

COMPETITIVENESS AND SUPPLY CHAIN MANAGEMENT STUDY ON TAIWAN GROUPEr INDUSTRY

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Abstract

Grouper is one of the major aquaculture products in Taiwan; however, we need to streamline the process in production, further enhance marketing activities, and boost or strengthen channels of distribution for grouper to develop an efficient and effective strategy to promote the grouper industry. Thus, integrating the producing and marketing channels including the consumers need, order form manufacturing, products certification, and transportation and sailing systems is important. This paper conducts questionnaire surveys and in-depth interviews, and it examines the competitiveness and supply chain system of the Taiwan Grouper Industry. Empirical results show the major key factors that can improve the intercalation of leading supply chain management into this industry successfully as follows: 1). government should promote collaboration between industry and academic community in bioscience research and strengthen their partnership; 2). industry should set up a center for handling goods and materials at the place of production in order to construct a supply chain network; 3). productions should establish an E-business management system; 4). members of the supply chain must establish a common understanding to form partnerships; 5). The grouper industry must comply with the GAP and HACCP systems, and open up the international market and aim for sustainable development. Finally, this research provides recommendations for development, and market strategy to the grouper industry in the future.

Keywords: Competitiveness, Grouper Industry, KSF, Supply Chain Management.

1. Introduction

Grouper is one of the major aquaculture products in Taiwan. There are more than twenty species of groupers in the current waters around Taiwan, including the Malabar Grouper, Humpback Grouper, Potato Grouper, Brown-marbled Grouper, King grouper, and others, including the orange spotted grouper, tiger grouper, and leopard coral trout etc. Among them, the King Grouper culture has developed in the last few years and is growing continuously at a strong rate. All these groupers are warm water fish. The optimal temperature ranges from 24°C to 30°C, with most able to tolerate range of 15°C to 35°C. Juvenile fish, 30-40cm, and 0.5-1.0kg [1], are the favourable market size in Taiwan, Hong-Kong, Shanghai, Singapore and other parts of Asia. Currently, Taiwan has taken the leading role in grouper culture. According to a report by the aquaculture organization of the United Nations, in 2004, the culture grouper production in Taiwan was 13,219 tons, which were more than 80% of total culture grouper production in Southeast Asia. The main challenge that global grouper culture industry faces is insufficient and unstable supply of groupers fry and juveniles. The deficiency in the processes of producing and marketing channels are calling for deeper integration of production and marketing channels, incorporating the consumers need, order form manufacturing, products certification, transportation and sailing system. This paper conducts questionnaire survey and in-depth interview, and examines the competitiveness and supply chain system of Taiwan Grouper Industry.

2. Literature review

Huang(1999) discuss the productivity and cost analysis on grouper industry. It shows that the aquaculture cost, and technology will be the grouper cultivation future direction. In this paper also analysis the grouper industry and its development. In this paper shows that grouper industry should reduce the cost of operation, promotion international trade competitiveness, and will be the main export species in Taiwan [2]. Lin (1999) use seven core resources, including land, money, credit, economic-net, professional skill, managing style, and the spirit of business, to analysis the Key Success Factor in grouper fry industry [3]. Yeah's (1999) research shows that the fry cost is the highest (36~45%) in aquaculture stage. Therefore reduces the fry cost is increasing the profit the most important item. In marketing, he suggest the fishermen organize the marketing collaboration, and establish common transportation and sale system [4]. Fu(2002) found that feeding cost and fry cost are two main cost in grouper farms. And she suggests that industry should effectiveness reduce both hectare feeding rate and the fry cost, and also reduces the cultivation density, and the increase area of cultivation [5]. Shih(2002) analysis the elasticity of grouper in Taiwan, and this research shows that the income elasticity of grouper is bigger than 1. And it means grouper is possibly luxury goods and will have the enormous market potential in the future [6]. Jung(2004) surveys consumer's seafood purchasing behavior. And he found that consumers are willing to pay more in buying safe and certificated seafood [7].

