Value Chain Analysis for Frigate Tuna (*Auxis thazard*)
in Selected Aquatic and Agricultural Systems
Communities along the Sogod Bay Area,
Southern Leyte, Philippines

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Abstract
The frigate tuna industry in the Sogod Bay area of Southern Leyte is constrained by various factors. The study aimed to look for effective pathways and linkages for upgrading the industry, transforming it to a highly competitive and profitable system for the poor and marginalized people of the Sogod Bay area. Examination of the value-creating flow of the industry from the input supply sector, production, trading until the finished goods are delivered to the end consumers was done. Participatory systems analysis was used to examine the profitability of an existing value chain, identify problems and areas for improvement for frigate tuna enterprise in Limasawa Island and selected communities in Sogod, Southern Leyte, Philippines. Value chain mapping showed fresh frigate tuna traded to local buyers, trader-assemblers and brokers in Pasil Fish Port, Cebu City. Downstream, retailers traded products directly to institutional buyers. Data revealed that at the current market situation, there is 48.83% excess demand of frigate tuna. Chain performance analysis also showed that traders in Limasawa generated higher net returns than the upstream players in Sogod, Southern Leyte. Moreover, upstream players across study sites are alarmingly facing declining catch per unit effort in their fishing activity. Logistic issues and external influences were evident in the area. The presence of large fishing vessels in a “no fishing” area aggravated the decline in the catch per unit effort of frigate tuna in the Sogod Bay area. Strategies to upgrade the chain are forwarded to bring back the frigate tuna enterprise, thus, generating more benefits and opportunities for high value adding products where the poor and marginalized sectors in the selected AAS communities can participate.

Keywords: Value chain analysis; Frigate tuna; Upgrading strategies; Participatory systems analysis

Introduction
Tuna is the common name for several large, pelagic, schooling fishes found in most of the waters of the world. One of its various species is the Frigate tuna (*Auxis thazard*) commonly known as “Mangko/Mangkoh”, “Budburon” and “Tulingan/Tolingan”. This species can be a substitute with the tuna in General Santos City (Bureau of Fisheries and Aquatic Resources, 2012).

It is highly migratory species especially in the open sea (Pacific Ocean). These fishes dispersed themselves and even spawn to locations along its migratory route. Philippines is one of its spawning areas. Hence, huge...
volumes of fresh frigate tuna catch were obtained by small to large-scale fisherman in the past. This volume decline continuously due to constraints ignored by policy makers. Among them were the heavy competition among small scale and large scale fisherman, unregulated and illegal fishing practices and poor implementation of support programs, ordinances and regulations in municipal waters. Opportunities, however, also come along with these constraints. The demand for frigate tuna is consistently growing; yet, unavailability of processed product in the local market is still experienced.

The study aimed to examine the value-creating flow of the frigate tuna industry from raw materials, production, commercialization, and delivery to end-users or consumers in the Sogod Bay area of Southern Leyte, Philippines. Likewise, effective pathways and linkages for upgrading were identified to transform the existing value chain into a highly competitive and profitable system for the poor and marginalised people of the Sogod Bay area.

Specifically, the study aimed to:

1. provide an overview of the frigate tuna industry in the Sogod Bay area;

2. map-out the existing value chain of frigate tuna and identify/describe the roles of the key players involved

3. analyze the performance of players at each stage of the value chains and discover both institutional and non-institutional barriers for possible areas of improvement; and

4. identify possible entry points for the small fisherman along the value chain and the needed interventions/initiatives to improve the profitability of frigate tuna industry in the selected AAS communities in Sogod, Southern Leyte.

Review of Literature

Production and Issues in the Frigate Tuna Industry in the Philippines

Frigate tuna (Auxis thazard) is one of the major tuna species in the Philippines (Vera & Hipolito, 2006). From 2003 to 2013, the largest commercial production was observed in 2004 reaching up to 141,320.92 MT (Philippine Statistics Authority, 2014). Vera & Hipolito (2006) claimed that the surge in the commercial tuna production was due to the enhanced monitoring efforts and the operation of the General Santos City Fish Port Complex. However, this declined to almost half of the highest observed production volume (73,647.23 MT) in 2013 (Philippine Statistics Authority, 2014). The work of (Vera & Hipolito, 2006) indicated that the decline was due to overfishing by commercial fishers encroaching into municipal waters, the use illegal fishing practices (e.g. cyanide fishing), water pollution, and degradation of coastal ecosystems. They added that the insufficient capital of fishers prevented them in improving their vessels and in the installation of floating artificial reef or “payao”.

