

OBJECTIVES

To produce the maximum quantity of palm products per planted hectare at the lowest possible production cost.

To maintain the plantation and associated infrastructure using technology that is both environmentally and socially responsible.

To sustain large yields over successive generations of palms.

To maintain or increase soil fertility in the long term.

STANDARDS

Yield and production targets are reached.

ENVIRONMENT



Observe and follow environmental guidelines throughout this handbook.

SAFETY



Observe and follow safety guidelines throughout this handbook.

NOTES



- 👉 By the time oil palms are classified as 'mature' (>3 years), a large proportion of the total costs apportioned to that palm stand during its lifetime has already accrued. Therefore, to compromise and reduce maintenance standards at this stage is never economic in the long term.
- 👉 Palms must be maintained properly for up to 25 years, and diligent management will be compensated by large yields until the palms are replanted.



The ultimate measure of efficiency in an oil palm plantation is the yield of oil per hectare, expressed as tonnes crude palm oil and palm kernel oil/ha.



Large yields will be sustained over many generations of palms if the plantation is properly maintained.

OBJECTIVES

To harvest all available fruit at optimum ripeness, when fresh fruit bunches (FFB) contain the maximum quantity of oil and kernels.

To harvest only ripe fruit and collect all loose fruit (LF).

To deliver the FFB to the mill within 24 hours of harvest and in good condition, which will reduce the amount of free fatty acid (FFA) in the crude palm oil (CPO).

To maintain optimum frequency of harvesting rounds.

STANDARDS

Mature bunches must have at least one detached loose fruitlet on the ground at the base of the palm before the bunch is harvested.

Pruned fronds must be cut and stacked neatly in the interrow (refer to Section 216.0).

All ripe bunches and all LF must be harvested, collected and delivered to the mill.

Harvesting rounds should be maintained at 7–10 day intervals.

FFB and LF must be stacked neatly on the roadside for collection.

Stalks must be removed from harvested bunches and any debris removed from the FFB stacks prior to loading.

Oil extraction rate (OER) >22%, palm kernel (PK) extraction rate >4%, and FFA content <2%.

EQUIPMENT

Palms <7 years from planting

Chisel (10–12.5 cm wide), attached to 4-cm Ø galvanized steel pipe or hardwood shaft.

Aluminium dish (with holes), and clean, used fertilizer bags for LF collection.

Wheelbarrow.

Bushknife or small axe (to cut FFB stalks), and a sharpening stone or file.

Harvesting nets or loading spike.

Palms ≥7 years from planting

Sickle, bolted to telescopic aluminium pipe or bamboo pole.

Aluminium dish (with holes), and clean, used fertilizer bags for LF collection.

Wheelbarrow.

Bushknife or small axe (to cut FFB stalks), and a sharpening stone or file.

Harvesting nets or loading spike.





Chisel harvesting - frond removal from this palm is excessive and will reduce fruit yield in the following year.



Sickle harvesting, using a sickle attached to a strong wooden pole, begins when the palms have grown too tall for chisel harvesting.



Sickle harvesting in tall palms, using a sickle and bamboo pole, is a skilled operation.

MATERIALS

None.

PROCEDURES

Each harvester is issued with a complete set of harvesting tools.

Harvesting always takes priority over other work, and workers from upkeep sections should be transferred to harvesting as required to maintain harvesting standards.

Each harvester is allocated a number of rows. The number of rows issued will depend upon the age of the palms, yield, the time of year and the skill of the harvester.

New rows are only issued when previously allocated rows have been harvested to the required standard.

If harvesting nets are used, they are issued to each harvest site at the start of work so that FFB can be loaded directly onto the nets at the collection point (e.g. roadside harvesting platform).



FFB collection is convenient when fruit has been stacked on a net.



Loose fruit trapped behind frond butts should be picked out during harvest.



Extended harvesting intervals may result in large losses of loose fruit.

1. The harvester proceeds down the assigned row and inspects each palm circle for LF *and* each palm crown for ripe bunches (sometimes LF is trapped behind frond butts).

