

CROP YEAR VERSUS CALENDAR YEAR AS BASIS FOR COMPILING ANNUAL YIELD IN COCONUT

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ABSTRACT

Coconuts are harvested throughout the year at an interval of about 30-60 days and the annual yield is the number of nuts obtained in a 12 month period. Two different methods of compilation of annual yield data showed that the year to year variation is more pronounced in the case of calendar year tabulation, as compared to agricultural years. When two year averages were taken, these differences were found to come down. With the help of experimental data, it has been shown that conclusions drawn can be different depending on the method of compilation of annual yield data. Analysis of mean yield for two consecutive years is suggested to overcome this problem.

INTRODUCTION

In coconut, the annual yield is taken as the number of nuts harvested at 30-60 days interval, in a 12 month period. In the past, many research workers have tried to discuss the annual and seasonal variations in the yield of coconut (Menon and Pandalai, 1958; Satyabalan *et al.* 1968, 1969; Abeywardena, 1971; Thampan, 1981). In some cases, they have considered for analysis the yields obtained in a calendar year, while in some other cases, the crop year or agricultural year (viz. July to June) yields have been considered. For official statistics also, while agencies like FAO and APCC present the data on calendar year basis, some other agencies like Directorate of Economics and Statistics (Ministry of Agriculture, Government of India) publish the figures on crop year

basis. While presenting experimental results in research publications also, both these methods of tabulations have been noticed. In this paper, an attempt has been made to study the variations that may arise by adopting the two different methods of compilation.

MATERIALS AND METHODS

At Central Plantation Crops Research Institute, Kasaragod, coconuts are harvested almost regularly at an interval of about 30 days and palm-wise, harvest-wise data are available for the past many years. For this study, the yield data of a total of 375 West Coast Tall palms, from four different locations in the farm, for the period from July 1978 to December 1984 were considered. Mean annual yield of nuts, for the the data tabulated on the basis of calender years and crop years,

Table I. *Mean annual yield of coconut for crop years and calendar years.*

Year	Annual Data				Two year moving averages			
	Plot 1 (n = 42)	Plot 2 (n = 39)	Plot 3 (n = 194)	Plot 4 (n = 100)	Plot 1	Plot 2	Plot 3	Plot 4
1978-79	77.4	99.1	61.7	37.5				
1979-80	65.3	44.1	39.1	38.7	71.3	71.6	50.4	38.1
1980-81	73.2	67.6	43.7	39.3	69.3	55.9	41.4	39.0
1981-82	82.9	72.1	65.8	74.4	78.1	69.9	54.8	56.8
1982-83	87.4	82.3	69.8	73.9	85.2	77.2	63.8	74.1
1983-84	76.2	63.3	66.5	82.6	81.8	72.8	63.2	78.3
Mean	77.1	71.4	57.8	57.7	77.1	69.5	54.5	57.3
1979	84.8	85.2	64.3	45.9				
1980	57.3	37.1	23.0	31.2	71.1	61.1	43.7	38.6
1981	90.5	91.4	74.4	60.8	73.9	64.2	48.7	46.0
1982	65.2	48.4	49.3	68.6	77.8	69.9	61.9	64.7
1983	102.3	105.3	93.2	92.6	83.8	76.9	71.8	80.6
1984	67.1	38.4	40.1	73.7	84.7	71.7	66.7	83.2
Mean	77.9	67.6	57.4	62.1	78.3	68.8	58.5	62.6

for the different plots are presented in Table I. All the palms were growing under rainfed conditions. While the palms in Plot 1 were around 40-50 years old during this period, others were much younger, the years of planting being 1959, 1965 and 1968 respectively for Plots 2, 3, and 4. The palms in Plot 4 are the non-experimental border palms of an irrigation experiment, while in Plot 3, both the experimental and the non-experimental border palms of a regular fertilizer trial were considered together. Two-year moving averages for these plots have also been presented in Table I.

To illustrate the possible effects of these two methods of tabulation on the analysis and interpretation of experimental data, the yield records of a well laid out genotype-cum-fertiliser trial from CPCRI, Kasaragod was considered. This

experiment was laid out in 1965 on newly planted seedlings, with nine treatments, representing the factorial combinations of three genotypes and three levels of fertilizer mixture, all replicated thrice, in a randomized block design with six-tree plots. The analysis of the annual data was carried out for the years 1979 to 1984 in the case of calendar years and for 1978-79 to 1983-84 in the case of crop years and the summary of the analysis of variance table is presented in Table II. Pooled analysis of data for the six year period was also carried out, as suggested by Patterson (1939) (Table III).

RESULTS AND DISCUSSION

The data presented in Table I clearly show that the year to year variation is more pronounced in the the case of calendar year tabulation, as compared to

