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Value Chain Analysis of Blue Swimming Crab in the Bicol Region, PHILIPPINES

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Abstract

Blue swimming crab (*Portunus pelagicus*) is one of the processed fishery products exported by the Philippines in the global market. However, the volume of production continuously decline due to overexploitation of the commodity in major fishing grounds in the country. This research was undertaken to identify and map-out the value chain of the key sectors of the blue swimming crab industry, estimate the value added received by these sectors at each stage of the chain, and identify factors affecting the establishment of lying-in facility as a solution to the declining catch of blue swimming crabs in the Bicol region. The value chain of blue swimming crab in the Bicol Region is composed of few well-integrated players which extend to other parts of Luzon and the Visayas. Volume of production and prevailing price are the common information shared among key players. In terms of payment, cash on delivery is the common practice among the key players. The estimated value of a kilogram of “all-in” cooked crab meat is USD18.40. Approximately USD4.97 per kilogram or 55.69% of the value of picked crab meat is contributed by the crab catchers because they make the blue swimming crab available in the market from the wild. The cooked crab dealers contribute USD2.91 per kilogram or 32.62% of the value added by processing the cooked blue swimming crabs into higher value crab meat. Lastly, cooked crab dealers contribute USD1.04 per kilogram or 11.69% of the value added due to preliminary post-harvest processing conducted on the blue swimming crab. The result of the participatory systems analysis (PSA) revealed the establishment of a lying-in facility will be successful if there is an operational ordinance prohibiting catching of berried crabs, an ordinance prohibiting the use of illegal fishing gears, and provision technical assistance about blue swimming crab for fishers and other key players.

Key words: value chain, blue swimming crab, Bicol

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Introduction

Fisheries are culturally and economically important to Filipinos. Aside from its importance in domestic consumption, many fishery products are being exported and provides billions of export revenue every year. In 2010, the country ranked 5th among the top producing countries in the world with its total production of 5.16 million metric tons of fish, crustaceans, mollusks and aquatic plants (FAO, 2013). Meanwhile, fisheries production in 2011 was valued at USD 4.49 billion with 4.974 million metric tons of marine products produced (BFAR, 2011). However, despite the considerably high value of marine products production, poverty incidence among fishers and individuals working in the fisheries sector is high at 49.9% (BAS, 2008).

One of the most harvested and exported fishery products in the country is the blue swimming crab. It is locally known as “*alimasag*” for the Tagalog and “*kasag*” for the Bicolanos because of its sapphire-tinted claws. The ten-legged crustacean resembles other crab species but also has physical characteristics that make it unique. It has four frontal teeth and three spines in the merus of their chelipeds. It also has a single pair of chelae and three pairs of long ridged legs. Blue swimming crabs are excellent swimmers, with specially adapted hind appendages shaped like paddles. Its scientific name, *Portunus pelagicus*, means “beautiful sea swimmer”.

The blue swimming crab industry has a boom and bust history. Prior to the 1970’s, only traditional gears such as nets were used in catching crabs. When bottom trawls were introduced during the mid-1970s, the volume of production of crabs for commercial consumption doubled but its exploitation also increased. The trawl ban in 1982 provided a temporary reprieve for the blue crab resources from high-level exploitation. However, this reprieve was short-lived when demand for blue crabs soared following the collapse of the blue crab (*Callinectes sapidus*) fishery in Chesapeake Bay, Maryland, USA (Ingles, 1996).

The first commercial scale fishery of blue swimming crab in the Philippines was established by Phillips Seafood Inc. in Bantayan Island, Cebu. Being the lone player in the industry then, Phillips Seafoods Inc. was able to dictate the minimum size of landed crabs. It did not take long before other companies saw the economic potential of blue swimming crab and followed suit, causing the industry to swiftly spread in other areas. As a consequence, compliance to the minimum size limit of blue swimming crabs to be caught was not followed.

