

TREND IN OIL PALM YIELD DURING THE EARLY YEARS OF BEARING UNDER RAINED 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

ABSTRACT

Long term trends in oil palm yield and other associated characters were examined for the first 15 years after planting, in a population of 798 palms planted in 1976 and grown under uniform management at CPCRI Research Centre, Palode, Trivandrum Dist., Kerala. Thirtyfour percent of the palms came to harvest by the fourth year. Yield of FFB/ha showed an increasing trend from 0.125 ton in 1980 to 21 tons in 1990, with peak yield in 1986 and 1990. Similar trend was observed in the case of the number of bunches also. Mean bunch weight showed a steady increase from 1.6 kg to 18.7 kg during this period, with mean annual growth rate of 1.6 kg. The peak yields obtained during 1986 and 1990 were found to be more due to the increased production of bunches. Regression studies showed that 96% of the changes in annual yield is explained by the variations in bunch number and mean bunch weight.

INTRODUCTION

Oil palm is a comparatively new crop in India and is coming up in a large way in South India. In a perennial crop like this, an understanding of the trend in yield is very essential for planning plantation strategies, including establishment of processing facilities, which in turn depends upon the availability of fresh fruit bunches. Also from the point of view of statistical techniques in field experimentation, a knowledge about trend and variability in yield is essential. Though the first oil palm plantation in Kerala was established in 1961, this information is not available. Therefore, this study was taken up.

MATERIALS AND METHODS

The material consisted of 798 tenera palms planted in 1976, at Central Plantation Crops Research Institute, Research Centre, Palode, Trivandrum District. The *dura* mother palms used were of Malaysian origin, planted at Oil Palm Station, Thodupuzha, Kerala, and the *pisifera* pollen was imported from Nigerian Institute of Oil Palm Research, Nigeria. The spacing adopted for the plantation was 9m X 9m X 9m, in a triangular system of planting. The palms are growing under rainfed condition,

receiving uniform fertilizer and management practices. During 1985 the pollinating weevil *Elaeidobius kamerunicus* was introduced in this plot.

Data on number of bunches harvested and weight of fresh fruit bunches (FFB), available from 1980 to 1991 (4th to 15th year, after field planting) were used for this study. Harvest - wise data were compiled on calendar year basis to obtain the annual yield. This was used to study the long term trends in total yield of FFB and total no. of bunches harvested (expressed on per hectare basis, density : 143 palms), mean bunch weight, cumulative number of palms which came to harvesting, and per palm yield of FFB and number of bunches during the initial years of bearing. Using simple regression models, annual growth rate was estimated taking age of the palm as the independent variable (Table I). Interrrelationship between yield and other associated characters was studied by working out the coefficients of correlation (Table II). Using simple and multiple regression models, the relative contribution of different component factors (age of the palm, no. of bunches harvested and mean bunch weight) in explaining the variation in total yield was also studied (Table III).

* CPCRI Regional Station, Kayangulam - 690 533, Kerala

Table I. Yield and associated characters during the early years of bearing

Year	Age (years)	Total wt. of FFB (tons/ha)	Total bunches (no/ha)	Palms harvested (cum.%)	Mean bunch wt. (Kg)	Mean wt. of FFB (Kg/palm)	Mean no. of bunches (per palm)
1980	4	0.125	80.3	33.9	1.6	2.58	1.65
1981	5	0.986	256.6	75.8	3.8	9.10	2.37
1982	6	1.438	291.4	89.2	4.9	11.26	2.28
1983	7	1.736	262.3	92.5	6.6	13.13	1.98
1985	9	5.258	714.5	97.7	7.4	37.62	5.11
1986	10	17.376	1571.2	99.6	11.1	121.72	11.03
1987	11	8.047	676.1	99.6	11.9	56.49	4.74
1988	12	11.677	753.5	99.6	15.5	81.97	5.29
1989	13	14.781	867.5	99.7	17.0	103.62	6.08
1990	14	21.390	1230.4	99.9	17.4	149.76	8.61
1991	15	15.780	843.7	100.0	18.7	110.35	5.90
LGR		1.808	87.1	1.6	12.47	0.54	
R-square		0.800	0.53	0.98	0.80	0.47	

LGR : Linear growth rate.

