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台灣茶葉生產及其多元化利用[1]

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摘　要

台灣地區茶葉生產基於歷史淵源，生活、文化及經濟背景，先後引進烏龍茶、包種茶、紅茶、綠茶（龍井、眉茶及煎茶）等製造技術，經由滿清政府的獎勵生產，日據時期之試驗改良，奠定茶業基礎，及至台灣光復，政府更積極復興茶園，改組茶業研究專責機構成立茶業改良場，改良耕作及製茶技術，民國六十二年再設立茶葉生產專業區，將茶業科技研究與產製技術相互配合，使台灣成爲獨一兼具不發酵茶類（綠茶），部份發酵茶類（包種茶、烏龍茶）及全發酵茶類（紅茶）產製技術的產茶地區。

隨食品科技的發展及消費者追求新口味，新風潮的要求，各類食品加工均朝向多元化發展，茶葉產品自不例外。茶業改良場爲開創台茶發展新局面，擴大茶葉消費型態及提高茶葉附加價值，近年來研究開發完成各種茶葉產品諸如：速溶茶、罐（瓶）裝茶飲料、茶果凍、茶果凍蛋糕、茶葉軟糖、果茶、餅茶、加料（調味）茶、粉茶、茶酒、茶雞尾酒及茶菜等，經各界品嚐，極獲好評，並將其加工技術陸續轉移民間從事商品化生產。

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TEA PRODUCTION AND MULTIPLE TEA PRODUCT UTILIZATION IN TAIWAN[1]

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ABSTRACT

Taiwan tea industry has undergone sweeping changes from the export market to the domestic market over the past years. Exports of green tea is sharply shrunk, whereas imports of black tea is fastly growing. There has been the expected increasing demand for partially fermented-tea, partly due to the prosperity of Taiwanese living standard. Some production data of Taiwan's tea are: total acreage 23,737 ha; annual production, 22,000 tons; exports, 5,296 tons; imports, 6,435 tons in 1992 and the key variety, Chinsin Oolong.

As that of tea plucking in most tea growing areas, tea manufacture is facing deep labour shortage, because manpower is pretty much involved in processing tea. There is an obvious polarization in tea production that quantities of oversupply tea (intermediate and low grade tea) are enormous as compared to the high quality tea, being in high demanding. Thus, in addition to lowering down tea production cost, governmental measures are also taken to diversify tea uses as an incentive to enhance tea consumption.

It is historical background, due to living, cultural and economic reasons, that production skills of Oolong, Paochung, black tea and green tea were introduced and developed on Taiwan in different times. This has made Taiwan a solely area of simutaneously producing non-fermented tea (green tea), partially fermented tea (Paochung, Oolong tea) and fully fermented tea (black tea). Through the Chin Dynasty's promotion on tea production as well as Japanese rulers' construction of tea experimental organizations, the foundation of tea production development was once firmly laid. After Taiwan's retrocession, the Nationalist government positively encouraged tea garden recovery, organized the Taiwan Tea Improvement Committee for cultural practices and tea processing improvement, and set up tea producing and extension areas as well as the Tea Experiment Station. These joint efforts of industry, government and academic circles has made Taiwan won the reputation for her tea research and production technology, and the uniqueness of tea produced.

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As food technology's development and consumers' seeking for new changes in taste, every sort of food industry has been developed toward diversification because of the irresistable trend . Tea is without exception. At present, the Taiwan Tea Experiment Station(TTES) aims at the research and development on diversification in tea. The objective is not only for the promotion of tea and the enlargement of consuming styles but also for solving the increases of by-products of tea such as fanning, stalk and dust, which are caused by mechanical tea plucking. The station has taken advantage of R&D to increase economical value of processed tea products in the hope to meet consumers' need of new tastes. So far to now, the TTES has R&D sorts of diversed tea products , such as: instant tea, canned tea, tea jelly, caky tea, tea candy, tea powder, fruit tea, tea biscuit, flavoured tea, tea wine, tea cocktail and tea dishes. Development of tea multi-products has a special meaning as traditional tea consumption is suffering the influences of new wave of convenient beverage.