The demand for blue swimming crab has increased with the development of the crab meat processing industry. Processed crab meat is canned and exported primarily to the USA. Over 80% of the country’s export of processed crabs is sold to the United States while live crabs are mainly sold to Taiwan (Ingles, 2004). In 2010, the US imported approximately 21,000 metric tons of crabmeat, about 50% of which came from Indonesia, the world’s largest producer of blue swimming crabs (Sea Fare Group, 2011). This was followed by China (23%), Thailand (13%), the Philippines (9%) and India (6%).

Increased demand for crab meat has resulted to increased extraction of blue swimming crab regardless of size and stage of maturity. This has a negative impact on the sustainability

of the industry and on the thousands of households who are dependent on this resource for their livelihood. It is, therefore, imperative to identify and clearly define the avenues sustain blue swimming crab industry. Similarly, the knowledge and information on the value chain of blue swimming crab meat would help identify key entry points for various initiatives for poverty alleviation and narrow income inequality between and among the key players of the supply chain. Thus, this research was undertaken to:

- (1) identify and map-out the value chain of the key sectors of the blue swimming crab industry,
- (2) estimate the value added received by these sectors at each stage of the chain, and
- (3) identify factors affecting the establishment of lying-in facility as a solution to the declining catch of blue swimming crab in the Bicol region.

Methodology

The research was conducted in the provinces of Sorsogon and Camarines Sur in the Bicol peninsula including Bacolod City and Lapu-lapu City in the Visayas. Based on the preliminary observations and data gathered, questionnaires were prepared for fishers, cooked crab dealers, and picking plant operators. The following key questions, which served as guide in the preparation of survey instruments, were adopted from Brown et.al. (2010):

1. Who are the key customers and what are their product requirements in terms of species, volume, quality, packaging, delivery schedules, as well as grades and standards?
2. Who are the key players in the chains and what are their respective roles?
3. What are the activities and processes along the chain?
4. What is the flow of product, information and payment along the chain?
5. What are the logistic issues?
6. What are the external influences (e.g. ordinances, regulatory requirements, policies, etc.)?

There were a total of 43 fishers, three cooked crab dealers, six picking plant operators, 16, sorters, six Quality Analysts, and three canning plant operators that were interviewed. The flow of information, products, and payment, as well as constraints, issues and opportunities of each key player were documented.

The material and labor inputs required at each stage of the value chain were determined and given monetary value to be able to estimate the value added by chain actors to the blue swimming crab as it passes through the different stages of the value chain. Value added is defined as the difference between the sales of the product and the cost incurred from the inputs used and purchased. This is the contribution of the different factors of production owned by



each key player to the value of the product when sold to the next player. This value addition then translates to payments to the owners of the various factors of production that can be measured in terms of income earned. Along the chain, the value can be created through the following: (1) form, through transformation activities like processing, (2) time, through storage, and (3) place, through movement from various stages (Brown *et. al.*, 2010).

Participatory Systems Analysis (PSA) was undertaken to determine the factors that could lead to the successful entry/participation of the poor and women in the blue swimming crab value chain. This tool was designed to evaluate the relationships among relevant elements or factors within the context of sustainability of blue swimming crab supply. It reveals which elements can be potential starting points for project activities, and which ones may require further investigation and better understanding.

The PSA exercise was carried out during the focused group discussions (FGDs) where participants (e.g., fishers, cooked crab dealers, pickers, and quality assurance examiner) were asked to exhaustively identify the factors that would lead to successful entry and participation of the poor and women in putting-up lying in to sustain the supply of blue swimming crab. The factors were arranged in a matrix and the degree by which a factor influences another factor was examined. The ratings that were used are as follows:

- (a) Strong influence = 2.0
- (b) Moderate influence = 1.0
- (c) Weak influence = 0.5
- (d) Very weak influence = 0.1

The various factors were categorized depending on the degree by which they influence and are being influenced by other factors. A PSA quadrant was constructed to clearly situate the factors based on four systems of coordinates. Each coordinate implies a certain character or function within the system:

- (a) Symptom - A symptom is an element that is greatly influenced by other elements but may not have much power to change the system itself. Symptoms can be useful indicators of context changes, but development activities in this sector may only amount to a "treatment of the symptom, not the cause".
- (b) Buffer - A buffer is characterized by low importance in the context. It is unremarkable because it neither influences other elements much nor is it influenced much by others. Development activities in this sector are expected to have little impact on the context.
- (c) Critical element - A critical element is an accelerator or catalyst in the system. It changes many things quickly, but may also create many unexpected and undesired side effects.