Table II. Interrelationship between total yield and other characters

	Palms harvested	No. of bunches	Bunch weight	Total yield
Age of the palm	0.725	0.725	0.988	0.892
Palms harvested (Cum %)		0.638	0.702	0.602
No of bunches			0.703	0.912
Bunch weight				0.895

Table III. Regression models showing the contribution of different characters to variations in total yield

Equation	Constant term	Regression coeff. corresponding to			R-square
		1	2	3	
1	-8.46	1.808** (0.306)	-	-	0.80
2	-1.60	-	0.015** (0.002)	-	0.83
3	-2.90	-	-	1.126** (0.187)	0.80
4	-6.38	0.993* (0.345)	0.008* (0.003)	-	0.89
5	-5.05	0.667 (2.079)	-	0.719 (1.291)	0.80
6	-4.17	-	0.009** (0.002)	0.631** (0.127)	0.96
7	-1.51	-0.856 (1.011)	0.010** (0.002)	1.134 (0.608)	0.96

1. Age of the palm, 2. No. of bunches harvested, 3. Mean bunch weight. Figures given in parentheses denote SEs of regression coefficients.

* Significant at P=0.05, ** Significant at P=0.01

RESULTS AND DISCUSSION

Under conditions prevailing at the Research Centre, bunches could be harvested from about one-third of palms by the fourth year and most the palms except four came to harvesting by the tenth year (Table I). The yield (weight of FFB) was only 0.125 tons/ha during the fourth year and slowly rose to 1.736 tons/ha by the seventh year. By the ninth year, it went upto 5.258 tons and the next year (1986) a bumper yield of 17.376 tons was recorded. Then it suddenly fell to about half this yield. Again it was showing a rising trend, with another peak yield of 21.390 tons during 1990 (14th year), followed by a sudden dip in yield, the next year. Almost a similar trend was observed in the case of number of bunches harvested also, with an unusually higher number during 1986 and 1990 and a sharp fall in the very next year. In the case of weight of FFB, the 1990 yield was 23.1% higher than the 1986 yield, where as in the case of number of bunches harvested, the 1990 figures, though high, were 21.7% lower than the 1986 figures (Table I). Similar trend was noticed in the case of per palm figures also. Unlike these characters, mean bunch weight was showing a steady rising trend during this period, with no sharp rise or fall in any of the years. The weight of the bunch which was only 1.6 kg during the fourth year, rose to 11.1 kg in tenth year and 18.7 kg in the fifteenth year.

Corley and Gray (1976) have reported that in *dura* palms the first fruit normally ripens during the third year after field planting. Yield rises to a maximum during the first few years and thereafter usually tends to decline. But *tenera* is expected to reach peak yield earlier than the *dura*, and the yield decline slowly with the age, maximum yield is obtained 10 years after planting and bunch yield decreases with age. Obasola and Nampoothiri (1977) have reported from Nigeria that peak production of bunches was noticed during 4th to 12th year, after which there was a sudden decline. Data presented here shows that the production of bunches has reached the peak, but there is a steady increase in bunch weight even at the 15th year (Table I). Therefore, it appears that the yield of FFB may show a rising trend for some years more.

Linear regression analysis showed that the mean bunch weight was increasing by 1.6 kg ($R^2 = 0.98$) every year during this period (Table I). The per palm yield and the total yield were also increasing at an average annual rate of 12.47 kg and 1.81 tons/ha respectively, both with an R^2 of 0.80.

Correlation studies (Table II) showed that age of the palm, number of bunches harvested and mean bunch weight have a very high correlation (around 0.9) with total yield. It is also seen that bunch weight is purely dependent on age of the palm ($r=0.988$), during the initial years of bearing. Cumulative percentage of bearing palms had a correlation of 0.6 only with total yield. This is because almost all the palms could be harvested by the 10th year and its influence on total yield was confined to the period prior to this only. Therefore, this character was not included in the multiple regression analysis.

