

UNI-SLANT: UNIDIRECTIONAL SLANTING-HOLE PLANTING TECHNIQUE FOR OIL PALM ON DEEP PEAT

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Peat (with a total national area of approximately 2.6 million hectares) is a problem soil (Mutalib *et al.*, 1991). The inherent physical and chemical properties of peat make its development for oil palm cultivation difficult and costly. Low bulk density, high water table and subsidence are among the major physical properties of peat that need amelioration for successful cultivation of oil palm. Leaning of the palms is among the major problems that seriously affect palm growth and yield, and poses difficulty to the management of oil palm on deep peat. Mohd Tayeb *et al.* (1996) reported that the severe leaning of palms resulted in a sharp early drop in yield, followed by a slow recovery taking three to five years. Leaning is influenced by several factors, such as land preparation, planting technique, planting density, depth of water-table as well as the peat depth and decomposition stage. Several workers have worked on overcoming the problems, especially in land preparation and planting (Gurmit *et al.*, 1987; Mohd Tayeb *et al.*, 1996).

FIELD TRIAL

The trial was initiated in 1995 at MPOB Research Station, Sessang, Sarawak. Initially, the peat depths in the area was 300 to 350 cm, which is considered deep. The drainage was a system of field drains at every four planting rows, giving an intensity of 340 m ha⁻¹. Twelve-month-old seedlings were planted at 160 palms ha⁻¹. Fertilizer application and other field operations followed the normal estate practices. The trial was a randomized complete block design (RCBD) of split plots with two replicates. The main plots tested four levels of soil compaction, *viz.*, 0, 1, 2 and 3 rounds of mechanical compaction. The sub-plots tested combinations of four commercial planting materials - P1, P2, P3 and P4 - and three planting techniques - normal hole (Figure 1), hole-in-hole (Figure 2) and slanting-hole (Figure 3).

FFB yield over a six-year period was recorded for individual palms by taking their bunch number and weight, commencing at 36 months after planting. Leaning incidence was recorded every six months and grouped into three categories:

Mild: Leaning at < 45°. No serious effect on palm growth and yield (Figure 4).



Figure 1. Normal hole planting.



Figure 2. Hole-in-hole planting.



Figure 3. Slanting-hole planting.

- Severe:** Leaning angle at > 45° or toppled. Serious effect on palm growth and yield which can take a long time to recover (Figure 5).
- Recovered:** Leaning palms becoming erect again with yield recovered to normal level (Figure 6).

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Figure 4. Mild leaning.



Figure 5. Severe leaning.



Figure 6. Recovered leaning.

RESULTS AND DISCUSSION

Effect of Palm Leaning on FFB Yield

The incidence of leaning over 20 years is summarized in *Table 1*. Overall, almost 94% of the palms leaned - 29% mild and 65% severe. Most of the leaning started early (three to five years after planting) and was initially mild with little effect on the yield. But from 6 to 11 years, more than 50% of the palms leaned severely, and yielded 9% to 26% less than the upright palms. The mildly leaning palms suffered less yield loss - less than 9% as compared to the severely leaning ones which lost 15% to 26%. Severe leaning caused a sharp drop in yield which then recovered slowly as the palms grew upright again. It seems that leaning and some loss in yield is inevitable on deep peat. The results indicated that early leaning will avoid haphazard leaning later on, with less yield loss.

Effect of Planting Techniques on Incidence of Palm Leaning

As shown in *Table 2*, the planting technique significantly affected the incidence of leaning. Over the first nine years from planting, slanting-hole planting had the highest incidence of leaning compared to normal hole and hole-in-hole plantings. Almost 80% of the palms planted in slanting holes leaned, 60% mildly and less than 1% severely. *Figure 7* shows that the slanting-hole planting produced 'better' leaning with more than 80% of the palms leaning in the same direction.