3The Framework and Supply Chain of Grouper Industry in Taiwan

3.1 The Framework of Taiwan Grouper Industry

Taiwanese grouper aquaculture farms are distributed in Pingtung county(74%), Kaohsiung county, Tainan county and Chiayi county. In 2004, the production was about 13,000 metric tons, and the output value is about 2,700 million NTD ([8], [9]). Taiwanese are cautious about their seafood, especially expensive variety (groupers are included indeed). In Hong Kong, live groupers weighing 0.5-2.0 kg cost \$ 22 to 44 USD per kg (wholesale) depending on the species. Due to grouper's excellent taste, supply seldom meets demand and the grouper is always on the menus of gourmet restaurants. To meet demand, Taiwanese started cultivating groupers in Penghu, across the violent in the Taiwan Strait in 1975. Now, Taiwan has taken the leading role in grouper culture [10]. According to the reports by the agriculture organization of the United Nations, in 2000, the culture grouper production in Taiwan was 5,053 tons, which was more than 50% of total culture grouper production in Southeast Asia (9,488 tons). The main obstacle of global grouper culture industry is insufficient supply of fry and juvenile grouper. In Southeast Asia, most groupers were grown up juveniles.

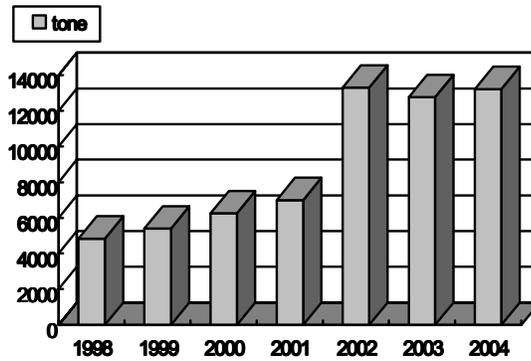


Figure 1 The production of grouper in Taiwan

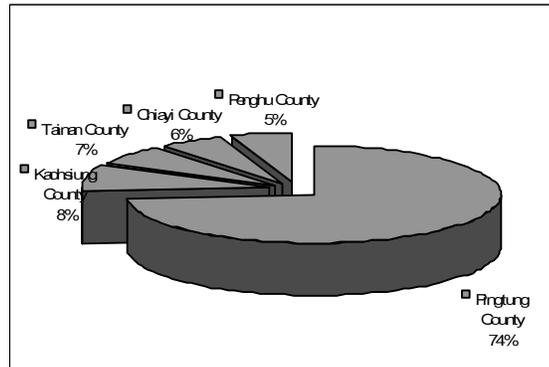


Figure 2 The distribution of grouper industry in Taiwan

Due to high demand in Southeast Asia and the (seasonal) shortage of grouper fry, the price of grouper fry is higher than other species'. Taiwan has already been analogous to achievements on a kind of reproduction in grouper industry. Nowadays, Taiwan hatcheries produced 300 thousands brown-marbled grouper and 2.0 million king grouper juveniles. However, about one-third of the groupers were not grown in hatcheries. In 2000, 33million fry and record 323 metric tons of live groupers were exported. Taiwan's live groupers have been seen not only to the restaurants in big cities, such as Hong Kong, Shanghai, and Singapore, but also in inner cities in China, such as Chongqing, Chengdu, Wuhan and Xian. In 2004, more than 400 metric tons export annually -- 3.6% of the production. The total value of export was about 34 million NTD (mostly export to China and Hong Kong). Taiwan is expected to keep this leading role in grouper culture and global supply in the years to come.

3.2 The Supply Chain of Grouper Industry in Taiwan

Marketing can be defined as a series of services performed between times that producer usually sells his product and the time it is purchased by consumer (Brunk & Darrah, 1995). Marketing involved a series of marketing activities and functions that additional utilities are creating or increasing then can be view as a social system (Chen, 2001) [11].