Development activities in this sector can be highly uncertain, and impacts may be unpredictable. Therefore, critical elements have to be treated very carefully. It is particularly important when formulating impact hypotheses for this sector.

- (d) Motor or Lever - A motor or lever is an active element with predictable impacts. This is the most interesting sector for development activities. Identification of opportunities and constraints along the value chains were identified and examined using the market maps, estimates of value additions, the insights drawn from the PSA, key informants and other stakeholders as basis. Opportunities include improving value chain efficiency and equity or the development of new products for whole chain upgrading

Results and Discussions

The value chain of blue swimming crab in the Bicol region is composed of few well-integrated players which extend to other parts of Luzon Island and the Visayas. Blue swimming crab is being traded in the global market as canned crab meat and its major export destination is the United States of America. Depending on which part the crab meat was derived, it is available in different forms such as lump, flower, claw meat and special. Crab meat is used as topping for meat and fish, crab cake, dips, soups, spreads, sauces, cocktails and salads.

The value chain of blue swimming crab in the Bicol region is composed of fisher folks/crab catchers, assemblers/cooked crab dealers, crab meat picking plant operators, canning plant operators, and exporters. In support to the blue swimming crab industry are ice plants, can factories, steamer factories, and plastic factories that supply raw materials for the different stages of the blue swimming crab value chain, and the transport sector which facilitates the flow of raw materials and finished products from the point of production to the point of consumption.

Value Chain of Blue Swimming Crab

Product Flow.

The blue swimming crabs that are processed in the Bicol region came from towns surrounding Sorsogon Bay and San Miguel Bay. During lean months, the picking plants obtain the crabs from Bataan, Cavite, Pangasinan, and Malabon to augment the declining volume of supply coming from Sorsogon and Camarines Sur. The picking and canning plants in the Bicol region acquire blue swimming crabs from within and outside Region. The crabs that are caught by fisher folks are immediately sold to the assembler/cooked crab dealer between 8:00 AM to 2:00 PM. The cooked crab dealers boil the live crabs within two hours upon delivery to ensure



its freshness. The cooking operation usually ends at 4:00 PM. The spatial and temporal flow of the value chain of blue swimming crab in the Bicol region is shown in Figure 1.

Blue swimming crab is a highly perishable commodity. It has to be cooked immediately and canned within 72 hours after catching. Cooked crabs from within the region are delivered to the picking plants within the day from 8:00 AM to 6:00 PM. In the same manner, cooked crabs coming from outside the Bicol region takes at least 12 to 18 hours before reaching the picking plants in Bicol region on the following day. Picking plant operators need to deliver the crab meats from Sorsogon City and Castilla, Sorsogon to the canning plants in Cebu City and Bacolod City in 12 to 18 hours across the Visayan Sea. It also takes 12 to 18 hours to deliver canned crab meat from Naga City to exporters in Cebu City and Bacolod City.

Information Flow

Crab fishers provide minimal information to the cooked crab dealers, assemblers or buying stations. The information they relay to the cooked crab dealers is the schedule of their next offshore fishing. This is important especially if the crab catcher has financial obligation to the cooked crab dealers. Knowing the crab catcher's schedule of next offshore fishing is also important in scheduling the cooking operation and delivery of cooked crabs to the picking plants. Crab catchers seldom relay information on the volume of crabs to be delivered because it is dependent on the season and weather condition. The information needed in every value chain node of blue swimming crab industry are presented in Table 1.

