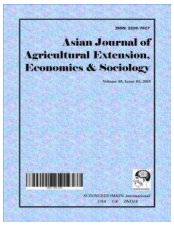

Asian Journal of Agricultural Extension, Economics & Sociology

27(3): 1-10, 2018; Article no.AJAEES.44041
ISSN: 2320-7027

Marketing of Freshwater Chinese Mitten Crab and Support to the Mitten Crab Farmers in China

Hayford Agbekpornu[1,2*], Xinhua Yuan[3], Junchao Ming[3] and Weifan Zhu[2]

[1]Fisheries Commission, Ministry of Fisheries and Aquaculture Development, Ghana.
[2]Wuxi Fisheries College, Nanjing Agriculture University, China.
[3]Freshwater Fisheries Research Centre, Chinese Academy of Fishery Sciences, Wuxi, China.

Authors' contributions

This work was carried out in collaboration between all authors. Author HA designed the study, wrote the first draft of the paper including literature review. Author HA analysed the data while all authors discussed the findings, read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2018/44041
Editor(s):
(1) Dr. Sait Engindeniz, Professor, Department of Agricultural Economics, Faculty of Agriculture, Ege University, Turkey.
Reviewers:
(1) Iyiola, Adams Ovie, Osun State University, Nigeria.
(2) Emil José Hernández Ruz, Federal University of Pará, Brazil.
Complete Peer review History: http://www.sciencedomain.org/review-history/26613

Original Research Article

Received 22 June 2018
Accepted 15 September 2018
Published 11 October 2018

ABSTRACT

The study examines a snapshot of domestic marketing of freshwater Chinese mitten crab and support to the farmers in China with focus on the Jiangsu Province. 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 the 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. Majority of farmers relied on own source of income (savings) to fund their mitten crab farming activities. Farmers who are members of cooperatives benefited from services such as technical support, uniform sales and purchase, unified feed and uniform crab seed of good quality. In conclusion, Chinese mitten crab

**Corresponding author: E-mail: hayfodgadry@yahoo.com;*

farmers mostly share price information among themselves and employed multiple quality attributes in determining the quality of mitten crab. Most preferred supplying their mitten crab 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. Fish and fish products are highly traded commodities [1] in the market.

Carter [2] 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 [3] 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 [4].

1.1 Crab Marketing in China

Farmed mitten crabs market is located in Asia. Majority of farm raised mitten crab is consumed within China [5]. It is exported to countries like Singapore [6] Japan, South Korea and Hong Kong [7] with large ethnic Chinese [5].

Farmed Chinese mitten crabs are marketed and then transported live. Meat recovery from crab is understandably low, approximately 15% of harvest weight for *Scylla serrata* [8]; 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 [9]. 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 large in size are generally sold at a higher price [6,10]. 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. These include crab meat powder, crab oil, crab paste among others [11].

Harvested crabs are usually kept in provisional holding tanks awaiting sales. Mitten crabs are frequently delivered in straw bags kept moister during transportation. The legs and claws are knotted to reduce movement. Ice-bags [12] as well as cold bottled water are used to maintain low temperature and low mortality rate during transportation.

Over the past years, an increasing proportion of Chinese mitten crabs have been sold 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 [13]. Studies on the domestic marketing and support to the farmers will enable stakeholders in the industry; researchers and government 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. Fig. 1 summarizes sources of access of price market information by the mitten crab farmers.

a. Source of price information of Chinese mitten crab

Results indicate that the respondents' accesses price information from various sources. A good number of them (79.2%) accessed price of Chinese mitten crab information from colleague farmers followed by wholesalers (57.3%). There are those who obtained their information from cooperatives (8.3%), local markets (7.3%) and internet sources (3.1%). Results demonstrate that the sampled farmers depended on their colleagues mostly for price information.

