

THE IMPACT OF HARVESTING COCONUTS AT MONTHLY INTERVALS

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ABSTRACT

From the time immemorial coconut bunches were harvested at two monthly intervals. In general two such bunches are harvested at a given harvest. However on the average a coconut bunch matures more or less every month. If these could be harvested at monthly intervals without any adverse effect on the nuts there will be several benefits. These are availability of nuts over the months, savings on mature nut fall which otherwise would have lost, steady monthly income to the pickers and thereby reducing the risk of extension of skilled pickers. There was however no information about the nature of impact monthly harvesting has on the production of yield. In order to address on this issue three long term experiments were conducted at three different agro climatic zones, to study the impact of monthly harvesting on yield as compared to two monthly harvesting. One experiment ran over a period of 10 years, while the other two over a period of five years. Overall results were promising, by way of, increased nuts, quality of copra unaffected, mature nut fall reduced to a bear minimum and substantive gain in income to the pickers who play a vital role in the production of coconut, for harvesting coconuts at monthly intervals.

INTRODUCTION

The Coconut palm being a perennial is a life long crop. From the time of planting a seedling, it achieves its full bearing status between 10 to 15 years under average management conditions. From attaining the bearing stage, the coconut palm delivers one mature bunch more or less regularly each month. Once a bunch is matured, it is ready to be harvested. By retaining such a bunch on the tree any longer will not provide any benefit, except that it would be considered as an unwanted bunch by the tree. Though a bunch of coconut is ready to be harvested at monthly intervals, the farmer however used to harvest the mature nuts at two monthly (60 day) intervals. This is the tradition practiced from the time immemorial for convenience and with the objective of saving on costs. Also there was an expressed concern that, harvesting at 30 day intervals would effect the quality of copra.

In general 12 mature bunches are harvested during a given year, six of these bunches however remain one month longer than required. On an average two bunches are generally harvested when harvesting at 60 day intervals. The two bunches are such, one bunch is two months old and the other one month old. Hence the argument that harvesting at 30 day intervals could effect the quality will not hold much good.

This paper describes the results of three long term studies which examined the overall scope for harvesting mature coconuts at monthly intervals as against two monthly intervals.

MATERIALS AND METHODS

Experimental site

The first field experiment was conducted at Walpita Research Centre (7.3°N, 80°E) belonging to the Coconut Research Institute. The duration of the experiment was from 1991 to 2003. The research centre falls in the wet zone of Sri Lanka. The soil was sandy loam. Subsequently two additional experiments were established at Ratmalagara and Poththukulama Research Centres. Ratmalagara Research Centre (7.5°N, 79.9° E) falls in the low country intermediate zone, while Poththukulama Research Centre (7.6°N, 79.8°E) falls in the low country dry zone. The soil types of the two centers being gravel and sandy loam, respectively. These two experiments were commenced simultaneously in 1999 and concluded in 2003.

Weather Conditions

The rainfall in all the three stations is bimodal with peaks in April/June and October/November. The total rainfall for each year since 1994 to 2003 in respect of each research centre is shown in Table I.

Table 1: Total rainfall in (mm) at the three research centers over the period 1994 to 2003

Research centre	Total rainfall in mm.									
	1994	95	96	97	98	99	2000	01	02	03
Walpita	1688	2266	1623	2739	2253	2649	2096	1743	2143	2217
Ratmalagara	1718	1630	1199	2075	1750	2046	1700	1331	1800	1363
Poththukulama	1286	1834	1195	1767	1649	1637	1499	965	1644	1211

The average rainfall during the 10 year period for Walpita, Ratmalagara and Poththukulama research centers were 2142, 1661 and 1469mm., respectively.

- average copra weight/nut (gm.) at 6% moisture
- grading of copra (MS-1 in %)
- copra out turn(nuts/250 kg)
- coconut oil (g/kg of copra)
- Free fatty acid (FFA) (as lauric acid in%)

Results are discussed and presented here

RESULTS

Plantation

The experiments were conducted on an adult plantation. The coconut plants were open pollinated tall variety.