Cooked crab traders provide the fishers information about the current price of live crabs and sometimes important advisories such as "stop-buying" season. A "stop-buying" season was declared by cooked crab dealers in the province of Sorsogon for a week due to the absence of electricity and difficulty in obtaining ice from the plants the province was hit by Typhoon Glenda in 2014. They also inform the picking plant operators about the volume of cooked crabs produced and time of delivery or pick up. Picking plant operators provide cooked crab dealers with information on the current price of cooked crabs. This buying price of picking plant operators are the basis of cooked crab dealers to make price adjustment at the upstream level.

At the picking plant-canning plant (tool packing) node, picking plant operators provide the canning plant operators information about the volume of crab meat they produced as well as the date and time of shipment. In return, canning plant operators provide the picking plant operators information about their buying price and they provide feedback regarding the volume per grade accepted, volume of spoilage, and others. Financial transactions and information such as the selling price of crab meat in the USA is strictly kept within their level.

Information is provided to the various value chain players either face-to-face or thru mobile phone. Players at the upstream side of the value chain (i.e., crab catcher-cooked crab dealer) usually share information face-to-face because they live in the same village except in some situations when information is sent thru text messaging because it is urgent. Text messaging and voice call using mobile phone are the means of information sharing among

players at the downstream end of the value chain (i.e., from cooked crab dealer up to the canning plant/exporter).

Payment Flow

Several modes of payments were practiced in the blue swimming crab value chain depending on the value chain node and players involved. At the upstream end of the chain, the mode of payment between crab catcher and cooked crab dealer is cash on delivery. When the crab catcher has financial obligation to the cooked crab dealer (e.g., the cooked crab dealer provided the crab catcher with fishing net), a certain amount, say USD 0.40 to USD 2.00, is deducted from the proceeds every transaction until the loan is completely repaid. If the crab catcher has no financial obligation to the cooked crab dealer, the former can sell live crabs to any crab dealers in the village that offer relatively higher price. The laborers hired by cooked crab dealers are paid based on the prevailing daily wage in the village.

At the cooked crab dealer-picking plant node, the mode of payment is cash on delivery. Cooked crab dealers are paid after the all crabs for the day are delivered. When the cooked crab dealer obtained cash advances during the previous transactions, the picking plant operator deducts the amount provided from gross sales before giving the net proceeds to the cooked crab dealer. At the level of the picking plant operators, the workers are paid on a wholesale or *pakyawan* basis. This is computed based on the volume of crab meat produced by all workers per table in a day. A table is composed of 2 to 8 workers who are predominantly females. Each person specializes on one part of the crab to process so that they can finish picking the crab meat earlier. The payment is equally divided among the members of the group. The workers may receive the payment either at the end of the day or at the end of the week depending on their choice.

According to the picking plant operators, the price is constant throughout the year. Jumbo and flower crab meats command the highest price because of their size and aesthetic value. Most of the time, females pick the flower crab meat because they have to maintain its form which is used for garnishing. Males usually pick the claw meat because it can be found inside the hardest shell of the blue swimming crab. Special is the cheapest blue swimming crab meat because it is composed of broken or deformed meat.

Value-added along the Chain

The contribution of the crab catchers, cooked crab dealers, and picking plants to the value of the blue swimming crab meat is summarized in Table 3 and Figure 2. The value added is based on a kilogram of “all-in” crab meat sold by the picking plant operators to canning plant operators. To be able to produce one kilogram of “all-in” crab meat, approximately 3.85 kg of cooked blue swimming crab is needed. As noted in the interviews conducted, the fresh crab shrinks by approximately 20% when cooked thus 4.81 kg of live blue swimming crab is needed to produce one kilogram of “all-in” crab meat. Based on these assumptions, the value of a



kilogram of “all-in” crab meat is approximately USD18.40 / kg. It was estimated that the picking plant operators contribute USD2.91 / kg or 32.62% to its total value added by providing owner’s labor and management, family labor, and capital. The physical capital provided by the picking plant operators include buildings, vehicles, tables and other equipment. Most of the materials (e.g., plastics, canisters, styro boxes, etc.) are provided by the canning plant to ensure the loyalty of the picking plant operator and for the later to continuously supply blue swimming crab meat. Their share in the gross value can be attributed to their ability to transform the cooked blue swimming crab into crab meat which commands higher unit price.

