

Market Analysis of Freshwater Chinese Mitten Crab and Support to the Farmers in the Jiangsu Province of China

Abstract

The study examines a snapshot of domestic marketing of freshwater Chinese mitten crab and support to the farmers in the Jiangsu Province of China. A total of 96 farmers were sampled for the study. A semi-structured questionnaire was designed to elicit information from the mitten crab farmers. The researchers employed descriptive statistics for data analysis.

Chinese mitten crab farmers accessed price information from their fellow farmers, wholesalers, cooperatives, local market and the internet. Most farmers accessed price information from their fellow mitten crab farmers. Farmers determined the quality of mitten crab through attributes such as maturity, appearance, weight, odour and texture with maturity ranked as the highest followed by appearance in quality attributes. Actors within the producer output supply chain are wholesalers, retailers, enterprises/organizations, supermarkets, cooperatives and consumers. Most farmers relied on own source of income (savings) to fund their mitten crab farming activities. Farmers who are members of a cooperative benefit from services such as technical support, uniform sales and purchase, unified feed and uniform crab seed of good quality. In conclusion, Chinese mitten crab farmers mostly share price information among themselves and employed multiple quality attributes in determining the quality of mitten crab. Most preferred supplying their products mostly to wholesalers and depend less in accessing of credit. Majority of the farmers have been trained in the culture of mitten crab.

Keywords: Marketing, support, freshwater mitten crab, farmers, China

1 Introduction

The paper examines a snap-shot of the prevailing domestic Chinese mitten crab marketing and support in the Jiangsu Province. This includes market analysis and supports (financial and technical) to the farmers. Studies have shown that marketing system and structure contribute to main circumstances of socio-economic conditions of local people and production of any area. Fish and fish products are highly traded commodities (Ahmed, Rab and Mimbao 1993) in the market.

Cater (1988) defined marketing as the process of building lasting relationships through planning, executing and controlling the conception, pricing, promotion and distribution of

ideas, goods and services to create mutual exchange that satisfy individual and organization needs and objectives. Crawford (1997) also saw marketing concept as an integrative force that matches production to customer needs and satisfaction.

Marketing agricultural produce is different from marketing every other product. Agricultural produce is alive and sensitive. Its quantity, quality and price are almost totally dependent on natural conditions. A product can be defined as an assembly of physical, service and symbolic qualities which yield gratification or benefits to a user or buyer. It is a mixture of size and shape (physical) and subjective traits such as image or quality (Carter, 1997).

• Crab marketing in China

Farmed mitten crabs market is located in Asia. Majority of farm raised mitten crab is consumed within China (FAO 2008). It is exported to countries like Singapore (Lucas and Southgate 2012), Japan, South Korea and Hong Kong (Wang, Wang and Ma 2014) with large ethnic Chinese (FAO 2008).

Farmed Chinese mitten crabs are marketed and then transported alive. Meat recovery from crab is understandably low approx. 15% of harvest weight for *Scylla serrata*, (Chiou and Huang 2003); however, the edible part is often higher for mitten crab which is 33%. Edible recovery is increased by marketing mature adults, especially females with ripe ovaries, meaning the potential broodstock are marketed (Chen et al. 2007). The hepatopancreas, eggs (gonad), and meat are the three main edible parts of matured mitten crab. The adult crab with fully developed eggs (gonad) or ovaries and are large are generally sold at a higher price (Wu, et al. 2007c, Lucas and Southgate 2012). The Hong Kong market prefers large-sized males because the female gonad (eggs) contains relatively high level of cholesterol, while Japanese and south Korean markets liked middle and small-sized crabs, because they are consumed in hot pots. Different crab products have been developed, including crab meat powder, crab oil, crab paste among others (Gui, et al. 2018).

Harvested crabs are usually kept in provisional holding tanks awaiting sales. Mitten crabs frequently delivered in straw bags kept moister during transportation. The legs and claws are knotted to reduce movement. Ice-bags are occasionally used to maintain low temperature and low mortality rate during transportation (FAO 2017).