The Value Chain Concept

The concept of value chain includes the overall activities required to bring a product from the farm (initial input-supply), production, to its final market destination – the consumers (United Nations Industrial Development Organization, 2009). This concept was introduced by Porter (1985). Each link in the chain involves sourcing inputs, making/producing, and then delivering/selling product to the next link in the chain (Macfadyen, et al., 2011). In each phase of the value chain the product/service gains some value. If a phase is malfunctioning the chain will break down and the mission of generating value for the customer will not be realized (TBK Consult, 2012). During the stages of production, a combination
of physical transformation happens which includes the participation of producers and support services.

The Value Chain Analysis Tool

Value chain analysis (VCA) is used as an analytical tool that aids the understanding of every activity in the chain from raw materials to the eventual end-user. This means that it proceeds with the segmentation of the chain into parts (input supply, production, trade, processing, end consumption) in order to have a better view and understanding of the structure and its functions including the chain players’ roles and relationships (United Nations Industrial Development Organization, 2009). Factors influencing industry performance, including access to and the requirements of end markets; the legal, regulatory and policy environment; coordination between firms in the industry; and the level and quality of support services are identified and included in the analysis (ACDIVOCA, 2012). The flows of activities in the chain are evaluated in order to detect problems or identify opportunities to improve the contribution of specific actors and the overall performance of the chain (United Nations Industrial Development Organization, 2009).

Theoretical and Conceptual Framework of the Study

Michael Porter (1985) first introduced the value chain as a powerful tool in analyzing firm’s activities for competitive advantage. It sees organisations as a system that is made up of subsystems that follow transformation processes converting inputs to outputs (University of Cambridge, 2014). Understanding these activities or processes determines costs and profits. Nowadays, this tool is used to find out sources of competitive advantage in the industry level. According to Kaplinsky (2000), the value chain approach describes the full range of activities which are required to bring a product or service from conception through the different phases of production delivery to final consumers and final disposal after use. This identifies problems and opportunities in an industry for growth and competitiveness. The study involved the analysis of frigate tuna from understanding the needs of the final consumer and how the upstream players (e.g. retailer, wholesaler, trader, fisherman and input suppliers) are satisfying these needs. The enabling environment composed of national and local authorities, research agencies, and institutions shapes the value chain environment and its operating conditions. They exert influence to the activities performed by the key players in the value chain (Figure 1).

Methodology

The study was conducted in Limasawa Island and in the Aquatic Agricultural Systems (AAS) communities of Barangay Maac and Mahayahay, Sogod, Southern Leyte, Philippines. The study employed mixed-methods research design involving quantitative and qualitative research tools under the value chain analysis framework. Key informant interviews were conducted using in-depth quantitative and qualitative survey questionnaire. Snowball sampling technique was used as there was no established sampling frame for frigate tuna value chain actors. Moreover, since the actors are affiliated to each other through their link in the chain, thus, appropriate to locate other chain players based on existing ones. Data collection started at the downstream actors (final buyers) – the one that defines value. Then, they were asked to locate other actors (upstream actors or participants) in the chain that they knew. Around 40 key informants were involved in the study.

Mapping out the value chain was also done using the convention of the six key questions of value chain analysis by Brown, et.al., (2010). Questions include: (1) who were the
key customers and what were their product requirements (especially quality standards)?
(2) how do product, information and money flow through the value chain?; (3) what were the activities and services provided at each step in the value chain?; (4) who were the key players and what were their respective roles?; (5) what were the critical logistic issues?; and (6) what were the external influences?

Participant observation technique, semi-structured interviews and focus group discussions were also conducted in order to cross-validate and acquire the greater understanding of the characteristics and patterns of the data/information obtained from the surveys. Moreover, secondary data were obtained from industry publications and information from the Bureau of Fisheries and Aquatic Resources (BFAR) and Bureau of Agricultural Statistics (BAS).