The assembler/cooked crab dealer has the lowest share to the value of “all-in” blue swimming crab meat which accounts to USD1.04 / kg or 11.69% of the total value added of crab meat. Their roles are primarily to assemble crabs sold by the crab catchers and cook them before shipping it to the picking plant operators. Sometimes they serve as buying station of the picking plants especially then their fixed assets such as stove, steamer and other equipment are provided by the picking plant. Most of the intermediate inputs, especially ice, are also provided by the picking plants.

Fisher folks contribute approximately USD4.97 / kg or 55.69% to the total value added of “all-in” crab meat. Their inputs in production include labor, family labor and capital. They have the highest share in the value added of blue swimming crab because they make the commodity available in the market from the wild.

Factors affecting the Establishment of Lying-in Facility

The main problem faced by the players in the blue swimming crab industry is the declining volume caught per person in Sorsogon Bay and San Miguel Bay. The solution identified by the value chain players is to put-up lying-in facility for blue swimming crab. Thus, the focus group discussion was designed to determine the factors affecting the establishment of a lying-in facility in Sorsogon Bay. The launching question during the FGD was: **“if a lying-in facility for blue swimming crab is technically viable, what factors would encourage you to engage in the said practice?”**

The result of the participatory systems analysis (PSA) exercise is presented in Figure 3. An operational ordinance prohibiting catching of berried crabs and prohibiting the use of illegal fishing gears appeared to be the motor/lever element in the establishment of the lying-in facility in Sorsogon. This motor/lever element is the starting point in establishing the lying-in facility. However, to accelerate the establishment of the facility there is a need for technical assistance not just for fishers and other key players. Technical assistance is a critical element in crafting effective ordinance for the establishment of the lying-in facility. Technical information include the spawning and fishing grounds of blue swimming crabs in Sorsogon Bay, the biology of blue swimming crab, and the underlying technology in a lying-in facility. The optimal location and method of berried crab delivery to the lying-in facility can also be determined through the aid of the technical information.

Financial assistance, management and sustainability plan, and organization of blue swimming crab fishers' organization appeared to be symptom elements. Development interventions along these symptom elements would not lead to a sustainable lying-in facility because these elements are not the main prerequisite for the establishment of the facility, based on the PSA conducted. But these elements can serve as indicators whether the lying-in facility is operating sustainably. Operational blue swimming crab fishers' organization and continuous financial assistance can indicate sustainable operation of the lying-in facility.

In as much as incentive system is being considered by the key players as important element in the establishment of the lying-in facility, the result of the PSA appears that incentive and zoning are only buffer elements. An incentive system or cash / in-kind payment for fishers to place entangled berried blue swimming crab in the lying-in facility may not work because from their point-of-view this can already be converted to cash when sold to cooked crab dealers. The incentive system may be less effective during lean season when fishers can only catch one to five kilograms of live blue swimming crabs and they have no other choice but to sell the crabs rather than wait for another two to three days for the crabs to spawn.

From the point-of-view of the cooked crab dealers, buying live berried blue swimming crabs and placing them in the lying-in facility may not also work. This proposal appears to be a disincentive to them because they have to shoulder the transportation cost of the berried crabs to and from the lying-in facility. They are hesitant to adopt the proposal because the weight of the blue swimming crab decreases when it spawn which further reduces their potential revenue. There is no existing practice to recover these potential costs of the cooked crab dealers.

Conclusions

The development of the crab meat processing industry has triggered high demand for blue swimming crab in the Philippines. Crab meat is a high-value export whose sustainability is threatened by overexploitation of blue swimming crab. Increasing demand for crab meat in the world market, particularly in the United States, and the lack of fishing regulation had resulted to crab overfishing and habitat destruction. Per capita crab harvest, on the average, declined over the last two decades. This will have a negative impact on the sustainability of the industry and on the thousands of households who rely on this fishery resource for their livelihood. Despite these ominous signs, no concrete steps had been adopted to address aforementioned issues/concerns. Overexploitation of this marine resource continues due to the increasing demand in the world market.

