruiting season.
- Ripe fruits can be sold locally, and processed fruits may be transported and sold in urban areas or to supermarkets of developed countries.
- Additional income comes from growing other crops between trees.
- Timber can be sold.



5. Fuel and timber

- Timber is a medium hardwood, termite proof and shows some resistance to fungal and bacterial decay.
- Timber is used for furniture, oars, implements and musical instruments, as well as for construction.
- Large roots are good for carving and picture framing.
- Branches and leaves are used as firewood.



6. Cultural value

- Chips of heartwood when boiled yield yellow dye, used to colour the robes of Buddhist priests.
- The people of Hindu communities use leaves to decorate temples and other places of worship.

7. Land-use systems

Jackfruit trees may take 15–18 years to come to full bearing stage, so inter-cropping between trees provides an earlier income.

- Space between rows may be planted with short duration pulses, spices and vegetables, if water is not limited.
- Supports for black pepper (*Piper nigrum*) vines.
- Shade trees in pineapple and coffee plantations.
- Plant in coconut and durian plantations.
- Plant on property boundaries.

8. More uses

- Latex, which flows from all parts of the plant when cut, can be used as adhesive.
- Resin in the latex can be used in varnishes.
- Green leaves: fodder for cattle and other livestock.

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How to Grow the Jackfruit Tree

1. Collecting planting materials

The criteria for selection of a jackfruit mother tree for seed or scion should be as follows:

- Mature tree in fruit-bearing stage.
- Exuberant growth with strong trunk and good crown.
- History of abundant fruit bearing every year.
- Fruit shape is uniform and attractive, and quality excellent.
- No sign of insect pest infestation or incidence of diseases.



2. Merits and demerits of seed propagation

Merits:

- It is simple and easy to reproduce young plants.
- The tree has a strong taproot; this facilitates good anchorage, and greater resistance to drought and high wind.
- The tree grows taller and thus produces a higher trunk, which yields valuable timber.

Demerits:

- Fruit quality of the mother tree may not be retained in the fruits of the new trees.
- The seedling trees take a longer time to reach the fruit-bearing stage.
- The tree grows taller, which is more difficult for its management and fruit harvesting.

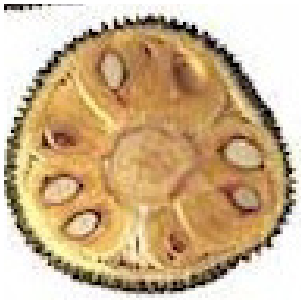
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How to Grow the Jackfruit Tree
- Growing Seedlings and Young Trees -

Jackfruit is often propagated by seed.

- It is best to plant freshly extracted seed quickly, since it germinates better when fresh. Generally 80–100% germination is expected with fresh seeds.
- Germination falls to 40% in four weeks.

1. Seed collection



- Collect fully matured fruit from the selected mother tree.
- When the fruits are fully ripe, break them open and take out the edible pulp containing the seeds.
- Separate the seed from the pulp.

2. Seed treatment

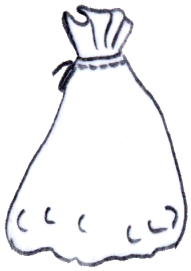
- Immediately after extraction, wash the seeds in clean water to remove the slime coating.
- Seeds may be planted immediately or stored for one or two days in a closed polythene bag to prevent drying.
- Germination is improved by soaking seeds in clean water for 24 hours.
- If longer storage is necessary, keep in airtight containers at ambient temperature. The seeds remain viable for 7 weeks in this condition.



Soak seeds



Airtight bottle



Polythene bag

SEEDS

2b

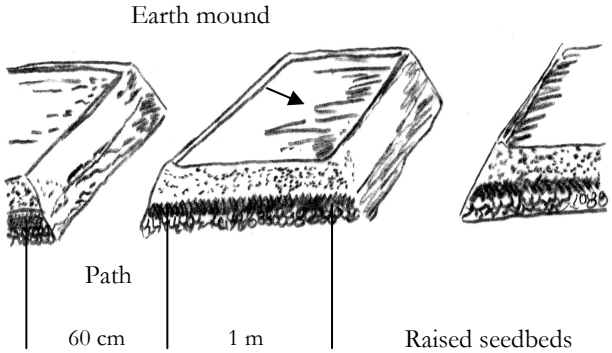
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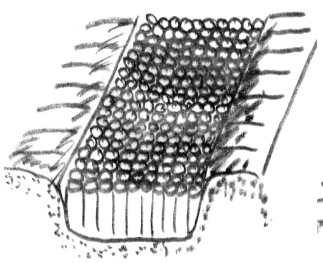
How to Grow the Jackfruit Tree
- Growing Seedlings and Young Trees -

