COPRA DRYING. I. COMPARISON BETWEEN THE RECOMMENDED PRACTICE AND FARMERS' PRACTICE OF SPLITTED-NUT ARRANGEMENT BEFORE DRYING

Ly, Tung and Edilberto A. Hinay

Acting Director and Research Aide, Regional Coconut Research Center, Visayas State College of Agriculture, Baybay, Leyte, Philippines.

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ABSTRACT

Experiment was conducted to compare the recommended practice (RP) of arranging splitted nuts on drying platform before drying with farmers' practice (FP) in terms of rate and uniformity in moisture reduction of copra. Results indicate that FP is better than RP. Follow-up studies are underway.

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INTRODUCTION

About 92% of total nut production in the country is converted into copra. Copra is the commercial name of dried coconut kernel. Fresh kernel can be dried under the sun (sun-drying) or by using a copra dryer with firewood, coconut husk and/or coconut shell as sources of heat. Except when there are few nuts to be dried, and/or when there is bright and continuous sunshine, drying fresh kernel using a copra dryer is commonly practiced in the Philippines.

One of the most common methods of drying nuts using copra dryer is when the harvested nuts are husked. The dehusked nuts are splitted into halves, then the halves are arranged on the drying platform ready for drying. Dried coconut kernels are unloaded and separated from their shells only after the drying process is completed. This method, in general, is observed to produce copra with varying moisture content depending upon the position of the halves on the drying platform. Moreover, the more layers of coconut halves there are, the wider is the

moisture gradient of copra.

It is believed that the arrangement of coconut halves on the platform influences the drying pattern (rate and uniformity) of copra. In ViSCA and many other areas in the Visayas, copra makers arrange coconut halves this way: the halves are placed in inclined position, one leaning to the other; the degree of inclination increasing from bottom up with the topmost layer facing down; the two adjacent lines have opposite directions. This arrangement is found to be different from that recommended by PCARR (PCARR, 1975).

This paper presents the results obtained from the experiment conducted to compare the effect of two arrangements on rate and uniformity in moisture reduction of coconut kernels.

MATERIALS AND METHODS

The dryer. — A semi-direct copra dryer existing in ViSCA was used. The effective area of the drying platform was divided into two equal portions, i.e., the front portion (nearer to the firing place) and the rear portion. When a "cooking" trial was done, each portion served as a replicate. Each portion was subdivided into two compartments to accommodate two procedures at a time. Each compartment measures 1.725 m in length and 0.9 m in width.

Preparation of nut samples for copra making.— Three-hundred nuts (600 halves) per replicate per procedure were used. The sample nuts were taken randomly from a pile of nuts harvested from coconut trees belonging to Baybay tall population (Baliñgasa and Carpio, 1976). Only mature nuts were included in the study. The dehusked nuts were splitted into equal halves following the necessary care and precautions to avoid contamination with dirt.

Nut arrangement in the drying platform.

Recommended Practice (RP). Halves were arranged by laying the first three bottom layers facing up. The succeeding layers were placed with the kernel facing down in a brick formation until all 600 halves were accommodated (Fig. 1). This arrangement resulted in eight layers counting from the bottom up as L1, L2, L3, L4, L5, L6, L7, and L8. Each layer had about 75 halves.

Farmers' Practice (FP). There were four full layers counting from the bottom up as L1, L2, L3, and L4 each having about 135 halves. The topmost layer or L5 was not full (Fig. 2).

After piling the nuts, both procedures gave the same depth of about 0.5 m.

