



Irrigation Solution  
**OILPALM**  
With Jain Technology™



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# Oil Palm - Irrigation & Fertiligation

Oil palm, *Elaeis guineensis* originated in the Guinea coast of West Africa. It is the highest oil producer among the perennial oil crops. It produces two types of oil. 1. Palm oil (extracted from the mesocarp of the fruit wall) and 2. palm kernel oil (from kernel).

In India AP and Karnataka have large areas under the crop. Growing oil palm is slowly picking up in Tamil Nadu.

Highest yields of oil palm are from in East and West Godavari and Krishna districts. The identified potential area in AP is about 4 lakh ha.

## •Climate

- Oil Palm is a humid tropical crop. It requires a humidity of plus 80%.
- It grows well at 450- 900 m altitude.
- Requires evenly distributed rainfall of 150mm/month or 2500- 3000 mm/yr.
- Because of erratic rains in AP,irrigation is essential.
- A temperature range of 29-33 oC maximum and 22-24 oC minimum is ideal for oil palm.
- At least 5 hrs of bright sunlight is essential for the crop.
- Places prone to high wind velocity are not suitable for oil palm.

## Soil

- Oil palm grows well in all types of soil.
- It grows better in well drained, deep, loamy alluvial soils rich in organic matter.
- Soil should have at least 1 m depth.
- Avoid alkaline, saline and water logged soils.

## •Varieties

- Tenera is the ruling hybrid grown all over the world.
- Tenera has a thin shell, medium to high mesocarp content and high oil content.

## Planting Season

- Best time for planting is June- December; i. e. during monsoon.
- If planting is done in summer provide adequate irrigation.
- Mulching the basin around the plant in summer is beneficial.

## Planting Material

- 10-14 month old healthy seedlings with 1-1.3 m height and with 13 functional leaves with good girth at collar are best for planting.
- Seedlings up to 24 months age can be used for planting.

## •Spacing and Plant population

- The spacing recommended is 9m x 9m x 9m triangular
- Plant population is 57 plants/acre

## Planting

Pits of 0.6m x 0.6 m x 0.6 m are to be prepared.

- Take the pits prior to planting season.
- Apply 250 g DAP or 250 g of rock phosphate and 50 g phorate and mix with the soil at the base of the pit.

- Remove the polybag by making a longitudinal cut and place the seedling in the pit along with the soil.
- Fill the pit with soil and press firmly leaving the top portion so that the seedling bowl will be 25 cm below the ground level.
- Immediately after planting form basin and give irrigation.
- Provide stake support if the area is prone to wind.
- Take care that soil does not accumulate on the crown region which will result in crown rot.
- In low lying areas prone to water stagnation plant oil palm on mounts to avoid water logging of plants.

## •Irrigation management

- Oil palm has a very high growth rate and its requirement of water is also high.
- Do not venture to cultivate this crop if water sources are not identified ahead.
- Under water stress or insufficient irrigation the rate of leaf production, sex ratio of flowers and abortion of inflorescence and eventually yield reduction occurs.
- Up to 3 year a plant requires 150 l per day and older plantations require up to 200-240 l/palm/day.

## Micro irrigation for Oil Palm

- Frequent low volume irrigation is preferred for oil palm. Or else the high total volume of water required per day will result in leaching of nutrients from the root zone.
- A rate of water input matching the infiltration rate of soil would be ideal.
- Drip, minisprinkler or Jet irrigation is ideal .
- For drip irrigation 4 x 8 lph drippers for 5 hour duration is sufficient.
- Basin of each palm should be mulched to conserve moisture against evaporation.
- Research from Pedavegi (WG dist.) National Research Centre for Oil Palm showed that drip irrigation or jet irrigation resulted in maximum plant girth and number of leaves compared to conventional basin flooding.