When all the characters, viz. age of the palm, number of bunches harvested and mean bunch weight were considered together, 96% of the variations in total yield were found to be explained by them (Table III). However, when age of the palm was omitted from this model, there was no reduction in R^2 value, because of the close inter relationship between the age of the palm and the mean bunch weight (Table II). Age of the palm, along with total no of bunches harvested was also found to explain 89% of variations in total yield. Yield estimated on the basis of these parameters are found to be very much on par with the observed yield including the bumper yield recorded for 1986. For 1990, the estimated yield (around 18 tons) was lower than the realized yield (21 tons) indicating the possibility of some other factor (s) also influencing the total yield during this period.

The pollinating weevil *Elaeidobius kamerunicus* had been observed in this plantation during 1985 (Anonymous, 1986) and the bumper yield recorded in 1986 is considered to be due to this. The large number of bunches that could be harvested this year is perhaps due to lesser bunch failure, which in turn was due to the adequate pollination brought about by the presence of the weevil. Dhilepan and

Nampoothiri (1989) have recorded 40% increase in bunch weight with the introduction of the pollinating weevil. This was not observed in the present data, because the expected increase in bunch weight, was got nullified by the loss in weight associated with increased bunch production (Van der Vossen, 1974). The yield reduction in 1987 following the bumper yield in 1986, is mainly due to the reduction in bunches. Such fall in yield, after a boost in yield consequent to introduction of a pollinator, has been recorded from Malaysia also (Chan, 1985). The available data also throws light on the possibility of a four-year yield cycle under local conditions. Hartley (1977) has reported an approximate three year yield cycle in about 40% of the palms. Haines (1959) has also demonstrated the existence of three and five year yield cycles in Nigeria.

REFERENCES

- ANONYMOUS 1986. *Annual Report for 1985*, Central Plantation Crops Research Institute, Kasaragod, India. 212 pp.
- CHAN, K.W. 1985. The staus Weevil effects on yield production in well manured palms under

malaysian condtions. *The Planter*, 61 : 439-453.

- CORLEY, R.H.V. and GRAY, B.S. 1976 Yield and yield components. pp. 71-86. In *Oil Palm research*. eds. Corley, R.H.V., et al. Elsevier Scientific Publishing Co., Amsterdam.
- DHILEEPAN, K. and NAMPOOTHIRI, K.U.K. 1989. Pollination potential of introduced weevil, *Elaeiodobius kamerunicus* in Oil Palm (*Elaeis guineensis*) plantation. *Indian J. agric. Sci.* 59 (8) : 517-521.
- HAINS, W.B., 1959. The significance of cyclic peak yields in Nigerian oil palms, *Emp. J. Exptl. Agric.*, 27 : 1-9.
- HARTLEY, C.W.S. 1977. *The Oil Plam* 2nd ed., Longman, London. 804 pp.
- OBASOLA, C.O. and NAMPOOTHIRI, K.U.K. 1977. Trend and bunch characters of Oil Palm. Paper presented at the *Tech. Consultation on Oil Crops for West and Central Africa*, Benin City, Nigeria, Nov. 21-26, 1977.
- VAN DER VOSSSEN, H. A. M., 1974. Towards more efficient selection for oil yield in the oil palm (*Elaeis guineensis* Jacquin). Thesis. University of Wageningen. 107 pp.

DISCUSSION

R.D. IYER : The bumper yield of 1986 is attributable to introduction of pollinating weevil, but the sudden decline in 1987 should be explained in terms of climatic factors - whether moisture stress has influenced bunch production. Since oil palm is recommended only for irrigated agriculture, the role of climatic factors and moisture stress on stability of performance should be emphasized in this paper. The fact may be clarified in the title itself by revising "Oil palm yield trend during yearly bearing under rainfed conditions".

JACOB MATHEW : The influence of weather parameters on oil palm yield and other characters are being studied separately. A sudden fall in yield, after a boost in yield consequent to introduction of a pollinator has been recorded from Malaysia also and this has been quoted in the text of the paper also. The title of the paper is also being modified.