The value chain of blue swimming crab in the Bicol region is composed of players that perform distinct and complementing roles. The key players include fisher folks / crab catchers, assemblers / cooked crab dealers, crab meat picking plant operators, canning plant operators, and exporters. There is no duplication of functions among the key players in the blue swimming crab value chain. In support to the industry are ice plants, can factories, steamer factories, and plastic factories which supply raw materials for the different stages of the blue swimming crab value chain, and the transport sector which facilitates the flow of raw materials and finished



products throughout the Philippine archipelago. The decreasing catch rate in major blue swimming crab production areas in the Bicol region caused the local crab meat picking plant operators to source-out their crabs from other parts of Luzon Island.

Among the key players in the industry, the picking plant operators contribute approximately 51.69% to the total value of “all-in” blue swimming crab meat, followed by the crab catchers (39.56%), and assembler/ cooked crab dealer (8.75%). The crab meat picking plant operators provide owner’s labor and management, family labor and capital. Crab catchers employ their own labor, family labor, and capital to add value to the crab meat by making it available in the market.

The result of the participatory systems analysis (PSA) revealed that a lying-in facility is needed to solve the declining volume of BSC caught. To make it operational, there should be ordinance prohibiting catching of berried crabs, ordinance prohibiting the use of illegal fishing gears, and technical assistance for fishers and other key players.

Recommendations

To be able to address the declining volume of blue swimming crab caught in the region, establishment of a lying-in facility for blue swimming crab was proposed in the province of Sorsogon. There are, however, factors that can ensure the success of the lying-in facility such as:

- (a) Adoption and implementation of an ordinance prohibiting the catching of berried crabs and banning the use illegal fishing gears at the municipal level.
 - (b) Zoning of municipal waters and establishment of marine protected areas where the lying-in facility will be established. The area will be a “no-fishing zone” to allow spawning of blue swimming crabs.
 - (c) Organizing blue swimming crab fishers into an association which will operationalize and manage the lying-in facility and police their ranks.
 - (d) Technical and financial assistance in establishing the lying-in facility especially for the installation of floating cages for berried crabs.
 - (e) A multi-stakeholder management and sustainability plan which defines the role of each key player in the industry to prevent overexploitation of blue swimming crab.
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Figures and Tables