INTRODUCTION

Tea was introduced in Taiwan about two hundred years ago by immigrants from the mainland Chinese province of Fukien. Being located in a subtropical region with adequate rainfall, Taiwan is perfect for tea cultivation. Tea is one of important agricultural product in Taiwan. In fact, before 1957 it was the third highest foreign exchange earner among agricultural products. Currently, there are about 23,000 ha of land under tea, distributing from several hundred meter to 1500 meter above sea level.

Although annual production in Taiwan is only approximately 22,000 tons in recent years, Taiwan still occupies a unique position among tea- growing regions of the world. It alone can supply every type of tea for domestic and world markets, with products ranging from non-fermented Japanese-style Sencha, or green tea, semi-fermented Oolong tea, to black tea.

The rise of the New Taiwan dollar against the US dollar since 1986 has created a tremendous hardship for the exportation of Taiwan tea. This problem compounded by a dramatic increase in production costs because of a sharp increase in wages and the internationalization of trade in which cheaper and quality agri-products, including tea, are allowed to be imported in quantity. In addition, the high profitable tea crop and extension of plucking machines in many tea producing areas has brought out over- production and massive by-product of made-tea, especially the unsaleable summer tea. Indeed, all the Taiwan tea industry which is facing a crisis and structural change now.

Taiwan tea industry has economic value and non-economic value, too. Although the industry is facing labour shortage, high labour wage, consumers' taste multiplicity and import tea competition, if the following measures can be taken to upgrade cultural practices and tea processing, reduce production cost, and enhance tea consumption the industry can be more progressive and promising. A modernized and sustainable development of tea industry can also be expected. These measures tend to be taken by the Taiwan Tea Experiment Station, including (1) strengthen soil

and water conservation of tea gardens (2) improve machine-plucking technique, increase machine -plucked tea quality and lower down labour requirements in hand-plucking (3) apply water-saving irrigation system to reduce drought damage on tea growth (4) promote rationalization of fertilizer management by use of computer diagnosis (5) conduct organic farming to pursue sustainability of tea production (6) enforce non-pesticide control approach in tea plantations (7) promote automation of tea processing and refinery (8) promote development and utilization of tea multi-products (9) assist and guide farmers' groups in tea classifying and direct marketing (10) merge tea science & technology and tea art into daily life.

TEA CULTIVATION

According to 1992 statistics (PDAF, 1992), Taiwan currently has 23,737 hectares planted in tea, predominantly in the north and central parts of the island. The main tea plantations in Taiwan was found in Taipei, Taoyuan, Hsinchu, Miaoli, Nantou, Chiayi, Yunlin, Yilan, Hwalien and Taitung counties, with Chinsin Oolong, Chinsin Dapan and TTES No.12 as dominant varieties. The minor varieties include Huangkan, Wuyee, Te- Kwan Yin, Yinchu-honsin and Assam. Each variety has its unique agronomic characteristics and qualities for manufacturing different kinds of tea to meet market requirements.

Because of a booming demand in the domestic market for semi- fermented teas, new tea plantations in central and southern Taiwan, such as Nantou, Chaiyi, Yunlin, Kaohsiung, Taitung and Hwalien, have dramatically increased. It is estimated that more than 6,000 hectares of tea plantation for semi-fermented tea have been newly cultivated. There is a strong tendancy that high priced teas produced in high elevation areas are liked by consumers and sell well. This has generated a trend in which the major tea producing areas are shifting from the northern part of Taiwan (Taipei, Yilan, Taoyuan, Hsinchu and Miaoli) to middle, southern and eastern Taiwan.

Taiwan's black tea and green tea industry, which once prospered, has declined and is facing a crisis due to sharp increase in produciton costs. The main black tea growing areas include Puli , Yuchi, Taitung and Hwalien, with 455 ha of tea farms in total. The tea growers in Taoyuan, Hsinchu and Miaoli, which all produced green tea in the past, have shifted to semi- fermented tea production.