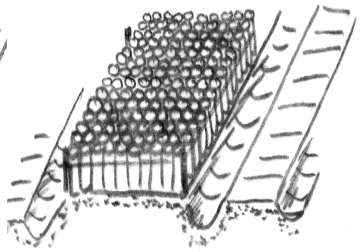
The nursery area should be in an open space near a source of water.
The nursery needs a fence around it and shade in which to prepare seeds and plants.

1. Setting up seedbeds and pot- beds

- **Seedbeds:** prepare seedbeds/nursery beds 1 m wide and 3–5 m long, raised 10–20 cm high. Leave 30–60 cm walking space between beds.

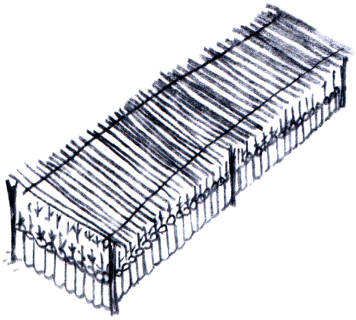



Sunken potbeds


Raised potbeds

- **Potbeds** for setting up the plant pots.
- Level with the ground, sunken, or raised in areas of waterlogging.

- **Shade:** build a frame over beds with bamboo or wood, and use shading net or fronds for the roof,
- Allow about 1/3 sunlight to pass through.


Pots under shade-net

2. Preparation of potting mixture and potting

- Mix one part top soil, one part sand and one part well-rotted farmyard manure (FYM) or compost. This allows good aeration and drainage.
- River sand can be used. Sand from sea beaches, may contain a high level of salt, which must be washed out first by leaving in the rain.
- Pots should have a hole underneath and polythene bags should have several holes at the sides, for proper drainage.
- Fill pots or polythene bags with potting mixture leaving top 2–3 cm empty.

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How to Grow the Jackfruit Tree

YOUNG TREES

2. Planting and germination

Seeds can be planted directly in the field or in the nursery to raise seedlings.

Nursery planting: plants seeds in well prepared seedbeds, pots or polythene bags.

- ☞ Plant 2–3 cm deep into the soil and press lightly.
- ☞ Keep soil moist but not saturated.

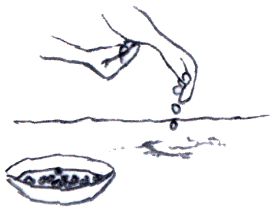


Sowing depth

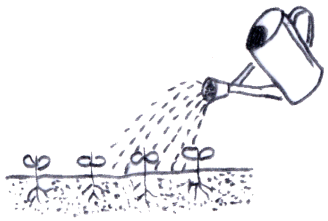
When watering, make sure that the upper rim of the polythene bag is not folded towards the plant, leading to pools of water.

Planting seeds directly in the field: generally practised in homestead plantation.

- ☞ Prepare pits of 1 x 1 x 1 m about 2–4 weeks before planting.
- ☞ Mix the pit soil thoroughly with 10–20 kg well-rotted organic matter.
- ☞ Fertilizers, particularly Triple Super Phosphate (500 g) and Mauriate of Potash (250 g), can be used in the top 10 cm soil of each pit.
- ☞ Plant 2–3 seeds at the centre of each pit, 20–30 cm apart and 2–3 cm deep.
- ☞ Press soil lightly, water, and then cover with mulch.
- ☞ Water pits regularly so soil is moist but not saturated e.g. every 2–3 days.
- ☞ Put a fence around the area or each pit to protect seeds and seedlings from stray animals.
- ☞ With good moisture and temperature, germination may start at or around 15 days after planting and be completed in 25 days.



2 to 3 seeds/hole



First weeks after germination

Waterlogging may cause rotting of seeds and emerging seedlings.

Young plants must be kept free from weeds.



Remove all plants after emergence except for one.

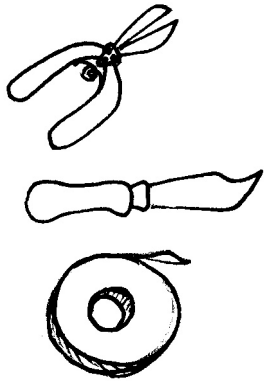
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How to Grow the Jackfruit Tree
- Vegetative Propagation -

Vegetative propagation is not common in jackfruit. However, new cultivars are becoming popular to reproduce true to type. Vegetative propagation may be by root or shoot cutting, air-layering, grafting or micro-propagation. Grafting is most commonly practised.

