

# OIL PALM LOOSE FRUITS COLLECTOR (MK III)

ABD RAHIM SHUIB; MOHD RAMDHAN KHALID; MOHD SOLAH DERAMAN and AMINULRASHID MOHAMED



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**L**oose fruits are currently collected by hand picking or raking. This technique is not only labour demanding and time-consuming but also tedious. The collection process requires the worker to squat and stand up repeatedly, which cause fatigue. On the average, the time taken for the worker to collect loose fruits is about 28% from the total time of harvesting. The general set back of the previous suction method of loose fruit collection is the lack of engine power, where the vacuum created by the engine is not strong enough to avoid choking. In this new design, the suction power has been increased to ensure that the fruits are easily sucked into the barrel with minimal choking problem. Choking problem mainly occurs during wet weather when the fruits are moist, which slows down the collection process.

## THE MACHINE

Constant suction power is the main advantage of a cyclonic vacuum. Using the vacuum concept, loose fruits are sucked into a cylindrical casing or barrel with conical shaped towards its bottom. The cylindrical shape creates a cyclone atmosphere once the fruits are sucked, with minimal bruising to the fruit. As the fruits circulate within the barrel/chamber, the heavier fruits fall to the bottom of the barrel (as it loses energy) while the lighter materials such as dried leaves will be sucked out of the system (*Figure 1*). This technology is also capable of separating the collected loose fruits and the debris into two layers in the vacuum chamber, hence producing clean loose fruits at the bottom of the barrel.

Referring to *Figure 2*, vacuum is created by a fan enclosed into its casing where the output shaft is connected to a 9 hp diesel engine via a series of pulley and belt system. The loose fruits are sucked using the suction nozzle with a diameter ranging from 60 mm to 75 mm. The operator needs to hold

the nozzle handle and points in the suction nozzle directly to the loose fruits on the ground. An adequate length of the suction hose is between 4 m and 5 m to enable a sufficient collection at each point.

Once the barrel is full with loose fruits, the content is transferred into the beg at the collection point by releasing the lever, mechanically connected to the gate opener with a spring system.

## SPECIFICATION

Dimension (mm)	4540 (l) x 2200 (w) x 1915 (h)
Engine	JD diesel, 9.5 hp, single-cylinder, water cooled
Fuel tank capacity	8 litres
Air flow rate	25 m <sup>3</sup> min <sup>-1</sup> @ 2000 rpm
Suction hose	5 m length @ 75 mm dia.
Fruits barrel volume	170 litres (can hold up to 150 kg of fruits)
Tyre size	7.5 x 16
Unladen weight	350 kg

## ADVANTAGES

- Loose fruits can be sucked faster.
- Less back pain to workers as the task is carried out while standing.
- Less burden to workers as they do not need to carry loose fruit bags.
- Increase the workers and plantation productivities.

## FIELD TRIAL

This mechanical loose fruit collector is fabricated with locally available parts. The only moving parts that need to be imported are the engine components. A field trial was carried out on

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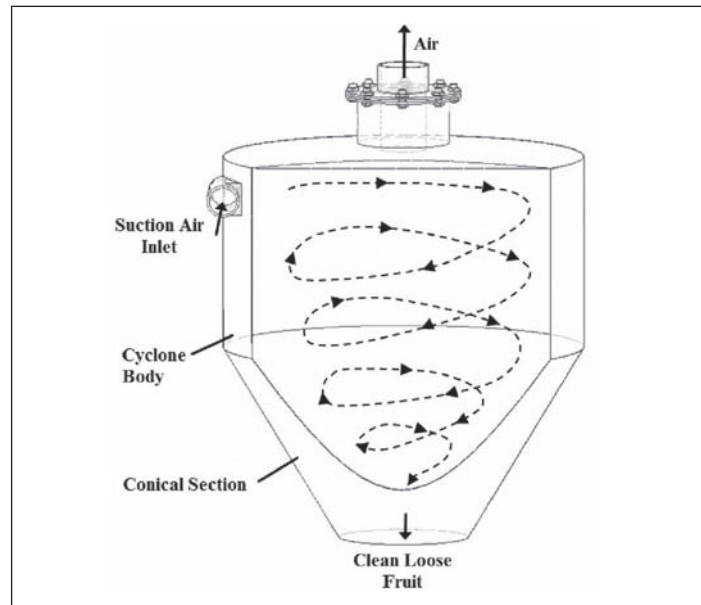


Figure 1. The cyclonic vacuum concept.