Participatory Systems Analysis (PSA) was employed to complement value chain analysis and determine factors that lead to the successful introduction/ adoption of effective pathways that enhance the chain. This evaluates the relationships among factors within the context of the problem being assessed. It also pointed out elements to potentially start project activities, for further investigation and better understanding (Brown, Perez, Garces, Ragaza, & Zaragoza, 2010).

Furthermore, value chain performance analysis was done to assess the overall performance of the value chain. Calculations were done to determine the value addition at each segment, cost and return analysis, profitability and efficiency.

**Results and Discussion**

**Frigate Tuna Industry in Eastern Visayas**

Volume of catch of frigate tuna showed fluctuating trend from 2003 to 2013 (Figure 2). The highest was recorded in 2009 at 70,844.88 MT, and lowest in 2012 at 59,118.78 MT. In 2013, volume of catch increased slightly to 60,634.35 MT, 2% higher than in 2012 (BAS, 2013).
Frigate tuna were primarily sold fresh. Its retail and wholesale prices at the national level continued to increase from year 2003 to 2013. This was brought about by the declining volume of catch. The highest retail price per kilogramme in retail was PHP 111.57 per kilogramme in year 2013 while the highest wholesale price was PHP 89.36 per kilogramme in 2012.

**Value Chain Mapping**

**Trading routes of frigate tuna within the Sogod Bay Area**

There were two different trading routes of frigate tuna in Sogod Bay Area (Figure 3). The first trading route which was very short was observed in the two selected AAS communities in Sogod, Southern Leyte. Tuna caught by fisherman at sea were immediately sold down to the final consumers of nearby communities. The second route was found in Limasawa Island. Frigate tuna were collected, assembled and distributed the products within the municipality as well as in the neigbouring towns (e.g. Padre Burgos, Malitbog, Maasin and Bato) and Pasil Fish Port, Cebu. Brokers were present in each distribution sites. They facilitated the distribution of fresh fish to the retailers in consignment basis. Trading process took place within trader-broker-retailer. Retailers took frigate tuna to public markets in Carbon, Opon, Consolacion, Pasil, Mandaue and Tabuan and were sold to walk-in buyers and regular customers or “Suki”.

**Key Customers and Product Requirements**

Frigate tuna is one of the preferred tuna species among consumers. Tuna is bought fresh and raw form (Bureau of Fish and Aquatic Resources, 2010). Generally, the major product requirement for buyers of frigate tuna includes freshness which entails clear eyes, natural “sea” smell, no deformed/lacking parts and with blood/red gills. The lowest volume traded among buyers was 46.20 kilogrammes per week in AAS communities and the highest was 89.6 kilogrammes per week for traders in Leyte and Cebu areas. Other product preferences include affordability, availability and its origin of the fish product where it was caught. These preferences need to be complied for customers’ satisfaction.

**Key Players and their Roles**

The input suppliers, fisherman, traders/assemblers, brokers, retailers and final consumers were the major players in the frigate tuna industry in the Sogod Bay area. Upstream players particularly the fisherman in the AAS communities as well as in Limasawa island represent the poor and marginalised sectors in the value chain activities of frigate tuna (Figure 4).
**Input and Services.** The input and service providers were the paddle boat (“banca”) makers, paddle makers, boat engine dealers, fish hook (“taga”) manufacturers and suppliers of other fishing tools and devices. These actors particularly the fisherman were very much affected by the reduced volume of fish catch. Thus, key players must have inputs to effectively function in the entire stretch of the value chain.

**Production.** The fisherman were the main players in this segment. They were directly involved in fishing fresh frigate tuna at sea to be distributed to the subsequent segments of the chain. Average age of fisherman was 51 years old with 31.1 years experience in fishing. Majority (60%) owned paddle boat (“banca”), pressurized kerosene lamp and basin as fishing equipment while 40% owned 3-28 Hp engine-driven boats, had styro containers, fishing hooks “pasol/taga”, basin, lamp and “payao” or floating artificial reef. Data indicated more catch of frigate tuna catch among Limasawa fisherman than in AAS communities, Limasawa fisherman were equipped with better fishing tools and devices.