1. Grafting

- Veneer and epicotyl grafting are commonly practised in jackfruit.
- Grafting involves collection of a terminal shoot, called a scion, from a selected mother tree and grafting it on to a seedling plant, called a rootstock.
- Once the union is successful, fresh growth starts in the scion portion.
- The equipment required for grafting are:
  - Secateurs.
  - Clean sharp knife.
  - Polythene film 1.5–2.0 cm wide and 30–40 cm long.



2. Merits and demerits of vegetative propagation

Merits:

- Quality of fruits of mother trees is retained in the fruits of the new trees.
- Fruit-bearing stage is reached earlier than in seedling trees.
- Grafted trees are relatively shorter than seedling trees, making tree management and harvesting of fruits easier.

Demerits:

- Grafted trees are often shallow rooted.
- Trees tend to be dwarf and grow branches from ground level, which reduces timber quality.

3. Collecting material

- Scion should be mature and dormant with a plump unopened terminal bud.
- Collect a scion 5–15 cm long and 1 cm in diameter, with several buds, from a selected mother tree.
- Cut leaves with a sharp knife, retaining the petiole.
- Put scions in a closed polythene bag with clean water to prevent drying out.
- Choose a rootstock: 9–15 months old and 1 cm diameter seedling.

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How to Grow the Jackfruit Tree
- Veneer Grafting -

PROPAGATION

1. Rootstock preparation

- Clean the stem of soil.
- Make a 6–8 cm shallow downward cut, slanting inward to 1/4 of the stem diameter to the point of active growth, or where the bark separates easily from the wood.
- Make a second downward slanting cut at the base of the first to remove a piece of wood.



Rootstock with a slanting cut.

2. Scion preparation

- With one stroke of the knife, make a long shallow cut at the base of the scion, to match the rootstock.
- Make a short slanting cut on the opposite side of the scion.
- The scion should fit tightly into the notch on the rootstock.



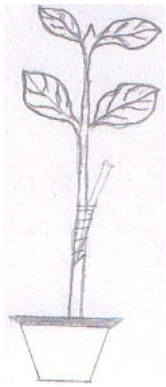
Scion

3. Graft

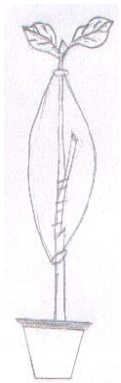
- Tie the graft tightly with polyfilm; ensure cut surfaces are covered to prevent drying.
- Cover the cut portion including the scion by polythene tube/poly cap. Place the grafted rootstock under shade.



Cut surfaces brought together.



Cut surfaces tied with a polyfilm.



Cut surfaces including scion covered with a polycap.

- Remove excess water from inside the poly cap every alternate day by opening the lower end of the cap.
- The union is successful when new growth starts on the scion part, in 3–5 weeks. Remove any growth from the rootstock part as it appears.
- Remove the polycap and cut off the top of the rootstock above the graft union.
- When the leaves are green, transfer to an open space in the nursery bed and water.
- After a month remove the polyfilm used in tying the graft union.
- Keep grafts in the nursery for a year, then sell or plant in the field.

4b

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How to Grow the Jackfruit Tree
- Epicotyl Grafting -

This method is also known as **stone grafting** or **soft wood grafting**.
In this method a seedling rootstock is uprooted, to facilitate grafting.

1. Rootstock preparation

- Carefully uproot a 10–15 day old plant without any fully opened leaves, with its seed.
- Cut the top off 5–6 cm above soil level.
- Cut down vertically through the middle of the rootstock to a depth of 1.5–2.5 cm.

2. Scion preparation

- Make slanting cuts 1.5–2.5 cm long on both sides of a scion at its lower end.
- Insert the scion into the vertical cut of the rootstock and tie them together with a piece of polythene film 1.5–2.0 cm wide and 10 cm long .
- Put a polythene tube over the scion and the rootstock.