TEA MANUFACTURE

Although individual domestic consumption of tea has grown steadily in the past several years , there are still a number of problems affecting tea manufacturing industry in Taiwan.
Tea production structure is confusing because most tea grower start their own tea manufacturing factories which currently amounts to over 6,000. It is very difficult for large scale tea manufacturers to remain competitive due to the failure of obtaining enough tea leaves for processing quantities of tea needed to maintain a presence in world markets.

Chinsin Oolong is a key variety for manufacturing semi-fermented tea. Consequently, the plucking period is too concentrated among tea gardens, resulted in tea growers' competition on plucking and manufacturing labours.

Domestic consumption on semi-fermented tea with curly spheric shape is in high demanding . As the course of manufacturing, frequent rolling hot tea balls is adopted, which creates labour intensive and brings on high production cost of the tea made.

The selling price of tea produced in high grade tea areas is very attractive for the tea growers but the price is too high for the most consumers. Although the price of intermediate and low grade tea is reasonable, the quality may not meet the consumers' requirement.

The singularity of Paochung tea and Oolong tea on the market is facing new rivals, imported tea bags and canned beverage made of foreign black tea.

DEVELOPMENT OF MULTIPLE TEA PRODUCTS

To meet the taste preferences of various consumers and increase tea consumption, the manufacture of diverse tea products has been attempted. Some products are pretty much liked by consumers and have a good market potential.

Depending on processing order, tea multiple products can be classified into these products made from 1. regular tea 2. process tea and 3. tea extract.

I. Tea Multiple Products Made from Regular Tea

Traditional made-tea, for instance, green tea, Paochung tea, Oolong tea, black tea, is taken as material and simple food processing technique is applied to diversify the product with different flavours for different tastes, particularly, with convenient package and preparation for serving. Such production lines include flavoured tea, scented tea and tea bag.

1. Flavoured tea

Flavoured tea also is called additive tea. Traditional tea is used as basic material, to which traditional edible roots, stems, leaves, flowers and fruits are added to make different or various tastes. It is horticultural and medical crops that dominate as additives among currently developed products. Renowned additives to be blended with made-tea are mint, ginseng, ginger,cinnamon, licorice, chrysanthemum, hibiscus, lichee, rose and lemon.

2.Scented tea

Traditional teas are used as matrix to be scented with fragrant flowers or natural essence, with no modification of the original tea taste. Scented tea, in addition to making pleasant to the taste, provides also the flowery or fruit fragrance. Scented black tea is the main products in local market. An array of scented tea, such as earl black tea, strawberry black tea, honey peach black tea, passion fruit black tea, is a combination set of black tea and natural essence. As the flowery tea, most Chinese favourite such as jasmine tea, sweet osmanthus tea, is flavoured with fragrant flowers. Scented tea has been gradually accepted

by most youthful consumers. Particularly, the prosperity of the shops serving tea shake drinks in everywhere of Taiwan, has made the scented tea in high demanding. The scented tea has been considered as a star for tommorrow in tea.

3.Tea bag

Modern volumetric packing technology has sophisticatedly made tea bags in massive production. Usually, tea with fixed amount(2.0 to 2.2 gram per bag) is packed in filter paper (or called long fiber paper). Because of the fine tea fragments in the bag, it is easy to infuse tea and to clean tea grounds. Tea bag also pretty much meets the requirements of instant food suppliers and office workers. The demanding of black tea bags in Taiwan is increasing. Prior to 1981 Taiwan only had 2 automatic packing machines for tea bags (150-180 bags/minute). Up to 1991, the number of automatic bagging machines has increased to 12. On an average, each machine is capable of packing 20 million tea bags in a year. Based on this, in 199 1 Taiwan should have produced about 240 million tea bags. Imported tea bags were 160 million to 180 million. Including the tea bags packed by semi-automatic packing machine, the yearly total of consumption on tea bags is over 600 million. Mean year consumption on tea bags is 30 bags per person. Nowaday, black tea bag still dominates the tea bag market. However, the market of tea bags made of Paochung tea, Oolong tea and jasmine tea, and that of flavoured tea bags has started dramatic growth from these 2-3 years. This kind of tea bags, well liked by youthful people and students, is available in supermarkets or convenient shops, with mean selling price, 2.5 to 3.0 NT$/bag. In short, tea bag has become a main product of tea consumption.