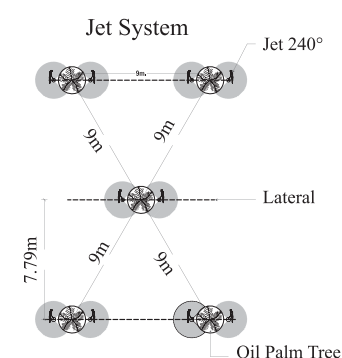
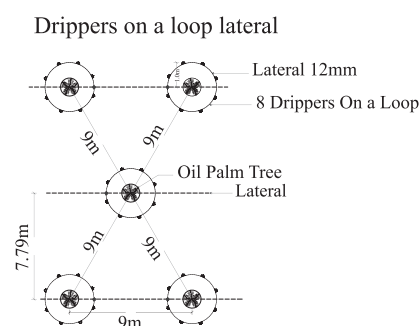
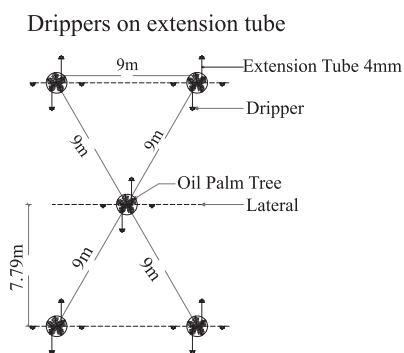
Month	Water requirement	
	Mm/day	Lt/plant/day
June	2.05-2.44	145-172
July	1.69-2.14	119-151
August	1.64-2.23	115-157
September	1.96-2.21	138-156
October	1.84-2.20	130-155
November	1.80-2.09	127-147
December	1.55-1.95	109-137
January	1.74-1.99	123-140
February	2.12-2.33	150-164
March	2.57-2.81	181-198
April	2.81-3.18	198-224
May	2.86-3.39	202-239



## Drip system lay out

The online drip system is found to be more suitable for oil palm. The drip laterals are spaced at 7.79m row spacing. Each tree is provided with 4 drippers placed around the trunk using extension tubes from the lateral. The drippers are to be placed 1 m away from the trunk in case of mature trees, either on extension tubes or on a loop of polytube around the tree.

In case of Jets or Mini sprinklers two jets/mnisprinklers per palm are given attached to poly lateral at 1m away from the trunk on either side of the palm.



## Fertilizer requirement

Oil palm is a heavy feeder.

The recommended fertilizer doses for Oil Palm in AP are given below. Estimation of fertilizer requirement based on soil analysis will be more accurate.

Fertilizer recommendation for Oil Palm

Age	N	P	K	MgSO <sub>4</sub>
1st year	400g/tree	200g/tree	400g/tree	125 g/tree
2nd year	800	400	800	250
3rd year onwards	1200	600	1200	500

- In very high yielding gardens 20% more of the above doses are recommended.
- Borax 100g/palm/yr is recommended in B deficient soils.
- First dose of fertilizer should be given 3 months after planting.
- 50-100 kg/palm/yr FYM or 100 kg green Manure to be applied from the first year onwards.
- A dose of 5 kg Neemcake is to be applied per palm per year.
- Method of Application
- If drip is adopted fertigation of N and K sources is possible.
- Or else broadcast the fertilizers around the clean weeded basin about 50 cm away from the trunk base and incorporate by forking in.
- If not fertigated, irrigate after forking in the broadcasted fertilizer.

## Fertigation Schedule

- Two equal splits of fertilizer application is recommended; July-August and December- January
- Keeping the same application timings the following fertigation schedule is worked out.

### 1st year palm

Apply P as SSP (1250 g/tree) or Rock Phosphate (1000g/tree) to the tree basin in two splits, one in July and 2nd in December.

Fertilizer	Quantity g/tree	Rate of fertigation g/tree/wk	Duration
Urea	435	62	July 1st - Aug 3rd wk
	435	„	Dec 1st - Jan 3rd wk
MOP	334	48	July 1st - Aug 3rd wk
	334	„	Dec 1st - Jan 3rd wk
MgSO <sub>4</sub>	62.5	16	July 1-4th wk
	62.5	16	Dec 1-4th wk

### 2nd year palm

Apply P as SSP (2750 g/tree) or Rock Phosphate (2000g/tree) to the tree basin in two splits, one in July and 2nd in December.