The performance of Taiwan marketing system is predominantly decided by many internal and external factors. Internal factors which are emanative from or dependent on the nature of something, such as culture, diet habits, population, politics, public attitude and opinions, commercial-minded heritage, government policy, social structure and market structure. External factors which not directly relevant to the marketing system. Such as producer's organizations (e.g. fishermen's associations, farmers' associations, marketing cooperatives), marketing infrastructure (e.g. assembling, grading, packing, strating, processing, transporting, selling, financing, information, risk-bearing, etc.), wholesale markets (help for transaction prices control), marketing technology (e.g. computerized auction bid system, utilization of automatic machines and market information reporting system for seafood marketing), legislation, government organization, administration and policy. Typical marketing channel for the regular seafood products can be show in Figure 3 ([11], [12]) .

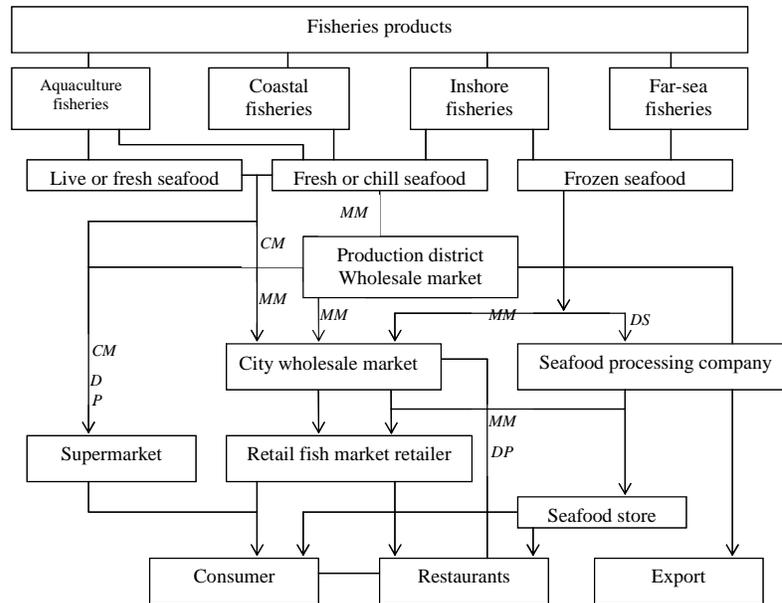


Figure 3 General marketing channel of most seafood products in Taiwan (Chen, 2003).
 Note: DS: direct sale; DP: direct purchase; MM: middleman; CM: cooperative marketing

There are two stages of grouper marketing: transportation and sales stage. There are three main types of transportation and sales in Taiwan grouper industry: (1) through fishery marketing cooperation sales to the fish market or export; (2) selling to wholesale fish markets by farmers themselves; (3) selling to the shipping trader and then sale in fish market, restaurant or export. The third way is the main model in Taiwan grouper industry. And grouper marketing is mostly all managed by the shipping traders, and most of the shipping traders manage only grouper business.

In addition, major cities of grouper consumption are Taipei, Taichung, and Chiayi. According to Shih's (2002) and Shen's (2003) calculation, 59.55% of the groupers are sold to shipping traders, 20.43% are sold to the fishery marketing cooperation, and others are sold to wholesale fish market (13.57%). Based on Chen's (1999) research, 52% of the grouper are sold to shipping traders, 20% are sold to the common transportation, and others are sold to wholesale fish market (12.6%) ([13], [14], [15]).

Because of the dissymmetry of market information, the shipping traders are usually price makers and the aquaculture farmers are price takers. Also some transportation and shipping traders could easily reduce their transportation and sales cost and earn the extra profit by manipulating fish prices. Moreover, there are mutually beneficial relation between the farmers and factories. Whenever the production surplus happens, the ability of negotiation of a factory is higher than that of the farmers; on the contrary, when the production amount reduces or is in shortage, then producers have better negotiable power to raise price. Therefore, if we could provide symmetric market information for everyone (including farmers, shipping traders and factories) in the supply chain, we could make more profit.

