Research paper

Production and marketing channels on green bamboo shoots (*Bambusa oldhamii*) in Taiwan

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【**Abstract**】Due to the favorable climate and environment for the bamboo growth, Taiwan has rich and diverse bamboo resources with an area of 183,330 ha in 2014. Among them, green bamboo (*Bambusa oldhamii*) is an important species with great economic values in bamboo shoots. In this paper, we investigated the production and the marketing channels on green bamboo shoots in Taiwan. Results showed that 8 cites and counties produced green bamboo, among them, the cultivation area of green bamboo in Tainan City was largest about 1,874 ha in 2013, with the next in New Taipei City about 1,600 ha. The amount of bamboo shoots produced in Tainan City was biggest about 15,701 tons in 2013, followed by New Taipei City about 6,400 tons. The average price of green bamboo shoots was highest in the beginning of production season and decreased a half from April to November. The net profits of lead farmers were higher about two times than normal cooperative members. Four types of green bamboo shoots marketing channels are available in Taiwan. In north area close to urban district, for example, Bali, Sanxia and Wugu in New Taipei City, the major market channel was through the auction market by farmers and local shippers and then directly ship to local markets. However, in the rural area, for example, Fuxing in Taoyuan City, the major products were first shipped to Taipei Fruits and Vegetables Wholesale market, and then to retailers. In southern area, except for directly ship to local markets, most bamboo shoots were through cooperatives northwardly shipped to Taipei Fruits and Vegetables Wholesale market, and then to retailers. However, the way through hyper retail chains (i.e., internet) was increasing in recent years.

【**Key words**】green bamboo; marketing channel; cooperatives.

研究報告

台灣綠竹竹筍生產和銷售通路之研究

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【摘要】由於適宜之天氣和生長環境，台灣擁有充沛之竹林資源。到2014年台灣共有183,330 ha竹林面積。綠竹 (*Bambusa oldhamii*) 林多分布於臺灣淺山地區，是台灣重要之經濟竹種之一。其竹筍美味，營養價值高，竹筍收穫爲竹農重要的收入來源。本研究探討台灣綠竹竹筍之生產和銷售通路。研究結果顯示台灣有8個縣市生產綠竹竹筍，栽培面積在2013年以台南市之1,874 公頃最多高，其次爲新北市之1,600公頃，同年生產量以台南市生產量15,701噸爲最，其次爲新北市之6,400噸，可見台南市和新北市是台灣生產綠竹竹筍之重要地區。竹筍銷售方式有4種通路，竹農選取方式隨產地有異。北部地區接近都會地區之鄉鎮如新北市八里、三峽和五股，大都透過農會由竹農與集貨商以拍賣方式進行現場交易，再由集貨商送至當地或鄰近鄉鎮傳統市場銷售，運銷通路層次簡單。但離都會地區較遠之鄉鎮如桃園縣復興鄉，因當地人口稀少，絕大多數之竹筍必須運至台北果菜市場集中銷售。南部地區除部分竹筍在南部果菜市場銷售外，大多數之竹筍都南筍北送，運至北部果菜市場集中銷售。此外，竹農自行接單或由農會協助透過網路直銷之方式，近年有增加之趨勢。
【關鍵詞】綠竹、市場通路、合作組織。

INTRODUCTION

The marketing strategy of selling bamboo shoots is changing gradually as production and marketing patterns varies in Taiwan. During the past several decades, factors such as rising wages, fragmental farmland, price competition and monopolies from wholesalers led bamboo shoot producers to face harder conditions and lessen benefits. Hence, independent producers need to vertically coordinate their products through the cooperative marketing built by Taiwan government to maximize their profits and improve their quality of life.

Marketing cooperatives play an important and growing role of changing agricultural industry (Bruynis et al. 2001). For instance, cooperatives have the ability to solve various market problems facing independent producers, such as they negotiate the price of agricultural products to traditional market venders and develop sales channel, therefore, there is no much need for producers to invest significantly for further development on the supply side (Sirieix et al. 2011).

However, it is necessary that marketing cooperatives are based on the common beliefs among members, otherwise, they will be disintegrated by human greed. The lifespan of cooperative depends on four major factors-business volume, financial statements, management training and board experience (Dunn 1988; Bruynis et al. 2001). If some unacceptable conditions such as unclear financial statements appear in cooperatives, lead farmers would leave their cooperatives and specialize their products to make higher profits (Kledal 2009).