**Trade.** Key players in this segment include fisherman-traders, assemblers, traders, brokers and retailers who performed the post-fishing activities namely: procurement from fisherman, sorting, grading, assembly, distribution and selling products to the subsequent chain players. In the AAS communities, frigate tuna were directly sold to end consumers in the community due to the small volume of catch. However, trading activities in Limasawa Island were dominated by fisherman-trader. This actor had an adequate fish aggregating devices (FADs) and other fishing facilities. Meanwhile, this actor also assembled fresh frigate tuna catch from the individual fisherman who took cash advances from them. The accumulated catch and the actor’s own catch was transported to Cebu Pasil Fish Port where trader-broker-retailer took place. Brokers served as mediator between the traders and retailers (fish vendors). They facilitated in selling fish from traders to fish retailers on public markets in Cebu. The broker usually charge PHP 5-20 per kilogramme of frigate tuna taken by retailers. Brokers pay the traders when retailers have paid the amount due of fish taken. Consequently, the retailers sold it to regular buyers or “suki” and walk-in consumers. Most retailers were women and commonly stationed in public markets. Female retailers hire male labourer or porter (usually male) to transport their procured frigate tuna from the port until to
their respective retail stalls.

**Final Consumption.** The final consumers were the final purchaser of frigate tuna. They were from So. Leyte (Limasawa, Padre Burgos, Bato, Malitbog, Sogod and Maasin) and Cebu (Pasil, Tabuan, Carbon, Opon, Mandaue and Opon). They were identified as regular buyers “suki” and walk-in customers.

**Enabling Environment.** External actors influenced the overall functioning of the chain. Enablers in the existing value chain include the Department of Agriculture, LGU as well as WorldFish. These institutions provided support services and expertise to the fisherman. However, their assistance was still inadequate for the industry.

**Activities/Processes and Costs**

The value chain of frigate tuna consists of various activities and processes in bringing the product from input suppliers, fisherman until it reaches the final consumer. These activities incur costs which can be cash or non-cash. Among the players in the entire stretch of the value chain, traders were the most benefitted. They have adequate access to resources allowing them to move effectively and efficiently in the chain, thus, allowing them to compete with other players in the industry. In the fisherman’s node, activities can be categorised into pre-fishing, fishing and post-fishing activities. These were predominantly performed by men while women (wives) and children only participated/assisted in pre-fishing involving the procurement of supplies and sometimes fishing (Table 1). Pre-fishing activities include procurement/ preparation of inputs, fishing gadgets tools and devices, and maintenance of fishing boats. After these activities were accomplished, fishing proper follows. This process constitutes the fisherman’s activities in catching the fish at sea using fish nets and other fishing gears. This action incurred the major part of the cost due to labour expenses in catching the fish (Figure 5 and 6). Calculations indicated that the present catch per unit effort was only 0.44 kilogramme per hour as compared to 2.66 kilogrammes per hour when frigate tuna was still abundant. Post – fishing activity included sorting and delivery to the next player of the chain. Comparing the fisherman in AAS communities and Limasawa, it was found out that Limawasa fisherman incurred higher cost since they used more inputs in their fishing activities (e.g. fuel, baits) which is not complemented with their current volume of fish catch.

On the other hand, most traders at the same time fisherman. They capture fish and were directly selling their catch to buyers. Like Limasawa traders, they captured fishes at sea...
and also assembled the fish catch from other fisherman and distributed them to various sites in Leyte and in Cebu. Their activities include procurement of fishing tools/devices, purchase of fresh catch from fisherman, sorting as well as transporting products to different distribution sites. Large part of the cost was incurred in the purchase of fresh fish from fisherman’s level at an average price of PhP 100.00/kilogramme. It was followed by the cost incurred in post-fishing activities (e.g. transportation expenses) due to the distance from the source to the distribution sites. Key players in this node were mostly male. However, women also helped in some trading activities at times when their husbands (trader) were busy in receiving/assembling fish catch from other fisherman. Wives established trading agreements with other fisherman (e.g. giving of cash advance) and communicating brokers to expedite selling.

Brokers deal the frigate tuna coming from Limasawa Island assemblers to buyers, wherein, most of them were from Pasil Fish Port. Pure marketing strategy, good communication skills and interpersonal relationship were the qualities of brokers in undertaking their activities. Brokers were mostly women. Broker received the delivered frigate tuna from traders in Leyte and sold it to retailers at an average price of PhP 150 with the PhP 5-20 commission for every kilogramme sold. They facilitated the distribution of delivered fish catch to the retailers “pasahera” waiting at the fish port. They have assistants who haul the fresh fish from delivery trucks to their assigned places in the fish port where they sorted fish according to sizes and put into styro-container.

