

茶樹栽培之管理工時與成本分析*

A Labor-Time Study and Cost Analysis of Tea Cultivation

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摘 要

本研究之目的在於節省茶樹栽培之勞力與降低生產成本。所有之資料乃是根據本文第一作者於74年7月至75年6月在鹿谷與名間茶區進行茶葉生產成本調查而得。

本文所探討茶園栽培作業之範圍包括：施肥、病蟲害防治、中耕除草、覆蓋、剪枝、灌溉、採收及搬運等。

進行以上所有作業之生產成本，在鹿谷約為每公頃新臺幣458,000元而名間則約為每公頃291,000元。除了灌溉與搬運外，以上所有作業之工時，在鹿谷約為每公頃3440小時而名間則約為每公頃1280小時。以上兩區之差異主要是由於鹿谷以手採為主，以求獲得較一致也就是較高品質之茶菁；而名間則以機械採收茶葉。手採較花工也就增加成本。

由本研究中，可看出那裏可以節省勞力或者降低成本。可是問題是在於要如何節省勞力及降低茶葉生產成本而仍確保相同品質。因此，進一步之研究應利用系統方法分析臺灣各地茶園機械化作業概況，然後從中找出最佳之方法以達到節省勞力與降低成本之目標。

主鍵語：茶，成本，勞力。

Abstract

This study is aimed at saving labor and reducing costs for tea production in Taiwan. All data are from the survey of tea production costs in the towns of Lu-Ku and Ming-Chien, conducted by the first author from July 1985 through June 1986.

The farming operations investigated in this study include fertilizing, pest control, cultivation and weed control, mulching, pruning, irrigation, harvesting, and transportation. Total tea production costs for conducting the above operations is around NT\$458,000 (US\$12,100)/ha in Lu-Ku and NT\$291,000 (US\$7,660)/ha in Ming-Chien; while total labor hours required (except for irrigation and transportation) is about 3,440 h/ha in Lu-Ku and 1,280 h/ha in Ming-Chien. The difference in those two

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regions is mainly due to the fact that hand-picking of tea is popular in Lu-Ku for the purpose of maintaining tea quality, while mechanical harvesting is common in Ming-Chien. Hand-picking needs more labor and increases costs, too.

From this study, we can see where the costs or labor may be reduced. The problem is how to save labor and reduce costs for tea production while still assuring the same quality. Therefore, further studies should be conducted by using a systems approach to analyze the status of mechanized tea cultivation everywhere in Taiwan; then, find out optimal ways to reach the goals of saving labor and reducing costs.

KEY WORDS: TEA, COST, LABOR.

INTRODUCTION

Drinking tea is as popular in Taiwan as drinking coffee is in western countries. The harvested acreage of tea in Taiwan is around 25,000 ha annually for last decade. In 1986, main producing areas are in the following counties: Hsinchu (7650 ha), Taipei (6100 ha), Nantou (4370 ha), Taoyuan (3130 ha), and Miaoli (2550 ha). Most high-quality tea is raised in Nantou county. Therefore, survey results from part of Nantou county is used for analyses of labor requirements and production costs in tea cultivation as a starting point for this kind of study. The survey was conducted by the first author from July 1985 through June 1986.

The objectives of this study are:

1. To save labor in the cultivation of tea, and
2. To reduce costs for tea production.

SURVEY

The survey of tea production conducted in Nantou county covered two townships, namely Lu-Ku and Ming-Chien. High grade tea is produced in Lu-Ku. So, hand-picking of tea leaves is a common harvesting practice in that area for maintaining better, more uniform tea quality. The background information, such as total tea harvested acreage, survey acreage and farm households, is shown in Table 1. Table 2 shows the average statistics of tea trees obtained in the survey.

Table 1. Background information

Location	Acreage (ha)		No. of farm household surveyed
	Total	Surveyed	
Lu-Ku	1412	42.0	60
Ming-Chien	1237	39.1	30

Table 2. Statistics of tea trees

Location	Age (yr)	Row space (cm)	Plant space (cm)	Plant height (cm)	Canopy width (cm)	Mis-planted (%)
Lu-Ku	5.5	135	54.9	59.3	71.0	3.8
Ming-Chien	6.0	152	50.1	46.1	74.5	1.5

The most popular variety of tea grown in the surveyed area is Chin-Hsin Oo-Long. Next are Wu-Yi and TTES No. 12 & 13 Tea.