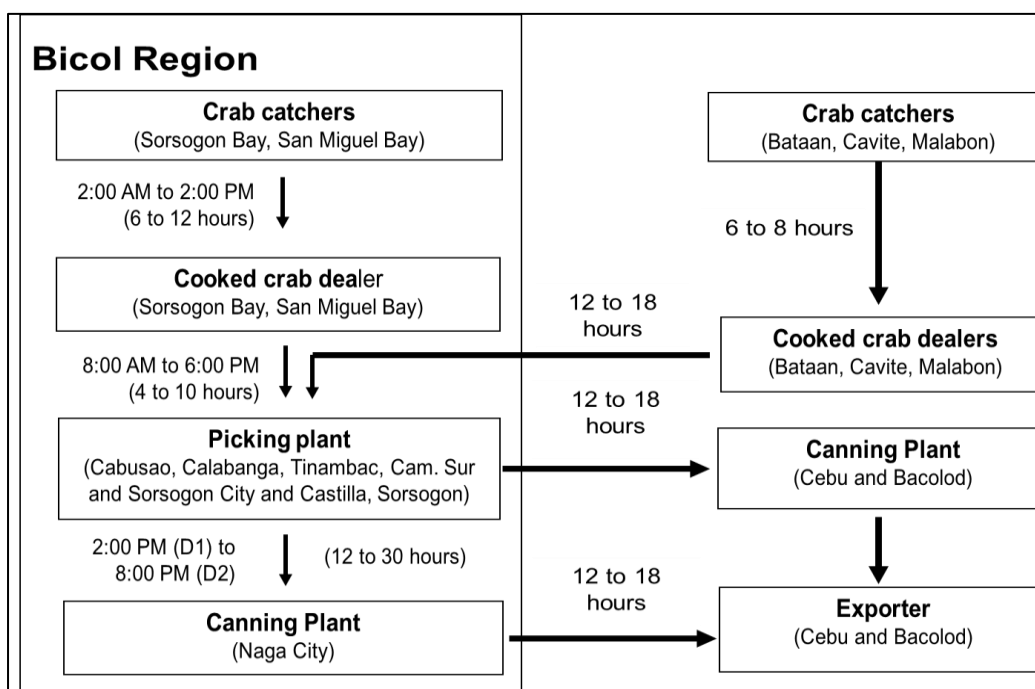


Figure 1 Spatial and temporal flow of blue swimming crab in the Bicol Region, Philippines: 2014.

Table 1 Information needed in every value chain node of blue swimming crab industry, Bicol region, Philippines: 2014.

Value Chain Node	Information Needed	
	Downstream	Upstream
Crab catcher-cooked crab dealer	Current price of live crabs	Schedule of offshore fishing
Cooked crab dealer-picking plant	Current price of cooked crabs	Volume of crabs cooked
Picking plant-canning plant (tool packing)	Current price of picked crab meat	Volume of crab meat picked and date/time of shipment
Canning plant-exporter	Current price of canned crab meat	Volume of canned crab meat

Table 2 Mode of payment in every value chain node of blue swimming crab industry, Bicol region, Philippines: 2014.

Value Chain Node	Mode of Payment
Crab catcher-cooked crab dealer	<ul style="list-style-type: none"> ▪ Cash on delivery ▪ Daily wage of laborers
Cooked crab dealer-picking plant	<ul style="list-style-type: none"> ▪ Cash on delivery ▪ Wholesale / <i>Pakyawan</i> for pickers
Picking plant-canning plant (tool packing)	<ul style="list-style-type: none"> ▪ Bank transfer ▪ Wholesale / <i>Pakyawan</i> for laborers
Canning plant-exporter	<ul style="list-style-type: none"> ▪ Bank transfer

Table 3 Value added (USD / kg) of crab catchers, cooked crab dealers and picking plant for a one kilogram crab meat, Sorsogon, Philippines: 2014.

Variables	Crab Catcher (<i>Live crabs</i>)	Cooked Crab Dealer (<i>Cooked crab</i>)	Picking Plant (<i>Crab meat</i>)	TOTAL
Selling Price	13.46	14.81	18.40	18.40
Buying Price	-	13.46	14.81	
Cost of Intermediate Inputs	8.49	13.76	15.49	
Value-added	4.97	1.04	2.91	8.92
Hired labor	-	0.29	0.30	0.59
Management, own capital	4.97	0.75	2.61	8.33
Share of Value-added to	55.69%	11.69%	32.62%	100%
Gross Value				
Factors of Production	Fisher folk's labor, family labor, capital (e.g. boat, net, etc.)	Owner's labor and management, family labor, capital	Owner's labor and management, family labor, capital	