Effect of Planting Techniques on FFB Yield

The effects of the various planting techniques on early FFB yield is summarized in *Figure 8*. Yield in the first two years for the slanting-hole planting technique was slightly lower than from the other planting techniques

TABLE 1. EFFECT OF LEANING ON FFB YIELD (17-year mean) OF OIL PALM ON DEEP PEAT

Leaning category	Incidence (%)	FFB yield (t ha ⁻¹)	FFB yield reduction (% of control)	Bunch production (palm ⁻¹ yr ⁻¹)	Average bunch weight (kg)
Upright palm (control)	5.8	32.92	-	19.8	12.26
Mild at 3-5 years old	28.5	30.03	8.8	20.2	10.78
Severe at 3-5 years old	10.5	27.99	15.0	19.5	10.51
Severe at 6-8 years old	28.5	26.08	20.8	18.5	10.32
Severe at 9-11 years old	23.5	25.16	23.6	18.3	10.01
Severe at 12-14 years old	3.2	24.51	25.5	17.3	10.23

TABLE 2. EFFECT OF PLANTING TECHNIQUES ON DEEP PEAT ON INCIDENCE OF PALM LEANING (9-year period)

Planting technique	% of Palms Leaning			
	Mild	Severe	Recovered	Total
Normal hole (S1)	47.3b	1.1a	24.8a	73.2a
Hole-in-hole (S2)	50.0b	1.2a	15.7a	63.9b
Slanting-hole (S3)	60.2a	0.5a	19.1a	79.8a
Overall mean	51.5	0.9	19.9	72.3
LSD _{0.05}	7.04	1.00	9.65	8.92

Note: Means with the same letter are not significantly different at $p = 0.05$ (Duncan's Test).

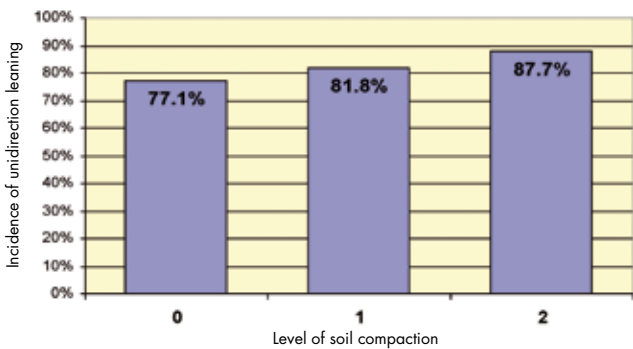


Figure 7. Effect of soil compaction on unidirectional leaning (9-year period) by oil palm planted on deep peat in slanting holes.

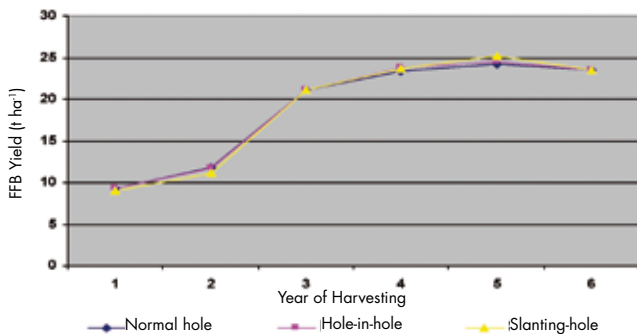


Figure 8. Effect of various planting techniques on early FFB yield.

but improved from year 3 onwards. Overall, the six-year cumulative FFB yield showed no significant difference between the planting techniques. This suggests that slanting-hole planting had no adverse effect on the early FFB yield compared to the normal hole and hole-in-hole techniques. Although the early FFB yield showed no significant difference between the planting techniques, in later years the slanting-hole planting is expected to give higher yield due to the more even unidirectional leaning and earlier palm recovery. The slanting-hole planting will minimize haphazard leaning and ease field operations.

ADVANTAGES OF SLANTING-HOLE PLANTING TECHNIQUE

- Early, progressive and unidirectional leaning;
- No adverse effect on early FFB yield;

- Minimize FFB yield loss over the long-term, through even unidirectional leaning and earlier palm recovery; and
- Avoid haphazard leaning to facilitate field operations.

SLANTING-HOLE PLANTING TECHNIQUE

- Step 1: Mechanical soil compaction of the planting row and harvesting path (Figure 9).
- Step 2: Digging of slanting planting hole either manually or by using specially-designed puncher (Figure 10).
- Step 3: Planting 12- to 14- month old seedlings (Figure 11).
- Step 4: At 24 to 36 months after planting, deepen and widen the side trench for the non-leaning palms (Figure 12).



Figure 9.



Figure 10.



Figure 11.



Figure 12.

RECOMMENDATION

The slanting-hole planting technique shows good promise to minimize the negative effects of palm leaning on FFB yield and field operations (Figure 13). It is recommended that this planting technique be adopted for oil palm planting in deep peat.



Figure 13. Slanting-hole planting technique for a unidirectional leaning of palms.

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