



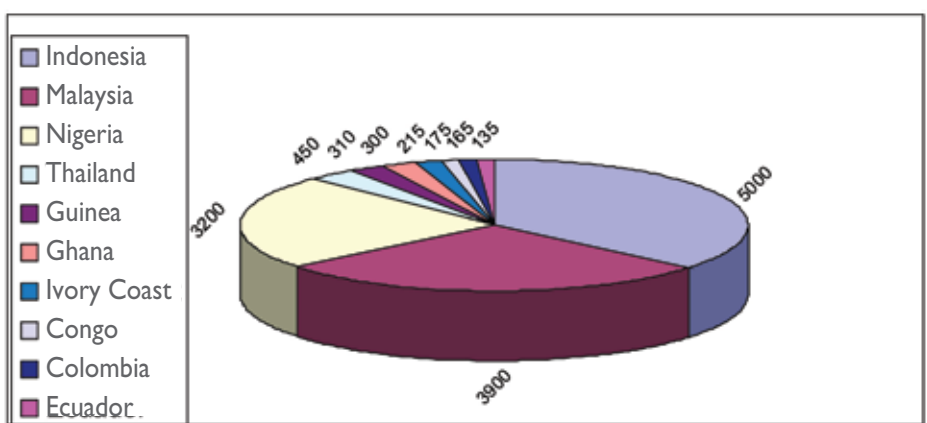
# Oil Palm

**NAANDANJAIN**  
*Irrigation*

## BACKGROUND

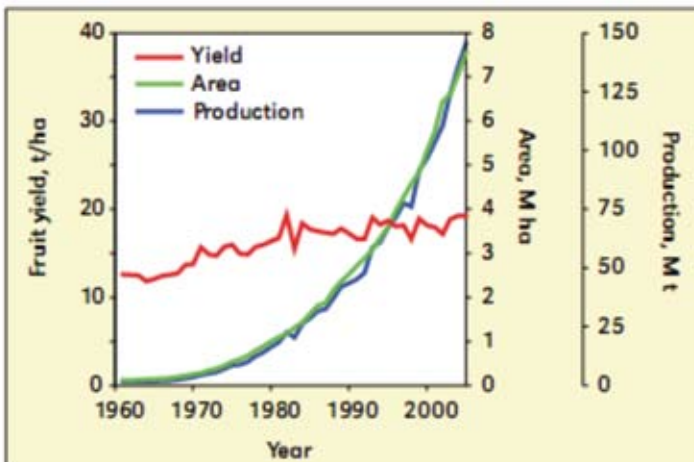
- The main species of oil palm cultivated today is *Elaeis guineensis*. It is native to west Africa.
- Today palm is grown in the tropical regions of West Africa, Central and South America, and Asia.

### Ten leading producing countries 2008 (thousands of hectares)



- Oil palm is considered a highly efficient crop in terms of oil production and energy balance.
- Fruit yields range from 10-30 tons/ha depending on local conditions and agricultural practices

### Yield, area, and production of oil palm fruits from 1961 to 2006



Source: FAOSTAT 2008

- Oil palm is mainly used for:
  1. Cooking oil and margarine
  2. Oil for the cosmetic industry
  3. Industrial oil
  4. Oil for the production of bio-diesel
  5. Residues of the oil extraction are used for the alimentation of livestock or as fertilizer and mulch.

## SOIL

Oil palm grows in almost all types of soils. For optimal conditions well-drained ,deep fertile loamy to loam-clay soil, are the most suitable for cultivation.

## WATER REQUIREMENTS

Oil palm is commonly grown in tropical areas where rain is abundant throughout the entire year. In areas where rain doesn't meet the water demands, production can be negatively effected. In such cases, water deficit should be supplemented with irrigation.

Oil palm requires adequate irrigation, as it is a fast growing crop with high productivity and biomass production. Annual water requirement is in the range of 1300mm. Mature plantations, during peak summer, the daily requirement may go up to 300-350 liters/tree.

### Yield related irrigation management

The climate changes around the globe causing longer periods of time without rain. Although oil palm is growing naturally in tropical climate productivity is effected.

Oil palm yield potential is reduced when trees are exposed to stressful conditions. Low moisture is the most common stressful condition oil palm faces.

The most critical periods for oil palm are 24 months, 18 months, and 6 months prior to maturation of the fruit bunches.

