FEATURE ARTICLE

RECENT TRENDS IN OER IN RELATION TO MPD ANALYSES IN GOLDEN HOPE MILLS

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1. OER Trends in Golden Hope

As observed in other mills in Peninsular Malaysia, Golden Hope mills also experienced a similar decline in OER for the period studied. OER as high as 22% was recorded in 1991 but this has not been achieved in the last two years. Based on the group average, OER in Golden Hope generally ranged between 20 and the 21% grid lines in 1991 (*Figure 1*) and between 19 and the 20% grid lines from 1992 to mid-1993. However, in July 1993, OER dropped to below 19%. Generally all the mills in Golden Hope are affected by this phenomenon to some extent especially in July 1993.

It is not the intention of this paper to relate the climatic variables to OER for studying the seasonal variation which undoubtedly exists and beyond any form of control. What is more

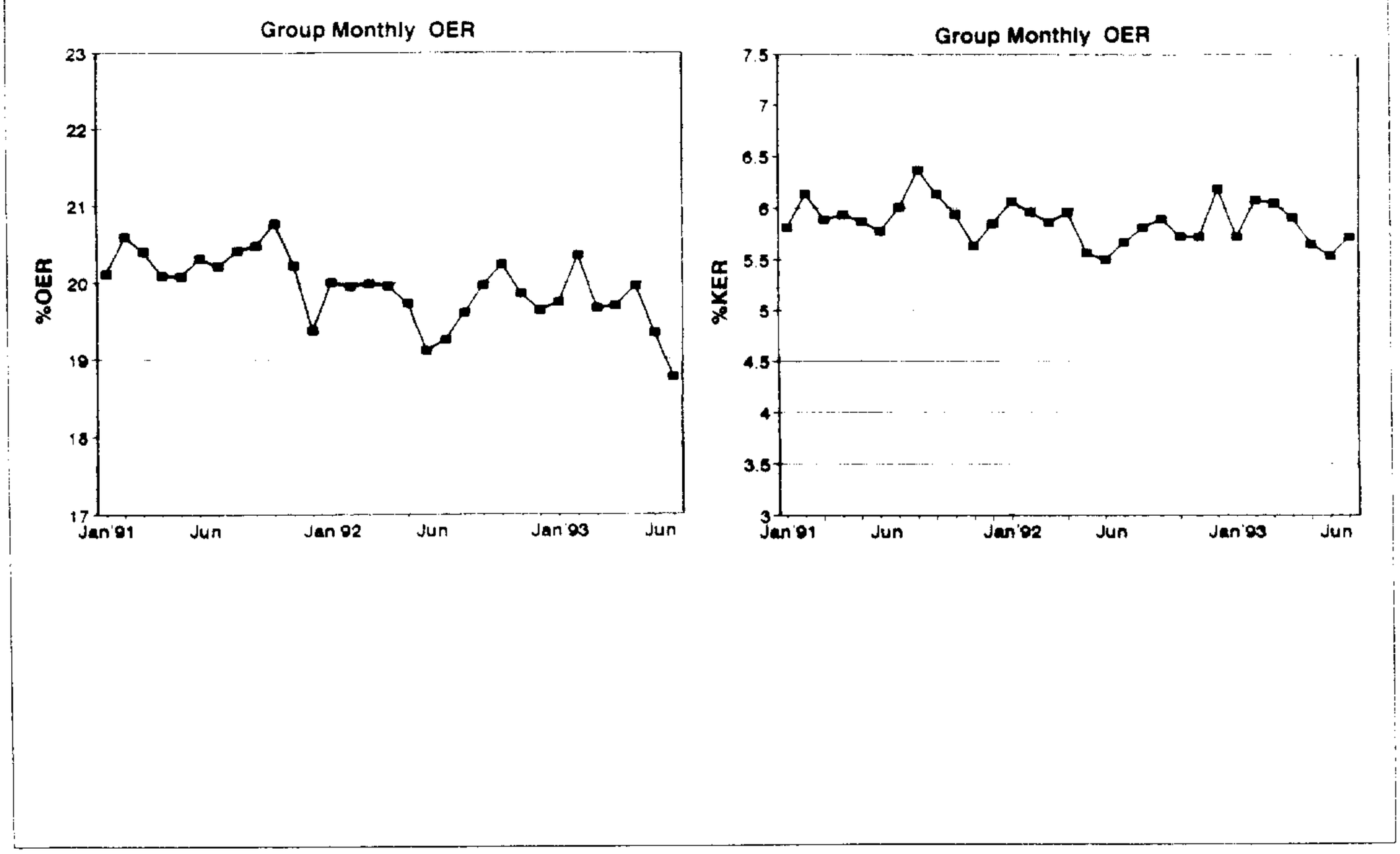

Figure 1. Mean Monthly OER and KER in Golden Hope Mills

important is to determine the underlying reasons for the overall downward trend in OER and rectify them as soon as possible.