Over the past years, an increasing proportion of Chinese mitten crabs have been sold also over the internet. In 2015, about 60% of Yangcheng Lake crabs were sold online. The figure

was estimated to rise to 70% in 2016. The retailers include Alibaba Group Holdings' tmail.com, jd.com, suning.com and yhd.com. These retailers deal with platform that are authentic and high quality mitten crab (Li 2016). Studies on the domestic marketing and support to the farmers will enable stakeholders in the industry, researchers and government to understand this aspect of the sector.

2 Methodology

The study used primary data collected during a period of five (5) months on domestic marketing of Chinese mitten crab in three counties (cities) namely Changshu (Suzhou), Jintan (Changzhou) and Xinghua (Taizhou) within the Jiangsu province. Semi-structured questionnaire was designed for the study. Data collected include access to price information, quality attributes, actors within producer supply chain, and various forms of supports to the farmers. Results were presented descriptively in the form of frequencies, percentages, charts, and graphs.

3 Results

3.1 Market analysis

Information plays a key role in development including production and marketing of aquaculture products through the dissemination of relevant and vital messages. There are various means by which fish farmers and for that matter Chinese mitten crab farmers' access information on prices. Figure 1 summarizes sources of price market information by the mitten crab farmers.

a. Source of price information of Chinese mitten crab

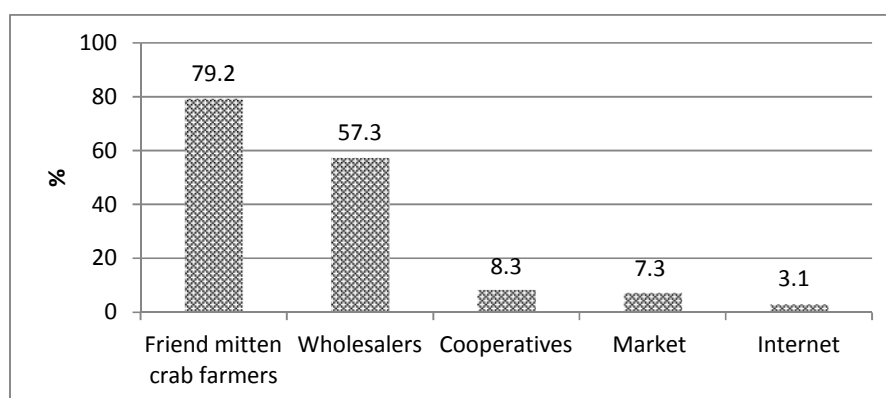


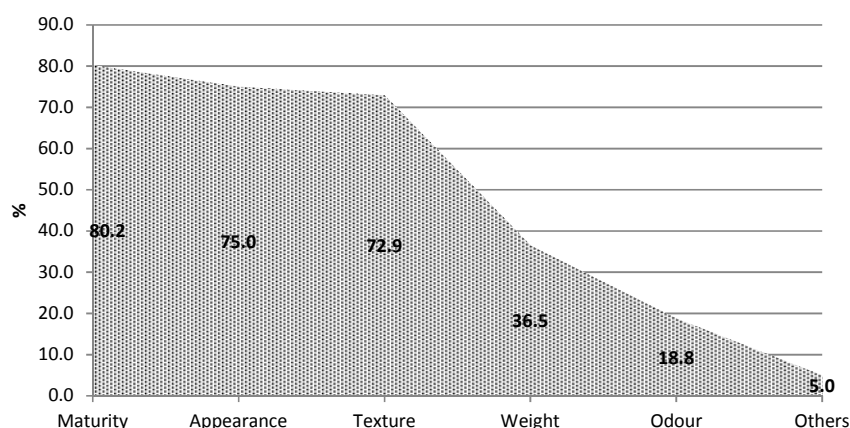
Figure 1: Sources of price market information. *Multiple response (n = 96)*

Results indicate that the respondents' accesses price information from various sources. A good number of them (79.2%) get price of Chinese mitten crab information from colleague

91 farmers followed by wholesalers (57.3%). There are those who got their information from
92 cooperatives (8.3%), local markets (7.3%) and internet sources (3.1%). Results show that the
93 sampled farmers depended on their colleagues mostly for price information.