Due to favorable climate and environment conditions to bamboo growth, Taiwan is rich in bamboo resources both in species diversity and stockings in bamboo forests (Lü 2001). Based on Taiwan Forestry Statistics, bamboo forests covered about 183,330 ha in 2014 (TFB 2015), approximately 8.34 % of forestland. Both culms and shoots have economic value for excellent properties and food sources for some bamboo species. Among them, green bamboo (*Bambusa oldhamii*) in 2013 estimated about 7,575 ha in cultivation (Wang & Chen 2014). Green bamboo

is suitable to be cultivated in level ground or in hilly area with high temperature and moisture below 500 m in elevation. With no usage in commercial, the culms of green bamboo, usually, were discarded on lands after harvesting the bamboo shoots. Due to the high economic value on bamboo shoots, bamboo shoots on green bamboo is the one of the most important shoot productions for bamboo shoot industry in Taiwan (Photo 1), therefore, the purpose of this paper is to investigate the production and the market channels on green bamboo shoots in Taiwan, and explained why the hyper retail chains preferred to develop in suburbs than in countryside, and the cooperatives in south of Taiwan transport their products northwardly to markets in Taipei city.

MATERIALS and METHODS

I. Interviews of agricultural staffs in local governments

All bamboo shoot-related cities and counties governments in Taiwan were interviewed by telephone to investigate major regions of producing green bamboo shoots in Taiwan. These regions were further surveyed to obtain the data used in analysis. Among them, four cities and four counties (Figure 1) were in operation because they were the production sites of many kinds of