2. MPD Analyses

MPD or Mass Passing To Digester is a routine analysis carried out in Golden Hope mills to assess the quality of the bunches processed based on studies of fruit components. The sample is a mass of sterilised fruits collected every 30 minutes after threshing. A component analysis on weight basis is then carried out by the oil mill laboratory to determine the composition of mesocarp, nuts, oil bearing and non-oil bearing parthenocarpic fruits and trash. In 6 out of the 10 mills studied, oil content of the mesocarp is also determined.

2.1 Mesocarp

Based on the group average, the mesocarp of normal fruits showed an obvious decline from mid-1992 onwards (*Figure 2*). Percentage mesocarp was much lower than the period before mid-1992 with the biggest drop recorded in July 1993. The possible reasons for this drastic decline are as follows:

i) Loose fruits are not totally collected for processing. This problem is accentuated when there is extended harvesting interval resulting in a higher proportion of over-ripe bunches harvested and loose fruit collection is poor. This situation will give rise to a higher proportion of middle and inner fruits being processed.

ii) In the mill, loose fruit spillage at the FFB ramp, if left uncollected will also contribute to the drop in mesocarp.

iii) Dura contamination, if high, can also lower the percentage of mesocarp on normal fruits. At our plantations the dura contamination is low and is considered insignificant to cause the downward trend in OER.