94 **b. Accessing of quality of crab**

95 Food choice is influence by many factors. Producers, traders and consumers in the supply
96 chain all alike make decisions based on them. Each choice may play a critical role in what a
97 person may consider as a quality product. The mitten crab farmers in this study were asked of
98 the attributes of the quality of a quality mitten crab from their perspectives. Results showed
99 that a greater percentage of the farmers which represent the modal percentage (29.2%)
100 depended on appearance, maturity and texture as quality attributes of mitten crab followed by
101 17.7% who used five attributes such as appearance, maturity, weight, odour, texture and
102 others (experience and sales time) as quality attributes. This shows that mitten crab farmers
103 are well- educated, informed and used multiple characteristics or factors to determine the
104 quality of the crab. Results conclude that mitten crab farmers in the study area depended on
105 more than one attribute to evaluate the crab.



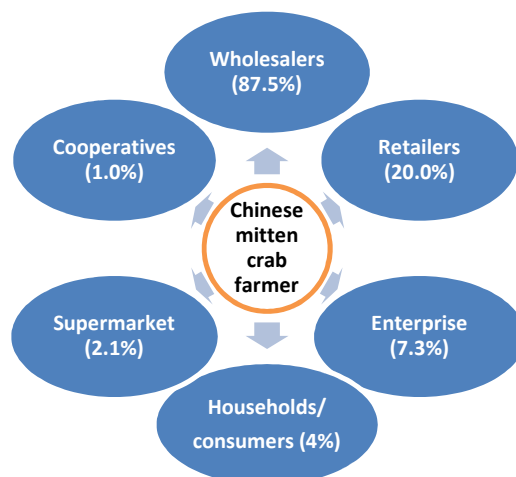
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108 **Figure 2: Attributes of quality Chines mitten crab**

109 If mitten crab meets the buyers or consumers expectation, the beneficiaries will be happy and
110 will view it as worthy of high quality. Results from the study (Figure 2) show that in ranking
111 the quality attributes, maturity was ranked as first (80.2%) followed by appearance (75%).

112 **c. Producer Supply chain actors**

113 Figure 3 depicts producer output supply chain pattern of Chinese mitten crab in the selected
114 counties. Results show that the farmers sell to the following intermediaries: wholesalers

115 (87.5%), retailers (20%), enterprises/organizations (7.3%), consumers including households
 116 and restaurants (4%), supermarkets (2.1%), and cooperatives (1%) with wholesalers being the
 117 highest followed by retailers. The farmers have wider audience or actors to supply their
 118 mitten crab product to hence covering a bigger market. There are farmers who are supported
 119 in the production and or sale of mitten crab by organizations (enterprise). The support can be
 120 in the form of inputs such as quality crab seed and feed. Farmers can also depend on such
 121 enterprise to buy or help sell their harvested mitten crab.



122
123

124 **Figure 3: Production output supply chain (multiple responses > 100%)**

125 Producers were further asked as a follow-up question to provide the percentages of volume of
 126 mitten crab sold to both wholesalers and traders within the producer supply chain since they
 127 were the two major actors as shown in Figure 3. Results revealed that 20.7% of mitten crab
 128 farmers did not sell to traders while the rest sold to them at various percentages. The average
 129 percentage sold to traders is about 33%. Furthermore, there were 5.2% of mitten crab farmers
 130 who did not sell to wholesalers. The average percentage of mitten crab sold by farmers to
 131 wholesalers is 68%. It implies that there is higher percentage of farmers selling to
 132 wholesalers as compared to retailers.

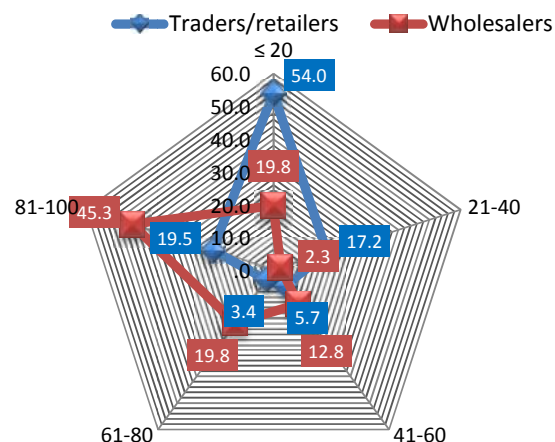


Figure 4: Percent of crab harvested sold to both wholesalers and traders by producers

Furthermore, the farmers were asked to provide in percentage terms, distribution of their produce by groupings to the two significant actors within the chain. Figure 4 shows the percentage distribution of mitten crab by farmers to both wholesalers and traders. A greater percentage of the farmers (54.0%) sold less than or equal to 20% of their harvested mitten crab produced to traders followed by 19.5% who sold 81-100% of mitten produced to retailers. It was revealed from the chart that 45.3% of the sampled mitten crab farmers sold 81-100% of their farm produce to wholesalers followed by equal percentage (19.8%) who sold less than or equal to 20% of crab and 61-80% of their crab produced to wholesalers.

