International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Optimum Quantity Supply Analysisof Tunaand Tuna-like Fisheries in Indonesia

Ateng Supriatna[a*], Budhi H Iskandar[b], Sugeng Hari Wisudo[c], Mulyono S Baskoro[d], Victor PH Nikijuluw[e]

[a] *Student of Post Graduate Program, Bogor Agricultural University, Bogor, Indonesia*

[b,c,d, e] *Lecturer of Department of Marine Fisheries, Bogor Agricultural University, Bogor, Indonesia*

e-mail: atengsupriatna@gmail.com

Abstract

The contribution of tuna and tuna-like fishery tend to increase if their quantity supply optimum of the products to the potential markets. The objective of this study is to analyze the optimum quantity supply of tuna and tuna-like products in Indonesia. The study conducted on October 2012 to September 2013 in the potential area of production of tuna and tuna-like in Indonesia (Bitung-North Celebes, Ternate-North Mollucas, Ambon-Mollucas, and Sorong-West Papua). Analysis of Economic Order Quantity (EOQ) applied to analyze the optimum quantity of tuna and tuna-like fisheries in every players to minimize the total cost (TC) periodically. The result shown that tuna and tuna-like players in potential area have to produce in optimum quantity and control the availibility. The optimum quantity of supply in Ternate and Sorong respectivelly occured 36,000 kg/order and 40,000 kg/order for fresh tuna, 30,000 kg/order and 40,000 kg/order for fresh mackerel, and 30,000 kg/order and 36,000 kg/order for fresh mackerel. Smoked fish of skipjack in average 263 kg/order (Bitung and Ternate), and for boiled mackerel 583 kg/order (Ambon and Sorong). Tuna loin was 26,667 kg/order (Bitung and Ambon), for katsuobushi 21,429 kg/order (Bitung) and 18,750 kg/ order (Ambon), sashimi in range of 20,000 packs/order (Bitung), and for canned tuna was approximately 30,000 cans/order (Bitung). The optimum quantities of supply for frozen tuna, mackerel, and skipjack in the potential areas (Ambon and Sorong) respectively were 68,571 kg/order, 60,000 kg/order, and 60,000 kg/order.

---

* Corresponding author.

E-mail address: atengsupriatna@gmail.com.

KeyWords: Tuna and tuna-like; optimum quantity supply; Economic Order Quantity

1. Inroduction

In Indonesia, fisheries resources particularly tuna and tuna-like are the potential and important for the development of national economy and people welfare (Indonesian Government Act. No. 31 of 2004 on Fisheries, as amended by Act No. 45 of 2009). The resources are expected to provide significant contributions to the provision of food security, especially for animal protein, as well as one important source of revenue in the potential production area. To utilize the resources for people welfare purposes, Indonesia promoting the policy to develop of tuna and tuna-like production and marketing.

In the country, tuna and tuna-like resources available in Banda sea, Mollucas, Flores, celebes, Indian ocean, Northern part of Papua, Norther part of Aceh, western part of Sumatera, southern part of Jawa, northern part of celebes, Tomini bay, dan Halmahera. The production of tuna and tuna alike in the country tend to increase annually [12].

Currently, tuna and tuna alike production develop in the country with several kind of products such as fresh, frozen, tuna loins, sashimi, smoked tuna, canned tuna, and boiled tuna which is produce in central fisheries area such as Bitung, Ternate, Ambon and Sorong. The products well developed in the area and tend to increase annually since 2009 to 2011 respectivelly from 945,121 to 974,011 ton [12]. Its activities contribute to the job creation and gain the people income. In general, the fisheries sector in Indonesia contribute a direct job of 5.35 million people and off site of fisheries reach to 10.7 million people [13].

The strong business competition impact of the globalization and the implementation of free trade change the business paradigm from comparative advantage to competitive advantage that forces the entrepreneur to operate the right strategies. Its phenomenon derives to the business players to refocus to the strategic position and adapted to the environment change. Its applied to the generally objectives of construction of the business entity [19]. The strong competition in tuna and tuna-like business implicated to the players to pay attention in every value chain in every step of production. This environment is force to the players to analyze the value chain.

Value chain analysis is to identify the strategies to create the differentiation through value development [15]. Furthermore, value chain analysis is a concept approach to improve the activities and to increase the value of products in maximum in the supply chain to the consumers [17]. The value of the products is reach to the high value if the quantity supply was optimum. In addition, according to the scientists, the general category of value chain is improvement of the activities in organization [1].

On the other hand, supply quantity and value chain depend on the condition and management due to the production and marketing as a main activity in value chain and guarantee the supply of the goods/materials in every chain at the end of the market destination. In the activity of tuna and tuna-like production, producers/fishermen/processors not only to supply that they have to produce but have to supply also the demand of the consumers [8]. In the other circumstance, supply and value chain analysis is the strategy to decrease the cost to improve the value of the products and the benefit with vertical and horizontal coordination [17].

The tuna and tuna-like fishery in the region can be increased if their quantity supply to the potential markets are optimum. Its condition not only the positive impact for regional revenue but also decreasing the total cost of the players that encourage the local producers and contribute to the stronger of the value chain of tuna and tuna-like fisheries in the region. The study conducted to analyze the optimum quantity supply of tuna and tuna-like products in Indonesia.

