Occasional Paper

CHUNG-HUA INSTITUTION FOR ECONOMIC RESEARCH

75 Chang-Hsing St., Taipei, Taiwan 106

Republic of China

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A Comparison of Competitiveness between Taiwan and Mainland China in Major Agricultural Industries -- Shrimp-cultivation Industry and Swine-breeding Industry

by
Yi Chou and Chyau Tuan

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by

Yi Chou** Chyau Tuan***

I. Introduction

According to 1990 government data on agricultural products, the major export markets for Taiwanese agricultural products were Japan, Hong Kong and the U.S.. In terms of Taiwan import-source markets, large numbers of agricultural products were imported from the U.S. and Australia. In the same year, the major export markets for mainland China's agricultural products were the former USSR, Hong Kong and Japan. Mainland

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China's agricultural products were mostly imported from America, Canada and Australia.

On the other hand, meat of swine, shrimp and eels are the most important agricultural exportation products in Taiwan, so we would like to introduce shrimp-cultivation industry and swine-breeding industry in this article. As to eels, there is more detailed illustration in the other article of Chou Yi (1992) "A comparison of competitiveness between Taiwan and mainland China in eel-cultivation industry".

There are three sections in this article. The first section is introduction, and the second section points out that Japan, Hong Kong and America are the major trade markets for both the two sides. At last, the analysis of competitiveness of shrimp-cultivation industry and swine-breeding industry is illustrated in the third section.

II. A summarized sketch of competition in agricultural products between Taiwan and mainland China

Japan, Hong Kong and America are the three major competitive markets between Taiwan and mainland China. In order to understand the competitive condition of agricultural products between the two sides, we try to scan the items in the three markets and find out which items are most important.

II.1 Japanese markets

In 1990, agricultural products which were exported from Taiwan to Japan totalled US$2,482.42 million. Meat and edible meat offal accounted for the major portion (27.29%).

The next product area in value terms was aquatic products (including fish, crustaceans, molluscs and other aquatic invertebrates), with 20.77% of the total. This was followed by food preparations of meat and aquatic products (13.26%), articles of wood (9.94%), edible vegetables, and certain roots and tubers (9.16%). In mainland China, exports of agricultural products to Japan totalled US$2,073.25 million in 1990. Aquatic products and aquatic preparation foods accounted for the most significant part of the export trade, amounting to 27.52% of the total. Following this were vegetables and fruits (19.92%), animal oils and fats (9.56%), cereals and their products (7.28%) and oil seeds and oleaginous fruits (7.03%).

Based on the above introduction and our observations, aquatic products represent the most competitive area between Taiwan and mainland China for the Japanese agricultural products market. In 1989, exported aquatic products from Taiwan to Japan totalled US$534.17 million, and US$515.60 million in 1990. Among these, live eel, prepared eel, tuna, live shrimp, and frozen shrimp were the major products. In 1989, exported aquatic products from mainland China to Japan totalled US$469.55 million, and US$250.49 million in 1990. Major products from the mainland were live eel, frozen shrimp, and other kinds of fish or snails, abalone, clams, etc..

Analyzing the statistical data above, there are two points which need elaboration: (1) recently, shrimp disease has seriously damaged the Penaeus monodon shrimp industry in Taiwan, so that this shrimp variety has completely lost its market share in the Japanese market. Nevertheless, the Penaeus chinensis shrimp from mainland China has remained competitive. In the Japanese live shrimp market, the Taiwanese live Penaeus japonicus are popular. (2) The Taiwanese eels industry has tremendous potential, particularly due to the scarcity of glass eels. In mainland China, glass eels are naturally produced in four provinces

(Kiangsu, Chekiang, Fukien and Kwangtung). However, the governments of Chekiang, Fukien and Kwangtung have prohibited the exportation of glass eels, and in Kianngsu, a licence from the Economy & Trade Ministry and large export taxes are demanded. Taiwan's eel production industry also has some advantages over that of mainland China, such as technology, management and marketing capabilities.

In 1990, agricultural products imported from Japan to Taiwan totalled US$391.03 million. Raw hides and skins (26.12%) and forage (24.90%) were the two major products. In mainland China, agricultural products imported from Japan totalled US$74.26 million of which forage (30.02%); skins, leather and its articles (20.15%) and cereals (17.96%) were the three major items.