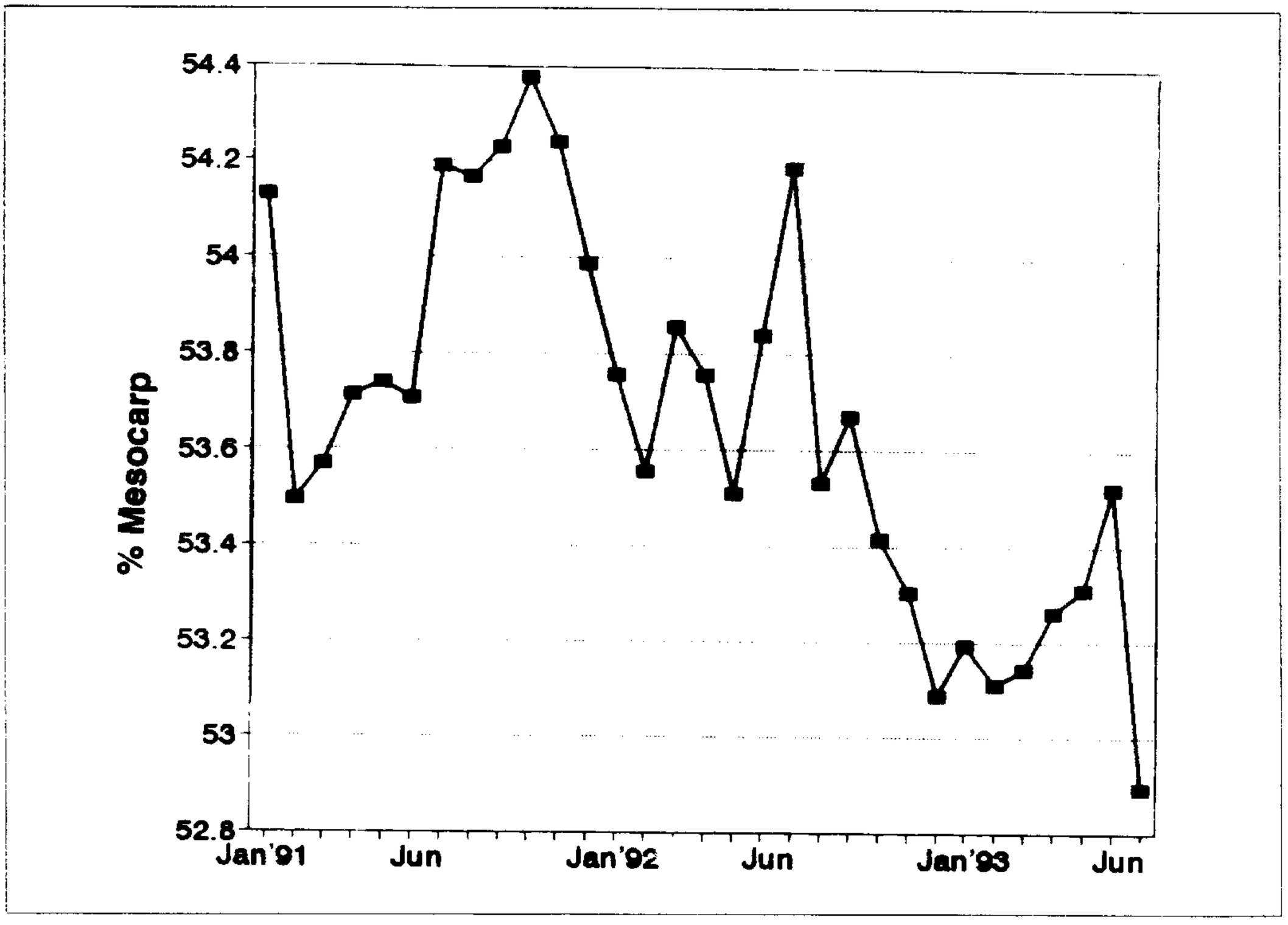

Figure 2. Monthly Percentage Mesocarp of Normal Fruits

iv) Harvesting unripe bunches, when the fruits are not fully developed will also contribute to a drop in mesocarp to a lesser extent.

Results from a study carried out at OPRS from 7–year old palms indicated that the percentage mesocarp of outer fruits are much higher than the middle and inner fruit (*Table 1*). Based on weight since outer fruits are heavier than the middle and inner fruits, mesocarp of the outer fruits contains 62.1% more mesocarp than the middle fruits and 142.7% more mesocarp than the inner fruits.

The oil content in the mesocarp is also higher in the outer fruits as compared to the middle and inner fruits. On weight basis, the outer fruits contain 68.0% more oil than the middle fruits and 206.1% more oil than the inner fruits. This means that substantial losses will occur if loose fruits are not collected for processing.

TABLE 1. FRUIT COMPONENTS OF OUTER, MIDDLE AND INNER FRUITS OF THE BUNCH

Fruits	Fruit Wt (g)	M/F(%)	K/F(%)	O/WM(%)
Outer	14.8	82.9	8.6	54.1
Middle	10.0	75.7	12.7	52.2
Inner	7.2	70.2	15.9	42.9

M/F - Mesocarp to fruit
K/F - Kernel to fruit
O/WM - Oil on wet mesocarp

Based on weight, kernel for outer and middle fruits are similar and both categories are heavier than kernel of inner fruits by 11.4% on the average.

2.2 Nuts

There is no obvious change in trend for nuts within the Group. As shown earlier, the kernel extraction rate for Golden Hope mills was not affected.

2.3 Parthenocarpic Fruits

Parthenocarpic fruits are fruits formed without pollination. In the oil palm, there are two types and these are oil bearing and non-oil bearing parthenocarpic fruits. An increase in percentage of parthenocarpic fruits within the bunch would indicate poor fruit set as a result of inadequate pollination. MPD analyses indicated that both oil bearing and non-oil bearing parthenocarpic fruits were generally higher in the first half of 1991 and subsequently were lower for the rest of period studied (*Figure 3*). As such, it can be concluded that parthenocarpic fruits are not the contributing factors to the observed decline in OER for Golden Hope.

2.4 Trash

Trash refers to all non-fruit components which includes calyx, spikelets/stalk fragments, stones and soil. Trash is picked up during loose fruit collection and from dirty bunches especially during wet weather. Based on the group average, it was observed that the amount of trash in MPD had increased significantly from August 1992 onwards with July 1993 being the highest ever recorded (*Figure 4*). An increase in the volume of trash will obviously lower OER because of the following reasons:

i) Trash will absorb oil which are discarded at the press, and the centrifuge phase of the processing.

ii) Trash increases the weight of the non-oil contributing portion of the bunch.

2.5 Oil in MPD Without Nuts

This refers to the oil from the mesocarp of normal fruits as well as parthenocarpic fruits excluding nuts. MPD records from 6 mills indicated that for the Group, the oil in MPD without nuts was on the gradual decline with a sharp drop in July 1993 (*Figure 5*). A drop in oil content can be attributed to the following reasons:

i) Loose fruits are not totally collected for processing resulting in a higher proportion of middle and inner fruits being processed. As discussed earlier, the middle and inner fruits have lower oil content as compared to the outer fruits.