Exchange rate: PhP 50.00 / USD



Fishers/ Crab Catchers			Assembler/ Cooked Crab Dealer				Picking Plant			
Pre-catching	Catching	Delivery	Receiving	Processing	Storing	Delivery	Receiving	Processing	Storing	Delivery
Preparation of boats, nets and lamps; Buying of gasoline.	Fishers leave their houses at 2:00 AM to the bay, line-up their nets and wait until 6:00 AM to get entangled BSC. They return to the shore at 9:00 to 10:00 AM	Fishers or their wife or children delivers live BSC to the assembler.	Sorting of BSC by size; weighing of live BSC.	Cooking of live BSC for at least 25 min.; Cooling for at least 1 hour.	Packaging in plastic bags and storing in iced styro boxes	Delivery to picking plants within the day.	Sorting of fresh cooked BSC.	Loading of cooked BSC to pickers' tables; removal of carapace, splitting of crabs and removal of fats, and picking of BSC meat; final sorting.	Sorting of crab meat in clean canisters and iced styro boxes; labeling of iced styro boxes.	Delivery to transshipment point to canning plants within the day.
Costs (Php/kg)	8.49			13.76						15.49
Buying Price (Php/kg)	0.00			13.46						14.81
Selling Price (Php/kg)	13.46			14.81						18.40
Value Added (Php/kg)	4.97			1.04						2.91
Share to total value added (%)	55.69%			11.69%						32.62%
Time (Days)	0.25 to 0.5			0.17 to 0.42						0.50 to 1.25
Constraints	<ul style="list-style-type: none"> Declining volume of catch Bad weather (e.g. typhoon) Use of illegal fishing gears 		<ul style="list-style-type: none"> Declining volume of live BSC bought due to competition. Lack of capital for live BSC procurement, 			<ul style="list-style-type: none"> Declining volume of cooked crabs bought. Absenteeism of pickers 				
Opportunities	<ul style="list-style-type: none"> Lying-in for gravid BSC. 					<ul style="list-style-type: none"> Job opportunity for women and the poor. 				

Figure 2 Summary of activities and value added of each key players in the value chain of blue swimming crab in the Bicol region, Philippines:

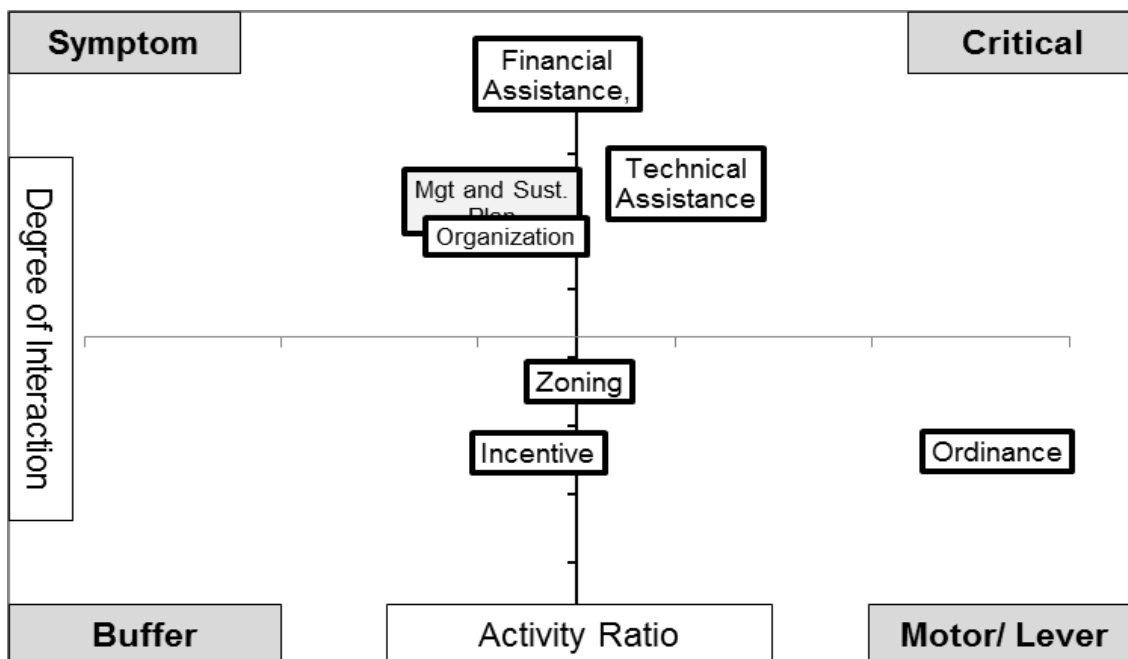


Figure 3 Factor quadrant showing the factors affecting the establishment of lying-in facility for blue swimming crab, Sorsogon, Philippines: 2014.