Treatments

Two frequencies of harvesting, ie. 30 and 60, day intervals were tested at Walpita research centre. Three frequencies of harvesting, 30, 60 and 120 day intervals were tested at the other two research centers. Randomized block design was used in all the three experimental sites. There were six replicates in each experiment. Each plot constituted 6 palms.

Observations

Harvesting was continued throughout the experimental period according to the chosen intervals. Number of nuts per each bunch was recorded at each harvest. The total yield in respect of each year was first analyzed separately. The average over the experimental period was subsequently analyzed for each experiment. Records of fallen nuts too were kept.

Assessing the quality of Copra

Nuts collected from the experiment at Walpita research centre were used to assess the impact of monthly harvesting on copra quality. Copra was made in the Ceylon copra kiln. The copra drying was carried out in one major chamber in the copra kiln available at Coconut Research Institute after seasoning the nuts for 21 days. A wooden box subdivided into 40 apartments was used for curing split nut samples. Each sample contained 8 nuts. Twelve drying cycles were done over the period, October 1998 to

August 2000. The quality of copra was thus assessed over a two year period.

Quality of copra was assessed using the parameters

Effect of frequency of harvesting on the yield

Walpita Research Centre

Numbers of nuts per tree recorded over the period in relation to harvesting frequencies are shown in Table 2.

Table 2: Effect of Frequency of harvesting on number of nuts per tree

Harvesting frequency	Year												Average
	91	93	94	95	96	97	98	99	00	01	02	03	94-03
30day	117.6	51.6	126.4	98.8	87.5	107.8	93.8	106.2	98.3	92.7	72.3	73.4	95.7
60 day	112.2	48.5	94.2	80.7	75.3	90.1	87.8	72.9	78.1	66.4	55.9	50.1	73.1
Significance (p=)	ns	ns	0.001	0.01	0.05	0.05	0.001	0.01	0.01	0.001	0.01	0.001	0.001
CV%			12.2	11.9	12.3	13.6	10.6	16.6	11.7	12.7	13.4	15.5	12.7

When the experiment was commenced in 1991, nuts per tree indicated no difference between the yields of the two treatments. No significant difference was also shown between the two treatments for the year 1993 as well. From 1994 onwards, all the years showed significantly higher yields for 30 day harvesting as against 60 day harvesting. The yields for 60 day harvesting indicate the general pattern of harvesting at two monthly intervals. The yields for 30 day harvesting indicate the kind of additional yields that were observed when harvested at monthly intervals. The average yield for the year 1994 to 2003 showed 22.6 more nuts per year for 30 day harvesting compared to 60 day harvesting. This is a 30.9% yield increase.

Ratmalagara Research Centre

The effect of frequency of harvesting on the yield is shown in Table 3.

Table 3: Effect of frequencies of harvesting on number of nuts per tree

Harvesting frequency	Year					Average (2000-2003)
	1999	2000	2001	2002	2003	
30 day	96.1	85.6	92.0	74.4	74.4	81.5
60 day	83.5	65.5	74.8	64.5	61.6	66.6
120 day	90.5	60.4	67.5	63.8	63.7	63.8
Significance(p=)	ns	0.01	0.01	0.05	0.05	0.05
CV(%)	7.5	9.5	11.3	9.8	10.4	9.7

As could be expected the commencement year (1999) did not show any significant difference between the treatments. During the period 2000 to 2003 harvesting frequencies showed significant difference between the treatments. The significant difference was observed for harvesting at 30 day intervals as against the other too harvesting intervals. Harvesting at 60 day and 120 day did not show a significant difference between the two treatments. The analysis for the average yields (2000 to 2003) showed significantly 14.9 more nuts per tree for harvesting at 30 day intervals as against 60 day harvesting. This is a 22.4% yield increase.

Poththukulama Research Centre

The results indicate similar pattern as that shown for the experiment conducted at Ratmalagara research centre. The yields for 30 day harvesting showed significantly higher yields when compared to rest of the two treatments, with no appreciable difference between harvesting at 60 and 120 day intervals. The results are described in Table 4.