Fertilizer	Quantity g/tree	Rate of fertigation g/tree/wk	Duration
Urea	870	124	July 1st -Aug 3rd wk
	870	„	Dec 1st -Jan 3rd wk
MOP	666	95	July 1st - Aug 3rdwk
	666	„	Dec 1st - Jan 3rd wk
MgSO <sub>4</sub>	125	16	July 1st - Aug 3rd wk
	125	16	Dec 1st - Jan 3rd wk



### 3rd year palm

Apply P as SSP (3750 g/tree) or Rock Phosphate (3000g/tree) to the tree basin in two splits, in July- August and two splits in December- January.

Fertilizer	Quantity g/tree	Rate of fertigation g/tree/wk	Duration
Urea	1305 1305	186 ,,	July 1st - Aug 3rdwk Dec 1st - Jan 3rd wk
MOP	1000 1000	142 ,,	July 1st - Aug 3rd wk Dec 1st - Jan 3rd wk
MgSO4	250 250	38 38	July 1st - Aug 3rd wk Dec 1st - Jan 3rd wk

### Pruning

- Maximum number of green leaves should be retained on the palm.
- Only the lower dried and diseased leaves must be pruned.
- Give clean cut to the petiole as close to the stem as possible with a sharp chisel.
- Any damage to the petiole or stem will attract disease organisms.

### Mulching

- Mulching of basin is compulsory to conserve moisture.
- Mulching can be done dried leaves, male flowers, coconut husk, empty bunches obtained from factory.
- In adult plantations all the cut leaves can be heaped in between two rows of oil palm which can act as a mulch.
- Flowering of Oil palm and management of fruiting
- Oil palm comes to flowering in 14-18 months after planting
- It produces male and female flowers separately on the same palm (monoecious).
- Male and female phases do occur naturally in consequent cycles in palm.
- Some trees may exhibit a phenomenon of producing more male inflorescences. This is not a serious situation as long as an average 10-12 female bunches appear a year.
- Excess male flowers occur due to the following reasons
  1. Insufficient irrigation and infrequent irrigation
  2. Non application of recommended doses of fertilizers.
  3. Excessive removal of leaves
  4. Ploughing close to the stem and thereby damage of roots.
- Practice ablation; removal of male and female flowers produced in the early stages of plantation
- Ablation helps in developing strong stem girth, vigour and extensive root system.
- Ablation can be extended from 14 th to 18th month after planting and extend upto 2-3 years depending upon growth and vigour.

### Pollintion

- Oil palm is highly cross pollinated crop. Pollination is assisted by wind and insects.
- Wind pollination alone is not adequate.
- Good fruit set occurs after insect pollination. The insect

Elaeidobius kamerunicus is a good pollinator.

- Releasing this insect after 30 months of planting is a good practice.
- If the plants are of low vigour, release the weevils after 3 years.

### Intercropping in Oil Palm garden

- Oil palm is a wide spaced perennial crop with a long (3 year) juvenile period.
- Therefore intercropping is compatible.
- Vegetables, banana, turmeric, chillies, tobacco, pine apple, ginger, pulses and ground nut are compatible intercrops.
- While ploughing for intercrop, do not plough close to the palm base to avoid root injury.
- Water management of intercrop should not restrict oil palm's water requirements.

### Cover cropping

- Cover crops are generally recommended for mature oil palm gardens.
- Pueraria phaseolodes, Calapagonium mucunoides, Centrosema pubescens, Mimosa invisa etc. are the good cover crop species.
- Cover crops are also can be taken after harvest of intercrops in early years.
- Cover crop should be sown in the entire field leaving the basin
- Cover crops are ploughed in situ.
- Cover crops help in soil and water conservation. And when incorporated into the soil will improve the organic matter content and nutrient status.

### Benefits of Drip irrigation for Oil Palm

- Increases yield upto 45%
- Reduces water used for irrigation up to 50%
- Increased fertilizer uptake by plants when fertigation is practiced and increased fertilizer use efficiency through fertigation.
- Reduces NO<sub>3</sub>-nitrogen leaching (thereby nitrate pollution) by 50% when fertigation is practised.
- Controls weed growth as water is applied only to the root zone.
- Allows for intercropping during the early years.

