

SEASONAL VARIATION IN OIL PALM YIELD UNDER RAINFED CONDITIONS

JACOB MATHEW*, K. U. K. NAMPOOTHIRI, R.S.N. PILLAI and C. KESAVAN NAMPOOTHIRI*
Central Plantation Crops Research Institute, Research Centre, Palode - 695 562, Trivandrum, Kerala, India.

ABSTRACT

Month-wise compilation of the harvest data available from a large oil palm plantation at Palode revealed considerable variation in yield and associated characters between months. Weight of FFB harvested during March to July was found to be generally high. In general, about 45% of the total yield was obtained during the period March to May, and nearly 23% was the share of June- July. The remaining 32% was harvested during the seven months period from August to February. The maximum quantity harvested was during April (18.1% of the total annual production) and lowest share of 3.15% was in December. In real terms, the mean weight of FFB harvested per hectare in a month was 2.0 tons during March to May, compared to 1.5 tons during June-July and 0.6 tons for the rest of the period. The increased share in production during the summer and early monsoon periods was due to the more number of palms and bunches harvested during this period. Mean bunch weight was also comparatively high during this period. In younger palms the seasonal variations were more conspicuous, and as palms grew older, the seasonal differences in yield and yield attributes narrowed down. In the years of bumper yield, the proportion of total yield obtained during yield, the proportion of total yield obtained during March to May was over 53%. The significance of seasonal variation in FFB production in relation to processing requirement is also discussed.

INTRODUCTION

Long term trends in oil palms yield, and the other associated characters, under rainfed condition had been studied earlier (Jacob Mathew, *et. al.*, 1993). This study revealed an increasing trend of yield of FFB upto the 14th year after planting, while the mean bunch weight was showing a steady rising trend, even at the 15th year. The seasonal variation in yield and the factors associated with the same, at different stages of the growth of the palm, is discussed in this paper.

MATERIALS AND METHODS

The material consisted of 798 tenera palms planted in 1976, and grown under rainfed conditions at Central Plantation Crops Research Institute, Research Centre, Palode, Kerala. Data on number of bunches harvested, and weight of

fresh fruit bunches (FFB) recorded during 1985 to 1992 (9th to 16th year after field planting) were made use of for this study. The data were compiled on monthly basis to study the seasonal variation in total weight of FFB harvested and number of bunches harvested (for convenience, expressed on per hectare basis, with 143 palm per ha., under 9 x 9 x 9m triangular system of planting). Changes in seasonal variation of yield, and yield attributes have been looked into for the years of peak trough and normal yields, and also in relation to the age of the palm. The significance of seasonal variation in yield, in relation to processing requirement had also been looked into.

RESULTS AND DISCUSSION

The total weight of FFB harvested was 13.32 tons/year/ha., during the period 1985 to

* CPCRI Regional Station, Kayangulam - 690 533, Kerala, India.

1992. For the individual years it varied from 5.26 tons in 1985 to 21.39 tons in 1990. Though bunches can be harvested throughout the year, clear month to month variation in the quantity of bunches harvested was visible. On an average, the maximum harvest was in April (2.4 tons/ha). Thereafter, it was showing a steady decline till August. In September, there was a marginal increase in the weight of FFB harvested, but the declining trend continued with the minimum reaching in December (0.41 tons/ha). Thereafter it showed a rising trend (Table 1). During the five months period March to July, the harvest of FFB was generally above average. In general, 45.1% of the total yield was obtained during the three-month period March to May and 22.7% during June-July. The remaining 32.2% was obtained during the seven-month period from August to February. In real terms, the total weight of FFB harvested was around 2.0 tons/ha/month during March to May and 1.5

tons/ha/month during June-July, compared to about 0.6 tons/ha/month for the rest of period.

Total number of palms from which bunches were harvested, total number of bunches harvested from these palms, and the mean bunch weight are all factors influencing the total weight of FFB. These associated characters also exhibited a similar trend in seasonal variation (Table 1). The maximum number of palms were harvested during April (63.7 palms/ha) coinciding with month of maximum production and minimum being in November-December (17.6 and 19.4 palms/ha, respectively). In the case of bunches harvested, the trend was almost the same, as in the case of total weight of FFB, with 44.4% of the total bunches harvested in a year falling in the period March to May and 22.3% during June-July. In other words, while about 134 bunches could be harvested per month per ha. during March to

Table 1. Seasonal variations in yield of FFB and associated characters (mean for the period 1985 to 92)