Most importantly, both Taiwan and mainland China have trade surpluses with Japan in the agricultural products sector. Taiwan's trade surplus was US$2,091.39 million, mainland China's was US$1,998.99 million. It is likely that there will be strong competition between the two sides of the Taiwan Strait for Japanese agricultural product markets in the near future.

II.2. Hong Kong Market

In the Hong Kong agricultural product markets, the amount of agricultural products exported from mainland China to Hong Kong obviously exceed that from Taiwan to Hong Kong. In 1990, exports from mainland China to Hong Kong totalled US$2,558.18 million --- more than mainland China-Japan exports. Vegetables and fruits made up the largest part (17.18%). Two kinds of marketing channels are used in mainland China to sell vegetables to Hong Kong: one for "special-zone vegetables" is directly from the Shen-jin vegetable markets; the other for "non-special zone vegetables" through Wu-feng Hang and Kwang-

nang Hang. Fish, crustaceans, molluscs and their manufactured products amounted to 16.43% of the total, followed by edible live animals (live swine being the most important) at 15.67%. Other animal, and vegetable materials accounted for 10.37% of the total.

In 1990, agricultural products exported from Taiwan to Hong Kong totalled US$340.76 million (far less than the amount to Japan). Raw hides and skins made up the major part (30.77%), followed by wood articles (19.35%), skin articles (14.79%), fish, crustaceans and molluscs (11.22%) and edible vegetables and fruits (4.56%).

Competition between Taiwan and mainland China for Hong Kong's agricultural products markets is obviously concentrated in aquatic products, vegetables and fruits. In both areas, exports from mainland China to Hong Kong were far greater than those from Taiwan -- US$420.38 million (aquatic products) and US$439.58 million (vegetables and fruits) versus US$38.25 million and US$15.55 million.

As for import markets, imported agricultural products from Hong Kong to mainland China totalled US$337.32 million in 1990. Among all items, skins and skin articles amounted to US$147.34 million (43.68% of the total). In 1990, however, skins and skin articles were the most important agricultural products shipped from Taiwan to Hong Kong, amounting to US$156.16 million. In addition, tobacco and related products its articles (12.69%), vegetable oils (7.94%), and fodder (7.63%) also made up a large part of imports from Hong Kong to mainland China.

In 1990, agricultural products exported from Hong Kong to Taiwan totalled US$26.52 million. Fish, crustaceans and other aquatic invertebrates took 31.13% of the total, in which fish fry dominated. Other items of importance were products of animal origin which were not elsewhere specified or included (20.62%) and skin articles (12.07%) and raw hides and skins (11.18%).

According to the above, both Taiwan and mainland China have trade surpluses in Hong Kong agricultural product markets. Mainland China's surplus was US$2,220.86 million, and Taiwan's was US$214.25 million. There seems to be a compensatory relationship between mainland China and Taiwan in the external trade of Hong Kong agricultural product markets. The major compensatory items were skins and their articles (which were export products of Taiwan and at the same time, import products of mainland China.) and fish, crustaceans, mollusca and other aquatic products (which were exportation products of mainland China, and importation products of Taiwan). With respect to competitive relationships, mainland China has slightly exceeded Taiwan in aquatic products and vegetables & fruits.

II.3. The U.S. market

In 1990, the total amount of agricultural products exported from Taiwan to the U.S. was US$1,117.37 million. Among all agricultural products exports skin articles amounted to US$470.72 million (42.13% of the total) and were the most important part of the export structure. This was followed by wood articles (29.65%), and fish, crustaceans, molluscs and other aquatic invertebrates (11.28%).

Exports of agricultural products from mainland China to America totalled US$467.39 million, dominated by fish, crustaceans, molluscs and other aquatic products (53.59%); other animal and vegetable materials (13.92%); vegetables and fruits (11.21%); and coffee, tea, cocoa, cocoaflavours and its preparations (8.31%). According to the above analysis, the most severe competition between Taiwan and mainland China in agricultural products for the American market was in aquatic products. Taiwan has maintained superiority in these markets, but mainland China is gradually catching up. Shrimp,

especially the Penaeus chinensis variety have successfully entered the American market; while mainland China has also become one of the main suppliers of frozen shrimp to the U.S.