### Pest and disease management

Most of the pests of Coconut are found to attack oil palm.

#### Spindle bug

Necrotic lesions and dry brown patches on leaves. Spindle fails to open

Keep phorate (2g) filled perforated poly sachets in the leaf axil

#### Tussock Caterpillar

Defoliation

Hand picking of caterpillars. Cut and burn damaged leaves. Spray monocrotophos (0.036%) or carbaryl (0.1%).

#### Root Grubs/Cockchafer beetles

Sudden death of young plants.

Fill the seedling bags with soil free from root grub. Apply 50 g phorate per seedling while planting sprouts.

### **Termites**

Stunted growth of the plants

Give enough irrigation water. Apply Quinalphos (0.06%) or Chlorophyriphos (0.05%)

### **Wild Boar**

Destruction of boll region

Keep scaring device.

Insect Pests of Adult palms.

### **Rhinoceros beetle**

"V" Shaped gaps in the leaf silhouette. Hole at the leaf base. Chewed up fibre seen at the base.

Destruction of breeding sites. Maintain sanitation in the orchard. Extraction and killing of insect from the spindle portion using a metal hook. Trap adult with fermented castor cake. Use bioagents like Baculovirus oryctes. Use completely rotten FYM.

### **Red Palm weevil**

Gradual wilting and drying of palms. Presence of few holes with a brown liquid oozing from the holes.

Removal of damaged or dead palms or rotten bunches from the orchard. Apply coal tar to the wounds and cuts on the stem to prevent egg laying. Trap adult beetles using pheromone baits. Maintain good sanitation. Root feeding of monocrotophos (10 ml/10 ml water).

### **Case worm**

Holes on leaves. Defoliation. Cone shaped bags on the under surface of leaves.

Cut and burn badly infected leaves. Spray carbaryl (0.1%) on infested leaves. Root feeding of Monocrotophos (10 ml/10ml water).

### **Birds**

Bird feeds on mesocarp of fruits

Cover fruit bunches with wire net. Use bird scare devices.

### **Rats**

Damages young fruits. Exposed pericarp. Kills young plants

Follow IPM practices. Baiting with Zinc Phosphide, Use rat traps. Cover the base portion of the plant with wire mesh while planting.

## **Diseases of Oil palm and Control measures**

### **Stem Wet Rot**

Sudden death of spear leaves. Yellowing discoloration of remaining fronds. Death of leaves.

Provide drainage and avoid flooding of the field. Early detection of the disease and trunk surgery can save the tree. For early detection, a sharp iron rod may be pierced into the stem base of suspected trees, which gives out some liquid. If the liquid has putrid smell the palm should be subjected to trunk surgery. Trunk surgery is done to excise all affected fibrous tissues from inside the trunk. First the outer stem tissues and frond butts should be chiseled. The innermost disease tissues including yellowish lesions which are generally seen along with the border of healthy and diseased tissues also should be removed. After this a protective covering with carbendazim (1%) plus Monocrotophos (1ml) paste flowed by coal tar should be given to prevent the wound invading microorganisms and insects.

### **Bud Rot disease**

Yellowing of the spear leaves which later turns brown. Basal tissue of the spear completely gets rotted. Rotten tissue emits a foul odour. Continuous rotting leads to destruction of meristem and death of palm. The disease becomes rampant during monsoon. Palms of all ages are prone to the disease.

If detected early, control is effective. The affected spear should be pulled out along with the decayed tissues. The affected tissues in the crown should be removed and drenched with carbendazim or thiram (1%). For treating advance stage disease affected palms, first remove all the leaves surrounding the spear. The affected tissue and meristem should be removed layer by layer. Till fresh tissues are seen. The exposed fresh tissues of the apical bud should be cleaned and smeared with 1% Carbendazim solution. The exposed portion should be covered with dried leaves or perforated polythene sheet. Prophylactic measure: Where beetle damage is predominantly high, it should be checked by keeping 10g phorate granules in perforated polythene sheet.