Retailers were the last players that traded the frigate tuna to the final consumers. Their highest cost was accounted on the procurement/purchase of fresh frigate tuna. Likewise, labour was the second contributor on the cost.

**Product Information and Payment Flow**

Results showed that frigate tuna products flow through different intermediaries from fisherman, trader, broker, retailers’ until it

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**Table 1. Gender division of labour in the fishing activities of frigate tuna in the two selected AAS communities in Sogod, Southern Leyte**

<table>
<thead>
<tr>
<th>CHAIN ACTIVITIES</th>
<th>Men (Husband)</th>
<th>Women (Wife)</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Fishing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procurement/preparation of fishing supplies, equipment, tools</td>
<td>✔️ ✔️ ✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Checking/inspection of fishing supplies, equipment, tools</td>
<td>✔️ ✔️ ✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Fishing (Catching of Fish)</td>
<td>✔️ ✔️ ✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Post-Fishing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorting</td>
<td>✔️ ✔️ ✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Weighing</td>
<td>✔️ ✔️ ✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Filing</td>
<td>✔️ ✔️ ✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Delivery and Payment</td>
<td>✔️ ✔️ ✔️</td>
<td>✔️</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Primary data sources (focus group discussions)*
Table 2. Spearman’s correlation of BPI and its Factors.

<table>
<thead>
<tr>
<th>TRADERS</th>
<th>Actual Volume of Frigate tuna traded (kilogrammes/year)</th>
<th>Desired Volume of Frigate tuna ordered per trading session (kilogrammes/ year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisherman (within Sogod)</td>
<td>981.5</td>
<td>2,000.00</td>
</tr>
<tr>
<td>Trader (Limasawa, So. Leyte)</td>
<td>76,800.00</td>
<td>150,000.00</td>
</tr>
<tr>
<td>Estimated Annual Volume</td>
<td>77,781.50</td>
<td>152,000.00</td>
</tr>
</tbody>
</table>

Source: Primary data sources (key informant interviews).

reaches the final consumers. It was found out that the estimated average total annual volume of frigate tuna traded was 77,781.50 kilogrammes which comprised of the volume traded by fisherman in AAS communities (981.50 kg/year) and traders in Limasawa (76,800 kg/year). However, the volume desired by buyers reached up to 152,000 kilogrammes per year. This means a shortage of 48.83% or 74,218.50 kilogrammes of the desired demand (Table 2). These values were obtained from the information given by each key informant fisherman (10 from AAS communities and 10 from Limasawa) and traders (5 in Limasawa) during the interviews. They were asked how much of the product on average they are selling to the next player in the chain, then, these numbers were added to make up the total annual volume traded. Meanwhile, their buyers were also asked on how much volume they need on the average.

**Logistics Issues along the Frigate tuna Value Chain**

No established organization, inadequate capital and poor fishing facilities were among the internal logistic issues common to all fisherman the area (Figure 7). Majority of the fisherman claimed that they do not have adequate resources to effectively and efficiently function along the chain. Thus, they were not able to compete with large scale fishers from other places. They were the hugely disadvantaged players along the chain. Being unorganized made them ineligible of the support provided by public/private institutions. Moreover, their problems especially the presence of large fishing vessels on the area were not raised and addressed by appropriate agencies since they are not empowered. They lack resources for their needs on to purchase fuel, maintenance of boats/"banca" and procurement of fish baits. Additionally, at the present, catch per unit effort is significantly low making fisherman spend several hours to catch enough fish enough to sustain their daily needs.

Traders also felt the issues encountered in the fisherman’s node as the supply for frigate tuna is insufficient. These issues, likewise, hindered them in obtaining support from public/private institutions and prevent them in meeting the quantity demanded by the buyers. Traders in Limasawa transported their tuna to Pasil Fish Port in Cebu). This will entail additional transport cost aside from the considerable due to mishandling. Poor handling practices in tuna distribution can not avoided considering the distance from the

Mode of payment practiced by fisherman was cash on delivery basis while trader, brokers and retailers practiced a credit term agreement system called “Bayad-utang”. This means that payment was made after selling/disposing the product. No new delivery will be made unless all dues paid. Moreover, technical information with regards to the activities that the chain players are doing was coming from their own experiences. Meaning to say, they were not involve in any trainings or seminars and information support services related to their present livelihood.
supply to the final buyers.