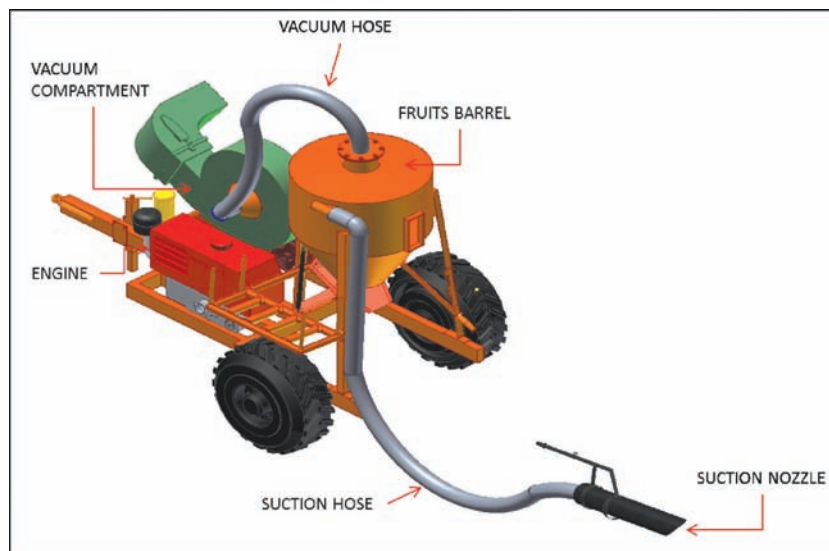


Figure 2. CAD drawing and parts of the machine.

a commercial oil palm estate to compare the productivity of this machine against manual collection under similar palm height and harvesting rounds. Manual collection was done by raking and scooping the fruits into a container.

The trial revealed that the machine was capable of collecting between 4.2 to 5.1 kg min<sup>-1</sup> with less than 15% debris (Figure 3). Fruits were not damaged or bruised during the operation. In the case of manual collection, 0.7 to 1.4 kg min<sup>-1</sup> of fruits could be collected, depending on the amount of loose fruits per palm.

## BENEFITS

This machine makes the collection of loose fruits more efficient. Loose fruits can now be sent to the mill with minimal contamination hence ensuring better quality and helps to reduce milling problems associated with current method of collection.

On average, the machine is capable of collecting 1200 to 1500 kg of clean loose fruits in a day. The use of this machine is very effective in cases where the scattered fruits had been heaped at one place.



Figure 3. Collecting of loose fruits (left) and discharging them into bag (right)

### ECONOMIC ANALYSIS

The prototype loose fruits collecting machine in the field requires three workers, *i.e.* one to drive the machine and two workers to rake the scattered loose fruits into a heap to enable the suction process to be completed in less than 10 s. Based on these assumptions, a cost analysis was carried out:

Machine price (RM)		25 000
Economic life (yr)		5
Productivity (t day <sup>-1</sup> )		1.5
Labour cost (RM day <sup>-1</sup> ) *		30
*25 days working/month		
<b>(@) 3 workers/ group</b>		
Depreciation of machine (RM day <sup>-1</sup> )		16.67
Labour cost (RM day <sup>-1</sup> )	RM 30 × 3	90
Fuel cost (RM day <sup>-1</sup> )	<b>15 litres day<sup>-1</sup> @RM 1.8</b>	27
Repair & maintenance (RM day <sup>-1</sup> )		20
Total cost (RM day <sup>-1</sup> )		153.67
Cost per tonne (RM t <sup>-1</sup> )		102.44

Assuming that the output of the machine is 1.5 t day<sup>-1</sup> with labour cost of RM 90 for three workers with 8 working hours per day, the operational cost of using the machine is RM 102.44 t<sup>-1</sup>. The payback period for the investment of this machine is within 14 months.

### CONCLUSION

The development of this loose fruits collector meets the criteria as set in the objective. In general, the machine works well in areas that are accessible to the conventional wheel type transporter, hence improving the recovery of loose fruits.

For more information, kindly contact:

Director-General  
MPOB  
P. O. Box 10620  
50720 Kuala Lumpur, Malaysia.  
*Tel:* 03-8769 4400  
*Fax:* 03-8925 9446  
[www.mpob.gov.my](http://www.mpob.gov.my)