2. When a ripe bunch is located, the harvester cuts the frond subtending the bunch. Chisels are used to harvest palms until harvester productivity is reduced by palm height. Sickles are then issued promptly.



FFB ready for collection but where is the loose fruit?

3. The thorny rachis base is cut off and placed in the centre of the frond stack

or in the interrow space, but not on or near the harvesting paths or circles. This will help to minimize leg and foot injuries to harvesters and maintenance workers.

4. In younger areas (< 4 years), it is preferable for harvesters to 'steal' the bunch and maintain 2–3 fronds below the harvested bunch (refer to Section 216.0). This helps to maintain the leaf area of young palms and improves early vegetative growth and yield. Other fronds must be pruned neatly and placed in the frond stack.

5. The exposed bunch stalk is then cut and the harvester stands clear as the ripe bunch falls to the ground.

6. After harvesting to the midpoint of the palm block, the harvester retrieves his wheelbarrow, collects the FFB and puts them at the collection site by the roadside. At the same time, he uses the aluminium bowl and fertilizer bag to collect LF.

7. FFB must be stacked properly at the collection point. Fertilizer bags containing LF should be placed next to the FFB or in the centre of the harvest net.

8. When harvesting has been completed in the assigned rows, the section leader checks the rows, counts and records the FFB, and assigns more rows to the harvester.

9. The harvester is issued with a ticket when he has completed the rows according to the specified standards and to the satisfaction of his section leader. This ticket is also used to record and calculate daily work rates, harvesting bonuses, and the number of bunches per block.

The section leader must withhold the harvester's ticket if

- a) the row has not been harvested fully,
- b) FFB and LF have not been collected,
- c) FFB and LF have not been arranged neatly for collection,
- d) there are long stalks, dirt, rocks or debris in the stack,
- e) the harvester has left 'dog ears' or redundant fronds on the palm,
- f) pruned fronds have not been properly stacked, or
- g) ripeness standard has not been maintained.





A young mature palm which has been neglected since it was planted.



Uncollected fruit results in volunteer palms, poor plantation hygiene and lost profits!



If nets or bags are not available to harvesters, loose fruit collection will be left to the fruit collection crew.

FREQUENCY



Once every 7–10 days for mature palms.

It may be necessary to increase the frequency of harvesting rounds at the onset of the peak crop period.

TIMING



Harvesting is practised throughout the year.

Peak crop periods may require additional labour and transport, particularly if significant areas of new planting are coming into full production.

TASK



t FFB/md	✗	✓	✓✓
Years from planting			
3	0.4	0.6	0.9
4	0.7	0.8	0.9
5	0.9	1.2	1.4
>5	1.4	1.5	2.0

RECORDS



Harvesting Ticket Book, Daily Harvest Record Sheet.

Crop Book, Bunch Records.

Data input	Frequency	Data	Calculation
FFB tonnes	Round	t FFB	t FFB/ha
FFB bunches	Round	Bunches	bunch/palm, kg/bunch

ENVIRONMENT



Do not allow streams and waterways to become congested with FFB, LF or fronds.



When fruit has been correctly stacked, collection and loading time is reduced.



Neatly stacked fronds in an old stand of oil palm. However, spreading of fronds may result in better utilization of nutrients contained in pruned fronds.



Bunches which fall into waterways during harvest must be retrieved immediately and sent to the mill for processing.

SAFETY



Harvesters should stand away from the palm, and cut on the spiral to avoid injury from falling fronds and FFB.

Remove the frond base and place the thorny part in the interrow frond stack to minimize foot and leg injury.

Clean, weed-free circles will provide safe access for harvesters and maintenance workers.

Harvesting chisels, sickles, bushknives and axes are sharp cutting instruments and must be handled with care.

Failure to follow safety procedures may result in serious injury!

All employees should be aware of first aid procedures.

Sharp tools



Loose fruit contain 40% oil. Poor collection of loose fruit is therefore often the underlying cause of a low oil extraction rate.



Ripe bunches ready for sterilization. Stalks have been cut short and loose fruit collected. The oil extraction rate should be >22% crude palm oil and >4% palm kernels.



