

**Package of Practice**

# **Kiwi Cultivation**



**ADVANCING**  
**NORTH EAST**

**An Initiative of North Eastern Council (NEC)**

Implemented by North Eastern Development Finance Corporation Limited (NEDFi)

**Kiwi**  
*Actinidia deliciosa*  
**Actinidiace**



Kiwifruit is a high value cash crop. Kiwi fruit has refreshing and delicate flavor, pleasing aroma and high nutritive and medicinal value. It is rich in Vitamin-C and contain more of potassium, phosphorus and iron and low in calories. Kiwi is known as “China’s miracle fruit” and “Horticulture wonder of New Zealand”. A large number of processed products such as jam, jelly, candy, squash and wine are prepared from kiwifruit.

**Climate and Soil:** Kiwifruit is very hardy deciduous vine can withstand a wide range of climatic conditions. For high yield and quality fruits, it requires 700-800 chilling hours below 7<sup>0</sup>C. A soil pH 5.5 to 6.5 is considered ideal for vine growth and fruit production. Deep well drained, sandy-loam soil with good amount of organic matter is ideal for its cultivation. Kiwi can be successfully grown at 800-1500 above mean sea level and a rainfall of about 150cm/year.

**Varieties:**

Abbott, Allison, Bruno, Hayward, Monty, Tomuri, Matua

**Propagation:**

- Kiwifruit is commercially propagated through cuttings, grafting and budding and tissue culture. Nursery management practices like weeding, irrigation, staking of grafted plants are done at regular intervals.

**Planting:**

- Land having gentle slope is ideal for planting of kiwifruit. Planting is done at a spacing of 6 m from plant to plant and 4 m from row to row in varieties like Allison, Abbott and Monty trained on T- bar Trellis system. Hayward is less vigorous and is planted at a spacing of 5m x 5m. In pergola system of training, a spacing of 6m x 6m is recommended for getting better fruit production.
- Planting is done during dormant season (December to January).
- One male plant is planted for every 9 pistillate plants.

**Training:**

- T-bar trellis and pergola systems are more popular training structures used for training a kiwi vine.

**Pruning:**

- The vine pruning is carried out in such a way that the fruiting areas are available every year requiring the wood to be young. This is achieved by 3-4 years lateral replacement system. In dormant pruning, the fruiting lateral is cut back to 2 vegetative buds beyond the last fruit. In the second year, these vegetative buds produce the fruiting shoots, which are pruned again. The arm on lateral shoots

are pruned and allowed to fruit for 3-4 years. In summer pruning shoot is cut beyond 6-8 buds from the last fruit during June-July.

**Pollination:** The Kiwifruit crop is highly dependent on pollination as the plants are functionally dioecious. For effective pollination, one male plant is planted for every 9 pistil late plants. Honeybees colonies about 8-9 per hectare are required in kiwifruit orchard for effective pollination.

#### **Manures and Fertilizers:**

- Generally, a basal dose of 20 Kg FYM along with 0.5 Kg of NPK fertilizers mixture containing 15 per cent N be applied each year of age.
- For fully bearing vines (8 years and above) 60-80 kg FYM, 800g N, 560g P<sub>2</sub>O<sub>5</sub> and 1200 g K<sub>2</sub>O/vine is applied every year per vine.

**Intercropping:** During the initial two years, intercrops like strawberry, peas, beans, cowpeas and vegetable crops like tomato, ginger etc. can also be grown in the vacant area between the trees.

**Mulching:** Clean cultivation with mulching of the tree basin area with 15 cm thick hay grass or black polythene mulch is recommended for kiwifruit orchards.

**Weed management:** The natural weed cover provides good and helps conserve soil and organic matter. The sod or the natural weed cover should be regularly mowed and can be used as a mulch (10cm thick) during summer.

#### **Water Management:**

- Kiwi fully grown vines require 80-100L of water for total daily transpiration from 16-17 m<sup>2</sup> canopy area during summer.
- Young vine should be irrigated at 2-3 days intervals, while bearing vines are to be irrigated at 20% depletion of soil moisture from field capacity (5-6 days intervals) during summer to get better size fruits.
- Drip irrigation at 100% gives higher yield of quality fruits.