II. Multiple Products Made of Process Tea

Superior technology such as grinding, extraction, condensation, can sealing, sterilization and compression is used to reprocess tea into tea related products. The usage of the products includes . 1. food additives, for example powder tea. 2. dessert such as tea jelly and tea candy. 3. simplified and convenient drink, such as canned tea beverage and instant tea. 4. drink with varied tastes such as fruit tea, tea wine and tea cocktail. 5. folk foodstuffs--caky tea 6. living utility --tea pillow and tea bathing bag.

1. Powder tea

Milling technique is applied to grind traditional tea into tea powder with particle size ranged from 80 to 200 mesh. Being used as food additives, Japan's application consists of tea biscuit, tea cake and tea icecream, that have been commercialized. Cooperated with local tool -machinery manufacturer, the TTES has used cyclonic separation technique in powder tea production. The specified particle size can be obtained through the control of wind inlet and cyclonic strength. The production know-how has been shifted to interested powder-tea developers with expect to view cakes and pastries prepared with powder tea, such as tea noodles, tea dumpling skins, tea cake, tea bread, steamed tea bun, tea rice cake in the market.

2. Tea jelly

Tea jelly is made from tea liquor, acids and coagulants (such as: pectin, agar, sea-weed extract, vegetarian geletin etc.). The product features for its retention of special tea flavour

3. Soft tea candy

The ingredients of soft tea candy are composed of tea liquor, sugar, maltose, pectin, acid additives and spices. The tea candy provides with tea and fruit flavour.

4. Instant tea

Instant tea is a powder or granulated product, that water soluble components in tea are extracted with hot water, concentrated and freeze dried. The tea is characterized for its maintenance of original tea flavour, convenient use and capability to be sold with automatic vending machine. Instant tea has been deserved attention by instant food industrialists and gradually accepted by consumers.

In 1983 the TTES set up an instant tea pilot plant. The tested products such as instant Paochung tea and instant black tea in terms of the color of the liquor or taste were by no means inferior to the same products made in other countries. In order to complement the aromatic defect of instant tea made from by-products of made-tea, the TTES has succeeded in the development of instant jasmine tea and lemon tea. Such production technique is transferable to local industry to fit special need for the manifold tea tastes.

The convenient brewing, serving and portability of instant tea coincides pretty much with modern lifestyles. The basic input material is by- product of tea, from which various kinds of flavoured tea can be made. In this regard, the instant tea is really a potential product of diversification. The flow sheet of preparation of instant tea is as follows:

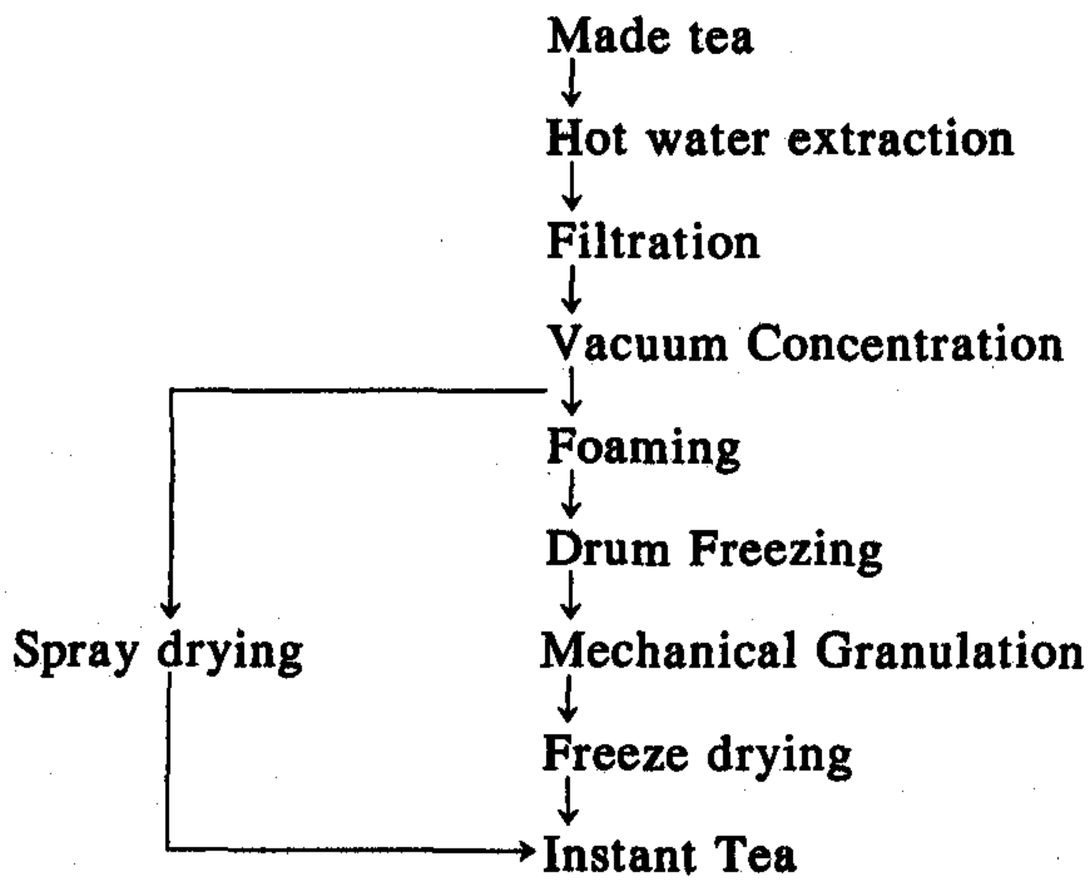

Diagram 1. Flow sheet for the preparation of instant tea

5.Tea beverage

In 1981 Itoen, a Japanese company, successfully developed canned Oolong tea, which

later on caused Oolong hit in Japan and more than 100 canned tea producers coming into the market. In succession, canned black tea and green tea (Sencha) appeared on the market. In 1 990, Japan's production of canned tea beverage were 90 million cases for Oolong tea and 70 million cases for black tea. Under the influence of Japan's prevalence and Taiwanese producers' promotion, market share (non-alcholic drinks) of canned black tea accounted for 12.37% in 1990, as compared to that of 0.46% in 1987. Sale quantities of canned tea beverage ranked the third, exceeding Coca Cola, root beer, coffee beverage and sports drink, but next to fruit-vegetable juices and carbonated drink. Domestic market of packed tea beverage are in fast growing. In 1989 the marketing worth only accounted for 2 billion NT$. In 1992 it jumped to 8.4 billion NT$ already, with a production scale next to that of carbonated beverage. Apparently the years of 1989 to 1991 were a booming stage. Predicted turnover of packed tea drinks for the 1993 is going to be over 10 billion NT$, comparatively closed to that of carbonated beverage. Tea beverage may become the largest quantity of consuming beverage in the future. Aluminium can or Tin-can is the dominant package for tea beverage in Japan , however some products are packed in PET bottle, glass bottle and paper package. Al-can or Tin-can is also a major packing container for tea beverage in Taiwan early. However it is cream down and deterioration problem of tea-liquor color, Al-can and Tin-can have been mostly superseded by tetrapak, which represented 78.63% of all packets used in the tea beverage market.

Recently, tea shake drinks are gaining popularity in the metropolis such as Taipei, Taichung, Tainan and Kaohsiung. Despite mostly advertised as black tea shake, nearly all tea shake shops offer various array of tea shake drinks. Not only black tea are used for tea shake preparation, but also green tea, jasmine tea, Paochung tea and Oolong tea. The multiplicity of condiments and additives used in the tea shake drinks and respective unique formula has created a quite good consumer response from youthful people. The wide distribution of tea shake houses in countless corners would definitely contribute to a good potential of tea consumption.