Table 4: Effect of frequencies of harvesting on number of nuts per tree

Harvesting frequency	Year					Average (2000 - 2003)
	1999	2000	2001	2002	2003	
30 day	109.3	96.6	97.6	79.3	97.1	94.1
60 day	106.4	80.2	84.3	68.4	85.0	86.2
120 day	110.7	58.4	77.6	64.1	80.9	80.0
Significance(p=)	ns	0.001	0.05	0.05	0.05	0.05
CV(%)	6.6	8.9	11.0	13.1	9.3	7.1

Analysis of average yields (2000 to 2003) showed significantly 7.9 more nuts per tree for harvesting at 30 day intervals as against 60 day intervals. This is a 9.2% yield increase.

Quality of Copra

Measured using parameters; copra (wt/nut), Grade of copra, copra out - turn and coconut oil

The average values of parameters measuring the quality of copra for the two frequencies of harvesting, monthly and bimonthly are shown in Table 5.

The values show that in some instances the average copra weight is slightly high for nuts harvested at monthly intervals, while low in other instances. The over all results suggest that there is no evidence to say copra yield is better for nuts harvested at monthly intervals as against for nuts harvested at bi-monthly intervals. When considering the period Oct 98 to Aug. 99 the average copra wt/nut for monthly harvesting is 189 gm while for bimonthly harvesting it is 198 gm. During the period Oct-99 to Aug 2000 the respective values were 207 and 197 gm. Considering the two time periods together, the overall average is 198 and 195 g., respectively. Similar arguments could be met in respect of grade of copra, copra outturn (nuts/250kg of copra) and coconut oil (g/kg of copra).

Measured using the parameter; free fatty acid (FFA)

FFA is an important parameter in assessing the quality of copra. For good quality copra, the FFA value should be less than 1%. Lower the better. The values shown in Table 5 indicate very low values of FFA in respect of nuts harvested at both the intervals. The foregoing results indicate that there is no difference in quality of copra produced using nuts harvested at monthly or bimonthly intervals.

DISCUSSION

A coconut palm, from coming into bearing, continues to produce nuts over a period of 50 years or so. The axil of each frond carries an inflorescence. From the stage of primodium of inflorescence, a bunch goes through a development cycle of around 44 months before being harvested as a mature bunch. An inflorescence once opened, takes on an average 12 months before it is ripe and ready to be harvested. The nuts produced is the most important commodity of a coconut palm. The yield status of a palm is generally identified according to the number of mature nuts it produces over a period of one year. A palm providing more than 75 nuts per year is considered to be a good yielding palm, which amounts to 1250 nuts/ha/yr.

The yield of a palm is however subject to fluctuations in relation to variation in weather. Thus any response, due to an external stimulant to increase yields, has to be looked into with the above explained background in mind. On reaching maturity, nuts have to be harvested, if otherwise these will start falling after some time. These nuts are collected as fallen mature nuts. It is frequently complained that these nuts are lost by way of thieving. Higher the number fallen, larger would be the lost.

From the time immemorial nuts were harvested at two monthly intervals. However on the average nuts reach maturity stage after a month or so from opening, which are thus ready to be harvested.

The three experiments described in this paper were designed to study the nature of impact, harvesting at 30 day intervals, will have on the yield of a palm as compared to harvesting at 60 day intervals. The three experiments showed clear evidence of increased yields when nuts are harvested at monthly intervals. The increases were evident for all the years, during the period the experiments were conducted. Walpita research center which falls in the wet zone showed an average increase of 30%. The respective average yields for Ratmalagara and Poththukulama, research centers were 22.4% and 9.2%. The results seem to suggest that the level of percentage increase in yield for monthly harvesting is also dependent on the climatic conditions.

Abeywardna and Mathes (1971) reported that 2/3 of button nuts fall during the first four months of opening an inflorescence. According to them the loss is in the range of 120 button nuts per year. Thus the increases observed in the experiment are marginal and could even be considered as retention of falling of button nuts.