3.2 Support

Credit plays significant role in agriculture and for that matter in aquaculture sector. The authors examined access to credit by mitten crab farmers. Table 1 depicts the funding sources of mitten crab farming in Jiangsu province by percentages.

a. Financial support

Table 1: Funding sources of crab farming

%	Indiv. (Own)	Relatives/Friends	Banks	Cooperatives
15	-	-	1 (16.7%)	-
16	-	-	1 (16.7%)	-
20	1 (1.4%)	2 (28.6%)	1 (16.7%)	-
30	3 (4.3%)	1 (14.3%)	2 (33.3%)	-
40	1 (1.4%)	1 (14.3%)	-	1 (50.0%)
50	4 (5.7%)	1 (14.3%)	1 (16.7%)	1 (50.0%)
60	2 (2.9%)	-	-	-
70	3 (4.3%)	-	-	-

80	2 (2.9%)	1 (14.3%)	-	-
84	1 (1.4%)	-	-	-
85	1 (1.4%)	-	-	-
100	52 (74.3%)	1 (14.3%)	-	-
Total	70 (100.0%)	6 (100.0%)	6 (100.0%)	2 (100.0%)

NB: Number of people (n) < 96

Results showed that 72.9% of the farmers out of 96 respondents depended on own source (individual) of financing, 7.3% (7) relied on loan from relatives and friends, 6.3% (6) accessed loan from the banks while 2.1% (2) were assisted by cooperatives. Of the crab farmers who depended on own source of funding (70%), a greater percentage (74.3%) depended wholly on own sources and the rest (25.7%) spread among different percentages.

Very few respondents relied on other sources of funding their mitten crab farming activities as compared to own sourcing. The interest charged on bank loan on loan was less than 5%. No interest was reportedly charged by cooperatives. Results show that the level of credit use among the mitten crab farmers from the selected counties is very low; farmers will rather depend on their own savings.

b. Technical support

• Membership of cooperatives/organization

Cooperatives are established to provide opportunities for farmers to raise incomes, empowered to address their problems, strengthen their securities, have common grounds for accessing information, inputs, sales and purchases among others.

Table 2: Membership of a cooperative

	Frequency	Percent
No	4	4.2
Yes	88	91.7
No response	4	4.2
Total	96	100.0

When the sampled respondents were asked if they are members of a cooperative/organization such as a producer organization, most of them (91.7%) answered affirmatively (Table 2).

Figure 5 revealed the reasons given by 91.7% of crab farmers (Table 2) for joining an organization or a cooperative. Majority of the respondents (60.4%) joined to benefit from uniform standard technical support while others (57.3) enjoyed unified sale of their products

(mitten crab) or purchase of inputs. There are those who joined the organization to benefit from unified seed (43.8%) and unified feed (31.3%) purchase. From the deduction of the responses of farmers, the cooperatives behave also like a producer organization.