Photo 1. Green bamboo shoots.
照片1. 綠竹筍。

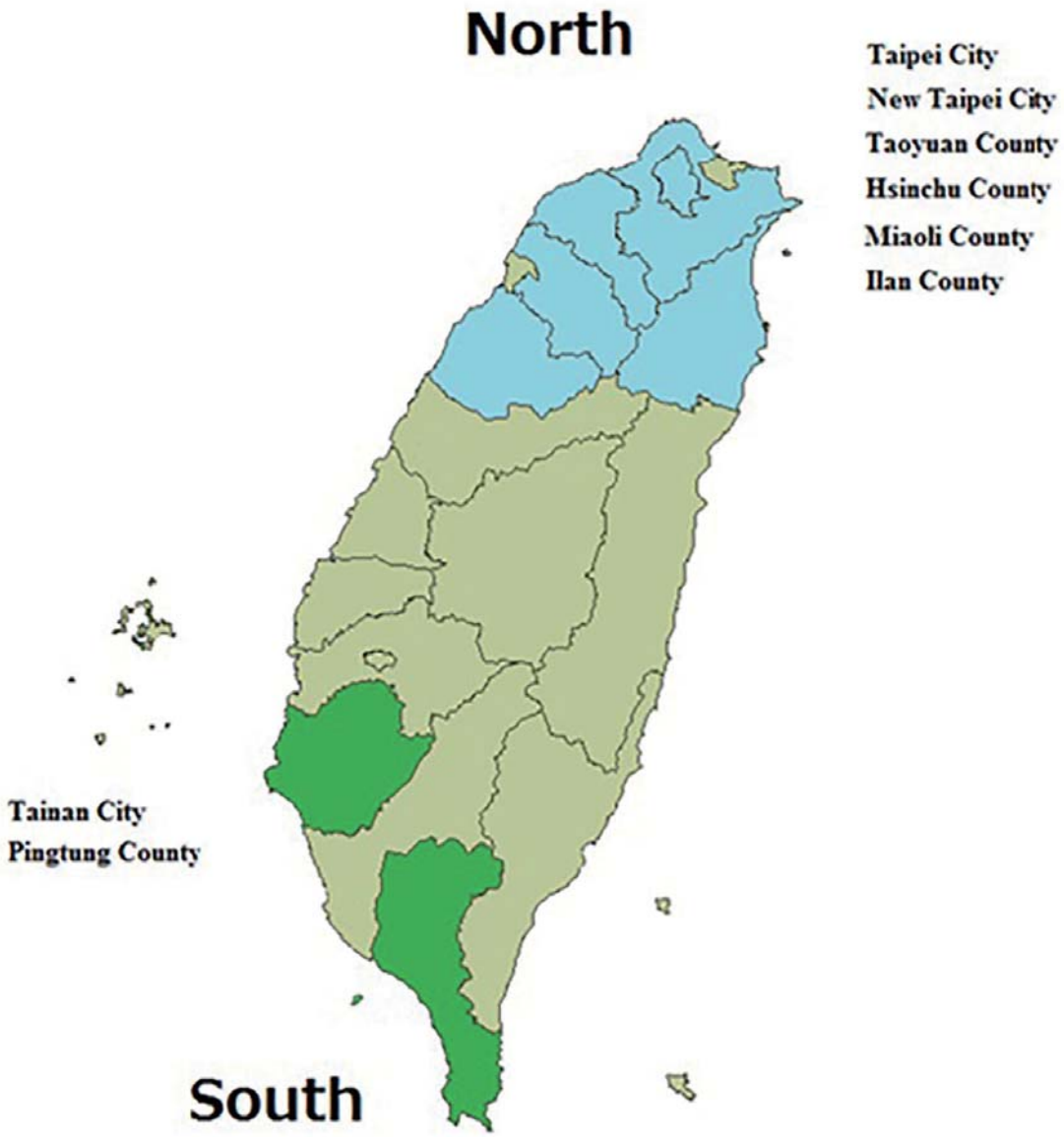

Fig. 1. The original region of green bamboo shoots in Taiwan.
圖1. 臺灣綠竹筍產地分布圖。

bamboo shoots. Agricultural staffs in these local governments were interviewed to acquire the more specific quantitative data, such as the amount of average production and the area of harvesting green bamboo shoots, needed to complete the statistical analysis.

II. Analysis of price and trading volumes from major traditional markets in Taiwan

In order to collect the data of price and trading volumes, we browsed the website of Agriculture and Food Agency, Council of Agriculture, Executive Yuan in Taiwan. Moreover, the data of cost and benefits of 30 individual

farmers, 50 Farmers' Association member farmers and 20 leader farmers in the study area were also collected by personal interview. These data were analyzed using SAS software to carry out analysis of variance (ANOVA) based on α= 5% significant level and Duncan's multiple range test determine if a significant difference between each group average exists.

III. Analysis of marketing channels of green bamboo shoots in Taiwan

We investigated the types of marketing channels in green bamboo shoots based on the interview to farmers mentioned above in the regions of producing green bamboo shoots in Taiwan.

RESULTA and DISCUSSIONS

I. The production of green bamboo shoots and trading volumes

Based on the information of green bamboo shoots on four cities and four counties in 2013 (Table 1), overall, New Taipei City and Tainan County were by far abundant in area and production, and Ilan and Pingtung County had the fewer cultivated area and smaller production of green bamboo shoots than other cities and counties in Northern and Southern Taiwan, respectively. Furthermore, the lowest annual yield of green bamboo shoots was found in Taipei City. On the other hand, the highest one was obtained in Pingtung County (Table 1).

Table 1. The amount of area, yield and production of Green Bamboo shoots in different regions of Taiwan in 2013.

表1. 2013年臺灣各地綠竹筍栽種面積及產量。

		Area (ha)	%	Production (ton)	%	yield (kg ha^{-1} yr^{-1})
Northern Taiwan	Taipei City	885.43	14.59	3,480	8.75	3,930
	New Taipei City	1,600.00	26.36	6,400	16.10	4,000
	Ilan County	40.00	0.66	180	0.45	4,500
	Taoyuan City	665.58	10.97	3,594	9.04	5,400
	Hsinchu County	421.70	6.95	2,861	7.20	6,784
	Miaoli County	119.61	1.97	1,596	4.01	13,345
	Sub Total	3,732.32	61.50	18,111	45.55	
	Average					4,852
Southern Taiwan	Tainan City	1,874.80	30.89	15,701	39.49	8,374
	Pingtung County	462.17	7.61	5,948	14.96	12,871
	Sub Total	2,336.97	38.50	21,649	54.45	
	Average					9,263
Total		6,069.29	100.00	39,760	100.00	

Out of the cities and counties investigated, the green bamboo cultivation area was noticeably higher in New Taipei City, northern Taiwan, at 1,600.00 ha (26.36%), and Tainan City, southern Taiwan, at 1,874.80 ha (30.89%). The amount of green-bamboo-shoots production was also higher in New Taipei City, northern Taiwan, at 6,400 ton (16.10%), and Tainan City, Southern Taiwan, at 15,701 ton (39.49%).

It can be seen that Ilan and Pingtung Counties had fewer green bamboo cultivation area, at 40.00 ha (0.66%) in North of Taiwan, and at 462.17 ha (7.61%) in South of Taiwan respectively. The amount of green-bamboo-shoots production was also lower in Ilan County at 180 ton (0.45%), and in Pingtung County at 5,949 ton (14.96%). The yield of green bamboo shoots increased from Northern to Southern Taiwan with the pattern from 3,930 to 12,871 (kg ha^{-1} yr^{-1}) (Table 1).