Financial benefits

Harvesting at 30 day intervals involves additional 6 harvests being done during an year. This will result additional expenditure on harvesting and other activities. The expenditure is about twice as much as harvesting at 60 day intervals. Thus acceptance of harvesting at 30 day intervals would largely depend on the additional income a farmer would derive. It is expected to present here the income that could be derived considering a marginal increase in yield for a farm producing a yield of 8750 nuts/ha/yr where harvesting is done at two monthly intervals. For example consider a marginal yield increase of 10% by adopting harvesting at monthly intervals. The absolute yield increase = 875 nuts/ha/yr. This increase is a mere 6 nuts/tree/yr or 6 nuts/12 bunches/yr.

The additional expenditure (per ha) that would be incurred for adopting harvesting at monthly intervals is as follows.

* picking extra 6 picks @ Rs. 1.25/per palm	= Rs. 1125.00
* collecting 875 nuts @Rs. 200/per 1000 nuts	= Rs. 175.00
* cart hire to transport 875 nuts @Rs. 200/- per 1000 nuts	= Rs. 175.00
Total additional expenditure	= Rs. 1475.00

Net income is calculated at different price levels of a coconut and shown in Table 6.

Table 6: Net gain in income (Rs. per ha per yr)

Price per nut Rs.	Additional expenditure per/ha/yr Rs.	Net income per ha per year Rs.	The ratio of income per unit additional expenditure
7.00		4650	1:3.1
8.00		5525	1:3.7
9.00	1475.00	6400	1:4.3
10.00		7275	1:4.9
11.00		8150	1:5.5
12.00		10,500	1:7.1

The results indicate the nature of financial benefits that could be achieved by a change to monthly harvesting. As the price of a coconut increases the net gain increases. At the price of Rs. 7 a nut, the net gain is 3.1 times per unit investment. And at Rs. 12 a nut, it is 7.1 times per unit investment. The results shown should be convincing for a farmer to decide on a change in respect of harvesting coconuts.

Extent of mature fallen nuts

Once a bunch is matured it is ready to be harvested. However if such a bunch is kept in the tree longer, the scars get dried and the nuts start falling. These nuts are usable nuts. The fallen nuts have to be collected regularly, if otherwise there could be losses by way of thieving. The number of fallen nuts is much high, for harvesting at 60 day intervals. This position is shown in Table 7.

Table 7 : Matured fallen nuts (%) at the three research centers

Frequency of harvesting	Walpita Research Centre		Ratmalagara research Center		Poththukulama Research Center	
	Range %	Ave. %	Range %	Ave. %	Range %	Ave. %
Monthly	2.5-19.3	9.9	1.6-4.4	2.9	1.1-2.4	1.6
Two monthly	8.3-35.6	23.7	4.5-17.2	12.6	9.9-11.3	10.7

There is substantial reduction in mature nut fall due to harvesting at monthly intervals. This offers two – fold benefits,

- less effort and time is required to collect fallen nuts. If at all such may not be necessary, because these are collected at the harvest.
- will reduce or stop losses due to possible theft.

Steady monthly income to pickers

The coconuts are harvested by coconut pickers. Thus their services are very valuable and should be recognized. Without the coconut picker, there is no way of harvesting nuts. Coconut pickers thus play a vital role in the process of harvesting nuts. Hence it is important that their living standard be improved by providing at least a good steady monthly income. The additional expenditure involved is very minimal as shown *priori*. The benefits however to the farmer are at large.

CONCLUSION

This long term nevertheless exploratory experiment, provided information as to the nature of overall benefits that is achievable by a farmer and pickers, by harvesting nuts at monthly intervals. The farmer benefited by way of increased yields and income. He was also relieved of the misconception that monthly harvesting could provide low quality copra. The picker benefited by way of increased income or an income twice, as much as they could have earned otherwise. Thus all in all there is good promise for adopting harvesting at monthly intervals.

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