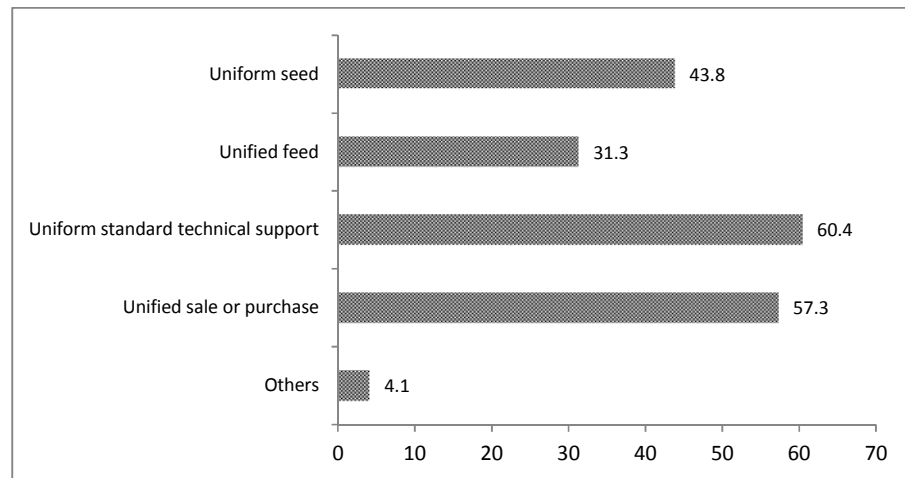


Figure 5: Reasons for joining the organization (n = 96); multiple responses

Farmers who were not members of a cooperative/organization as specified in Table 2 showed the interest of joining to access various benefits provided by the cooperatives/organization. It implies that farmers who are not members of a cooperative acknowledge the fact that cooperatives are very important in the mitten crab farming.

• Training

Result suggests that majority of the respondents sampled (94.8%) have had some technical training on aquaculture. This ranges from 3 to 15 times/year with an average of 7 trainings. Majority of the crab farmers sampled (63.0%) had between 6 to 10 trainings/year. About 28% had less than or equal to 5 trainings in the year. Five percent of the mitten crab farmers did not benefited from any training course. The modal figure of training is 6 in the year (45.8%) followed by 5 trainings (18.8%) (Figure 6). All the training sections were organized free of charge.

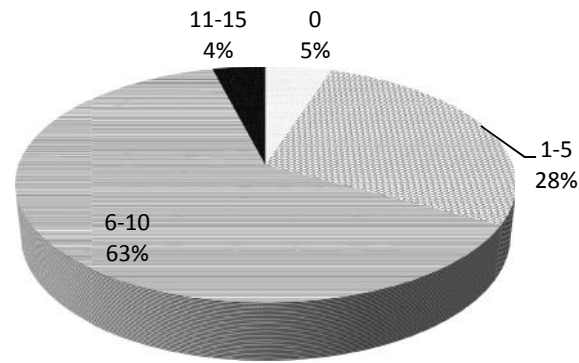


Figure 6 Years of training

4 Discussion

According to Demiryurek *et al.*, (2008), it is well accepted that timely, reliable, and relevant information will be able to contribute to better production. Studies have also shown that before farmers access global or domestic markets, they must negotiate series of procedures and standards that regulate their access to finance as well as market information and technology (van der Zijpp 2007). The findings from the study shows that most farmers sampled (79.2%) accessed price information from their colleague farmers while 57.3% accessed it from mitten crab wholesalers before selling their mitten crab. The rest accessed such information from cooperatives, local markets and on the internet. Those who access information from the internet undertake trading of the mitten crab on the internet platform (Li 2016).

Food safety remains a major burden facing the seafood industry, and it is of importance to safeguard food and nutrition security globally including China. In many developing countries, with hot climate, quality deterioration and post-harvest losses occur due to some reasons such as limited use of ice, inadequate infrastructure and services in physical markets. Given limited cold chain in many developing countries and large volumes distribution as fresh fish, it is probable that their quality and nutritional benefits deteriorate before consumption (FAO 2014). Studies have shown that the following reasons (heterogeneity of product) should be considered for fish consumption: health factors, environmental drawbacks, importance of species and how they are presented to consumers, perceived differences between species and how they are presented to the market and being able to

identify species which help in preventing fraud (Gaviglio, et al. 2014). In terms of accessing quality Chinese mitten crab, results showed that farmers have various ways of determining the quality of produced mitten crab. A good number of the farmers (29.2%) determine quality through appearance, maturity and texture. About 18% rely on five characteristics such as appearance, maturity, weight, odour, and texture. In all, maturity was ranked the highest as a means of addressing quality (80.2%) followed by appearance (75%) and then texture (72.9%).