4 The Transportation and Sales Problem in the Grouper Industry

Grouper is a high-price fish, and mostly sold while still alive. The major marketing style is that shipping traders collecting living groupers from farmers and then sell the living fish to other trader and restaurants in big cities [13]. It is sold less to the wholesale fish markets. The major problems that grouper industry faces are described as follows:

1. The traditional marketing method still dominates in grouper supply chain system. The shipping traders are the main body in the supply chain, and they control most of the transportation and sales of the grouper industry. Under this system, the transportation and sales efficiency, industry's supply and demand that groupers industry supplies are not obviously interests to the trafficking in traders.

2. 20% to 40% groupers is sold to Mainland China and Hong Kong. Since export should be transported through a third location and the transportation cost is high, the shipping traders usually export through smuggling. Not only this is a high risk in transport, but also the market is very unstable and possibly is cut off at any time.
3. The major selling type of grouper is whole live fish which consumers prefer. This makes the supply cost remain high, especially in export. Therefore, the crucial issue is how to decrease the transportation and sales cost, to raise the survival rate, and to conform the safety certification standard of the products.
4. Aquaculture farmers lack of organization and marketing ability in sales. Although there are a lot of fishery selling centres in Taiwan, most fisheries spend money in building seafood factories. The ability in establish supply chain system is relatively insufficient as well.
5. Consumers tend to buy high quality foods. Besides quality, freshness, processing degree, security hygiene and manner of packing, and etc will have an influence on consumers' willingness to buy.

Otherwise, the traceable system and barcode label is now used in the grouper industry for each stage (see Figure 4). The establishment of traceability system and production resume information for aquatic products includes feed production, breeding production, testing analysis, transport/wholesale, processing/pack, and sale/consume. If there is something wrong with a product, this traceable system would help us find problems that happened in which chain it occurred. In sale/consume part, we may check when the products are sold and who sells it and via what method. If there is no problem in this part, and then we will trace it to the process/pack part. We would check who process/packs and how they do so. We would also examine the product types and whom they deliver the products to. If there is nothing wrong in this aspect, we may inspect the logistic place and method and who transport the problematic product [16].

Problems may also occur in the testing analysis part. We would survey when and where it was sampled and the results of the analysis. If problems could not be found in this part, we will trace to the aquatic production to see who supplied the larvae, what kind of feed was used, process records, medicine management and whom they dispatched to. The final review is for feed factories, including who produces feed and who supplies feed.

In the track/ trace flow of grouper product production system, when an event happens, we may use the barcode label to trace the batch number, serial number of fishy farm, and track the defective products by using a production resume database system.

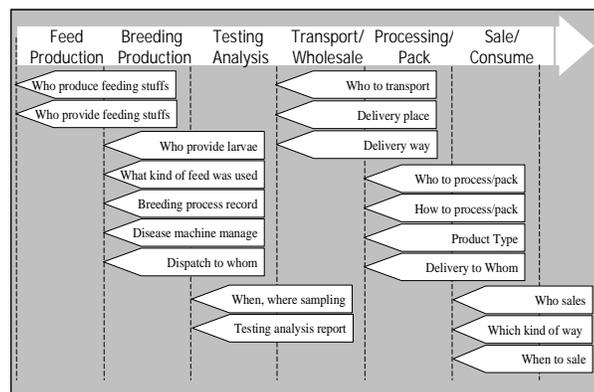


Figure 4 The tracing point of grouper industry in Taiwan

5. Findings and SWOT analysis

Taiwan is mostly managed by small farmers, and small and medium-sized enterprises. That's why the cost of personnel, man-hour restrain, restriction, environmental protection of terms are higher than other Asia countries. Under this situation, if we want to cost down effectively, we should improve our management skills to cultivate existing discomfort, in order to reach resource service efficiency and effectively.

Also, the processes of producing and marketing channels are complicated and lack of efficient mechanism. The residues are sometimes examined in fisheries (eg. grouper) products. Consumers are paying more and more attention to the food safety and health, and so do governments in many countries. And it has already become a global issue. In fact, there is a system of hazard prevention for food safety and hygiene under WTO Regulations, and the traceability of aquaculture and fisheries product history is also demanded in the

international trade. Consumers require information transparency of aquaculture and fisheries product. The modernization for aquaculture management is urgent, and quality, image, market sales and logistic efficiency of fisheries products should be enhanced, too.