Firing. — Dried coconut husks were used as fuel. Drying process was done in two stages, i.e., 12 hr of

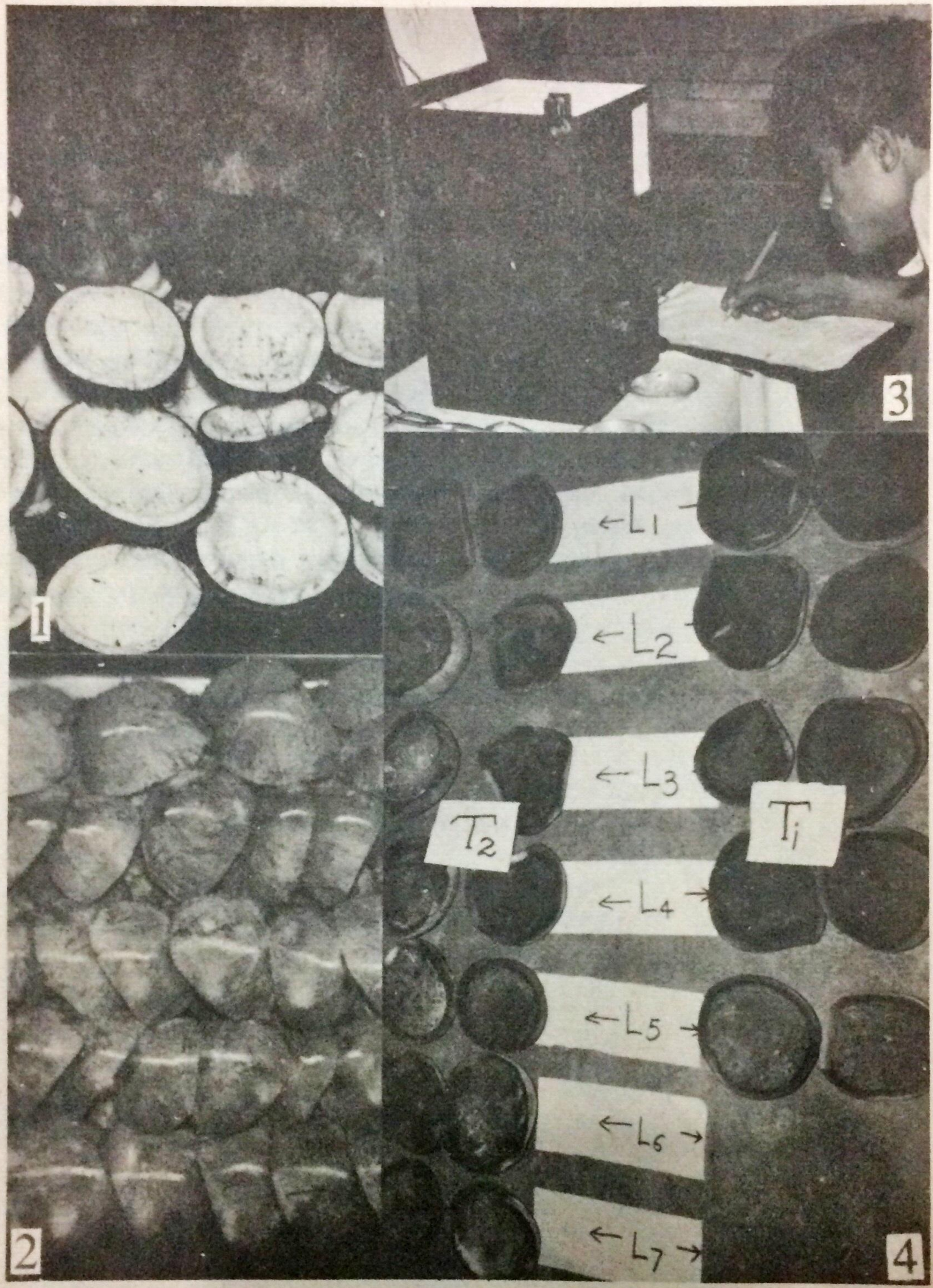

Fig. 1-4. 1)Arrangement of coconut halves following the recommended practice. 2) Arrangement of coconut halves following the farmers' practice. 3) Moisture content of copra is being determined using the DIREKTO moisture tester. 4) Sample of copra produced by the two procedures: the farmers' practice (T_1) and the recommended practice (T_2), showing no difference in color.

continuous firing at daytime (6:00 a.m. to 6:00 p.m.), a period of cooling during the night, and another 6 hr of continuous firing the following day.