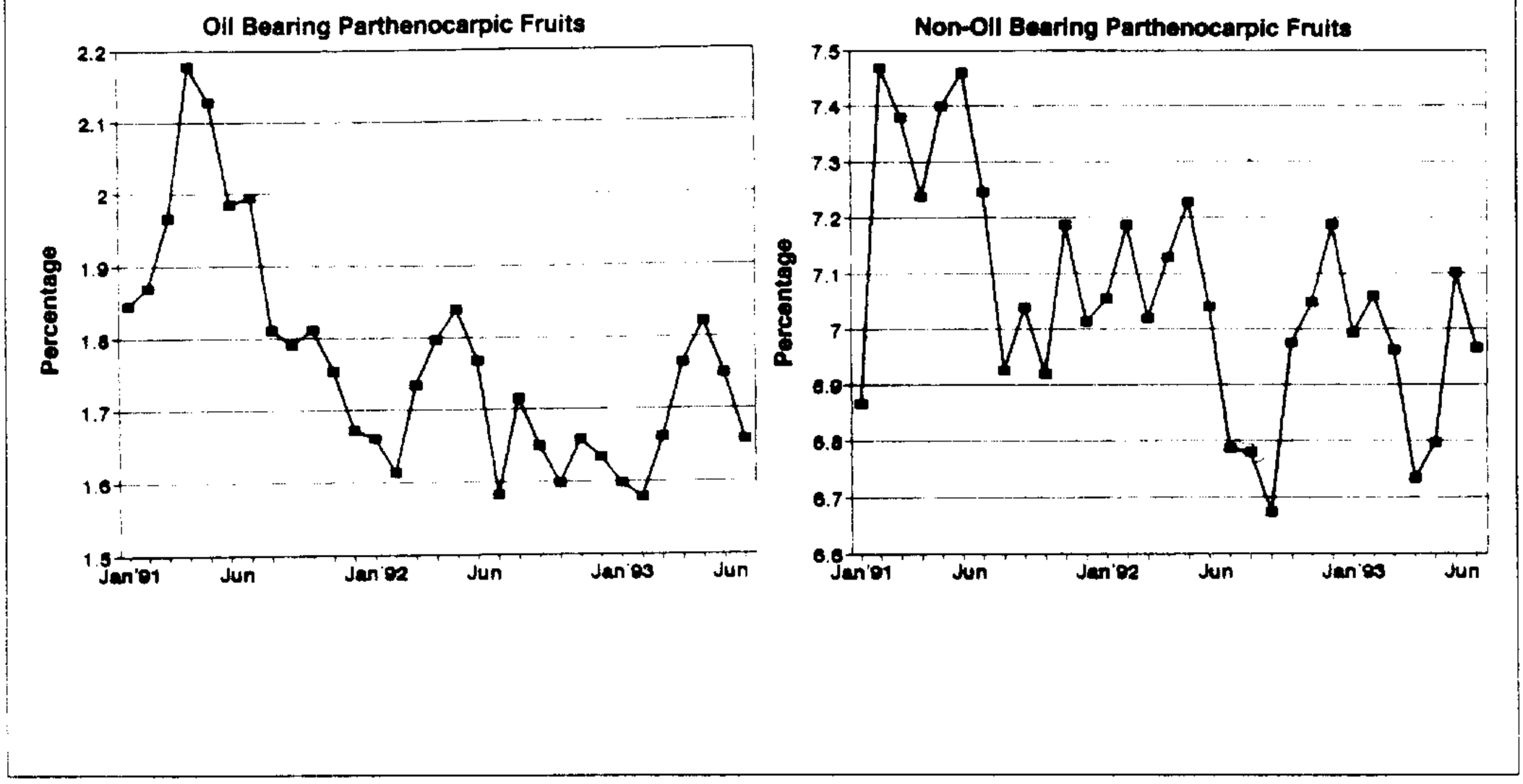

Figure 3. Monthly Percentage of Parthenocarpic Fruits

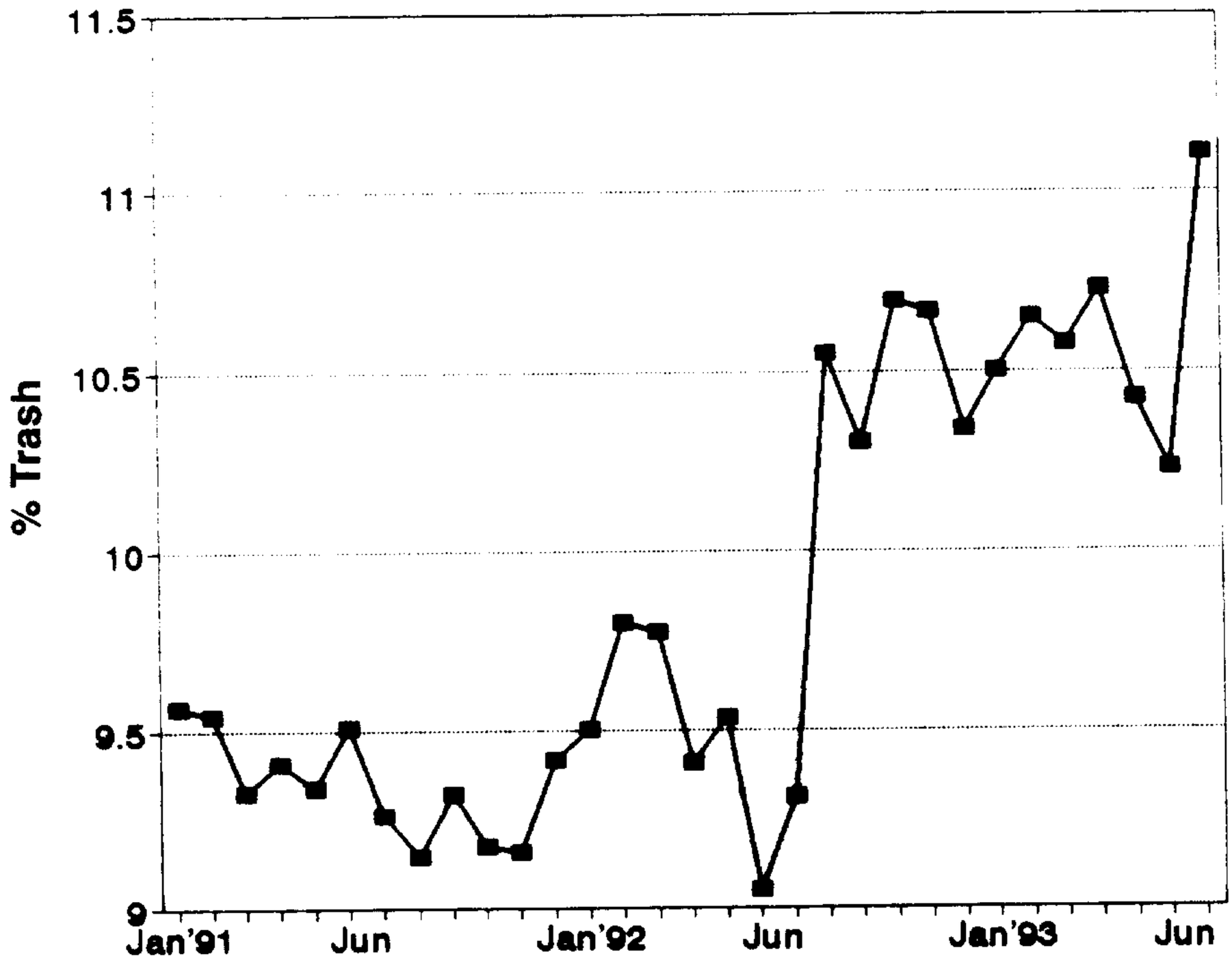

Figure 4. Monthly Percentage Trash

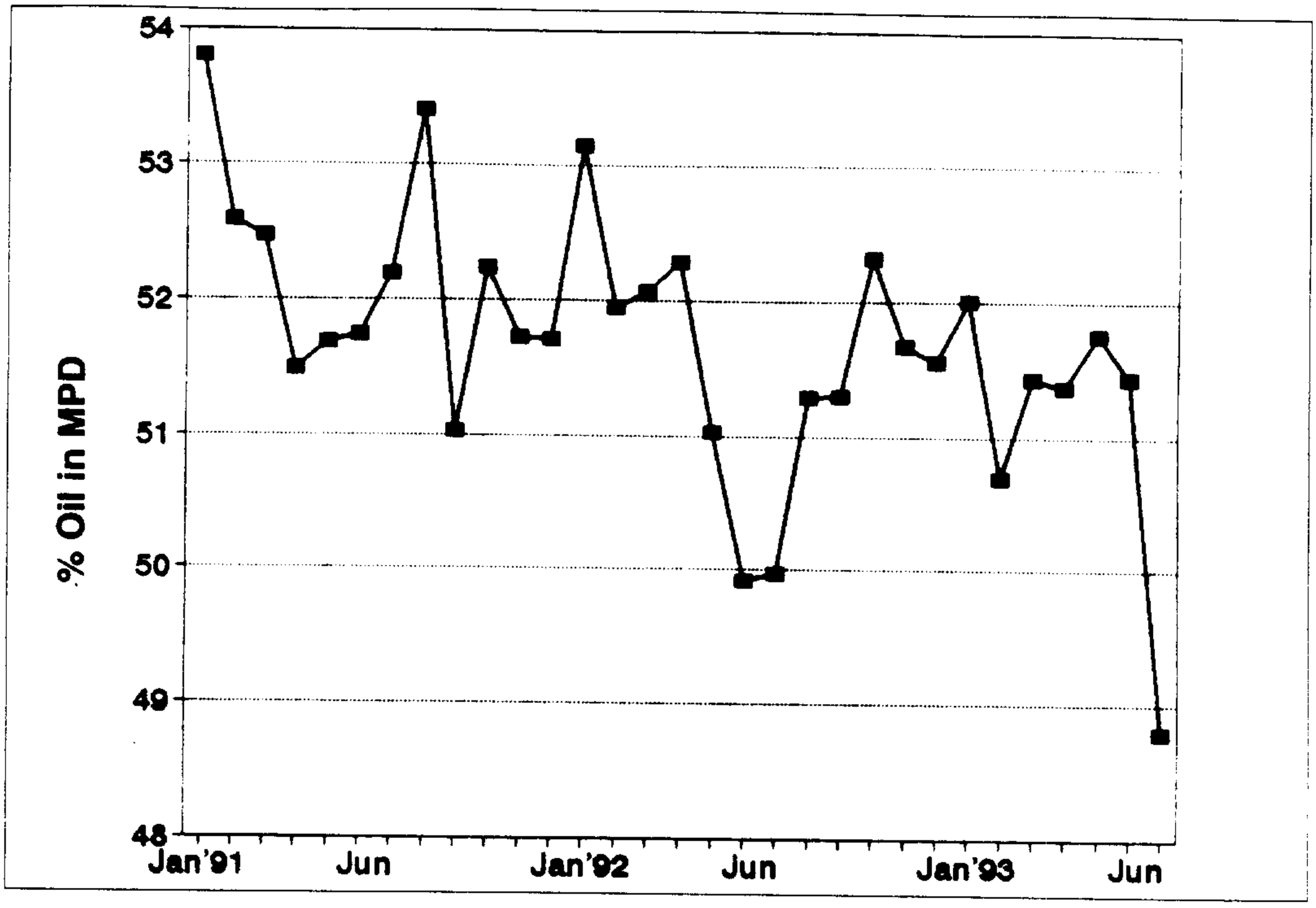

Figure 5. Monthly Percentage of Oil in MPD Without Nuts

ii) A higher proportion of the bunches harvested are unripe and under-ripe. These categories of bunches tend to have lower oil content in the mesocarp.

3. Unripe and Under-ripe Bunches

Bunches received by the mills are assessed for the degree of ripeness of the crop. Random samples of the bunches are assessed each day from the supplying estates. An increase in the percentage of unripe and under-ripe bunches will give rise to low OER as the oil content in mesocarp for these categories of bunches are lower than the ripe bunches. This is demonstrated from the data of 3 bunches with different degree of ripeness harvested from 10 random tenera palms. Results clearly showed that mesocarp, oil on wet mesocarp and oil to bunch ratios decreased if unripe and under-ripe bunches are harvested (*Table 2*).

Based on the group average, there was no observed change in trend for the percentage of unripe and under-ripe bunches over the period studied except for a few months which tend to be on the high side. These data would suggest that the percentage of unripe and under-ripe bunches was not responsible for the current observed decline in OER. Nevertheless, any decrease in percentage of these bunches harvested would help towards improving OER significantly through higher oil content of the bunches harvested and reducing the percentage of unstripped bunches.