In terms of imported products, the total sum of agricultural products imported from the U.S. to Taiwan in 1990 amounted to US$2,512.55 million of these products, cereals were the most important (32.51% of the total) followed by oil seeds and oleaginous fruits (21.00%), wood and wood articles (7.98%), and tobacco and manufactured tobacco substitutes (5.28%). Agricultural products imported from America to mainland China totalled US$1,033.15 million, of which cereals and their articles made up 66.22% (US$684.16 million) and cork and wood 22.08%.

Both mainland China and Taiwan had trade deficits in American agricultural product markets; Taiwan's amounting to US$1,395.18 million, and China's to US$383.77 million.

III. Shrimp-cultivation industry and swine-breeding industry****

According to the above analysis of different markets, we can see clear competition and compensation between Taiwan and mainland China in agricultural products. In this section, we would like to choose two kinds of agricultural products for analysis. The first is the shrimp cultivation industry. In volume terms, the shrimp industry in mainland China is ranked first in the world, and still has good potential. On the other hand, Taiwan's

**** Data resources and detailed analyzing process are illustrated in Yi Chou (1992), "An analysis of Taiwan and Mainland China's Competitive capabilities in major agricultural commodities", shrimp-cultivation industry is analyzed in chapter 3 and swine-breeding industry in chapter 10.

shrimp cultivation industry benefits from excellent technology. With regard to the swine-breeding industry, in both Taiwan and mainland China, pork is the most important source of animal protein for consumption. Although mainland China cannot export swine to Japan (the Japanese market is the most important export market for Taiwan's swine), Taiwan and mainland China could still compensate each other in the transaction of breeding swine, fodder and animal drugs.

In this section, "multiple factors analysis" is used to discuss the competitive capabilities of shrimp-cultivation industry and swine-breeding industry. As for the determination of those competitive factors, "expert opinion method" is taken to do this job and we identify those competitive factors in Table 1 and Table 2 clearly.

III.1. Shrimp-cultivation industry

In Table 1, we indicate 19 indicators for measuring the competitiveness of shrimp industries between Taiwan and mainland China.

Table 1. The competitiveness indicators of shrimp cultivation industries in mainland China and Taiwan

	Taiwan	Mainland China
1.Varieties	Penaeus monodon, P. japonicus	P. chinensis, P. monodon, P. penicilatus
2.Sources of brood shrimp	P. monodon: imported from Southeast Asia P. japonicus caught from seashore area	P. Chinensis: natural(70%) artificially cultivated(30%) P. monodon: imported from Southeast Asia

3.Supplies of shrimp fry	800 hatcheries; every stage in the production process is professional, and the survival rate is high.	1,000 hatcheries; almost all of the hatcheries are state owned, survival rate is lower.
4.Cultivation style	Intensified cultivation style plus polyculture system with milkfish, shells and mullet was recently developed.	Polyculture, bulky cultivation, half-intensified cultivation, intensified cultivation and web-impeded cultivation styles are used; half-intensified cultivation style dominates.
5.Water pollution	Due to cultivation intensification, the quality of water is worse; water wheels, water pipes around the pools, wind-stirring machines, water pumps, wave-making machines are used to increase oxygen dissolved.	Because of the low density of cultivation, the quality of water is better; sewage from factories and households is the major source of water pollution.
6.Supplies of fodder	Formulated fodder	Fresh fodder: 50% Formulated fodder: 50%
(a)Fodder formulas	Scientific formulas	Experienced formulas
(b)Supplies of raw material	Imported	Self-sufficient except a small quantity of fish powder
(c)Fodder coefficient	1.5-2.0	3.0-4.0
(d)Efficiency of feedmill	Privately owned, more efficient, better quality control	State-owned, less efficient, worse quality control
7.Sickness prevention	Abusion of medicine is in existence. Greater shrimp disease.	Less shrimp disease - emphasis on prevention.