Data collection. — Temperature immediately below the bottom layer and at the top layer was recorded every hour. To determine their moisture content (M.C.), copra samples were taken layer by layer, at 12-hr (after overnight cooling), 15-hr, and 18-hr drying intervals. M.C. was determined using the DIREKTO moisture tester (Model 11, 2001 Taft Ave., Pasay City, Philippines) (Fig. 3).

RESULTS AND DISCUSSION

General observation.

Husks derived from sample nuts were found adequate in reducing the M.C. of fresh kernel to about 9% or below. The two procedures produced no differences in the color of copra; all were observed to be light to dark brown (Fig. 4). The hourly drying temperatures fluctuated from a minimum of 59°C to a maximum of 95°C with a more frequent temperature ranging from 68°C to 86°C (Fig. 5). The two procedures required the same time for the arrangement of splitted nuts

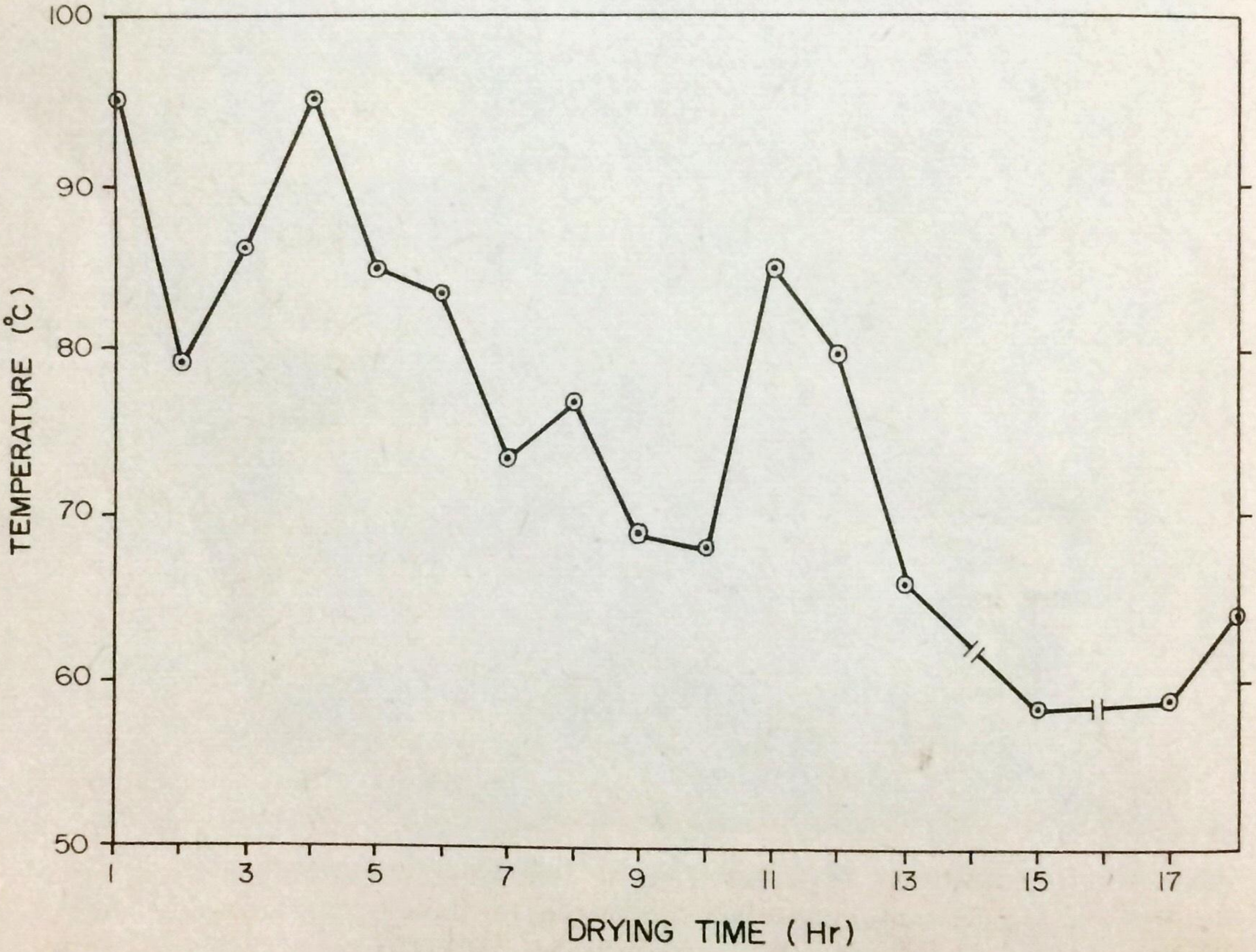

Fig. 5. Hourly drying temperature measured immediately below the bottom layers of both practices.

on the platform. FP has a slight advantage (shorter time) in unloading copra.