#### **Harvesting and Yield:**

- Kiwi fruits having 6.2% TSS are ideal for harvesting.
- Kiwi fruits can be harvested from October to December.
- Kiwi vine starts bearing at the age of 4-5 years while the commercial production starts at the age of 7-8 years.
- On an average, kiwi yield varies from 50-100 kg fruits/vine. Vines on trellis produce about 15-25tonnes / ha after 7 years.

#### **Post-Harvest Management:**

- Kiwi fruits can be stored at ambient temperature for 6-7 weeks, but for good commercial storage refrigeration is necessary. It can be stored for 4-6 months in cold storage at -0.6<sup>0</sup> to 0°C and 90% relative humidity.
- Fruits are graded on the basis of their weight. Fruits weighing 70 g. and above are graded as 'A'-grade fruits and between 40-70 g. as 'B' grade fruits.

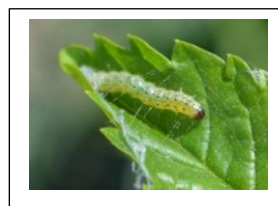
- Polythene liners in storage cases are very effective in maintaining high humidity and can be used to maintain kiwi fruits in good condition for a longer period.

### Plant Protection Measures:

#### Insect Pests:

**Brown headed leaf roller /Green headed leaf roller:** They web together leaf edges or leaves and fruit to form a shelter to live in often rolling the leaves into a tube. The caterpillars eat leaves and fruit'

Control: Follow proper training and pruning in the vineyards. • Infested leaves should be removed and burned to destroy the eggs and caterpillars. Release or augment the biological control agents like Predators: Predatory mite, Predatory Wasp and Larval parasitoids like *Trigonospila brevifacies*, Braconid wasp, *Dolichogenidea tasmanica*, *Goniozus jacintae*.



**Greedy scale:** Infestations are spread by the mobile, young scale nymphs or 'crawlers' older nymphs and adults are sedentary. Scale insects attack the bark and fruit of kiwi. • Heavy infestations affect the vigor of the plant and result in the presence of scales on fruit, causing it to be off grade.

Control:

Use propagative material that is free of scales. • Adequate plant spacing is important because armored scales seldom spread from plant to plant unless the crowns of the plants are in contact. • As plants grow, pruning maintains spacing and allows maximum coverage when using insecticides. • Scraping and scrubbing to remove scales from plants are effective mechanical control tactics. • Release or augment the biological control agents like parasitoids *Aphytis* wasps, *Encarsia* sp. and predators: Green lacewings, Minute pirate bugs, and Ladybird beetle, *Chilocorus bipustulatus*, *Chilocorus infernalis*, *Chilocorus cacti*.

**Passion vine Hopper:** They suck sap from succulent shoots and the result is distortion of fruit and leaves. Plants will get stunted, wilted and dieback overall. Because of the copious production of honeydew the likelihood of sooty mould is very high.



Control: Heavy winter pruning of egg laying sites. • Spray them with Neem; it acts as a deterrent and anti-feeder. Biodegrades within two weeks when exposed to sunlight. Repeated application. • Companion plants such as geranium and petunia, marjoram, coriander, chamomile and yarrow • Egg parasitoids *Aphelinidae* (Hymenoptera), *Scolyopa australis*. predators: Spider, birds.

**Two spotted spider mite:** It penetrates plant cells, preferably on the undersides of leaves, and ingests their contents. Each minute 1-2 dozen cell can be destroyed this way. The first visible symptoms are small whitish speckles, mainly around the midrib and larger veins. When these spots merge, the empty cells give areas of the leaf a whitish or silvery-transparent appearance.

## Model Project Profile

Control: Maintain proper plant canopy microclimate by using timely training and pruning of the plants.

- Predatory mites like *Amblyseius*, *Metaseiulus*, and *Phytoseiulus*; ladybird beetles, *Stethorus*; the minute pirate bugs, *Orius*; the thrips, *Leptothrips*; and the lacewing larvae, *Chrysopa*. *Scolothrips sexmaculatus*, *Phytoseiulus persimilis*,
- In greenhouses, the ghost ant, *Tapinoma melanocephalum* (*Fabricius* are good predator)

**Thrips:** Thrips uses its mouth-parts to rasp the leaf surface, rupture the epidermal cells, and feed on exuding cell contents. Feeding spots turn yellow then brown, and the surrounds become silvery where air enters the emptied cells.