Topped root-stock with vertical cut


Scion with slanting cuts


Scion inserted into rootstock


Scion and root-stock tied together


Graft with a polycap replanted

- Replant the grafted plant in the same or a similar polythene bag, place under partial shade, and water regularly.
- It may take 2–3 weeks for successful union of the scion with the rootstock, when dormant buds on the scion will sprout and the polythene tube can be removed.
- When the leaves are green, replant the grafts, first in a bigger container of 25 x 20 cm size and then transfer to an open nursery bed.
- Keep the successful grafts in the nursery for a year, until sold or planted in the field.

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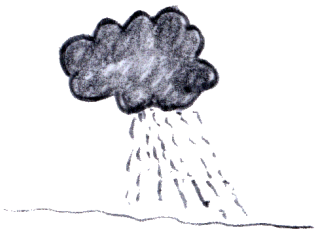
Where to Grow the Jackfruit Tree
- Field Establishment -

ESTABLISHMENT

1. Site characteristics

- Sea level to 1500 m elevation.
- Wide range of soils except in saline and waterlogged conditions.
- Open space in full sun.

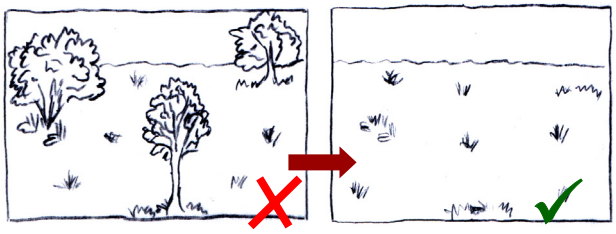
2. Season and time of transplanting



Rainy season

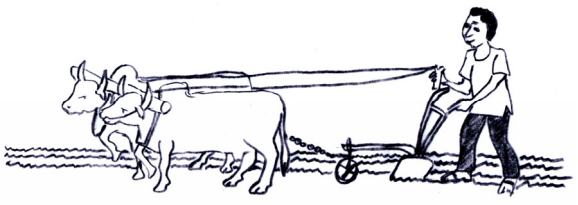
- Transplant grafts or seedlings at the beginning of the rainy season, when adequate water ensures field establishment.
- If irrigation is available, direct seeding may be done in early summer to establish seedlings before rainy season starts.
- Transplant in late afternoon to early evening to minimize water loss during the day.

3. Site preparation



Clearing the planting site

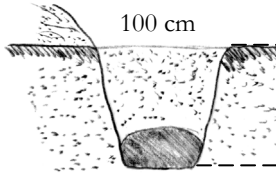
- Clear all weeds surrounding the planting pits, if transplanting a few trees at the homestead or on hill slopes.
- If planting a large number of trees either by direct seeding or transplanting, the entire area may be ploughed and leveled if tools are available.
- This practice controls weeds, breaks up hard soil, and allows aeration.
- On slopes; slash weeds at ground level.



Ploughing to 20–30 cm depth

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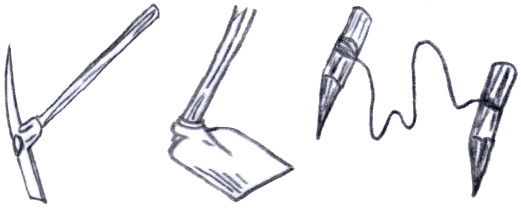
How to Grow the Jackfruit Tree
- Field Establishment -



Planting hole
(1 meter cube)

4. Layout and digging planting pits

- Spacing: 12 x 12 m apart in fertile soil with other crops or 10 x 10 m in the homestead for seedlings, and 8 x 8 m apart for grafted trees.
- Layout field arrangement using a planting board or peg and string to mark out the site.
- Dig planting pits 4 weeks before planting.


Pickaxe and hoe Pegs

5. Transplanting



- Transfer planting stock when 1–2 years old.
- Water plants thoroughly before taking them to the field.
- Handle plants carefully while moving them to the planting site.
- Remove polythene bags completely before planting.
- Plant in the centre of the pits with the root collar at ground level or at the same level as it was in the nursery. Fill in with soil mixed with organic matter at 20 kg per pit.
- Press the soil firmly around the base of the plant and flatten the soil.



- Tie the plant to a stake to support the plant.
- Water soon after planting.
- The stake may be removed after a year when the tree is established.
- Put fencing around the entire plantation area or around individual plants during first 3–4 years to protect them from stray animals.