Generally, the production of green bamboo shoots in Taiwan started from April to November. Figure 2 illustrates the average price of green bamboo shoots on markets from 2009 to 2013 in Taiwan (http://amis.afa.gov.tw/v-asp/top-v.asp). It can be seen that the average price reduced a half from 85.6 New Taiwan Dollars, (NTD) kg^{-1} in April to 38.2 NTD kg^{-1} in November.

Based on statistics of green bamboo shoots market activity in eight major fruits and vegetables markets around Taiwan (Table 2), significantly, the average sale price was higher at 73.85 NTD kg^{-1} in Taipei I and at 72.20 NTD kg^{-1} in Taipei II, and was lower at 39.60 NTD kg^{-1} in Sanchong and at 40.80 NTD kg^{-1} in Fongshan.

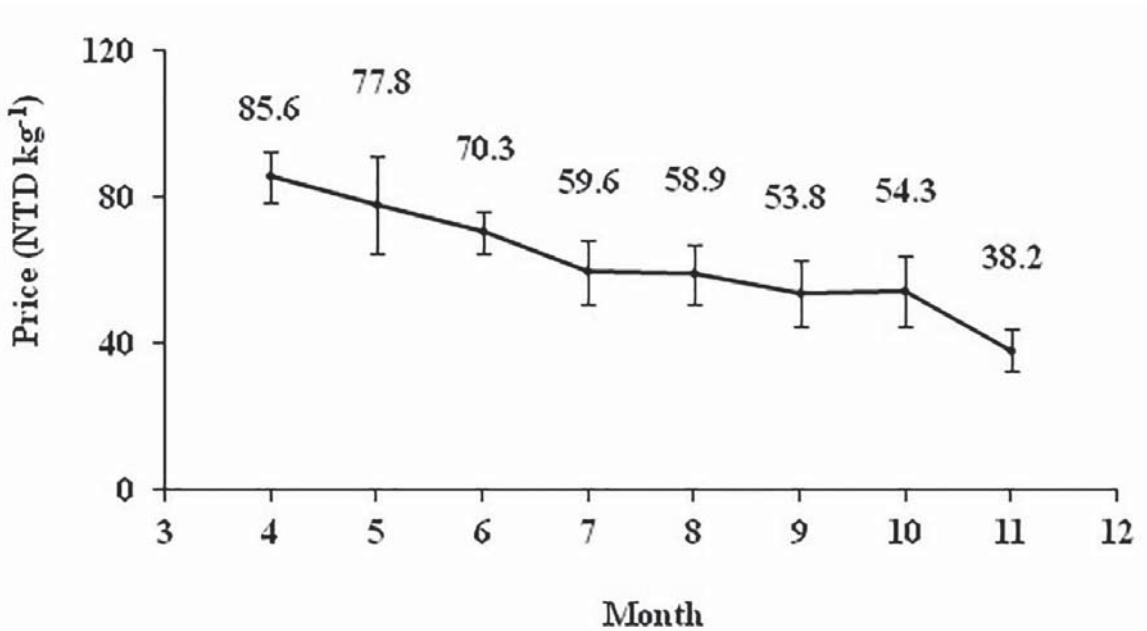

Fig. 2. The average price of green bamboo shoots in recent 5 years (2009-2013).
圖2. 2009-2013年臺灣綠竹筍每月平均售價。

Table 2. Average prices, trading volumes and sales revenue in major fruits and vegetables markets in 2013.
表2. 2013年臺灣各主要果菜市場綠竹筍平均售價、銷售量及收入。

Markets	Average Price (NTD* kg^{-1})	Trading Volumes (ton yr^{-1})	%	Sales Revenue (kNTD** yr^{-1})	%
Taipei I	73.85[a]	290.00[c]	10.38	21,416.50[c]	12.25
Taipei II	72.20[a]	1,356.00[a]	48.55	97,903.20[a]	55.99
Sanchong	39.60[d]	88.50[d]	3.17	3504.60[d]	2.00
Taoyuan	45.90[c]	3.00[g]	0.11	137.70[f]	0.08
Taichung	45.65[c]	10.00[f]	0.36	456.50[e]	0.26
Kaohsiung	68.45[b]	45.00[e]	1.61	3,080.25[d]	1.76
Fongshan	40.80[d]	10.00[f]	0.36	408.00[e]	0.23
Pingtung	48.40[c]	990.50[b]	35.46	47,940.20[b]	27.42
Total		2,793.00	100.00	174,846.95	100.00
Average	62.6				