In the recent years, HACCP system has been developed as a quality assurance system for processing safe foods. In many countries, such as European Union members, US, Canada, and Australia, mandated the processors to process seafood under HACCP-based control. The exported seafood is special required to follow the Agreement on Sanitary and Phytosanitary Measures (SPS). Currently, Taiwan (2002/1/1) has b a member of the World Trade Organization (WTO), globalization and liberalization are our mission on trade, including fishery industry. It is urgent to promote seafood inspection and certification in seafood industry. As concerns the outlook for fisheries in view of the Agreement on the Application of Sanitary and Phytocensanitary Measures (SPS), Taiwanese seafood trading must follow food safety standards (HACCP). Recognition of the urgent need for a framework to judge the equivalence of HACCP-based food control systems in different countries for seafood international trade is prevails in Taiwan.

In fact, the technique of Taiwanese grouper breeding is well-developed, and the quality of grouper product has already been in the leading status in the world [14]. However, the grouper industry lacks of scarce produce, disease prevention, selling channel between China and Taiwan. Thorough grouper farmers fare of disease and build constructing, and sound variety protection system [17].

According to this research, we analyze Taiwan grouper industry's SWOT as follows:

1. Strength

- (1) The fish maw itself contains abundant protein, unrighted acid (DHA). It is the food of nutrition of high price that the fat face on fish is rich in glue quality, sodium, potassium. Dissociate amine base sour and core sweet sour content high fingerling very too. Not only the meat is flavorful, but also special nutritious health care efficiency.
- (2) The cultural technique is superior to other countries.
- (3) The reproduction technology of the fry is mature. It can content production need all the year round.

2. Weakness

- (1) The shipping traders control the main transportation and sale of grouper.
- (2) Shipping traders have great ability of controlling the selling prices, but there are too many traditional transportation methods and sales strata.

3. Opportunity

- (1) The government supports the groupers strategic alliance established.
- (2) The grouper business is profitable and has potential in export that attracts related people to get involved and has already received the attention of relevant units.
- (3) Grouper has gained popularity due to expanding capacities of supermarkets and diverse marketing channels.

4. Threaten

- (1)Grouper industry may face severe competition from Southeast Asia (China, Vietnam and etc.).
- (2)Grouper may be substituted for other fishes.
- (3)The threats of low quality, poor hygiene control products from other countries.
(If they are low quality and poor hygiene, they won't be a threat. The point is to separate them, such as labelling)

According to the results of SWOT analysis, the feasible strategies mainly come from: (1) utilizing the present advantage to hold the future chance and dissolve the possible threat, if maintain advanced technology continuously, grouper products with stable and high quality; (2) improving important weak tendency, such as cooperation between grouper industry and academia, strengthening technology and facilitating the supply chain management system with higher capacity and efficiency.

6. Conclusions

This study examines the supply chain system of grouper, and evaluates the processes and structures of producing and marketing in Taiwan. The study also provides recommendation on how to increase the supply capacity and improve efficiency of marketing channels. It will also serve as a reference to enhance value to the industry. The major key factors for success are:

1. The government must promote further collaboration between the industry and the academic community and research in the area of bioscience, at the same time, build up and strengthen partners' relationship of supply chain.
2. Grouper industry or government should set up a trading center for proper handling of groupers and related materials for production and establish the supply chain infrastructure. And it must promote efficiency in flow of goods and to fortify rapid responds to meet consumers' demand -- the three measures crucial to aquatic productions.
3. The production of marketing of grouper should introduce the electronic business, parcel delivery service, traceability of fish, and certification system to ensure quality control, integrity in the system and expand marketing framework.
4. Members of the supply chain must have consensus to form partnership.
5. Industry must establish a system to project productions and boost marketing, stabilize the source of fry, so to put in place an effective system.
6. The government should support the strategic alliance of grouper, and establish a data base of production and marketing.
7. Aquaculture farms must comply with Good Aquaculture Practice (GAP) or HACCP, and processing factories must comply with HACCP and participate in international foods exhibits. The Grouper industry opens up the international market and aims for sustainable development.