Month	Wt. of FFB (tons / ha)	Palms harvested (no. / ha)	Bunches harvested (no. / ha)	Mean bunch weight (kg)
January	0.75 (5.6)	33.3	55.3 (6.1)	12.60
February	0.89 (6.7)	37.5	66.6 (7.4)	13.50
March	1.86 (14.0)	58.4	138.6 (15.3)	12.80
April	2.40 (18.1)	63.7	147.9 (16.3)	15.70
May	1.74 (13.1)	51.7	116.0 (12.8)	16.10
June	1.68 (12.6)	41.1	104.1 (11.5)	15.30
July	1.34 (10.1)	45.8	97.5 (10.8)	14.61
August	0.47 (3.6)	24.1	37.9 (4.2)	13.20
September	0.67 (5.0)	25.9	44.2 (4.9)	11.50
October	0.66 (4.9)	31.1	47.6 (5.3)	12.60
November	0.43 (3.2)	17.6	24.3 (2.7)	14.10
December	0.41 (3.1)	19.4	25.8 (2.9)	15.20
Total	13.32 (100.0)		905.8 (100.0)	
Average	1.110	37.5	75.5	13.92

May, it was around 101 bunches during June-July, compared to 43 bunches per month during the rest of the period. Mean bunch weight was maximum in May (16.08 kg) and minimum in September (11.55 kg). In comparison with the other yield contributing factors, month to month variation was less in the case of mean bunch weight, with slightly erratic trend between seasons. Still, the mean bunch weight was higher at 14.9 kg during March to May and 15.0 kg during June-July, with nearly 13.2 kg during August to February.

Seasonal indices constructed for these four parameters, showed that the variations between months were maximum in the case of total weight of FFB (range : 37.2 in December to 216.0 in April) and minimum in the case of mean bunch weight (range : 83.0 in September to

115.5 in May). In the case of number of palms harvested and number of bunches harvested, the indices ranged from 47.0 to 170.0 and 32.0 and 195.9 respectively.

Effect of age of palm on seasonal variation in yield (wt. of FFB) and yield components was also looked into. For this purpose, the period 1985 to 1992 was divided into two 4 year blocks, namely, 1985 to 1988 when the palms were 9 to 12 years old; and 1989 to 1992 when the palms were 13 to 16 years old. Trend in yield and yield attributes during the different months has been presented in Table II. In higher age group, though there was marginal reduction in the no. of palms harvested as well as number of bunches harvested, the mean bunch weight was almost double that of the palms in the younger age

Table II. Seasonal variations in yield of FFB and associated characters in different ages

Month	Total wt. FFB (tons/ha)		Palms harvested (no./ha)		Bunches harvested (no./ha)		Mean bunch weight (kg)	
	1985-88	1989-92	1985-88	1989-92	1985-88	1989-92	1985-88	1989-92
Jan	0.38	1.11	28.0	38.7	45.7	64.9	8.45	16.7
Feb	0.43	1.35	33.9	41.2	60.6	72.6	7.00	19.5
Mar	1.48	2.23	58.4	58.3	143.1	134.1	8.93	16.7
Apr	1.67	3.13	64.4	62.9	131.0	164.8	12.03	19.4
May	1.85	1.64	66.6	36.8	150.9	81.1	11.61	20.5
June	1.79	1.57	46.7	35.4	118.7	89.6	13.86	16.8
July	1.62	1.07	61.2	30.4	135.8	59.1	11.72	17.5
Aug	0.17	0.79	19.0	29.3	26.9	48.9	10.38	16.0
Sep	0.39	0.97	18.4	33.5	32.9	55.4	5.10	18.0
Oct	0.38	0.93	29.7	32.5	47.0	48.2	6.15	19.0
Nov	0.09	0.77	7.3	27.9	8.8	39.7	9.25	18.9
Dec	0.33	0.49	21.7	17.0	27.3	24.4	11.74	18.7
Total	10.58	16.05			928.7	882.8		
Average	0.88	1.34	37.9	37.0	77.4	73.6	9.68	18.2

Table III. Trends in the annual yield of FFB (tons/ha)

Year	1985	1986	1987	1988	1989	1990	1991	1992	Mean
Wt. of FFB	5.26	17.38	8.05	11.68	14.78	21.39	15.79	12.37	13.32

group. This had resulted in over 50% increase in FFB yield in the older palms. As the palms grew older, the distribution of yield in the different months were found to become more uniform. In the case of younger palms, nearly 80% of the total yield was obtained during the five-month period from March to July, while this was only 60% in the case of older palms, with the result that the proportion of yield obtained during the lean season increased from 20 to 40%. Similar trend was noticed in the case of palms harvested in different months. The total number of bunches harvested showed about 5% decline in older palms and this reduction was more conspicuous during June-July period. During the lean period, the number of bunches harvested increased from 35.6 to 50.6/ha/month (from 27 to 40% in relative terms) in older palms. In the case of mean bunch weight, no clear trend was discernible between seasons. In younger palms, the mean bunch weight was maximum in June-July (12.8 kg) followed by 10.86 kg in March to May and 8.30 kg during August to February. During September-October, the mean bunch weight was in the range 5 to 6 kg only. But when the palms grew older, these differences between seasons narrowed down, with 18.90 kg during March-May, 17.15 kg during June-July and 18.13 kg during August-February. In general, the seasonal differences in yield and yield attributes were found to narrow down, as the palms became older.