* NTD: New Taiwan Dollar
** kNTD: thousand New Taiwan Dollar

Among eight markets, the trading volumes in Taipei II was highest at 1,356.00 ton yr^{-1} (48.55%), followed by Pingtung, at 990.50 ton yr^{-1} (35.46%), and Taipei I, at 290.00 ton yr^{-1} (10.38). Consequently, the sales revenue was also significantly higher in Taipei II, at 97,903.20 kNTD yr^{-1} (55.99%), followed by Pingtung, at 47,940.20 kNTD yr^{-1} (27.42%), and Taipei I, at 21,416.50 kNTD yr^{-1} (12.25%).

It can be seen that trading volumes of green bamboo shoots in Sanchong, Taoyuan, Taichung, Kaohsiung and Fongshan markets, were all below 100 ton yr^{-1} (Table 2). Therefore, the sales revenue was noticeably lower in Sanchong, at 3504.60 kNTD yr^{-1} (2.00%), in Taoyuan, at 137.70 kNTD yr^{-1} (0.08%), in Taichung, at 456.50 kNTD yr^{-1} (0.26%), in Kaohsiung, at 3,080.25 kNTD yr^{-1} (1.76%), and in Fongshan at 408.00 kNTD yr^{-1} (0.23%), respectively.

Average direct and indirect costs incurred in managing green bamboo plantations for farmers interviewed were 250,568 NTD ha^{-1} and 3,169 NTD ha^{-1} (Table 3). Direct costs were higher than indirect costs because salary of hiring workers or owner worker was the highest part of them, at 206,167 NTD ha^{-1}. The direct costs also included gardening at 12,345 NTD ha^{-1} and fertilizer at 32,056 NTD ha^{-1}. The indirect costs included facilities at 1,092 NTD ha^{-1} and machinery at 2,077 NTD ha^{-1}.

The average gross profits of cooperative members and leader farmers* are 579,920 NTD ha^{-1} and 854,660 NTD ha^{-1}, respectively (Table 4). However, the net profits of the latter are higher about two times than the former (Table 4). Overall, while the production amount of green bamboo for the latter is less than that of the former, the higher sale price incurred by the latter, therefore, caused

Table 3. Cost statistic of green bamboo industry investigated in Taiwan 2013.
表3. 臺灣綠竹筍產業成本統計2013。

Items		(NTD ha^{-1})
Direct Costs		250,568
	Gardening	12,345
	Fertilizer	32,056
	Salary	206,167
Indirect Costs		3,169
	Facilities	1,092
	Machinery	2,077
Total		253,737

Table 4. Cost and benefits of green bamboo shoots between cooperative members and leader farmers*.
表4. 合作社成員及領導農民栽植綠竹筍成本及利潤比較。

	Cooperative members	Leader Farmers
Gross Profits (NTD ha^{-1})	579,920	854,660
Production of green bamboo shoots (ton ha^{-1})	9,263.9	5,660
Average Price on sale (NTD ton^{-1})	62.6	151
Total Cost (NTD ha^{-1})	253,737	253,737
Net Profits (NTD ha^{-1})	326,183	600,923

the leader farmers were by far more benefit for producing green bamboo shoots than farmers' association members.

II. The marketing channel on green bamboo shoots

A marketing channel is a set of practices or activities necessary to transfer the ownership of goods from producers to consumers (Armstrong & Kotler 2011). It is the way that products and services get to the end-user (i.e., the consumer), and is also known as a distribution channel (Evans & Berman 1995). A distribution channel in marketing refers to the path or route through which goods and services travel to get from the place of production or manufacture to the final users (Mullins et al. 2008). A distribution channel can be as short as a direct transaction from the vendor to the consumer, or may include several interconnected intermediaries along the way such as wholesalers, distributers, agents and retailers (Armstrong & Kotler 2011). During the distribution, it is noted that each intermediary receives the item at one pricing point and moves it to the next higher pricing point until it reaches the final buyer (Bovee et al. 1995). Bamboo shoots do not reach the consumers without going through a channel involving the farmers, distributers and the

retailers. Studying on marketing channel is useful for management (Kotler & Armstrong 2010), and is crucial to creating an effective and well-planned marketing strategy (Hardy & Magrath 1988).