Figure 7. Internal logistics issues along the frigate tuna value chain. (Source: Primary data sources (key informant interviews))

Meanwhile, issues that cannot be controlled or modified by the industry itself are considered external logistic issues that strongly influence the overall performance of the value chain. The most prevalent issues are the existence of large fishing vessels, presence of “floating artificial reef”, unstable weather condition, insufficient extension support and illegal fishing practices (Figure 8). The presence of large fishing vessels on the area is the major problem that poor and marginalized fisherman encountered. The continued presence of those vessels over the years reduced fish catch of small fisherman. Frigate tuna migrating towards the Sogod Bay is barred as these large fishing vessels positioned at the entrance of the bay. This might be the reason why spawning time for these fishes had stopped for a quite number of years already. The presence of several floating artificial reef sometimes caused problems among fisherman within the Sogod Bay. Fishing nets caught in this fixture are damaged; although, it is also advantageous as it attract fishes. Fisherman noticed changes in volume of fish catch over the years. Calculations indicated that catch per unit effort declined. This implies that the supply of frigate tuna flowing along the chain had significantly reduced. Hence, a huge gap between quantity supplied and demanded occurred.

Insufficient support extended to fisherman and traders aggravated this problem. Programs prioritized are on agricultural crops. Only few were granted to the fishery sector resulting in the inadequate knowledge on proper fishing practice. Thus, extensive support programs must be poured out or made available on frigate tuna industry to upgrade and transform the existing value chain. Unstable or unpredictable weather condition is the most unavoidable issue in the fishing industry. Bad weather condition stopped fishing and trading activities of key players dependent on fish catch and consequently affected trading.

Value Chain Performance Analysis

Calculations of the value added and cost and return analysis at each node of the value chain is presented in Figure 9.

Results showed that fisherman in the AAS communities in Sogod earned the highest value added (PhP 64.25/kg) compared to other chain players because most of these fisherman were also trader. They directly sell their catch at a reasonable price deriving 69% net profit margin and 220% return on investment. Brokers had the lowest
value added (PHP 9.40/kg) as these players engaged trading on consignment basis. They only facilitated selling of tuna from trader to the retailers for a commission of PhP 5-20 per kilogramme. Net profit margin and return on investment showed lower values on this node.

Cost and return analysis revealed that chain players earned income from its respective operations. However, a distinct trader (from Limawasa Island) earned the highest net returns reaching PHP 3,205,725 annually. This happened since this trader market tuna in bulk volume. Aside from engaging into fishing, they assembled fish catch from fellow fisherman and transport their tuna in Cebu. Net profit margin and return on investment ranked second in terms of net return earnings that reached PhP 1, 352, 377.60, annually with net profit margin and return on investment at 11% and 12%, respectively.

**Value Chain Visioning and Upgrading Strategies**

Fisherman in Limasawa and in AAS communities of Sogod envisioned bringing its existing fishing venture into a higher level of competitiveness and profitability. This can only be carried out through increasing the volume of frigate tuna catch in their respective areas. This vision was determined through the conduct of focus group discussion as well as participatory systems analysis. Specific strategies to address the stand-up issues are shown in Table 3. These can either be a product, process or market upgrading strategy. Product upgrading includes creation of new products or increasing the current volume/quantity of produce. Process strategies, on the other hand, include the adoption of new fishing practices, processing technologies or any improvement on the
operations. Market strategy involves the penetration of existing markets or capturing new markets. These strategies should be laid out to upgrade the current value into a more competitive and profitable environment. Major upgrading strategies at the fisherman’s node are geared towards increasing in the volume of frigate tuna catch. Monetarily, fisherman earned positively from their fishing operations. However, they were just constrained on fish catch from Sogod Bay areas. Employing strategies in improving fish catch would not only generate monetary returns to the fisherman but also generate more benefits of the poor and marginalised. These strategies could be facilitated through intensified extension support so that fishing policies are strictly implemented. Restriction or regulations on large fishing and overfishing will be carried out. Moreover, fisherman in these areas need to be empowered by establishing and strengthening their own organizations to be able to receive supports from government/private institutions.