TABLE 2. FRUIT COMPONENTS OF BUNCHES OF THE SAME PALMS WITH DIFFERENT DEGREE OF RIPENESS

Bunch No.	No. of Loose Fruits*	M/F (%)	K/F (%)	O/WM (%)	O/B (%)
1	26.8	77.4	11.3	52.6	26.1
2	2.0	76.5	11.8	48.6	21.9
3	0.0	74.2	12.9	42.0	19.3

* After harvest

M/F - Mesocarp to fruit
K/F - Kernel to fruit
O/WM - Oil on wet mesocarp
O/B - Oil to bunch

4. Milling Efficiency

Oil losses during processing is a measure of milling efficiency. Based on current milling technology, a certain level of oil losses do occur and these losses at the various stages of processing are continuously being monitored in Golden Hope mills. As steriliser condensate is being recycled, it is assumed that losses encountered at this stage of processing are considered insignificant.

4.1 Unstripped Bunches

Unstripped bunches will reflect the efficiency of the sterilisation and threshing process and at the same time indicate the level of unripe and under-ripe bunches harvested for processing. During the period studied, Golden Hope mills on the average, showed no change in trend for percentage of unstripped bunches detected.

4.2 Pressing

This is an important stage of processing in terms of the amount of oil extracted. However, there is a limit to reducing the oil loss in fibres as increasing the pressure during pressing will result in higher percentage of broken nuts and poorer kernel recovery. The percentage oil loss in fibres from January 1992 onwards was slightly lower than those recorded in 1991.

4.3 Centrifuge Waste

Oil loss in the centrifuge waste will indicate the inefficiency of the clarification station for oil recovery during processing. The oil loss in the centrifuge waste for the Group appeared to be lower from early 1992 to July 1993 as compared to the figures recorded in 1991.

4.4 Oil Losses During Processing

The results of unstripped bunches, oil loss in fibres at the press, and the oil loss in the centrifuge waste indicated that oil losses during processing are not the factors affecting the observed decline in OER for Golden Hope mills.

5. Discussion

Results from the MPD analyses and process control parameters from the mills indicated that the observed decline in OER for Golden Hope mills in recent months can be attributed mainly to the decline in mesocarp, increase in trash and decline of oil in MPD without nuts. The decline in mesocarp and the oil content of the mesocarp would tend to suggest that not all the loose fruits from the harvested bunches were processed. This problem can arise as a result of poor loose fruit collection as well as loose fruit spillage at the FFB ramp. It can further be amplified with extended harvesting round and non-availability of skilled harvesters. With an abundance of over-ripe bunches, loose fruit collection can be a pain to the estate management especially when there is a shortage of estate workers.

Since the outer fruits contains the most oil within a bunch, efforts should be made to ensure that there are no losses due to poor loose fruit collection. However, when loose fruits are collected, the estate management should ensure that trash is minimised. Golden Hope results showed that for the period studied, trash had increased significantly to the detriment of OER. Other than the harvesting standards which is probably the main factor affecting the decline in OER for Golden Hope mills, there is also the seasonal variation which is not studied in this paper. According to PORIM (1992), the trough usually occurs in the middle of the calender year. As such, the sharp drop in OER in July 1993 can be a combination of these factors.

Monitoring individual mill performance in terms of mesocarp of normal fruits, trash and oil in MPD without nuts will provide a means of detecting which mills as well as supplying estates are not performing so well in these parameters. This will enable management to rectify these production problems as soon as possible and get on track towards higher productivity.

Although the decline of mesocarp, increase in trash and the decline of oil in MPD without nuts were identified from MPD analyses to be the main factors affecting the overall decline in OER, all other factors should also be monitored and any unfavourable effects minimised. Ef-

forts should be directed towards reducing if not eliminating unripe and under-ripe bunches so as to maximise the production of oil. These categories of bunches will also contribute towards higher level of unstripped bunches. Unstripped bunches can also cause a substantial loss in OER especially if these bunches are not detected at the mills for recycling ending up as expensive fertilizers in the field. Efforts should be exerted by the estates and the mills towards achieving 0% unstripped bunches. Estate management should also ensure that bunch stalks are chopped off as much as possible to reduce oil absorption and the non-oil contributing portion of the bunch. The acceptable losses in the oil mills amounting to about 2% OER should be further reduced. This can only be achieved if there are conscientious efforts towards improving milling technology.

6. Conclusion

The studies of trends for MPD and process control parameters in the mills provide a means of identifying problems affecting OER. The observed decline in OER from 1992 onwards in Golden Hope mills could be attributed to the harvesting standards and the quality of the crop harvested. The sharp drop in July 1993 could possibly be confounded with seasonal variation. Improvements in harvesting standards, and milling efficiency with lower level of oil losses will definitely reduce the fluctuation observed in the seasonal variation and arrest or improve the current declining trend in OER.