The marketing strategy of selling green bamboo shoots has been changed in Taiwan recently. In this paper, we were going to investigate the types of market channels and answered the core questions raised in this study. Four types of market chains to sell green bamboo shoots, as illustrated in the Figure 3, were available in Taiwan. They are:

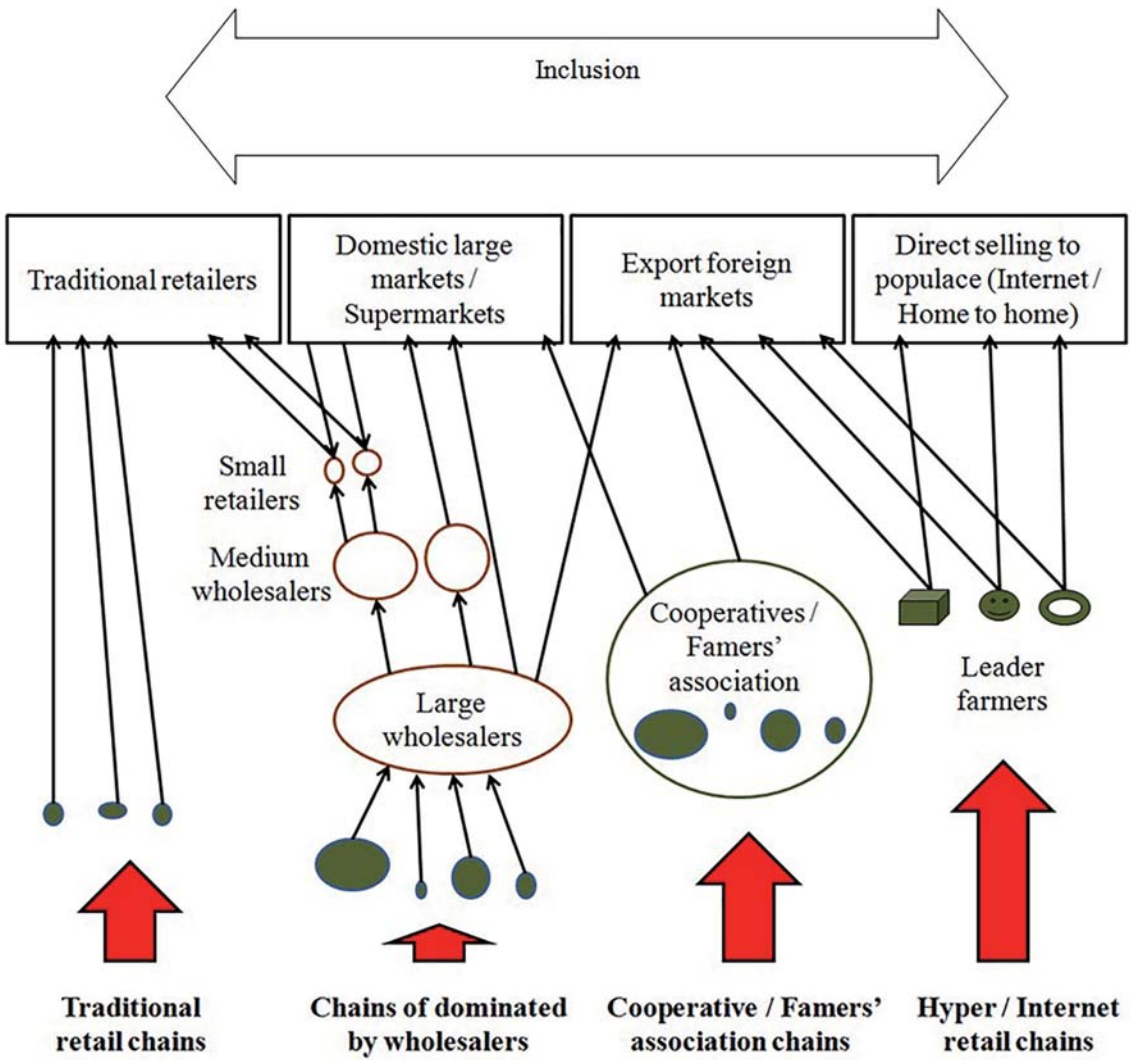

Fig. 3. The marketing channel on green bamboo shoots in Taiwan. Farmers; Wholesalers; Cooperatives; Leader farmers; Profits to farmers.