At 12 hr (after overnight cooling).

Table 1 shows the M.C. of copra, layer by layer, at three sampling periods. Generally, M.C. increased from bottom to top layers. This is true for the three samplings.

At the first sampling, the average M.C. over all layers for FP was lower than that for RP by 2% (12.23% vs. 14.46%). Most of the copra in FP had a M.C. of about 13% or lower, whereas 50% of copra in RP (from L5 to L8) had a M.C. ranging from about 15% to as high as 19%. Therefore, in terms of rate and uniformity in drying, FP was found to be better than RP.

As shown in Fig. 6, the temperature recorded at the top layer for RP was always lower than that for FP. Since the temperature immediately below the bottom layer was the same for both procedures, the temperature difference across the depth of splitted nuts arranged in RP was greater than that in FP. This phenomenon accounts for the faster rate and more uniform drying in FP.

A close observation on the moisture gradient across the different layers in RP revealed that the M.C. was almost the same for L2, L3 and L4 but there was a big difference between L4 and L5. This was also true in the second sampling (Table 1). It is speculated that when RP was followed, a large amount of heat was trapped by the first layer arranged facing down

Table 1. Percent moisture of copra produced by the recommended practice (RP) and farmers' practice (FP) at varying drying times.[1]

Layer	12 hr drying + overnight cooling		12 hr drying + overnight cooling 3 hr drying		12 hr drying + overnight cooling + 6 hr drying	
	RP	FP	RP	FP	RP	FP
L1 (Bottom)	9.83	9.67	7.83	6.83	7.00	6.67
L2	12.83	11.00	9.83	7.50	7.50	6.83
L3	12.67	10.83	8.17	9.67	8.00	7.83
L4	11.83	13.33	9.83	9.33	9.00	8.67
L5	14.67	16.33	12.67	11.55	8.33	11.33
L6	16.17	—	13.67	—	8.83	—
L7	19.00	—	13.50	—	11.83	—
L8 (Top)	18.67	—	17.50	—	12.17	—
Average over all layers	14.46	12.23	11.62	8.97	9.08	8.27

[1] Average of 3 replicates.