8.Harvest skills	Professional harvesters.	Casual labour at harvest time (October in the north, November in the south).
9.Freezing and extra working systems	Privately owned, extra working facilities, modern technology. Recently, some companies have transferred to mainland China or Southeast Asia, other companies develop frozen foods to stimulate the domestic market.	State-owned, management is less efficient. Technical resources and numbers of extra working factories are insufficient.
10.Cultivation cost	Penaeus monodon: N.T.154.5/Kg Penaeus japonicus: (1)export: N.T.221.5/Kg (2)domestic markets: N.T.165.5/Kg (3)mixed: N.T.185/Kg	N.T.60-80/Kg
11.Structures of cultivation cost	Fodder: 54.4% personnel: 11.2% electricity: 9.7% shrimp fry: 7.8% drugs: 3.9%	Half-intensified cultivation: 1.fodder: 61% 2.personnel: 20% intensified cultivation: 1.fodder: 77% 2.shrimp fry: 3.7% 3.personnel: 4%
12.Sale ratio of domestic or export markets	Penaeus monodon (1990) 1.domestic markets: 93.06% 2.export markets: 6.94% Penaeus japonicus (1990) 1.domestic markets: 45.5% 2.export markets: 55.5%	Domestic markets: 45.7% Export markets: 54.3%
13.Channels for domestic markets	(1)Extra working factories (2)Peddlers	(1)Extra working factories (2)Marketing co-operative societies

	(3)Mutual marketing	(3)Peddlers
14.Consumption	Average annual per capita consumption is 3.5Kg.	Average annual per capita consumption is less than 1Kg. Southern areas, especially Kwangtung, Fukien, Kiangsu and Chekiang most show highest consumption levels.)
15.Reasons for consumption	Freshness, taste, hygienic nature and quality of shrimps are all the most important factors, plus shrimps as a good source of protein.	Consumers regard shrimps as a good source of protein.
16.Channels for export markets	(1)Extra-working factories (2)Packaging factories (3)Trading companies	Through China import-export grain-oil companies and through Japanese companies for the Japanese market.
17.Market distribution	Japan: 83.73% America: 9.07%	Japan: 32.56% Hong Kong: 30.88% America: 30.21%
18.Export prices	US$15.01/Kg	US$14.86/Kg
19.Government's policy	Adjusting	Encouraging

Due to its abundant resources of water and land, a suitable climate and a sufficient supply of shrimp fry, mainland China is more suitable for shrimp cultivation than Taiwan. Also, due to abundant labour resources, shrimp production costs in mainland China are lower and thus enable it to maintain a competitive edge in international shrimp markets. Up to now, northern mainland China has been the major location of the shrimp industry, but a

transfer to the south is unavoidable. There are three reasons for this: (1) water and land resources in the north are gradually being polluted; (2) pools of shrimp cultivation are more and more aged; (3) shrimp disease has become more and more serious. At the same time, not only the Penaeus chinensis but also Penaeus monodon, Penaeus japonicus, and Penaeus penicillatus, etc., have potential for the international shrimp markets.

On the other hand, the Taiwan shrimp industry is restricted by its water and land resources. Taiwan's natural resources are poor, but it still has eight advantages over mainland China: (1) the professional nature of industry personnel; (2) skills in shrimp cultivation; (3) management of the cultivation process; (4) quality of fodder; (5) peripheral industries; (6) frozen chains; (7) marketing and transportation capabilities; (8) collection of information.

Recently there have been problems such as shrimp disease, high production costs, deterioration of the cultivation environment, policy restrictions, etc., so that Taiwan's shrimp industry has gradually lost its advantages over mainland China and Southeast Asia. There are three feasible strategies to solve these difficulties, such as continuously promoting the quality of products, developing markets other than Japan and the domestic market, and transferring parts of the production process to other countries which have the advantage of good natural resources. Because of language similarities, mainland China is likely to be a good location to which to transfer the Taiwanese shrimp industry. Nevertheless, there still are some problems which are worthy of note, such as the scarcity of marketing channels, different payment rules and interference from administrative organizations, etc..

III.2. The swine-breeding industry

Table 2 shows 18 indicators measuring the competitiveness of swine breeding

industries in Taiwan and mainland China.

Table 2. Competitiveness indicators of swine-breeding industries in mainland China and Taiwan

	Taiwan	mainland China
1.Scale (Average number of swine nourished/per company)	254	38 (In Beijing, large scale swineries are popular.)
2.Cost of production	N.T.40/Kg (The lowest cost in Taiwan is N.T.36.5/Kg.)	N.T.14/Kg (In mainland China, costs have increased rapidly, costs are lowest in Beijing.)
3.Cost breakdown	Piglets: 30% Breeding costs: 70% (including personnel expenses and material expenses)	Piglets: 30% Breeding costs: 70%
4.Personnel cost	N.T.2.69/Kg	N.T.2.45/Kg (In Kiangsu and Beijing, the efficiency of workers is higher, and the personnel cost is lower.)
(a)number of personnel	8-9 persons/500 sows	more than 50 persons/500 sows
(b)salaries	per person N.T. 20,000-25,000 /per month (In Taiwan, computerized and automatic systems are used and thus personnel levels are lower.	Per person N.T. 1,000-1,200/per month
5.Material expenses	N.T.25.21/Kg	N.T.7.65/Kg