Tea field practices investigated in this study include: fertilizing, pest control, cultivation and weed control, mulching, pruning, irrigation, harvesting and transporting. The results obtained are presented and discussed in the following sections.

RESULTS

In the fertilizing operations, both chemical and organic fertilizer are used and broadcasted by hand or mechanical devices. Total fertilizing expenses for both areas are shown in Table 3.

Table 4 shows pest-control expenses for both regions. The frequency of pesticide applications is around once a month, mainly for control of insects, mites and fungi.

For inter-cultivation and weed control, there are several different methods used in both regions. In regard to weeding and applying herbicide, using mowers or manual operations are commonly adopted. For inter-cultivation, a cultivator or subsoiler is used. Their total expenses are shown in Table 5.

Table 6 shows mulching expenses. Mulching materials such as peanut shells, rice straw, rice husk, wood chips, bagasse, etc. are applied to the field for covering of surface soil.

Table 3. Annual fertilizing expenses

Location	Labor hours (h/ha)	Labor wages (NT\$/ha)	Fertilizer costs (NT\$/ha)	Total expenses (NT\$/ha)
Lu-Ku	244	24,000	85,000	109,000
Ming-Chien	204	13,400	76,500	89,900

Table 4. Annual pest-control expenses

Location	Labor hours (h/ha)	Labor wages (NT\$/ha)	Pesticide costs (NT\$/ha)	Total expenses (NT\$/ha)
Lu-Ku	362	33,900	21,500	55,400
Ming-Chien	257	19,600	20,300	39,900

Table 5. Annual cultivation and weed control expenses

Location	Labor hours (h/ha)	Labor wages (NT\$/ha)	Herbicide costs (NT\$/ha)	Total expenses (NT\$/ha)
Lu-Ku	612	35,500	6,900	42,400
Ming-Chien	465	24,900	1,500	26,400

Table 6. Annual mulching expenses

Location	Labor hours (h/ha)	Labor wages (NT\$/ha)	Material costs (NT\$/ha)	Total expenses (NT\$/ha)
Lu-Ku	88	4,600	20,600	25,200
Ming-Chien	89	4,000	31,300	35,300

The pruning operations are usually divided into 3 categories, namely shallow-, medium- and deep-cutting of tea twigs or branches. Normally, this operation is applied after harvesting of winter tea for shallow- or medium-cutting or after harvesting of spring tea for deep-cutting. Two-man operated tea pruning machines are used mostly in Ming-Chien; while one-man operated ones are popular in Lu-Ku. Total pruning expenses are shown in Table 7.

Table 8 shows the irrigation expenses. Sprinkler system and ditch-flooded irrigation are two common practices applied in the surveyed areas for maintaining enough water supply to tea trees.

In Lu-Ku, tea is harvested mainly by hand five times a year, namely in spring,

summer, late summer, fall and winter. It is harvested mainly by machine 6 times a year in Ming-Chien with one more time in late fall. The annual harvesting labor expenses is shown in Table 9. Table 10 shows the transporting expenses of harvested tea leaves to tea processing sites or factories.

In the previously mentioned expenses, machinery-related expenses are not covered in all operations except irrigation and transporting ones. Agricultural machinery used for conducting tea cultivating operations include: sprayer, cultivator, pruning machine, tea harvester, mower and transporting vehicle. Annually, their total expenses including depreciation, maintenance and repair, and fuel & oil are shown in Table 11.

Table 7. Annual pruning expenses

Location	Labor hours (h/ha)	Labor wages (NT\$/ha)
Lu-Ku	56	5,650
Ming-Chien	46	4,140

Table 8. Annual irrigation expenses

Location	Irrigation expenses (NT\$/ha)
Lu-Ku	13,100
Ming-Chien	19,600

Table 9. Annual harvesting expenses

Location	Labor hours (h/ha)	Labor wages (NT\$/ha)
Lu-Ku	2080	173,000
Ming-Chien	220	40,400

Table 10. Annual tea-leaf transporting expenses

Location	Transporting expenses (NT\$/ha)
Lu-Ku	13,500
Ming-Chien	6,200

Table 11. Annual machinery related expenses

Location	Machinery expenses* (NT\$/ha)
Lu-Ku	21,100
Ming-Chien	29,600

* incl. depreciation, maintenance and fuel & oil.