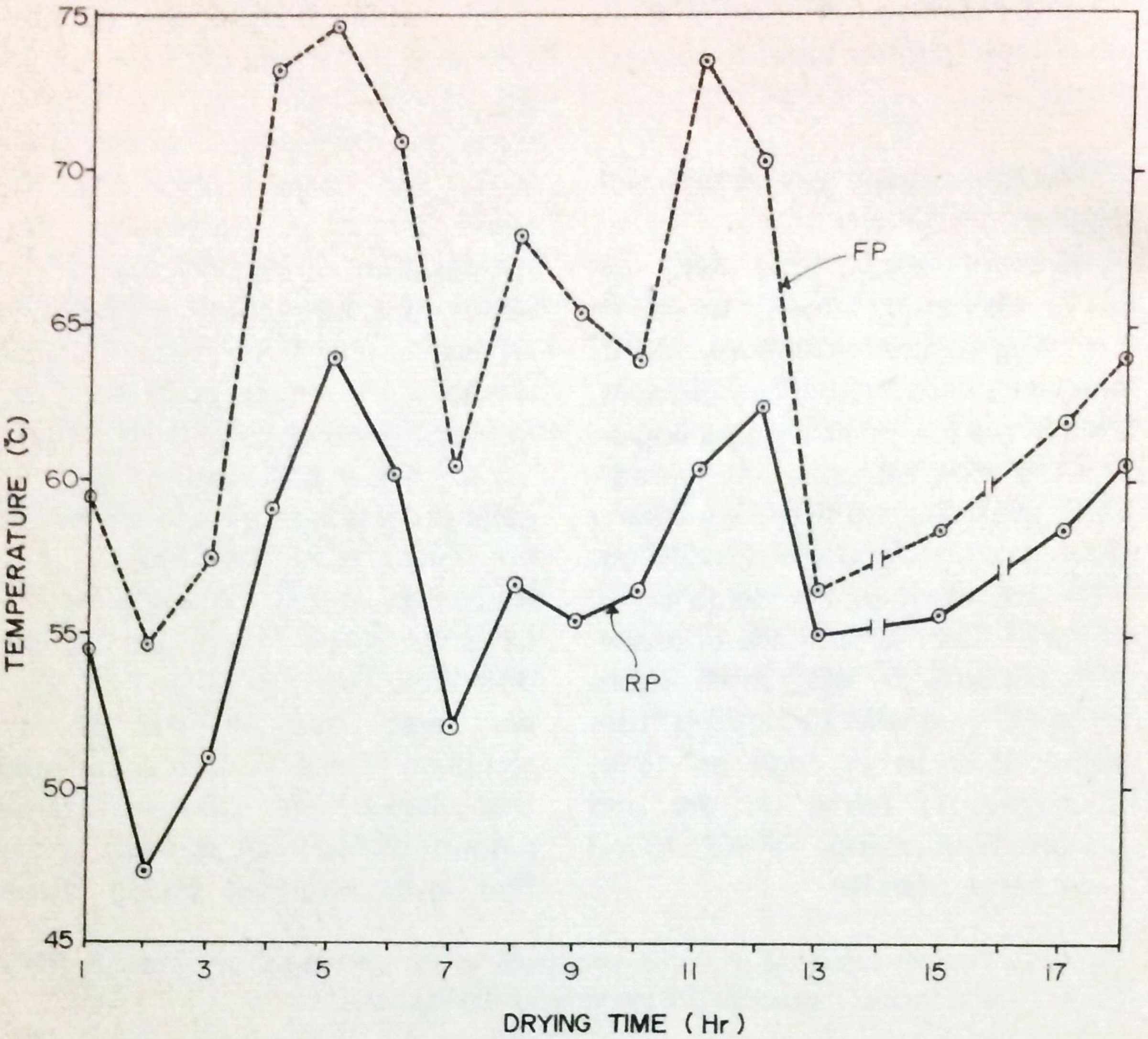

Fig. 6. Hourly temperature at the top layers of the farmers' practice (FP) and the recommended practice (RP).

(L4), hence allowing less heat to escape to the succeeding layers. As a result, the drying of coconut kernels was less uniform.

The advantage of better distribution of heat in FP over RP should be more obvious when there are more nuts to be accommodated on the same area of the drying platform.

At 15 hr.

Compared to the first sampling, the average M.C. over all layers in RP and in FP were considerably lower (Table 1). M.C. of dried kernel in FP increased from bottom to top layers ranging from about 7% to 11.5% with an average of 8.97%. In RP, only the dried kernel of the four bottom layers was found to have a M.C. comparable to that in FP. The succeeding four layers had a M.C. ranging from about 13% to 17%. This, again, indicates that there was more uniform drying of coconut kernel in FP than in RP. Furthermore, the overall average M.C. of copra in RP after 15 hr of drying was found to be comparable

to that in FP after 12 hr. This suggested that a faster rate of drying could be obtained following FP.

At 18 hr.

A little over 0.5% of water from copra was lost during the last 3 hr of drying in FP in contrast to a loss of about 2.5% in RP (Table 1). This indicates that, during this period, there was a reduced rate of moisture loss in FP while moisture loss in RP was almost constant (Fig. 7). This was so because the rate of water loss became slower in drier copra.