NOTES



- 🌴 In this section, a harvesting standard of one detached LF has been used as an example, but this may vary. In young palms just coming into bearing, the standard should also be set at one LF as the bunches are small and ripen quickly. The actual standard set should depend on local experience and climate. Managers on new estates should monitor fruit quality, liaise with the mill manager and adjust harvesting standards to achieve the maximum quantity of premium quality oil.
- 🌴 **There must always be close cooperation between the mill and field operations.**
- 🌴 Complete collection of LF is important because they contain up to 48% oil (bunches contain approximately 22% oil).
- 🌴 Management should anticipate and plan for
 - a) peak yield periods (e.g. wet, warm periods),
 - b) new areas coming into production (modern planting material usually starts to produce fruit bunches earlier and in greater quantity than older types),
 - c) likely delays in harvesting (e.g. excessive rainfall, muddy roads), and
 - d) planned delays in milling such as annual maintenance shutdowns.
- 🌴 If management anticipates problems in maintaining rounds at 7–10 days, plans should be made to hire additional labour or to reduce round frequency prior to the problem period. Harvester productivity may improve when the harvesting interval is 7–10 days because delays due to LF collection are reduced.
- 🌴 Where harvesters are in very short supply, it may be more efficient to assign harvesters to bunch-cutting only and deploy gangs of LF collectors.
- 🌴 Minimal post-harvest handling and damage to FFB is important to maintain an acceptable FFA content in the CPO.
- 🌴 Make sure that sufficient collection nets are available for harvesters. If nets are not available, harvesters should stack the FFB and LF on the roadside as if a net were available. In order to maintain delivery rates, additional labour may be required to load the FFB onto the nets or directly onto the trucks.
- 🌴 It is important for supervisors to check all palms in the harvested rows thoroughly, especially where access is difficult (e.g. swampy areas, steep banks, terraced areas).
- 🌴 Supervisors must ensure that FFB and LF that have rolled down hillsides or into waterways are retrieved and delivered to the mill.



A harvesting sickle that was forged locally.



Harvester efficiency is reduced when poor quality wheel barrows are used for fruit bunch harvesting and infield collection.

- 🌱 Assisted FFB collection using animals or motorized vehicles has shown scope for increased harvester productivity (10–30%), but may not be economic in many areas at present. Draught animals have been used successfully for fruit transport in areas where carry distances are short and unsuitable for motorized vehicles. Mechanized infield fruit transport may result in soil compaction, unless low ground-pressure tyres are fitted to properly designed vehicles.
- 🌱 In the past, estates have used the number of LF per kg of bunch as a harvesting criteria (e.g. 2 LF/kg bunch). This is difficult for harvesters to understand, difficult for management to enforce, and may result in the requirement to collect very large quantities of LF. Counting the LF on the ground before the bunch is cut is the best practical method of setting the standards for ripeness.
- 🌱 Frequent changes in harvesting standards will confuse workers and result in reduced productivity.
- 🌱 High quality harvesting chisels, sickles and wheelbarrows are essential. If a reliable source of tools is not available, chisels and sickles can be forged from truck springs and attached to steel, wooden or bamboo poles. Do not purchase inferior harvesting equipment to save costs – this approach will cost the plantation far more because of reduced harvester productivity and increased quantities of unharvested fruit.
- 🌱 Harvesting tools are checked by the section leader every morning and repaired in the afternoon, ready for use the following day.

Work rate guides

Harvesting times (minutes/palm).

Operation	Age in years after planting		
	2–4	8	>8
Cutting FFB (minutes)	0.7	1.8	2.6
Carrying to road – 2 workers (minutes)	2.0	3.4	5.5
Bunches/day – 2 workers	320	144	90

Average area covered by harvesting teams (2 workers/team).

Palm age (years)	Productivity (ha/team)
3–4	>5
5–8	4–5
9–16	3–4
>16	<3

Harvester work rate data are useful when designing block layouts for optimal harvest loads, carry distances, and minimum collection points.