6. Tea wine and tea cocktail

Tea contains pretty good natural pigments depending on its degree of fermentation. If it can be used to prepare or brew wine, it will make wine with bright and rich color apart from unique tea aroma and flavour. Of the tea wine prepared by the TTES, white-tip Oolong tea and Tungdin Oolong tea are especially noted for its good taste. Commercial tea wine is available.

Tea cocktail is a comparatively recent development at the TTES, which has greater variety and quality. A number of ingredients for preparing tea cocktail are (1). origin tea: Longgin (green tea), Paochung, white-tip Oolong, black tea (2). wine: brandy, gin, lichee wine , grape wine, plum wine, rose red etc. (3). sweetening: fructose, sugar, honey. (4). fruit juice : organge, pineapple, passion fruit, apple, pomelo (5). colorant and flavouring solution: guava syrup (red), mint wine (green), blue orange wine (blue), coffee wine (black), orange juice (

golden). The TTES has developed 22 punches of different formula, which is available upon request.

7. Tea dishes

The idea of developing tea dishes originated from the following reasons: diversifying the uses of tea, using tea as a health food in banquet or daily meals and providing consumers more selections of colorful, spicy and flavourous dishes. In fact, tea is one of the best food additives for its multi-functions of freeing from fishy, oily or other unpleasant odor, enforcing one's feeling of agreeable palate and enriching food color or taste. The TTES has developed more than 10 courses of tea dishes which can be used in tea banquet.

8. Citrus fruit tea

The tea is a traditional tea product in Hakka areas. Because of its unique flavour, the fruit tea has long been enjoyed by most seniors. Citrus fruit tea is declining due to its complicated manufacturing procedure and shortage of involvement of modern processing technology, resulted in labour intensive, high manufacturing cost and lack of coping with food hygienic requirements. In addition, to brew fruit tea is not convenient. For sake of innovating such unique features of fruit tea, the TTES has succeeded in the development of labour-saving method of fruit tea manufacture. The improvement of fruit tea packing consists of designing artistical giftware boxes and fruit tea bags, being sanitary, pleasant to the eyes, and handy for brewing and storage.

9. Caky tea

Caky tea is one of traditional teas in China. However, it is monotonous in appearance and is not liked by modern people. In order to let caky tea fit into folkway and merge into modern life, the TTES has developed various shapes of caky teas for the celebrated occasions , such as longevity peaches caky tea for birthday celebration, dragon-phoenix caky tea for wedding and caky tea with a shape similar to a silver or gold ingot used in old China. The caky tea is not only a good souvenir for congratulation but also a precious stuff for treasuring . The caky tea preserved for a long time is very valuable.

III. Multiple Products Made from Tea Extracts

The products are made from functional components of tea being extracted by hot water or organic solvents. The input materials are usually fresh tea leaves, made-tea of intermediate grade or by-product of made-tea. Through separation and purification of tea extracts some natural anti-oxidants and de-ordourants are obtained for diverse use. For the extractions, separation and purification, advanced technology is highly needed to ensure the good manufacturing practices of the products.

Since 1985, through concerted and diligent efforts from specialists, scholars, government officials, Japanese-scientists have in a position to offer many categories of the diverse products of tea extracts. Since 1988, there were many commercialized tea products available in the Japanese market. Example of such products are natural anti-oxidant extracted from tea, halitosis releaser,

de-odorant used in kitchen or toilet, paper towel for de- odorizing, chewing gum with tea extract added for removing halitosis, tea extract added noodles with health promotion. Tea extracts have been one of ingredients in candy for eliminating bad breath. Such candy appears with different flavors for different tastes in the market.

As for the Taiwanese research and development on tea anti-oxidant it should be dated back to 19 85 that Prof. Ming-Hsiung Lee of National Taiwan University has had an appraisable achievement . Unfortunately, it is not commercially feasible in Taiwan.