(a)cost of fodder	N.T.22.6/Kg (In Taiwan, 94% raw fodder material is imported from other countries.)	N.T.6.5/Kg (In mainland China, almost all raw fodder material is domestically produced, with the exception of fish powder.)
(b)fodder coefficient	3.0-3.4	more than 4.5 (In Beijing, the fodder coefficient is the lowest.)
6.Cost of piglets	N.T.12.2/Kg	N.T.4.25/Kg
7.Efficiency of production	100 (The index of production efficiency is represented by: numbers of swine butchered/ numbers of swine bred. In 1991, efficiency levels fell to 94.	62
8.Varieties	Landrace, Duroc, Yorkshire, Hampshire	Mei-shan, Large white, Duroc, Yorkshire
9.Breeding standards	Generally professional. Formulated fodder is the most popular. (In Taiwan, lean meat is sufficiently popular to overcome problems such as: numbers of delivery, piglet sickness and death ratios.)	The ratio of lean meat is lower, but the development of lean meat swine has been a major trend since the 1980s.
10.Organization of swineries	Automatic equipment with emphasis on pollution prevention. (The quality of machines made in Taiwan is qualified to export to other countries.)	Traditional family-style -- less attention to pollution prevention. (In Beijing, large swineries use automatic equipment.)
11.Disease	Plague, Pneumonia, Erysipelas	Food and mouth disease, Plague,

	(Quality of drugs made in Taiwan is higher and qualified to export to other countries.)	Neonatal, Scour, Erysipelas, Mycoplasma pneumonia
12.Pressure of environmental protection	High (In Taiwan, cost of environment protection is more than N.T.1/Kg.)	Low
13.Marketing channels	Domestic markets: (1)extra working factories (2)local markets Export markets: (1)extra working factories (2)trade companies (3)sale through Japanese companies. (More efficient marketing.)	Domestic markets: (1)state-owned commercial organizations (2)marketing co-operative societies (3)farmers' organizations Export markets: (1)China import & export grain companies and oil (2)China import & export native companies products and livestock (3)marketing co-operative societies
14.Price	1990: N.T.39.94/Kg 1991: N.T.39.41/Kg (decreasing gradually.)	1989: N.T.16/Kg (The price in mainland China is stable.)
15.Average consumption /person	1989: 34.4Kg/year 1990: 35.8Kg/year (stable consumption levels)	1990: 19.2Kg/year (gradually increasing)
16.Self-sufficiency ratio	1989: 116 1991: 122 (Export capacity is only lower than Denmark, Holland, Belgium	1989: 104

	and Luxembourg, and the same as Ireland.)	
17.Export markets	Japan	Live swine: Hong Kong, Macao Meat: Hong Kong, Macao, USSR, Eastern Europe
18.Government's policy	Adjusting	Encouraging

In terms of export markets, Japan is the most important for Taiwan. Hong Kong, Macao, Russia and Eastern Europe are important for mainland China. Restricted by the problem of foot & mouth disease, mainland China's swine breeding industry is unable to threaten Taiwan's exports to the Japanese market. With regard to compensatory activity between mainland China and Taiwan, breed swine, fodder and animal drugs are essential to the mainland Chinese industry. Thus, we suggest that the above items could be of profit to Taiwan - mainland China trade.

As to the operation of an economic and trade strategy, if Taiwanese enterprises sell breed swine to mainland China first, the next step would be to provide fodder suitable for breed and young swine. In the near future, after breed swine from Taiwan is sold to mainland China, the necessity for Taiwanese fodder, animal drugs and pasturing implements, etc. will be obvious.

IV. Conclusion

According to all the above analyses, Taiwan has advantages in technology, management, controlling information and markets, while mainland China has advantages in resources, lower production costs, less pressure in terms of environmental protection, support from government, etc.. Quite aside form the compensatory relationship of agricultural trade between mainland China and Taiwan, if mainland China and Taiwan's governments could co-operate and establish a plan for both sides' agricultural policy, it would benefit both the populations of Taiwan and mainland China in the future.

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