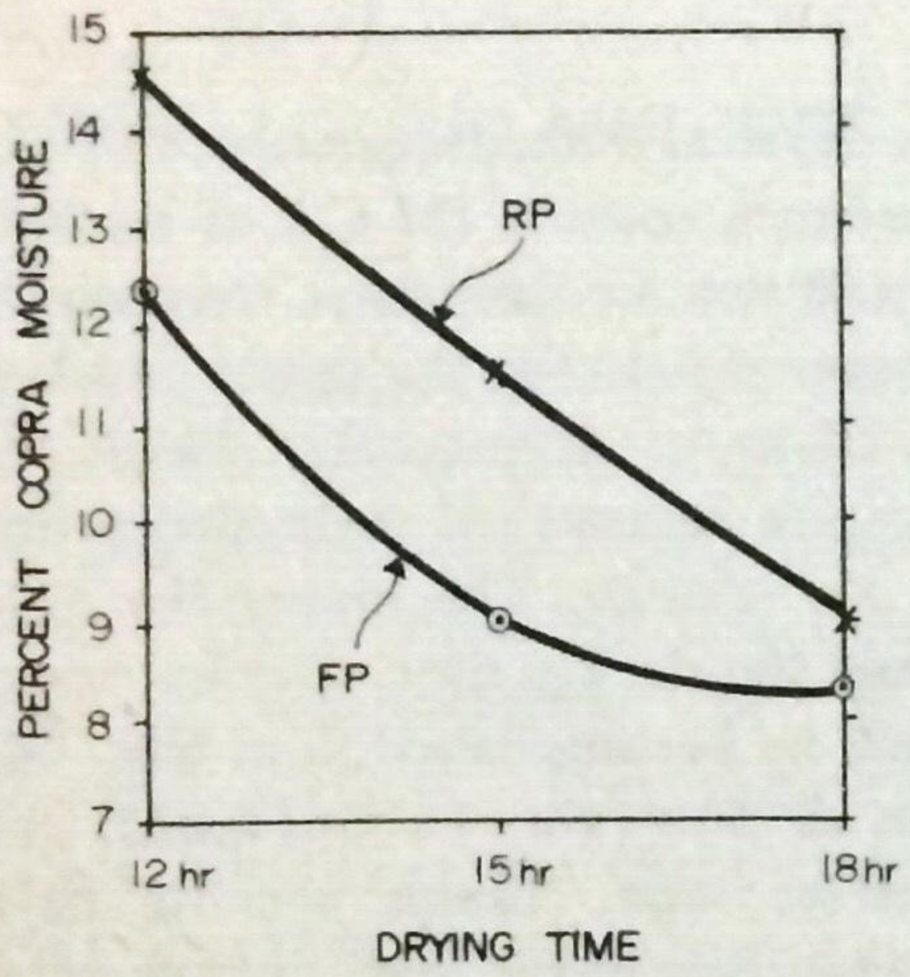

Fig. 7. Percent moisture of copra produced by the recommended practice (RP) and farmers' practice (FP) measured during three sampling times.

When the FP was followed, a cooking period of 15 hr was required to produce copra containing about 9% M.C. When the RP was followed under the same drying conditions, a period of 18 hr was needed to produce copra of similar M.C. However, the two curves in Fig. 7 tend to suggest that no difference in the M.C. of copra produced by the two procedures will be detected when the drying period is prolonged for more than 18 hr.

In practice, the number of drying hours observed by most copra producers usually falls short of PCARR's recommendation which is at least 16 hr (PCARR, 1975). Under this situation, FP is more advantageous than RP.

Although better arrangement of coconut halves was observed in FP in terms of rate and uniformity in drying, it is believed that the above procedure of drying could still be improved to obtain more uniform copra at the shortest possible time. Studies are going on to achieve this objective. In addition, trials will be made to investigate the drying pattern of copra when the number of layers is more than five. Results of these experiments will be published in succeeding issues of ATR.

LITERATURE CITED

BALIÑGASA, E. N., and CARPIO, C. B. 1976. Genetic potential of some coconut populations in the Philippines. 1975-1976 *Annual Report*. Philippine Coconut Authority, Agricultural Research Branch, pp. 7-19.

PCARR (The Philippine Council For Agriculture and Resources Research). 1975. *The Philippines Recommends for Coconut*. 63 pp.