### **Basal Stem Rot (Ganoderma)**

Withering, yellowing and orange discoloration of the leaves followed by necrosis of older fronds. Rotting of the bole at the stem base. Infected palms appear suffering from malnutrition. Dry rotting of internal tissue at the base of the trunk. Roots become friable and disintegrate easily. There is little chance of recovery of affected palms. By the time symptoms are visible almost 50% of basal tissues get affected. Progress of disease can be checked by field sanitation. Isolate affected palms by taking trenches of 1m deep and 30 cm wide. Apply 5 kg neem cake per palm/yr. Disease affected but healthy palms should be treated with 10 ml Calixin (tridemorph) or 10g Aureofungin sol (in 100 ml water) per palm through root feeding. The suspected diseased palms should be uprooted and destroyed immediately as soon as they are noticed.

### **Bunch Rot**

Affects fresh fruit bunches. During early stages of infection strands of mycelium can be seen spreading over the bunch surface. In later stages the mycelium grows over the fruit surface and penetrates into the mesocarp. The infected bunch becomes completely rotten and unfit for harvest. Sanitation: Before onset of monsoon, carry out crown cleaning, removal of dead inflorescence, bunch stalks, aborted bunches etc. Crowns of infected palms should be thoroughly cleaned and sprayed with 0.1% Carbendazim solution.

### **Dos**

- Ensure good drainage in the field.
- Adopt drip or jets for irrigation.
- Prepare pits and fill it with the mixture as recommended.
- Compulsorily apply organic manure as per recommendation
- Select high yielding, disease and pest tolerant variety suitable for each location.
- Practice drip/jet irrigation from the beginning of the orchard.
- Irrigate with drip/jet strictly following the schedule given by the engineer.
- Follow the drip/jet system maintenance schedule given by the engineer.
- Compulsorily weed/ intercultivate, timely operation helps in crop growth.

- Follow fertigation schedule as given by the engineer.
- Follow the precautions while operating the drip system as explained by the engineer.
- Apply micronutrient as and when needed.
- Follow disease and pest control measures timely and effectively.
- Apply sprays in the evening or early morning only.

### Don'ts

- Don't over irrigate the crop at anytime.
- For fertigation don't mix solid fertilizers and dissolve them together. Prepare individual solutions and mix them for application.
- Don't spray the crop under hot sunlight.
- Don't make a fire in the field with Drip system.
- Don't use the fertigation unit for bulky organic manure and fertilizers that are not soluble in water
- Don't add solid fertilizer from the bag directly to the fertilizer tank. Prepare solution separately and pour the solution to the fertilizer tank. Prepare solution only in plastic buckets.
- Don't use metal container.
- Don't stir the solution with naked unprotected hand. Use wooden spoon or stick.
- Don't heat the fertilizer solution to increase solubility.

### Frequently asked questions (FAQ's)

#### 1. Does oil palm require irrigation?

Yes. Its requirement can only be met if rainfall is regular and 150 mm per month. It can not be grown in AP/Karnataka/TN without provision for irrigation.

#### 2. Whether the meagre quantity of water supplied through drip/jet irrigation is enough?

Irrigation rate in Drip/Jet method is estimated based on the ETP of the location and therefore it enough.

#### 3. In drip/jet methods, water is applied to the surface at a very low rate. Whether this will cause root accumulation near the surface ?

In palm, only the absorptive roots are located near the surface and get directed by moisture and nutrient availability. The anchor roots penetrate into deeper soil layers and provide stability for the tree.

#### 4. Can I prefer Impact Sprinkler method of irrigation for oilpalm?

No. it is not suitable as it spreads water in the inter-tree spaces and the trunk of the trees will obstruct the spray jet from the sprinklers and thus affect the uniformity of irrigation. Moreover wastage of water per irrigation will be high.

#### 1. Can I take an intercrop with irrigation?

Yes. Till the canopies of oil palm cover the interspace, intercropping is possible. But provide additional drip line for the intercrop.

*Crop yields depend on climate, soil and management and therefore can't be guaranteed by the company.*



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