b. Accessing of quality of crab

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

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

c. Producer Supply chain actors

Fig. 3 depicts producer output supply chain pattern of Chinese mitten crab in the selected counties. Results show that the farmers sell to the following intermediaries: wholesalers (87.5%), retailers (20%), enterprises/ organizations (7.3%), consumers including households and restaurants (4%), supermarkets (2.1%), and cooperatives (1%) with wholesalers being the highest followed by retailers. The farmers have wider audience or actors to supply their mitten crab product to hence covering a bigger market. There are farmers who are supported in the production and/ or sale of mitten crab by organizations (enterprise). The support can be in the form of inputs such as quality crab seed and feed. Farmers can also depend on such enterprise to buy or sell their harvested mitten crab.

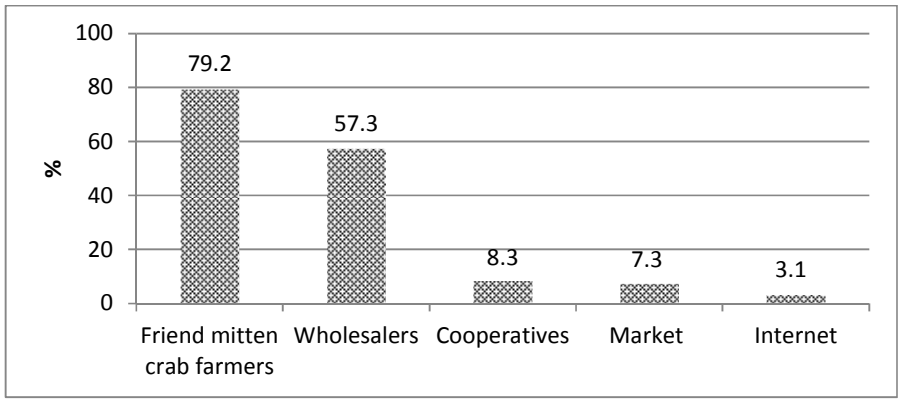

Fig. 1. Sources of price market information. (Multiple responses > 100%)

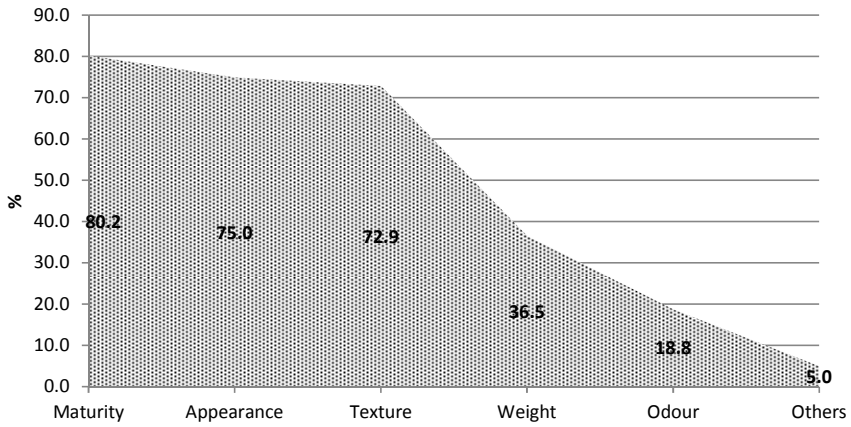

Fig. 2. Attributes of quality Chines mitten crab. (Multiple responses > 100%)

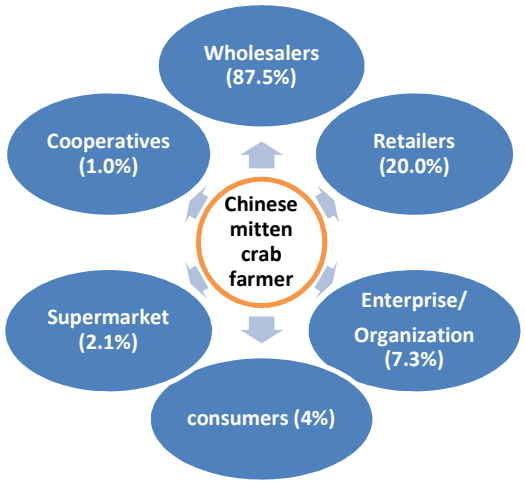

Fig. 3. Production output supply chain (Multiple responses > 100%)

Producers were further asked as a follow-up question to provide the percentages of volume of mitten crab sold to both wholesalers and traders within the producer supply chain since they formed the two major actors as shown in Fig. 3.