DISCUSSIONS

In Lu-Ku, total annual labor hours of 3440 h/ha as shown in Table 12 is required to conduct the following field practices: harvesting (60.5%), cultivation and weed control (17.8%), pest-control (10.5%), fertilizing (7.1%), mulching (2.6%) and pruning (1.6%). From this, we can see that the harvesting operation consumes most of the labor hours (more than 60%). If we want to save labor, we definitely should/can do something in this part. However, as far as the tea quality is concerned, it seems that we cannot do too much about it. The reason is that the human sense for judging the right time for harvesting of good tea leaves can not yet be replaced by machines. So, for saving labor, we have to deal with the other three operations of cultivation and weed control, pest control and fertilizing to see if high-efficiency machinery can be used. Further studies should be done to investigate how many types of machines are popularly used for each operation in Taiwan. Then optimal utilization of these machines can be derived by using a systems approach.

In Ming-Chien, 1280 h/ha is required to conduct those operations as shown in Table 12. It is only about one-third of that in Lu-Ku, mainly because tea harvesting practices are done by machines in Ming-Chien. As for saving labor, the situation in this area is more or less the same as that in Lu-Ku.

Annual tea production costs per hectare are NT\$458,000 (US\$12,100)/ha in Lu-Ku and NT\$291,000 (US\$7,660)/ha in Ming-Chien as shown in Table 13. Both are very high compared with those of other field crops in Taiwan. However, tea farmers still can make better profit from it than other farmers.

For reducing costs, we should find ways to improve fertilizing and pest-control practices in Lu-Ku; the same things should be done in Ming-Chien, along with the improvement of machine-harvesting operations by using higher efficiency, lower cost tea harvesters, if possible.

Table 12. Annual labor required for tea production

Operations	Lu-Ku h/ha (%)	Ming-Chien h/ha (%)
Fertilizing	244 (7.1)	204 (15.9)
Pest-control	362 (10.5)	257 (20.1)
Cultivation and weed control	612 (17.8)	465 (36.3)
Mulching	88 (2.6)	89 (7.0)
Pruning	56 (1.6)	46 (3.6)
Harvesting	2,080 (60.5)	220 (17.2)
Total	3,440	1,280

Table 13. Annual production costs of tea

Operations	Lu-Ku NT\$/ha (%)	Ming-Chien NT\$/ha (%)
fertilizing	10,900 (23.8)	89,900 (30.9)
Pest-control	55,400 (12.1)	39,900 (13.7)
Cultivation and weed control	42,400 (9.3)	26,400 (9.1)
Mulching	25,200 (5.5)	35,300 (12.1)
Pruning	5,650 (1.2)	4,140 (1.4)
Irrigation	13,100 (2.9)	19,600 (6.7)
Harvesting	173,000 (37.8)	40,400 (13.9)
Transporting	13,500 (2.9)	6,200 (2.1)
Machinery	21,100 (4.6)	29,600 (10.2)
Total	458,000	291,000

Note: 38 NT\$ = 1 US\$, in 1986;
28 NT\$ = 1 US\$, in 1988.

CONCLUSIONS AND SUGGESTION

It is concluded that more studies should be done for saving labor and re-

ducing costs in the cultivation of tea in Taiwan. A systems approach is suggested for analyzing the status of mechanized tea operations everywhere in Taiwan. Then, we can find optimal ways to accomplish these goals.

Total tea production costs for conducting all field practices mentioned in this study is about NT\$458,000 (US\$-12,100)/ha in Lu-Ku and NT\$291,000 (US\$7,660)/ha in Ming-Chien. Total labor requirements for conducting those operations (except irrigation and transporting) is about 3,440 h/ha in Lu-Ku and 1,280 h/ha in Ming-Chien. If suitable improvement measures are taken those numbers can certainly be reduced.

ACKNOWLEDGMENT

The authors would like to express sincere appreciation to Dr. T. F. Chiu, Messrs. T. F. Huang and C. L. Lee, all of TTES, for their encouragement and help in this study.

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