ESTABLISHMENT

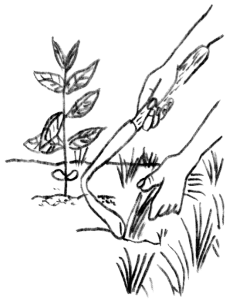
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How to Grow the Jackfruit Tree
- Field Management -

MANAGEMENT

1. Weeding and mulching

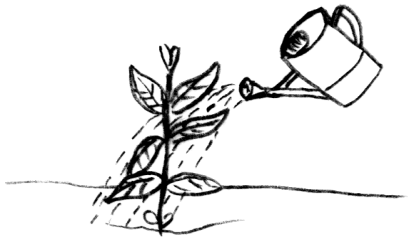


- Keep young trees weed free at least for the first 3–4 years.
- You may plough and harrow the spaces between the trees, at the beginning and end of the rainy season if tools are available.
- Apply mulch around the trees.

2. Watering

Extra watering is not normally needed, except:

- Water newly planted trees during dry periods for 3–4 years or until the plants are growing strongly.
- For mature trees, watering is recommended through dry periods during bloom and fruit development.
- Build a low ring of soil around the tree to retain water around the roots.



3. Pruning and training

- In grafted trees, prune the lower branches to obtain a longer trunk.
- Prune weak, dead and diseased branches and remove parasitic plants, generally at the end of rainy season.
- Remove the inner branches of the canopy to allow in light and air, to minimize pest and disease attack.



Grafted tree without pruning



Grafted tree pruned and trained to have longer trunk

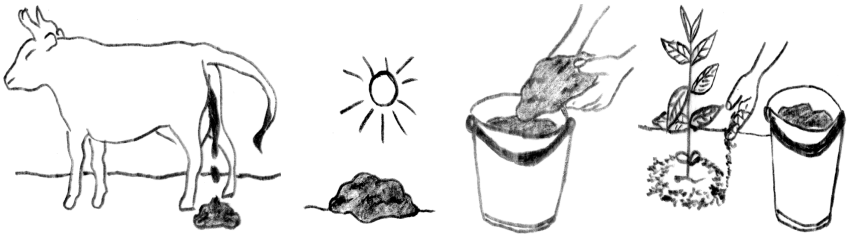
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How to Grow the Jackfruit Tree

4. Manure and fertilizer application

Generally no fertilizer is needed except farmyard manure (FYM). However, they need nutrition for regular and good fruit bearing.

See page 14 in Part 1.

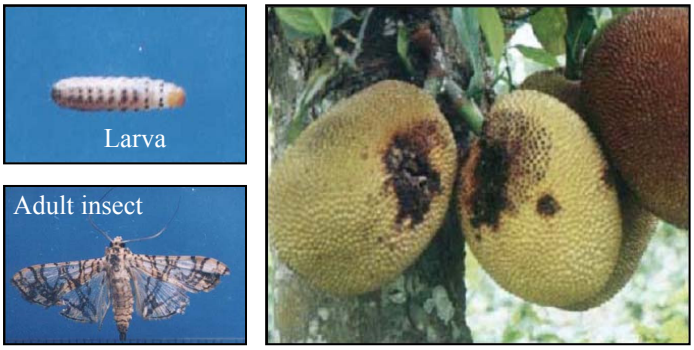


Cow manure is dried in the sun and added to the soil around the tree.

5. Insect pests

Shoot and fruit borer (*Diaphania caesalis*), and **bud weevil** (*Ochyromera artocarpi*) are the two major pests of jackfruit.

- To prevent egg-laying of **shoot and fruit borer**, cover fruits with polythene bags and remove and destroy all affected parts.
- Spraying of carbaryl @ 4 g/l of water during flowering may be necessary.
- To control **bud weevil** remove all infested shoots, flower buds and fruits.



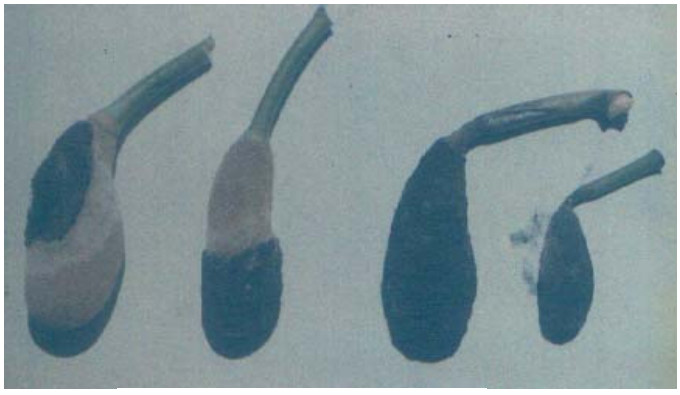
Shoot and fruit borer insect and fruit damage

Consult an extension officer before spraying.