As soon as the increase in fish catch will be stabilized, problems encountered by traders and other chain actors can be reduced or even avoided. Once the volume of frigate tuna catch will increase, traders would not just deliver its products to its existing market but also in other areas which are readily accessible to any kind of transportation. This will also create products with high value adding potential which can encourage participation among poor and marginalised players in the activities of the chain.

Participatory systems analysis (PSA) was done to pinpoint further the factors, constraints or issues in the frigate tuna value chain that will have substantial effect to industry once appropriate solutions are given. Focus group discussions were made to extract the factors in the industry, then, the examination of how one factor affects another followed. A PSA matrix was made to illustrate and categorize the degree of influence and how one factor can influence other factors. There are four quadrants in the PSA matrix, namely: 1) Symptom, 2) Buffer, 3) Critical Element and 4) Motor or Lever. The symptom is an element heavily influenced by other elements but does not have the power to change the system, thus, developmental activities may be useless. Meanwhile, the buffer is an element that neither influence nor influenced by others, therefore, the impact of development activities may be little. The critical element is the catalyst in the system. This generates quick changes in the system and carry unexpected and undesired side effects. Lastly, the Motor or Lever constitutes the active elements that produce predictable impacts in the system, thus can be very useful in crafting developmental activities.

Results of the focus group discussion among Limasawa fisherman showed that the factors influencing their fishing livelihood include: 1) stiff competition with large scale fisherman, 2) presence of floating artificial reef, 2) unpredictable weather condition, 3) availability of fishing devices, 4) strength and stability of fisherman’s organization, 5) the number of fisherman in the area, and 6) small scale fisherman do not have floating artificial reef (Figure 10). Among the aforementioned factors, results revealed that there are 3 active elements found the in the Motor or Level quadrant, namely: 1) poor fish aggregating device / fixtures of fisherman, 2) existence of floating artificial reef, and 3) the competition of large-scale fisherman. This suggests that once developmental solutions will be implemented and targeted to these factors, predictable impacts will be expected. Providing fisherman updated and complete fishing tools and devices and other essential inputs for fishing, will surely help them in attaining an increase in frigate tuna catch.

Resolving constraints under the MOTOR/LEVER quadrant could be a good start of improving and aiding the factors affecting the upgrading direction of the chain. This will not only improve the frigate tuna industry in Sogod Bay area but the fishing industry of the country as a whole. The existence of floating artificial reef
Table 3. Logistics problems and possible upgrading strategies for frigate tuna for Southern Leyte. (Source: Primary data sources (key informant interviews)

<table>
<thead>
<tr>
<th>Value Chain Problems/Issues</th>
<th>Suggested Solutions</th>
<th>Upgrading Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor Fishing Facilities</td>
<td>Provision of adequate fishing facilities from public/private sectors</td>
<td>Process</td>
</tr>
<tr>
<td>Inadequate Capital</td>
<td>Provision of soft-loans or other financing schemes</td>
<td>Product/Process/Market</td>
</tr>
<tr>
<td>No Established Fisherman Organization</td>
<td>Encourage barangay officials to facilitate the formation of fisherman's organization</td>
<td>Process</td>
</tr>
<tr>
<td>Distance to Buyers</td>
<td>Secure buyers within areas of Leyte and Southern Leyte</td>
<td>Process/Market</td>
</tr>
<tr>
<td>Poor Handling Practice</td>
<td>Train traders/labourers on proper handling of fish from source to distribution sites</td>
<td>Process</td>
</tr>
<tr>
<td>Employed</td>
<td>Secure buyers in proximate areas with considerable amount of volume requirement</td>
<td>Process/Market</td>
</tr>
<tr>
<td>High Transport and Labour Cost</td>
<td>Strict implementation of “No Fishing Zone”</td>
<td>Product/ Process/ Market</td>
</tr>
<tr>
<td>Existence of Large Fishing Vessels</td>
<td>Intensification of support services from government agencies</td>
<td>Product/Process/Market</td>
</tr>
<tr>
<td>Insufficient Extension Support</td>
<td>Implementation of “No Fishing Period” to allow frigate tuna to spawn within Sogod Bay Areas; Venture on Fish Caging</td>
<td>Product/Process/Market</td>
</tr>
<tr>
<td>Low Supply</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 10. Quadrant of factors affecting optimum productivity of frigate tuna in barangay Triana, Limasawa, So. Leyte. (Source: Primary data sources (focus group discussion)

(“payao”) and large-scale fisherman were included in the MOTOR/LEVER quadrant since they are the main challenges faced by small scale fisherman in increasing of frigate tuna catch. Once these factors were regulated or controlled, fisherman’s desire to increase fish catch will be realized.