圖3. 臺灣綠竹筍銷售通路。農民、批發商、合作社、領導農民、農民利潤。

(I) Traditional retail channel

In this channel, retailers buy the bamboo shoots from the farmers and sell them directly to the consumers. The retailers were characterized by a dominance of local unorganized supply chains and limited fundamental infrastructure (Kedal 2009, McCullough et al. 2008). Each retailer's dealing capacity is not affordable enough to supply larger markets nearby cities independently. Usually, farmers are willing to have a deal with a well-trusted retailer. Farmers in north area close to urban district such as Bali, Sanxia and Wugu in New Taipei City, for example, the major market channel of bamboo shoots is through the auction market by farmers and local shippers, and then directly ship to local markets retailers and subsequently to the consumers.

(II) Wholesalers' chains

A wholesaler is an intermediary entity in the distribution channel that buys in bulk and sells to retailers rather than to consumers. Instead of selling goods to retailers, bamboo shoots producers send their goods to the wholesalers, with the price involved through auction marketing system. While the wholesaler buys goods in bulk and takes away extra costs, such as service costs or sales force costs involved in the retailers, through the service cost incurred by retailers, the end-users always pay a higher a price for buying goods from retailers. Contrarily, the producers in general, get less profit in the competition marketing system (Mullins et al. 2008). In the rural area, for example, some farmers in Fuxing in Taoyuan City, or Guanmiao in Tainan City, they own directly shipped bamboo shoots products to Taipei Fruits and Vegetables Wholesale Market or fruits and vegetables wholesale markets in other cites.

(III) Cooperatives chains / Famers' association chains

Most of farmers own farmlands less than one hectare in Taiwan (Yen et al. 2003a, 2003b; Tsai & Li 2004), therefore block mechanizations of farming activities and hinder the upgrade of economic scale, leading to the prolonged high cost of production. Because the profit had been exploited by wholesalers, some of farmers want to challenge the unfavorable situations encountered. In order to help them, the government in Taiwan encourages farmers to organize cooperatives or join famers' association that can enhance the efficiency of agricultural production outputs and farmers income, reduce farmers management cost, and establish trading system to increase the ability of negotiation (Wang & Chen 2014).

Four factors affect the longevity of cooperatives: business volume, financial statements, management training and board experience (Bruynis et al. 2001). If those factors had been collaborated together harmoniously, the cooperatives would do work very well and improve the business volume and profits. However, some negative factors such as bad environment, the vicious competition among the cooperative members, greedy leader, inaction officials and vague accounts would let the cooperatives collapse and decay.

Many places of green bamboo shoots produced in Taiwan were carried to the consumers by attending the Cooperatives chains / Famers' association chains. Longqi in Tainan City and Chuchi in Chia-yi County, for example, through the assistance from Famers' association, the green bamboo shoots products were shipped bulky to Taiwan major fruits and vegetables markets (Table 2), sold to wholesalers and then to retailers, then finally to consumers.

(IV) Hyper retail chains (internet and home-to-

home)

Recently, green bamboo shoots trade through internet or home-to home base (i.e., hyper retail chains) is increasing in Taiwan. In this channel, some excellent famers detach from cooperatives and become leader farmers to pursuit higher profits (Table 3, 4). Due to various types of specialized skills (e.g., freezing and low temperature transportation facilities) and highly quality products produced by the leader farmers*, consumers (e.g., supermarket and restaurants) are willing to buy goods directly from leader farmers. Moreover, because of no intermediary entity involved, a higher profits obtained by farmers in this channel.

Due to the variety of chains associated with marketing channels, the farmers face with a more complex set of rules and regulations applied to domestic large markets or to export goods to foreign markets and various profits (Figure 3). Based on the farmers interviewed, the share proportion of type III channel is most (about 50%), next by the total of type I and type II (30%), and Type IV (20%). In terms of profits obtained by the producers, the profit obtained through the wholesale marketing is the least because of the unfavorable competition to the wholesalers. The next one is through traditional retailers because of dealing with well-trusted retailers. The profit through the Famers' Association chains is higher because of the enhanced ability in bargaining with wholesalers and the lessen expenses in transportation to market. Since the produced green bamboo shoots are in good quality and no intermediary entity involved in the process, the profit through the hyper retail chain is highest for the farmers.