Control: Sprinkle water over the seedlings to check the multiplication of thrips Biological control • Release or augment the biological control agents like larval parasitoids- *Thripobius semiluteus* and predators like Predatory mite, predatory thrips, hover fly, mirid bug etc.

### Root knot Nematode:

Formation of galls on host root system is the primary symptom • Roots branch profusely starting from the gall tissue causing a 'beard root' symptom • Infected roots become knobby and knotty • In severely infected plants the root system is reduced and the rootlets are almost completely absent. The roots are seriously hampered in their function of uptake and transport of water and nutrients • Plants wilt during the hot part of day, especially under dry conditions and are often stunted.



### Disease:

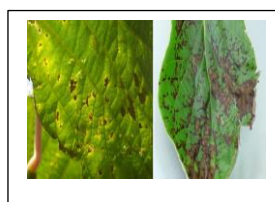
**Root rot, collar rot and crown rot:** Reduced shoot growth. Leaves are small and chlorotic. • Vines may collapse suddenly or show a gradual decline in productivity over several seasons. • Red-brown discoloration of roots and root crowns which is visible when root is cut in two.

Control: Control of the disease is reliant on good water management. • Kiwi should be planted in well-draining soils where water does not pool after rain or irrigation; • Vineyard should be allowed to dry out between irrigations.



**Bacterial leaf spot and blossom blight:** Symptoms include angular shaped spots, often associated with a halo, although not all leaf spots clearly exhibit the halo, brown discoloration of buds and, in advanced stages of infection, the leakage of red-rusty gum. Not all symptoms appear at the same time.

Control: Control of the disease relies on the avoidance of injuries to the plant which allow bacteria to enter. • Infected areas should be pruned by cutting 1 foot below the edge of the canker. • Disease severity can be reduced by protecting plants from freeze injuries during winter.



**Fungal Leaf spot:** Vines may completely collapse; white mycelial mats may be present under bark close to the soil line; cortical tissue has a dark discoloration and white mycelial strands are present; root like rhizomorphs extend from roots into soil.

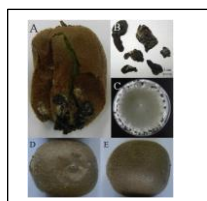
**Storage Rot:** Symptoms of decay and signs of the pathogen develop as shriveled fruit that may have gray fungal growth mostly at the stem end and occasionally around the sepals or over the entire surface of the fruit. Diseased internal fruit tissues appear water-soaked and dark green. In advanced stages of the disease black, irregular-shaped sclerotia of the fungus up to about 0.2 inch (5 mm) in diameter may form on the infected fruit.



**Rhizoctonia stem Rot:** The pathogen causes a reddish brown dry cortical root rot that may extend into the base of the stem. Later in the season, infections at the base of the plant (cortical rot) may result in plants snapping off during high winds. Foliar symptoms yellowing or wilting of leaves.

**Sclerotinia rot:** Infected fruit and stem first appear water soaked. • Fluffy white cottony fungal growth is seen on infected area. • Small hard black fungal structures known as sclerotia eventually develop embedded in the cottony mold. • Fruits are often infected through the blossom end and became rotted and watery sclerotia may be inside these rotted fruits.

Control: Implement deep ploughing during summer. • Use proper vineyard sanitation practices.



#### Cost and Returns of Kiwi: (Rs./ha.)

(approx. Amount in Rs.)

Particulars	Cost & Returns
Land Preparation & development	50000
Cost of planting material	35000
Manures & fertilizer cost	25000
Plant Protection cost	20000
Cost of Drip Irrigation system	25000
Cost of Labour wages (intercultural operations)	20000
Cost of Farm machinery heiring charges and agril equipment	5000
Rental cost of land	20000
Cost of Harvesting	15000
Cost of Marketing	10000
Miscellaneous cost	5000
<b>Total cost of cultivation</b>	<b>230000</b>
Average Yield	15t/ha
Average selling price of Kiwi	Rs.50/ kg

Model Project Profile

<b>Average Total Income / Return</b>	<b>750000</b>
<b>Net Income</b>	<b>520000</b>

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