Similarly, fisherman in Brgys. Maac and Mahayahay also experienced various constraints in achieving a good catch of frigate
tuna. These include competition to large scale fisherman, sand and gravel mining, use of or very small-mesh nets “Baling”, poor fish aggregating devices (FADs) among small scale fisherman, fish poisoning, presence of floating artificial reef/ fish attractants and improper waste disposal among communities along Sogod Bay (Figure 11). Among these, poor fishing devices of small-scale fisherman’s fishing devices, large-scale competitors and sand and gravel mining are active elements in the motor/level quadrant. Once these constraints were addressed and sustainable solutions it would generate remarkable effect on increasing fresh frigate tuna catch within Sogod Bay.

Sand and gravel mining in the area affected fish tuna catch. Its operation caused fish resources in the Bay to decline. Accumulated fine sediment, mud and clay particles at the bottom of a river from the processing of sand are carried by water current into the Bay, resulting in siltation. Siltation destroyed biodiversity of the bay that cause unrest of sea creatures like corals, sea weeds, and fish species (e.g. sardinella, scad, and anchovies) fed by frigate tuna. The most influential element in motor/level was the presence of large-scale fisherman which competes the small scale fisherman. Large scale fishers were capable of fishing in open seas proximate of Sogod Bay reducing the entrance of frigate tuna into the bay.

Conclusion and Recommendation

Frigate tuna industry in Sogod Bay area is beset with various issues and constraints. These include the presence large scale fishers, illegal fishing, pollution and poor enforcement of fishing laws and regulations. These restrict the industry to become competitive and profitable to key players in the entire value chain and the poor and marginalised sector. With these, the following recommendations are suggested:

1. The Bureau of Fisheries and Aquatic Resources (BFAR) as well as the local government units (LGUs) must strongly implement the existing laws, rules and regulations in fishing as stated in
the Fisher’s Code of the Philippines. LGUs around the Sogod bay area and the Bureau of Fisheries shall strictly implement RA 8550, Chapter II, Section 18 (users of municipal waters) that authorizes or permits only small and medium commercial fishing vessels to operate within the ten point one (10.1) to fifteen (15) kilometer area from the shoreline. Value chain players can therefore equally share the benefits once the supply of frigate tuna is revitalized. This also encourage the participation of the poor and marginalised sector in attaining higher fish catch of fresh frigate tuna and establish stable markets for tuna later.

2. Organize fisherman into viable associations/cooperatives. Organizing fisherman into viable fisher-folks organization will provide benefits to all key players. This serves as channel for support services and the rights and privileges extended by national and local government agencies on appropriate technology, research, credit, production and marketing assistance, and other livelihood activities.

3. Conduct of information drive, trainings and seminars in marine ecosystem management. Seminars, information drives, trainings on preserving/rehabilitating the marine ecosystem must be provided to fisherman and other stakeholders in the Sogod Bay area. Once they equipped with knowledge they can be empowered to catalyze changes in the industry. Awareness on what is happening to the frigate tuna industry including its existing constraints and opportunities empowers them to improve the industry. The Bureau of Fisheries and Aquatic Resources (BFAR), and Department of Environment and Natural Resources (DENR) should spearhead this undertaking. Information drives must be directed towards increasing of fish catch within the Sogod Bay area.

4. Conduct trainings/seminars on new technologies to increase the CPE of frigate tuna. Fisherman must be trained on new technologies and empowered in developing strategies of catching frigate tuna. Institutions specializing on fishery industry must be tap to train these fisherman.

5. Develop products with high value adding potential. Exploring new potential markets (e.g. processing for fish products) shall be carried out when the volume of fish catch is revitalized.

References