During the eight year period 1985 to 92, the annual yield of FFB varied from 5.26 tons/ha in 1985 to 21.39 tons/ha in 1990 (Table III). By

comparing the yields obtained in adjacent years, it can be said that 1986 and 1990 were years of bumper yields, 1985, 1987 and 1992 were years of low yields and the remaining three years, viz., 1988, 1989 and 1991, were years of normal yield. Pattern of seasonal variations was examined in these three sets of years also (Table IV). While the weight of FFB harvested was 19.23 tons/ha in the years of peak production, it was only 8.47 tons/ha in the years of low production. Similar trend was seen in the case of number of palms harvested as well as in the number of bunches harvested. In the case of mean bunch weight also, in the years of peak production, the bunches were also, slightly heavier. In these years, about 53.1% of the total yield was obtained during March-May, with only 16.8% share during June-July and remaining 30.1% harvested during August to February. In contrast to this, in the years of low production, there was slight reduction in the proportion of yield during March to May and August to February, with the share of June-July going up. In the former period (bumper yields), the mean monthly yield obtained was 3.4 tons/ha during March to May, compared to 1.6 tons/ha during June-July and 0.8 tons/ha during August to February. In the years of low production and normal production, the differences in the weight of FFB, between seasons was less conspicuous, with the June-July period recording a slightly higher average yield in normal years, which was due to the more number of heavy bunches harvested. During this period, the trend was more or less same, as in the case of weight of FFB.

Table IV. Seasonal variations in the annual yield of FFB and associated characters during the years of peak, trough and normal yields.

Particulars	1986,90	1985,87,92	1988,89,91	Pooled
Total wt. of FFB (tons / ha)				
Mean for Mar-May	3.404 (53.1)	1.396 (49.5)	1.633 (35.0)	2.001 (45.2)
Mean for Jun-Jul	1.616 (16.8)	1.013 (24.0)	1.923 (27.5)	1.516 (22.7)
Mean for Aug - Feb	0.827 (30.1)	0.320 (26.5)	0.748 (37.5)	0.612 (32.1)
Total for the year	19.230	8.465	13.981	13.317
Palms harvested (no./ha)				
Mean for Mar - May	92.1	47.5	44.4	57.9
Mean for Jun-Jul	59.8	33.7	41.9	43.5
Mean for Aug - Sep	32.0	21.6	28.5	27.0
Mean for the year	51.7	30.1	34.7	37.5
Bunches harvested (no. / ha)				
Mean for Mar - May	246.9 (53.2)	93.3 (42.8)	97.4 (35.8)	134.2 (44.4)
Mean for Jun-Jul	135.8 (19.5)	74.7 (22.8)	101.7 (24.9)	100.8 (22.3)
Mean for Aug - Feb	54.1 (27.3)	32.3 (35.4)	45.7 (39.3)	43.1 (33.3)
Total for the year	1391.0	655.6	815.8	905.8
Mean bunch weight (Kg)				
Mean for Mar - May	14.5	14.0	16.0	14.9
Mean for Jun-Jul	13.5	12.4	18.5	15.0
Mean for Aug - Feb	12.4	11.2	15.7	13.2
Mean for the year	13.1	12.1	16.3	13.9

Note: Figures in parenthesis denote the per cent share for each period.

While discussing the long term trends in yield, it had been pointed out that the bumper obtained during 1986 and 1990 were more due to the increased production of bunches during these years. Similarly the increased share in

production observed during March to July was due to the increased number of palms and bunches harvested during this period. Mean bunch weight had only limited influence in increasing the weight of FFB harvested during

this season. Seasonal variation in yield had been reported earlier also (Anonymous, 1993). According to them, peak yields of FFB bunches were obtained during the months of March to June; 63% of the annual production being recorded during these months. Production was very low in September and December.

The type of seasonal variation in the yield of FFB discussed in this paper is of significance in deciding the processing requirements. Since oil palm fruits are to be processed at the earliest after harvest, the palm oil mill should have the capacity to process all the fruits harvested. It also will be a deciding factor in deciding the minimum hectareage required for sustaining a viable mill. The average FFB yield is 13.3 tons/ha/year, with a maximum production of 2.4 tons/ha during April (Table 4). Therefore the mill has to be designed for processing this quantity. The maximum monthly production from 200 ha plantation will be around 480 tons during April. Assuming about 500 working hours per month, a one ton/hour mill will be able to process this quantity. Thus the minimum area of plantation should be 200 hectares to supply fruits to a one ton/ha mill, which is the smallest unit available in the country. It also leads to the conclusion that a mill of 5 tons/hour capacity is required for a 1000 a plantation. In the years of bumper yields, since the production during April may be slightly

higher, extra hours of work will be required for completing the processing.

As the mill will be idle during the lean season of seven months, this fluctuating trend in production is highly disadvantageous. Any effort to even out this and ensure a more uniform production will help in reducing the capital investment and reduce recurring costs, as for as processing is concerned.

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