Succeeding Japan, United States and Mainland China have stepped up efforts in the development of applications of tea extracts in health protection. It is believed that in the foreseeable future, 2 to 3 years, tea extracts as additives in health food or snack should be very popular in the market

CONCLUSIONS

For the development of Taiwan tea industry, the research and development of tea multiple products has the following special meaning:

1. Various drinks such as sports drink, carbonated drink, juice drink and fiber drink etc. have become a big hit in the beverage market in Taiwan. Miscellenous new products have been incessantly promoted into the market. However, tea consumption is still confined to the traditional consumption form. Apparently, the old style of consumption is quite deficient in diversity and freshness, resulting in great loss of competition in the market. In order to overcome the current impact of new wave of beverages on tea consumption, R&D effort towards new multi-use development and finding new market segments is pretty necessary.

2. As the consequences of the extension of machine plucking in Taiwanese tea gardens, there is an obvious increase of by-product of made tea (fanning and stalk). If such material can be reused to manufacture high-value products, it would undoubtedly increase farmers'income.

3. In view of modern lifestyles, busy and taut, manufacturing tea drink with simple, instant and convenient use either in indoor or outdoor would meet the demands from different profiles of consumers.

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Appendix

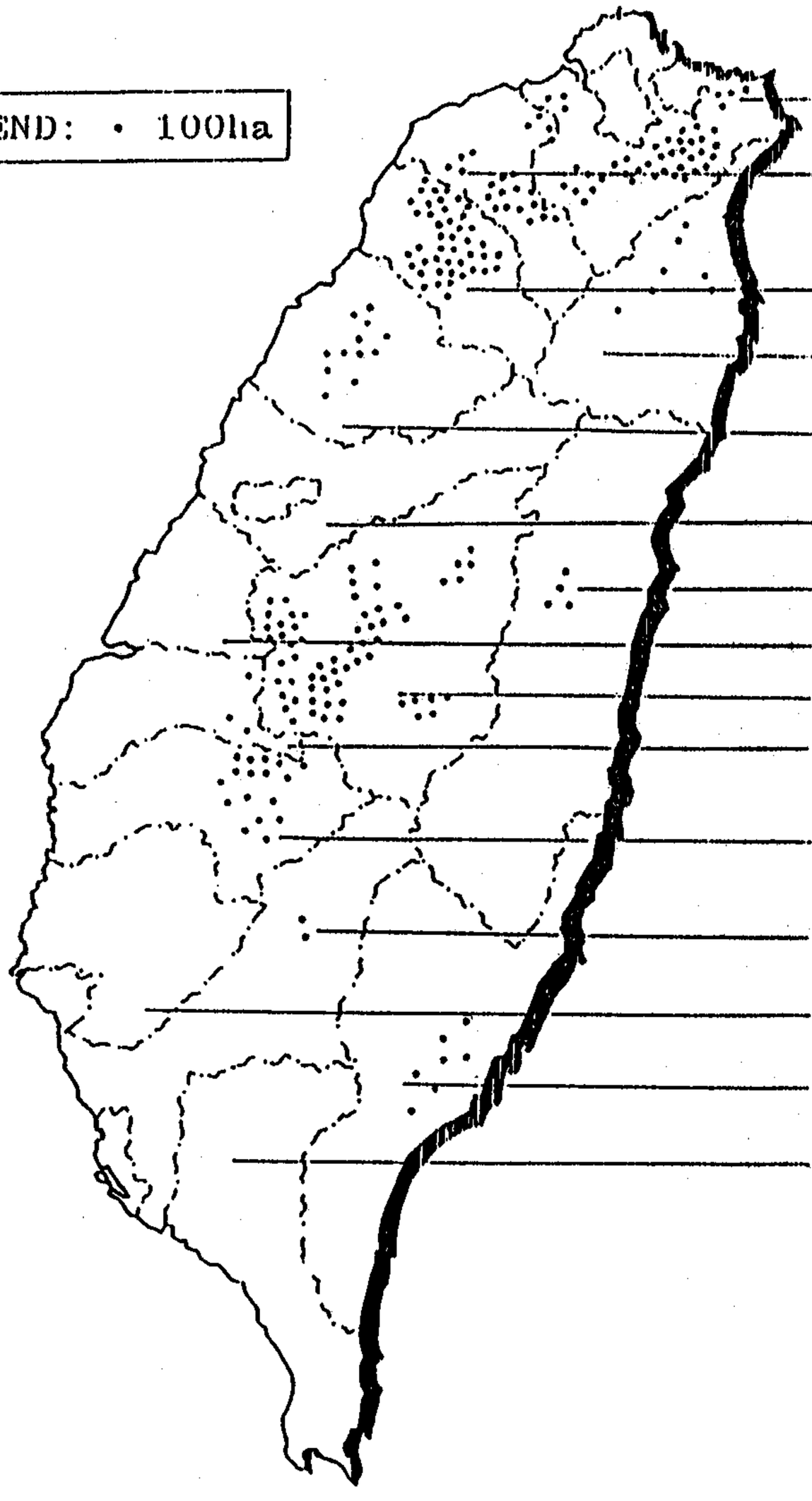
Table 1. Production and exports data of Taiwan tea