Table II. *Genotype-cum-Fertilizer Trial – Analysis of annual data – Summary of ANOVA (M.S.S.) and Table of means.*

a) *Crop year data*

Source	df	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Replications	2	165.4	9.5	1010.0	321.2	222.1	498.8
Genotypes	2	1236.6++	451.2+	663.9	1842.9++	473.7	1373.6++
Fertilizers	2	10603.9++	4291.7++	3196.2++	6258.9++	7805.7++	5436.7++
Geno. × Fert.	4	167.7	129.2	275.5	99.4	341.8	143.2
Error	16	129.8	87.4	228.8	223.6	209.7	212.8
Genotype 1		49.2	29.0	33.0	48.1	72.4	56.3
Genotype 2		69.3	41.8	46.0	73.4	86.1	79.0
Genotype 3		48.8	30.1	29.8	49.1	75.1	59.3
Fertilizer 1		17.0	8.8	14.7	26.6	44.6	36.5
Fertilizer 2		68.3	42.2	44.7	68.5	88.7	79.9
Fertilizer 3		82.1	49.9	49.4	75.4	100.4	78.2
Mean		55.8	33.6	36.3	56.8	77.9	64.9

b) *Calendar year data*

Source	df	1979	1980	1981	1982	1983	1984
Replications	2	49.5	2.6	2499.1	1401.5	982.7	1259.6
Genotypes	2	3943.4++	28.0	4536.4++	523.5	7319.9++	416.5+
Fertilizers	2	11853.8++	841.7+	11558.7++	1625.1++	14580.3++	1501.2++
Geno. × Fert.	4	572.6	41.9	920.9	696.2	998.2	234.1
Error	16	280.2	44.9	371.2	245.3	360.0	86.6
Genotype 1		46.3	17.2	53.3	45.7	89.1	35.4
Genotype 2		83.3	14.1	91.7	32.4	139.5	23.7
Genotype 3		47.9	17.1	52.3	45.6	91.2	35.5
Fertilizer 1		17.6	6.3	24.6	26.2	60.2	17.8
Fertilizer 2		75.3	16.6	82.9	45.6	128.1	33.5
Fertilizer 3		84.6	25.6	89.8	52.0	131.5	43.4
Mean		59.2	16.1	65.8	41.2	106.6	31.5

+ Significant at $P = 0.05$ ++ Significant at $P = 0.01$

agricultural year. Distinct ups and downs could be seen in alternate years, when the data was tabulated on the basis of calendar years, and these differences were found to reduce when the data were considered on crop year basis. Slight differences observed between plots can

be attributed to the age differences and the effect of irrigation in the adjoining plots. However, when two-year moving averages were taken, these differences, between years as well as between the methods of tabulation, were found to narrow down. This is because, during the

Table III. *Genotype-cum-Fertilizer Trial Pooled analysis of data - Summary of ANOVA (M.S.S.) Table.*

Source of variation	df	Crop-year data (1978-79 to 1983-84)	Calendar year data (1979 to 1984)
Replications	2	894.77	1338.50
Genotypes	2	5571.17++	4651.59++
Fertilizers	2	35990.72++	32474.39++
Geno. × Fert.	4	833.35	778.95
Error (a)	16	667.61	620.90
Years	5	7717.16++	27168.90++
Geno. × Years	10	94.15	2423.23++
Fert. × Years	10	320.46+	1897.27++
Geno. × Fert. × Years	20	64.67	537.01++
Error (b)	90	105.05	244.34

++ Significant at $P = 0.01$

period under consideration, a two year cycle was observed for peak yields.

These methods of tabulation of data were found to affect the conclusions that can be drawn from experimental data. While the variance-ratios for the annual data showed only marginal differences under the two methods of tabulation (Table II), a perusal of the treatment means showed that some of the genotypes which behaved in a steady manner when the data were tabulated on agricultural year basis, were found to behave in an erratic manner, for the calendar year data. This was confirmed in the pooled analysis also. Genotype × years and genotype × fertilizer × years interactions, which were not significant when the data were considered on agricultural year basis, turned out to be highly significant, when the data were tabulated on the basis of calendar years (Table III). Based on the analysis of agricultural year

data, while conclusions can be drawn about the consistent behaviour of the genotypes over the years, the same is not possible for calendar year data.

Half yearly yield data of these palms were critically examined to ascertain the reasons for these differences, when the same data were tabulated in two different ways. Menon and Pandalai (1958) has pointed out that about 60% of the nuts harvested in any year is from the months of January to June. A more-or-less similar trend was noticed in the present study also, in years of both high and low yields (Table IV). However, in lean years, the actual number of nuts harvested during January to June is lower than that obtained during July-December of the preceding or succeeding year of high yield. When yield data are considered on the basis of crop years, one half year of high yield is combined with a preceding or succeeding half year of low yield, and vice versa, or the two half years coming together are of medium yield, thus

Table IV. *Half-yearly yield obtained for different genotypes.*

Year	Period	Genotype 1	Genotype 2	Genotype 3
1978	July-December	20.2	16.8	17.4
1979	January-June	29.3	51.9	31.6
	July-December	17.5	29.2	16.6
1980	January-June	11.9	11.8	13.8
	July-December	5.5	2.7	3.6
1981	January-June	27.5	43.7	25.9
	July-December	25.9	46.8	26.1
1982	January-June	22.5	24.4	23.4
	July-December	23.7	7.3	23.0
1983	January-June	50.0	78.7	52.6
	July-December	40.3	59.3	38.7
1984	January-June	16.4	18.2	21.1
	July-December	19.1	5.4	15.1

reducing the year to year fluctuations. But, in the case of calendar years, two half years of high yield, or two half-years of low yield are coming together, thereby increasing the year to year variations.

The present study has shown that coconut yield data, when tabulated on the basis of calendar years, tend to fluctuate more widely between years, than when it is considered on crop year basis. Depending on the method of tabulation, the conclusions drawn from experiments may also turn out to be different. Whatever be the method of tabulation, since the differences narrow down when two year averages are taken, analysis of mean yield for two consecutive years is to be preferred to analysis of annual yield. Jacob Mathew and Vijaya Kumar (1984) had earlier pointed out that pooling of data of consecutive years reduces the error variance, thereby helping to detect treatment differences more precisely.

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