24 months before fruit maturity is when sex selection of the flowers occurs. If oil palm trees are subjected to stress at this critical time, a higher proportion of the flowers become male flowers, which do not become fruit. 18 months before fruit maturity is the time of floral abortion. If oil palm trees are subjected to stress at this critical time, fewer flowers develop so a smaller number of fruit is produced. 6 months before fruit maturity is the time of pollination. If oil palm is subjected to stress at this critical time, less pollination occurs and a smaller number of fruit is produced

### Potential benefit of irrigation

(Depends on local conditions and varieties as well )

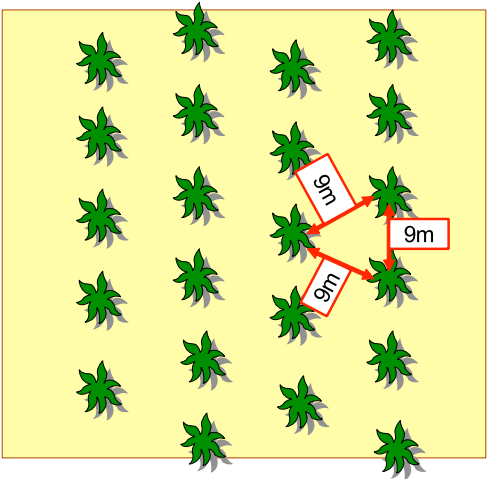
Planting distances 7m x9m triangles	Without irrigation Kg/Hectare	With irrigation Kg/Hectare	Price/kg	Income in USD	
				Without irrigation	With irrigation
Yield yearly/kg/year no. 6	12,000	30,000			
Expected oil extraction from the Pulp/kg	3,200	8,000	1.05	3,360	8,400
Expected oil extraction from the Kernel	230	570	2.30	529	1311
Total income USD				3889	9711

Source: Oil palm research institute Ghana.



### PLANT PRODUCTION AND PLANTING

Oil palm trees are usually produced in a two-stage nursery system. During the first stage, also called pre-nursery, the germinated seeds are grown in small containers for 2-3 months. This is usually done under a shading net house. When seedlings reach their optimum size, they are transferred to large containers and to an open field nursery. They remain there for 6-8 months, until they reach a planting size of 1-1.2 m. Planting in the field is commonly done in triangular form, with 9 meters between plants, reaching a total of 140-150 plants per hectare.



### FERTILIZATION

During nursery stages, fertilizers with a 2-2-1 NPK ratio are often used, providing both the phosphorus needed for good roots development and the nitrogen necessary for fast vegetative growth. Since these stages are done in a soilless medium, it is important to provide a full nutritional solution, including all macro- and micro nutrients. Once trees are transplanted to the field, the NPK ratio changes to 2-1-3 and general quantities increase as the plants develop. The quantities of nutrients applied vary according to expected yield, soil type, and local precipitation. We recommend that you perform soil and foliar analysis to determine an exact fertilizing regime.

**Malaysia - Fertilizer input for maximum exploitation of the genetic yield potential**  
kg/ha/year

N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	MgO	B <sub>2</sub> O <sub>3</sub>	CuSO <sub>4</sub>	CaO
Immature plants*						
60-120	75-110	65-105	12-20	4-8	-	20-40
Mature plants*						
170-230	70-90	220-310	25-35	8-12	-	40-60

\* Immature plants = up to 3 years

## FERTIGATION

Fertilizer application is most efficient when divided throughout the year. In this way, leaching and volatilization losses are minimized and nutrient availability is optimized, thus avoiding excess or deficiency. Fertigation - use of the irrigation system for fertilizer application - is the most efficient way to apply fertilizers. This method economizes on manual labor and fertilizer quantities, and ensures that the fertilizers reach the plants in a balanced and efficient way.



## NAANDANJAIN SOLUTIONS FOR OIL PALM

Each of the stages of oil palm growth—from the pre-nursery to the producing mature plantation—has its own specific water and nutrient requirements. NaanDanJain's solutions for each stage take into account all aspects, such as agro-technical operations, climate, maintenance and cost.

### FIRST STAGE NURSERY (PRE-NURSERY)

Having the right irrigation system in an oil palm pre-nursery shortens the growth cycle and reduces production costs. During this critical stage of plant development, substrate should be kept wet in a uniform and precise way. Since the roots system is still limited and plant water balance is critical, it is important to maintain high humidity in the net house. We recommend using a micro-sprinkler system, hung upside-down 1.8 m-2 m above the plants, providing full cover irrigation with high uniformity and an optional humidification effect. All emitters must have an LPD (Leak Prevention Device) that keeps the system full, prevents damage to plants through leakage, and allows simultaneous operation of the entire net house. Such a system also facilitates efficient fertigation.

## SOLUTION FOR HUMID AREAS—MICRO-SPRINKLERS

This system provides full cover irrigation with high uniformity at maximum economical benefits.

### Green Spin Bridge less 43 l/h with LPD

Distance between laterals: 3 m

Distance between sprinklers: 3 m

Height above the crop: 1.8 m

Pressure at sprinkler: 2 bar

The outstanding advantages of NaanDanJain's Green Spin are its drip-free operation with no dead corners, as well as easy installation, operation and maintenance.



## SOLUTION FOR DRY AREAS—MICRO-JETS

This system provides full cover irrigation with small-sized droplets that help increase humidity at relatively low operation pressure. The micro-jet has no moving parts, thus demanding minimum maintenance.