Finally, this research provides recommendations for development, and market planning to the Grouper industry. And the results of this study can be a reference for the policy makers and related strategic managers. With the time and cost constraints, this research focuses on competitiveness and the SWOT analysis on grouper's supply chain. In further research, we will incorporate cost analysis in the whole supply chain and consumer's survey for further discussion.

Reference

- [1] Chen, L.C., 1990, Aquaculture Taiwan Fishing News Books, Chapter 2, 31-38.
- [2] Huang, K. M., 1999, The Grouper industry in Main Cultivation Country, *China Fisheries*, 554, 29-46.
- [3] Lin, G. C., 1999, The Key Success Factors of Grouper Fry Industry, Institute of Aquaculture, National Taiwan Ocean University, Taiwan, pp.132.
- [4] Yeh, L. C., 1999, Economic Analysis in Production and Marketing System of Grouper (*Epinephelus malabaricus*) Farming in Taiwan, Institute of Aquaculture, National Taiwan Ocean University, Taiwan, pp113.
- [5] Fu, H. L., 2002, Profitability and cost function analyses for aquaculture production in Taiwan, Institute of Applied Economics, National Taiwan Ocean University, Taiwan, pp139.
- [6] Shih, Y. S., 2002, An Analysis on Production Cost and Supply-Demand of Groupers in Taiwan, Institute of Applied Economics, National Taiwan Ocean University, Taiwan, pp86.
- [7] Jung, S. M., 2004, An Analysis of Willingness to Pay for HACCP Certification of Fisheries Products by Consumers from Taipei County and Taipei City, Institute of Applied Economics, National Taiwan Ocean University, Taiwan, pp101.
- [8] Fisheries Agency, Council of Agriculture, Executive Yuan, 2005, Fisheries Statistical Yearbook Taiwan, Kinmen and Matsu Area 2004, Taipei, Taiwan.
- [9] Fisheries Agency, Council of Agriculture, Executive Yuan, 1999-2004, Economic Investigation of fisheries households of coastal, offshore and aquaculture in Taiwan, Taipei, Taiwan.
- [10] Huang, K. M., 1999, Grouper culture in the world, *Chinese Aquaculture*, 554, 29-46.

- [11] Yeah, L. S., 2003, A Study on Consumers' Support and Willingness to Pay of Seafood HACCP Certification, Institute of Marine Resource Management, National Taiwan Ocean University, Taiwan, pp.80.
- [12] Chen, Chin-Chung, 2003, Analysis of Efficiency on Groupers Supply Chain System report, Fisheries Agency, Council of Agriculture, Executive Yuan, Taiwan.
- [13] Shen, T. K., 2003, Analysis of Farmers' Opinion and Planning for Groupers Supply Chain System in Taiwan, department of Applied Economics, National Taiwan Ocean University, Taiwan, pp.153.
- [14] Shih, Y. H., 2002, An Analysis on Production Cost and Supply-Demand of Groupers in Taiwan, department of Aquaculture, National Taiwan Ocean University, Taiwan, pp.86.
- [15] Yeah, L. C., 1999, Economic Analysis in Production and Marketing System of Grouper (*Epinephelus malabaricus*) Farming in Taiwan, department of Aquaculture, National Taiwan Ocean University, Taiwan, pp.113.
- [16] Nan, F. H and S. C. Chen, 2005, The Establishment of Good Aquaculture Practice, *Development and innovation of white shrimp aquaculture*, Fishery Research Institute, Keelung, Taiwan, Vol. 6, 129-145.
- [17] Chuang, C. T., 2003, The Application of Supply Chain Management in Aquaculture, *Aquaculture*, Taiwan, 40, pp11-13.