Results revealed that 20.7% of mitten crab farmers did not sell to traders while the rest sold to them at various percentages. The average percentage sold to traders is about 33%. Furthermore, there were 5.2% of mitten crab farmers who did not sell to wholesalers. Also, the average percentage of mitten crab sold by farmers to wholesalers is 68%. It implies that there is higher percentage of farmers selling to wholesalers as compared to retailers.

Furthermore, the farmers were asked to provide in percentage terms, distribution of their produce by groupings in to the two significant actors within the chain. Fig. 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 chat 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

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 was less than 5%. No interest was reportedly charged by cooperatives. 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.

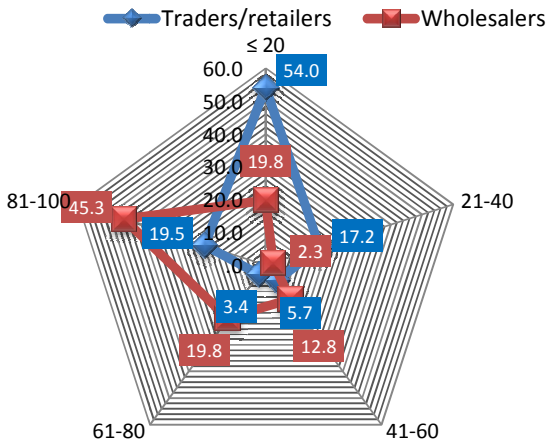

Fig. 4. Percent of crab harvested sold to both wholesalers and traders by producers

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: Total number of respondents (n) < 96

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).

Fig. 5 revealed the benefits obtained by 91.7% of crab farmers (Table 2) of joining an organization or a cooperative. Majority of the respondents (60.4%) benefitted 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 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.

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 cooperatives 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 while 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%) (Fig. 6). All the training sections were organized free of charge.

Sources of training include promotion stations, enterprise/organizations, self taught (e.g. pamphlets, books, internet, leaflets), and consultation with fellow crab farmers. Most crab farmers (85.4%) depended on promotion/demonstration stations for training, this may be as a result of many demonstration farms located in the study areas (Table 3).

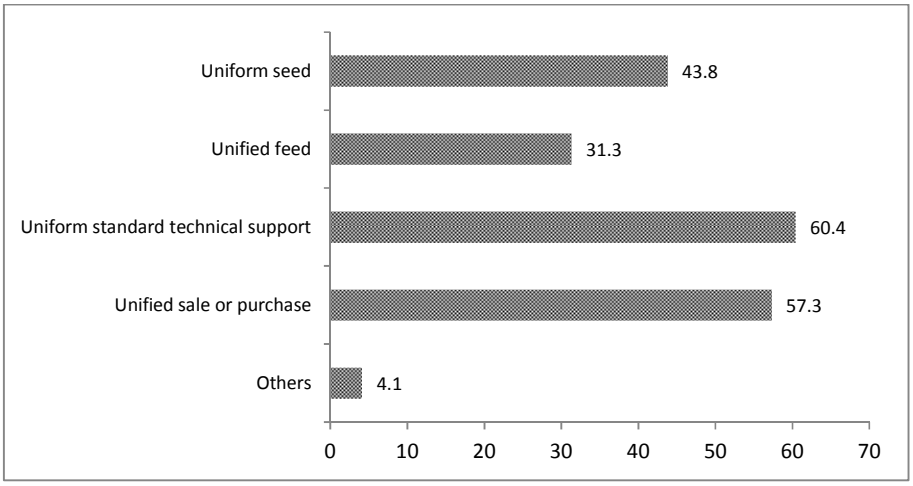

Fig. 5. Reasons for joining the organization (n = 96); multiple responses

Table 3. Source of training

	Frequency	Percent*
Promotion station/demonstration centers	82	85.4
Enterprise/organization	21	21.9
Self taught	18	18.8
Consult a colleagues	25	26.0