### Dan modular micro-jet 43 l/h with LPD

Distance between laterals: 1.5 m

Distance between sprinklers: 1 m

Height above the crop: 1.8 m

Pressure at sprinkler: 2 bar

To achieve humidification, irrigate in short pulses





## SECOND STAGE NURSERY

During this stage plants are placed in the field in containers with spacing of 0.75 m x 0.75 m. Water quantities are relatively small, but distribution uniformity is important. Fertilizer demand also increases and efficient fertigation is critical. Two options are available: Drip or Sprinklers



## DRIP IRRIGATION

This system provides accurate water and fertilizer application without wetting the surroundings of the containers, thus economizing in water and fertilizers and reducing weed development.

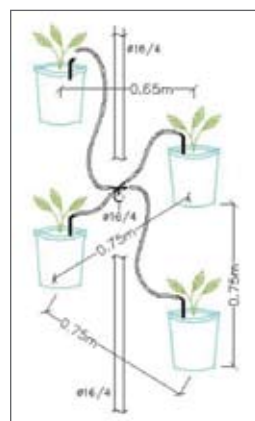
### Recommended Dripper: Click Tif 4 l/h with a 4 outlets

- Robust dripper for extreme conditions
- Self-compensated
- Special pointer stake

Distance between laterals: 1.5 m

Pressure at emitter: 1-3 bar

Filtration demand: 120 mesh



## SPRINKLER IRRIGATION

### Irristand system

This system is a full cover, fixed or semi-mobile irrigation system that simulates rain. It provides high water distribution uniformity and low water impact on plants and substrate. It is an economical and simple solution for open field nurseries that allows the grower easy mobilization of the system to storage or other locations.

### Recommended sprinkler: Super 10

Distance between laterals: 12 m

Distance between sprinklers: 12 m

Rod height: 1.2 m

Pressure needed at sprinkler: 2.5 bar (F.R. model - 3.0 bar )

Filtration demand: 80 mesh



## OIL PALM PLANTATION

An irrigation system for oil palm plantations should provide a daily rate of 3-5 mm in order to meet plant requirements during hot, dry seasons.

The roots system of the oil palm is widely spread and shallow, especially in the tropical areas where rainfall provides water over a long period. Therefore, the irrigation system must provide a wetting pattern in accordance to roots development. If the selected system is robust and reliable, only minimum maintenance will be required in the extreme conditions of the oil palm plantation.





## SPRINKLER IRRIGATION

This system provides a wide irrigated pattern with full coverage, which simulates rain. It allows the grower to irrigate and fertigate according to the crop requirements and the structure of the root system. Inspection and maintenance are easy and require no special training. Full cover irrigation facilitates the growing of inter crops. These can provide principal income in the first years, when palms are not yet in production, or provide extra income in producing plantations.

Minimum pressure needed at sprinkler: 2.5 bar

Filtration demand: 80 mesh

### Recommended sprinklers:

#### Super 10

Low volume, ball-driven mini-sprinkler

- Closed and protected sprinkler with high resistance for extreme conditions
- Flow rate – 450-850 l/h
- High water distribution uniformity
- Regulated version available with built-in flow regulator



#### 5022

Low-volume impact sprinkler

- High water distribution uniformity for large spacing
- Flow rates - 320–940 l/h
- Available with flow regulator
- Special SD model for larger spacing and improved wind resistance



## DRIP IRRIGATION

This system provides a localized irrigation pattern with high water and fertilizer use efficiency. It allows agro-technical operations during irrigation and reduces the growth of weeds between plant rows. Because of the water demand and roots distribution pattern in the early stages of plant growth, one lateral can be used per tree row during the first three years. In order to save water, dripper distance from the trees can be closed during primary stages and opened as the plants develop.

Laterals per tree row: 1 for first 3 years, 2 for mature plantations

Recommended flow rate: 50-70 l/h/tree for mature plantation

Recommended dripper spacing: 75 cm-100 cm, according to soil type

Filtration demand: 120 mesh

## Recommended driplines

### Tif Drip

Heavy-duty, cost-effective dripline

16 mm



2.0 l/h

4.0 l/h

### Naan PC

Heavy-duty, pressure-compensating dripline for maximum accuracy in variable topography and long laterals

16, 20 mm



1.6 l/h

2.2 l/h

3.5/3.8 l/h







SYSTEM COMPARISON TABLE FOR OIL PALM ORCHARDS

	Irristand and Amirit systems	Drip systems	Furrows
Water distribution	excellent	good	poor
Water use efficiency	good	very good	poor
Fertilizer use efficiency	good	very good	poor
Maintenance	low	medium	medium
Permits intercropping irrigation	yes	no	no
Micro-climate cooling effect	good	none	none
Filtration and water quality demands	low	high	none
Inspection during irrigation	easy	difficult	easy
Primary investment	medium	high	low







NaanDanJain is committed to finding the ideal solution for your Oil Palm, tailored to your local climatic conditions, soil and water properties, and budget.

Contact our office or your local dealer for further information.

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All specifications are subject to change without notice.

All information should be used only as a guideline.  
For specific recommendations contact your local agronomist.

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