III. The explanations of core questions

In this paper, two questions of why the hyper retail chains prefer to be developed in suburbs such as new Taipei city than in countryside, and the cooperatives in southern Taiwan always transport their products northwardly to large markets in Taipei city were addressed as below:

In reality, green bamboo shoots is not easy to store and transport to customers. Thus, how to maintain shoots fresh is very important to the farmers. Consequently, compared to farmers in the countryside area, farmers nearby Taipei metropolitan where people have more demands for green bamboo shoots have more advantages in maintaining their qualities of products and increasing the chance to rise up their profits (Table 3, 4), in this situation, suburban area provide more cultivatable area to farmers (Table 1).

For instance, Taipei I and II market have higher average prices and trading volumes than other markets in Taiwan (Table 2). It indicates that demand for green bamboo shoots is more excessive than supply provided by local producers, leading to green bamboo shoots to be northwardly transported from south of Taiwan to larger markets in Taipei city even though the production of green bamboo shoots in south is higher than one in north of Taiwan (Table 1).

Huge demand and low supply caused green bamboo shoots transportation from south to north of Taiwan. At the same time, it is easier to develop the hyper retail chains in suburban area than one in the countryside area.

CONCLUSIONS

The average price of green bamboo shoots was highest in the beginning of production season and decreased a half from April to November. The net profits of leader farmers are higher about two times than cooperative members. In Taiwan, four kinds of chains were available in the green

bamboo marketing channels, among them, the farmer profits is the least for the wholesaler's chains, and the highest one for the hyper retail chains. The hyper retail chains preferred to develop in suburbs than in countryside, and the cooperatives in south of Taiwan transport their products northwardly to markets in Taipei metropolitan city.

*Footnote: leader farmers refers to farmers who own good techniques in cooling and conserving bamboo shoots, with a high profit by sell bamboo shoots directly to restaurants. Cooperative members refers to farmers attending Farmers' Association.

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LITERATURE CITED

Armstrong G, Kotler P (2011) Marketing: An introduction. 10th ed. Upper Saddle River, NJ.

Bovee CL, Houston MJ, Thill JV (1995) Marketing. 2nd ed. McGraw-Hill, New York.

Bruynis C, Goldsmith PD, Hahn DE, Taylor WJ (2001) Success factors for emerging agricultural marketing cooperatives. Journal of Cooperation 16: 14-24.

Dunn JR (1988) Basic cooperative principles and their relationship to selected practices. Journal of Agricultural Cooperation 3: 83-93.

Evans J, Berman B (1995) Principles of Marketing. 3rd ed. Prentice-Hall, Englewood Cliffs, NJ.

Hardy K, Magrath A (1988) Ten ways of manufacture to improve distribution management. Business Horizons 31(6): 65-69.

Lü CM (2001) Cultivation and Management of Bamboo Forests. TFRI Extension Series #135. Taiwan Forestry Research Institute. (in Chinese)

Kledal PR (2009) The four food systems in developing countries and the challenges of modern supply chain inclusion for organic small-holders. Paper at: The International Rural Network Conference in India, Udaipur, 23-28 of August 2009.

Kotler P, Armstrong G (2010) Principles of Marketing. 13th ed. Upper Sadle River, NJ.

McCullough EB, Pingali PL, Stamoulis KG (eds) (2008) The Transformation of Agri-Food System: Globalization, Supply Chains and Samllerholder Farmers. FAO and Earthscan publications.

Mullins J, Walker Jr. O, Boyd H (2008) Marketing Management: a Strategic Decision-Making Approach. McGraw, Boston.

Sirieix L, Kledal PR, Sulitang L (2011) Organic food consumers' trade-offs between local or imported, conventional or organic products: a qualitative study in Shanghai. International Journal of Consumer Studies 35: 670-678.

TFB (2015) Taiwan Forestry Statistics. Taiwan Forestry Bureau, Taiwan (In Chinese).

Tsai MJ, Li WS (2004) Study on the organization of and supervision provided in the green bamboo shoot production and marketing groups in Taoyuan. Bulletin of the Taoyuan District Agricultural Research and Extension 58: 48-60 (in Chinese).

Wang S, Chen TH (2014) The techniques of cultivation and marketing of green bamboo shoots. Forestry Research Newsletter 21(4): 54-56 (in Chinese).

Yen TM, Hu HL, Lee JS (2003a) An economic

study on culms of Moso Bamboo (*Phyllostachys heterocycla*) in Chu-Sun area. Quarterly Journal of Forest Research 25(1): 25-36. (in Chinese with English Summary)

Yen TM, Hu HL, Lee JS (2003b) The shoots of Moso Bamboo (*Phyllostachys heterocycla*) management in Chu-Shan area. Quarterly Journal of Forest Research 25(2): 43-54. (in Chinese with English Summary)