** Multiple responses*

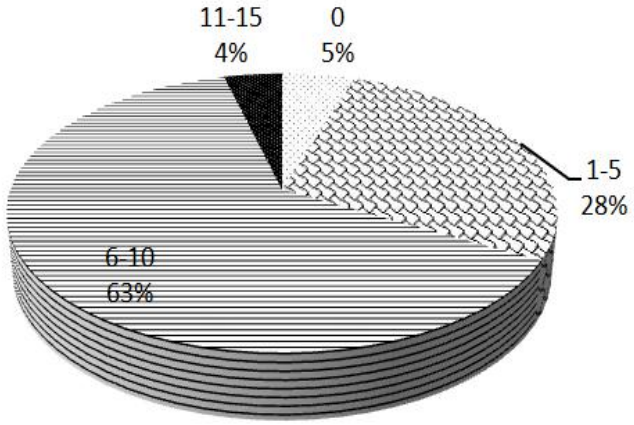

Fig. 6. Years of training

4. DISCUSSION

According to Demiryurek et al. [14], 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 [15]. 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 [13].

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 [16]. 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 [17]. 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% relied on five characteristics such as appearance, maturity, weight, odour, and texture. In all, maturity was ranked the highest as a means of determining quality (80.2%) followed by appearance (75%) and then texture (72.9%).

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

[18]. There are various sources of funding of mitten crab business activity in the study area. Majority of the sampled respondents (72.9%) relied on their own resources while 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. [19] 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. Benefits obtained from joining the associations are access to uniform seeds and feed (both of good quality), technical supports, 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 [20]. The responses attributed by members of an association suggest that the cooperatives also behave 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 [21]. 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 Anderson [22], 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 received between 1 to 5 trainings; 6.3% had no 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 [23,24]. Also, Tripp et al. [25] confirmed the importance of training as contributing to the enhancement of farmers' skills in farming. Khairul and Kamariah [26] 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 that the two major sources of accessing price information are 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 determine the quality of grow-out produced mitten crab 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%), with the third being texture (72.9%). The identified actors within the producer output supply chain of mitten crab farmers are wholesalers, retailers, cooperatives, super markets, enterprises/organizations, and 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%) relied on the banks for support with interest rate of less than 5%. Results suggest that access to credit is very low among Chinese mitten crab farmers. About 92% of the farmers interviewed are members of cooperatives. They access benefits such as uniform seeds and feed, 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 mitten crab farming. They obtained knowledge on crab farming from their fellow farmers, pamphlets, books, leaflets as well as from the internet. Number of training is skewed towards 6-10 in the year (64.6%).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ahmed M, Rab A, Mimbao MP. Household socioeconomics, resource used and fish

marketing in two Thanas in Bangladesh. Tech. Rep. 1993;40:82.