Year	Production (tons)	Exports (tons)	Percent exports (%)	Exports of various tea (tons)									
				Black tea	(%)	Green tea	(%)	Paochung tea	(%)	Oolong tea	(%)	By-product of made-tea	(%)
Max. amounts during Japanese occupation	17,165	13,166	77	150	1	-	-	3,810	29	8,807	67	399	3
1946	2,919	3,498	120	1,929	55	-	-	1,115	32	382	11	72	2
1951	10,502	11,134	106	4,796	43	2,882	26	1,432	13	225	2	1,799	16
1956	13,420	10,634	79	2,744	26	2,292	22	1,535	14	247	2	3,815	36
1961	18,064	14,232	79	3,561	25	5,675	40	1,767	12	257	2	2,972	21
1966	21,510	19,278	90	6,780	35	9,802	51	2,365	12	331	2	-	-
1975	26,984	22,923	85	5,954	26	14,124	62	2,330	10	515	2	-	-
1976	24,758	20,382	82	4,374	22	14,110	69	1,446	7	453	2	-	-
1981	25,223	14,957	59	3,068	21	9,323	62	1,549	10	1,017	7	-	-
1986	23,890	10,095	42	1,092	11	2,575	26	1,222	12	5,207	52	-	-
1987	25,578	7,820	31	744	10	1,894	24	834	11	4,349	56	-	-
1988	23,557	7,633	32	799	10	1,792	23	722	9	4,319	57	-	-
1989	22,130	6,745	30	487	7	1,816	27	663	10	3,779	56	-	-
1990	22,299	5,741	26	561	10	1,012	17	544	9	3,717	64	-	-
1991	21,380	5,317	25			883	17			4,434	83	-	-
1992	21,389	5,296	25			1,062	20			4,234	80	-	-

Source: Taiwan Agricultural Yearbook and Tea Newletter; Exports after 1991 are sum of that of Oolong and Paochung exported

Table 2. Development and utilization of tea multi-products in Taiwan

Multi-use order	Highly commercialized	Less commercialized	Very possibly commercialized	Being developed	Developing	To be developed
Regular tea	tea bag	flavoured tea			scented tea	
Process tea	tea beverage tea wine	instant tea tea cake tea hard candy tea cooked food fruit tea tea pillow tea bathing bag	tea soft candy tea jelly tea cocktail caky tea powder tea products	tea biscuit fruit tea-beverage powder tea	concentrate tea tea snack	
Tea extract		tea shampoo tea delergent instant tea-bathing powder		anti-oxidant de-odourant health food	pigment tea eassence	



	(ha)
Taipei Hsien	4,416
Taoyuan Hsien	2,222
Hsinchu Hsien	4,300
I-Lian Hsien	738
Miaoli Hsien	1,200
Taichung Hsien	24
Hualien Hsien	360
Changhua Hsien	8
Nantou Hsien	6,367
Yunlin Hsien	380
Chia-I Hsien	1,700
Kaohsiung Hsien	167
Tainan Hsien	2
Taitung Hsien	690
Pingtung Hsien	20
Total	22,594

Distribution of tea garden in Taiwan (1992)