6. Diseases

Blossom rot or **fruit rot** or **stem rot** caused by a fungus, *Rhizopus artocarpi*, is a serious disease, which may cause 15–32% crop loss.

- Collect and destroy all fallen leaves and fruits under the tree.



Stages of fruit rot

MANAGEMENT

7a

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Harvesting

1. Harvesting time

- Harvest tender fruits for use as vegetables 2–3 months after fruit set or until seeds are hardened.
- Harvest ripe fruits 3–8 months after flowering.

Flowering and harvesting time of jackfruit trees in South Asia.

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Flowering and fruit set				Harvesting fruits at full maturity							

2. Fruit maturity



Tests for fruit maturity:

- Hollow sound when tapped.
- Spines and skins become flattened and wider.
- Colour of fruit becomes pale.
- Develops a strong aroma.

3. Fruit collection



- Harvest in the morning.
- Cut off part of the footstalk and lower carefully by rope.
- Harvest with a portion of the stalk attached, for use in handling.
- The cut stalk will exude latex, which stains clothing.
- Transfer to a well-ventilated shed or under shade.

4. Yield

- Yield varies greatly e.g. 2 to 27 t/ha, on average 10 t/ha in Asia.
- 50–250 fruits per plant for example in parts of India.

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Post-harvest Handling and Processing

Latex may exude from the cut surfaces when extracting the flesh. Coat hands, knives and work surfaces with vegetable oil to make clean-up easier.

1. Post-harvest handling

Remove immature, over-ripe, damaged and misshapen fruits.

- ☞ Grade remaining fruits according in size:
  - Large: 16 kg and above
  - Medium: 8 kg to 16 kg
  - Small: less than 8 kg



- ☞ Wash fruits using chlorinated water (100 ppm) if available, to sterilize the skin.
- ☞ Drain fruits to remove excess moisture.

2. Processing



- ☞ Cut fruits in half lengthwise.
- ☞ Carve out the sticky central core.
- ☞ Scoop out the individual fruitlets (bulbs).
- ☞ Sort bulbs according to size, maturity and colour.
- ☞ Cut the end of the bulbs to remove the seeds
- ☞ Pack bulbs for storage or direct consumption.

Keep only full bulbs (not half or partly cut) for retailing.
Bulbs may be packed with or without seed.

3. Storage

Pack fruits in bulk into plastic containers or bamboo baskets for storage.

- ☞ At 25–35°C, freshly harvested ripe fruits can be stored for 4–5 days.
- ☞ At 11–13°C and relative humidity of 85–95%, fruits can be kept for 2–6 weeks, depending on cultivar and maturity stage.
- ☞ Below 12°C, fruits show chilling injury: dark-brown skin, pulp browning, poor flavour and higher risk of decay.

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Marketing and Economics

MARKETING and ECONOMICS

1. Marketing potential

- ☞ Sell fruits:
  - Along roadsides
  - Local markets
  - Urban markets
- ☞ Sell the fruits directly to consumers or to traders.
- ☞ Process the fruit and sell the products for higher prices.

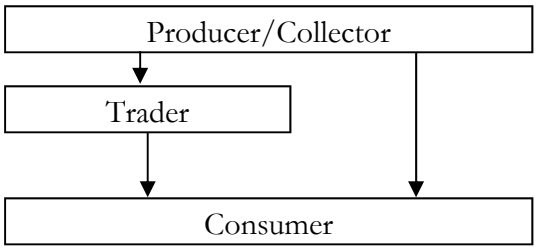


Selling at market

Products sold in local and regional markets are: pulp, juice, jam, chutney, pickles, sauce, paste, candy, leather and dried fruits.



Products



2. Economics

Yearly production per tree: 250 fruits

Price per tree: US$ 8–20

Turnover per hectare: US$ 1500*

Cost of establishment (in Indian Rs.) of jackfruit plantation in India per hectare

Item	Quantity	Rate	Amount
Planting materials	100*	20/plant	2000
FYM applied in pits (kg)	1000	0.3 kg	300
Labour cost	-	-	400
Total			**IRs. 2700 (US$ 54)**

* Based on 100 plants per hectare, spacing 10 X 10 m

Attention:
You must deduct the costs for harvesting and transport of fruits to the market to be able to calculate the profit of your crop!

8b

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