2. Carter S. Multinational and international marketing in constraints economies. The Quarterly Review of Marketing. 1988;13-18.
3. Crawford IM. Agricultural and food marketing management. Rome: Food and Agricultural Organization of the United Nations; 1997.
4. Carter S. Global agricultural marketing management. Rome: Food and Agricultural Organization of the United Nations; 1997.
5. FAO. Eriocheir sinensis: Cultured aquatic species information program. Fisheries and Aquaculture Department, Food and Agricultural Organization of the United Nations, Rome: FAO; 2008.
6. Lucas LS, Southgate PC. Aquaculture: Farming aquatic animals and plants. 2nd Edition. John Wiley and Sons; 2012.
7. Wang W, Wang CH, Ma XZ. Ecological culture of Chinese mitten Crab. Beijing, China: Chinese Agricultural Press; 2014.
8. Chiou, T K, and J P Huang. Biochemical constitutuents in the abdominal muscle of cultured mud crab Scylla serrata in relation to seasonal variation and maturation. Fish Sci. 2003;69:597-604.
9. Chen DW, Zhang M, Shrestha S. Compositional characteristics and nutritional quality of Chniese mitten crab (E. sinensis). Food Chemistry. 2007;103(4):1343-1349.
10. Wu XG, Cheng YX, Sui LY, Yang XZ, nan TZ, Wang JQ. Biochemical composition of pond-reared and lake-stocked Chinese mitten crab Eriocheir sinensis (H. Milne-edwards) broodstock. Aquaculture Research. 2007c:38(14):1459-1467.
11. Gui J-F, Tang Q, Li Z, Jiashaou L, De Silva S. Aquaculture in China: Success stories and modern trends. Seiten: John Wiley & Son; 2018.
12. FAO. Culture aquatic species information programme: Eriocheir sinensis (H. Milne-Edwards, 1953). Food and Agricultural Organization of the United Nations. July 7, 2018.
Available:http://www.fao.org/fishery/culturedspecies/Eriocheir_sinensis/en#tcNA00FE
13. Li Yan. Online crab sellers losing money while building fresh food retail business. Ecns.cn. September 29, 2016.
Available:http://www.ecns.cn/business/2016/09-29/228485.shtml (Accessed July 2017, 2017).
14. Demiryurek K, Erdem H, Ceyhan V, Atasever S, Uysal O. Agricultural information systems and communication networks: The Case of diary farmers in Samsun province of Turkey. Information Research. 2008;13(2):343.
15. Van der Zijpp AJ. Fishponds in farming systems. Wageningen Academic Pub; 2007.
16. FAO. Assessment and management of seafood safety and quality. Current practices and emerging issues. FAO Fisheries and Aquaculture Technical Paper 574, Food and Agriculture Organization of the United Nations, Rome: FAO. 2014;455.
17. Gaviglio A, Demartini E, Mauracher C, Pirani A. Consumer perception of different species and presentation forms of fish: An Empirical analysis in Italy. Food Quality and Preference. 2014;36:33-49.
18. Ghorbani M. The role of credit institutions in rural investment development in agricultural sector. Proposed Research to Agricultural Planning and Economic Research Institute. Jihad-Agriculture Ministry of Iran; 2005.
19. Quagrainie KK, Ngugi CC, Amisah S. Analysis of the use of credit facilities by small-scale fish farmers in Kenya. Aquaculture International. 2010;18(3): 393-402.
20. Bijman J, et al. Support for farmers' cooperative. European Commission; 2012.
21. Penrose-Buckley C. Producer organizations. A guide to developing collective rural enterprises. Oxford: Oxfam GB; 2007.
22. Anderson J, Feder G. Agricultural extension services: Good intentions and hard realities. World Bank Research Observer (The World Bank Research Observer). 2004;19(1):41-60.
23. Feder G, Slade R. The role of public policy in the diffusion of improved. American Journal of Agricultural Economics. 1985;67(2):423-428.

24. Rees D, Momanyi M, Wekundah J, Ndungu F, Mwaura L, Joldersma R. Agricultural knowledge and information systems in Kenya – Implications for technology dissemination and development. Overseas Development Institute, AGREN Network Paper No 107, 2000.
25. Tripp R, Wijeratne M, Hiroshini V. What should we expect from farmer field schools? A Sri Lanka case study. World Development. 2005;33(10):1705-1720.
26. Khairul BMN, Kamariah D. Investigating training impact on farmers' perception and performance. International Journal of Humanities and Social Science. 2011;1(6): 145-152.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/26613