Farmers supply harvested mitten crab to various actors within the chain. They are wholesalers, retailers, cooperatives, super markets, enterprises, and households/consumers/restaurants. The most prevalent actors are the wholesalers and retailers. Furthermore, respondents were asked to state percent sales among wholesalers and traders. Most farmers (45.3%) sell 81-100% of the harvested crab to wholesalers while 54% sell less than or equal to 20% of their crab to traders (multiple responses). Results indicated that farmers sell a chunk of the produce to wholesalers than traders.

Credit has significant role for the removal of farmer's financial challenges to invest in farm activities, increasing productivity and improving technologies. Credit accessibility is significant for development of quality and quantity of farm products so that it can increase farmer's income. On the other hand, some policy makers believe that payment of credit with low interest rate to farmers can support them against some results of development policies that threaten their welfare (Ghorbani 2005). There are various sources of funding of mitten crab business activity in the study area. Majority of the sampled respondents relied on their own resources (72.9%). A few relied on the commercial banks for support (7.3%) with an interest of less than 5%. Results conclude that access to credit is very low among farmers in mitten crab farming in the study area. This confirms the findings of Quagrainie et al. (2010) indicating that most fish farmers do not access credits. It was also revealed from this study that about 92% of the farmers interviewed are members of cooperatives. Reasons of joining the association are to access uniform seeds and feed of mitten crab both of good quality, technical supports, make unified purchase of aquaculture inputs and sale of matured mitten crabs among others. Studies have it that producer organizations are economic organization of agriculture producers with characteristics similar to cooperatives (Bijman, et al. 2012). The reasons attributed by members of the association suggest that the cooperative also behaves like a producer organization. One main objective of a Producer Organizations (PO) involves mainly joint selling of members' products. PO is usually centered at the upstream part of the

food chain. They are involved in joint bargaining with customers, and much less with the processing of members' products (Penrose-Buckley 2007). There are indications from the result that those who were not members of the cooperatives are willing to join to benefit from the support of the cooperatives.

According to Anderson and Feder (2004), farmers performance is directly linked to their human capital endowment, which encompasses both innate and learned skills. The study revealed that a high percentage of crab farmers benefited from various training programmes. Most (64.6%) received between 6-10 trainings in the year followed by 24.8% who have received between 1 to 5 trainings. Furthermore, 6.3% had not received any training. Average number of training reported was 7. The rationale for extension services, farmer education programs, and various forms of formal and informal training is the desire to enhance and expand farmers' human capital. Farmers also undertake initiatives to acquire knowledge from other sources (published media, radio), as well as from their own experiences and experimentation (Feder and Slade 1985, Rees, et al. 2000). Also, Tripp and Hiroshimil (2005) confirmed the importance of training as contributing to the enhancement of farmers' skills in farming. Khairul and Kamariah (2011) summarized the impact of training on farmers into six major benefits. These are (i) increased in work quality (ii) increased in farm products (iii) cost savings (iv) time savings (v) increased in income and finally (vi) increased in networking.

5 Conclusion

The findings from the study show the two major sources of accessing price information as from colleague farmers and wholesalers. Very few farmers access such information from cooperatives, local markets and on the internet. In terms of knowledge on quality crab, results showed that farmers have various ways of determining the quality of grow-out produced mitten crab. They are through appearance, maturity, weight, odour and texture. Mitten crab farmers employ more than one attributes to decide on quality. Maturity was ranked the highest attribute (80.2%) followed by appearance (75%), the third being texture (72.9%). The identified actors within the producer output supply chain of mitten crab farmers are wholesalers, cooperatives, super markets, retailers, enterprises, and households (consumers). The most prevalent actor is the wholesaler followed by retailer.

The main source of financing of mitten crab farming in the selected counties is own savings of farmers (83.3%). A few (7.3%) rely on the banks for support with interest of less than 5%

and other sources. Results suggest that access to credit is very low among Chinese mitten crab farmers. Result revealed that about 92% of the farmers interviewed are members of cooperatives. They access benefits such access of uniform seeds and feed of crab both of good quality, technical supports, and unified purchase and sale of aquaculture items including matured crabs among others. Benefits from cooperatives have attracted other farmers to join.

A high percentage of crab farmers benefited from technical training in the farming of mitten crab. Also, farmers learnt from their fellow farmers, pamphlets, books, leaflets as well as from the internet. Training is skewed towards 6-10 in the year (64.6%).

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