WORKSHOP PRACTICE

BEARING MAINTENANCE

Introduction

In a modern palm oil mill I think that virtually all the equipment and machines have roller or ball bearings of some type or other and a few words on bearing maintenance will not come amiss.

I am giving below four basic points for bearing maintenance which I trust will be of interest and help to the mill workshop staff.

1. Using the Right Tools

Roller, and ball bearings are precision components and many fail in service from either bad mounting, or dismounting, rather than their service conditions. Special bearing tools simplify the work process and help avoid damaging bearings and associated components, such as shafts, housings and seals.

Bearing-installation tools must conform to the size and type of bearing being worked on. Small bearings, for example, are usually best installed with mechanical tools, such as impact rings, or via heating with hot plates, ovens or induction heaters. Heating expands a bearing's inner ring so that it fits onto a shaft; as the bearing cools, the inner rings shrinks, achieving a firm grip on the shaft. Bearings should not be heated to more than 110°C and, of course, bearings fitted with shields or seals should not be heated at all. Dismounting tools, such as bearing pullers, prevent damage to adjacent components.

When mounting or dismounting, never hammer a bearing ring directly - see *Figure 1*. Use a tubular sleeve, closed at one end, to apply the mounting force through the ring with the interference fit (usually the inner ring on the shaft) - see *Figure 2*. Dismounting force should be through the ring with the interference fit. However, this is often not possible. Pulling through the loose ring transfers the force through the rolling elements, which can damage the raceways. Inspect the dismounted bearing, shaft and housing and if necessary fit a replacement bearing.

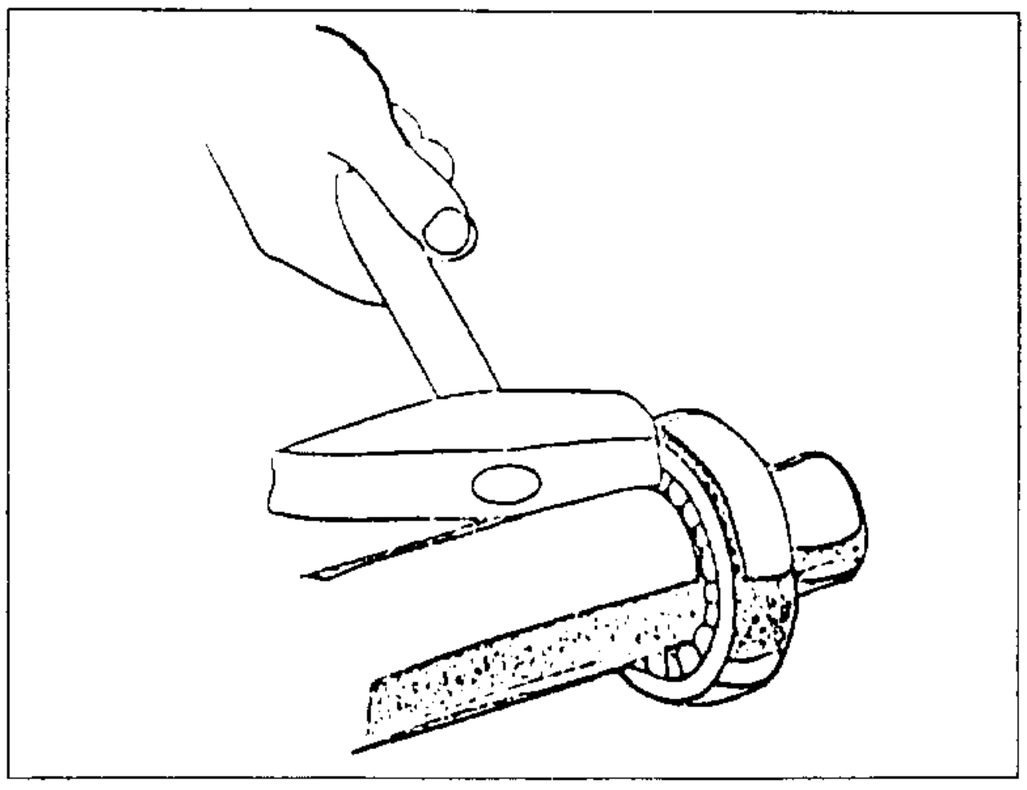

Figure 1. The way Not To Do It. (Hammering directly on a bearing ring can cause cracks which lead to bearing failure)