2. Methods

The study conducted on October 2012 to September 2013 in the potential area production of tuna and tuna alike (Bitung-North Celebes, Ternate-North Mollucas, Ambon-Mollucas, ans Sorong-West Papua). Primary and secondary data on value chain tuna and tuna-like fisheries in the region were collected to analyze. The primary data are related to the supply quantity of tuna and tuna-like fisheries activities which is consist of the demand, product's order, price, storage cost, products order per period (frequency), and booking fees (administration fee, communication, shipping, and other). The data collected by interviewing respondents that direct invole in tuna and tuna-like business (fishermen, fish processors, retailers, wholesalers/gatherers, and exporters), and indirect stakeholders, such as official government from Ministry of Marine Affairs and Fisheries, Department of Industry and Trade, Department of Transportation, and fisheries society. Number of respondents was approximately 5-10% of the total tuna and tuna-like players in every region. The secondary data were collected through literature review, studies related to the subject of assessment and reports activities at the relevant institutions.

Analysis of Economic Order Quantity (EOQ) applied to the players to analyze the optimum quantity of tuna and tuna-like fisheries to minimize the total cost (TC) in every periode. The order periode indicated weekly, monthly, and annually. It is considered necessary, for fisheries stakeholders (fishermen, processors, retailers, wholesalers/gatherers, and exporters) in each chain of tuna and tuna-like fisheries have better profits. In order, the supply chain becomes stable and develop. According to [4], the total cost is the sum of ordering costs (OC) and storage costs (holding costs or HC).

Ordering cost (OC) is the cost incurred for ordering tuna and tuna-like fishery products which covers the cost of administration, communication, shipping, etc. Ordering cost formulated by a mathematical equation:

$$OC = n.Co = (D / Q). CO$$

where:

OC = ordering cost per period (units/period)

n = frequency of tuna and tuna alike products orders per period (time/period)

Co = cost of each order frequency (IDR/times)

D = demand for tuna and tuna alike product per period (units/period)

Q = number of tuna and tuna alike products order (units/ time)

Storage cost (holding cost/HC) represents cost incurred for ordering tuna and tuna-like products which includes the interest on the invested money, the cost incurred for the modernization of machinery and equipment, the cost for preparing the room, security and insurance costs, etc. Storage cost (holding costs/HC) formulated by the following mathematical equation:

$$HC = (Q / 2) .p.Ch$$

where:

HC = holding costs or storage costs (IDR/period)

Q / 2 = average of tuna and tuna alike products order (units)

p = price of tuna and tuna-like product order (IDR/unit)

Ch = cost of holding for the tuna and tuna-like products before being released to the next market (% of orders per period)

The total cost (TC) incurred by any fisheries stakeholders in each chain of tuna and tuna-like fishery can be formulated by a mathematical equation:

$$TC = OC + HC$$

The quantity of tuna and tuna-like product supply which causes total cost per period of issuance to be minimum (cheapest) or called the optimum quantity of supply (Q *) formulated by the mathematical equation as follows:

$$Q^* = \sqrt{(2D.Co/p.Ch)}$$

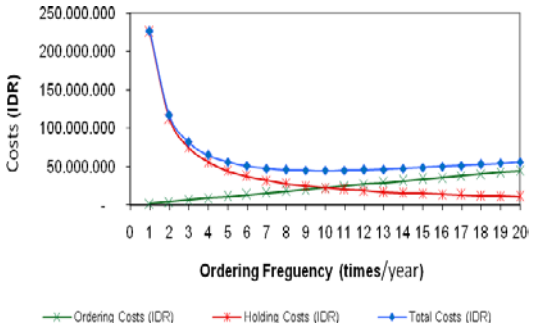
3. Results and Discussions

3.1 Results

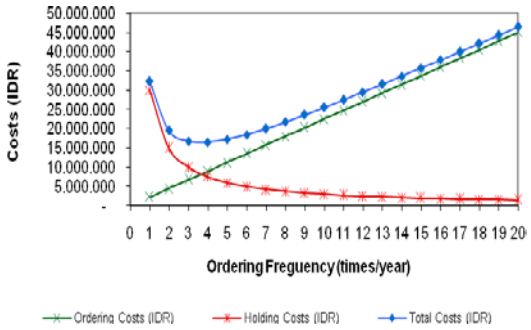
In Indonesia, fresh tuna and tuna-like are not only demanded by public consumers, but also as a raw material of processing plant. The fish produce by fisherimen in the region seasonally. The analysis of the relationship between the order frequency with cost that affected the optimum quantity of supply for fresh tuna and tuna-like products in potential areas are important for sustainable of business (Figure 1).

Occording to this finding, the ordering cost (OC) and holding cost (HC) were intersected at a specific frequency order. This condition occurred to the minimum of annual total inventory cost (TC), and optimum supply quantity of fresh tuna and tuna-like products. In fresh tuna products activity, the total inventory cost (TC) minimum when the order frequency was 10 times/year (TC = IDR 45 million) in Ternate and 9 times/year (TC =

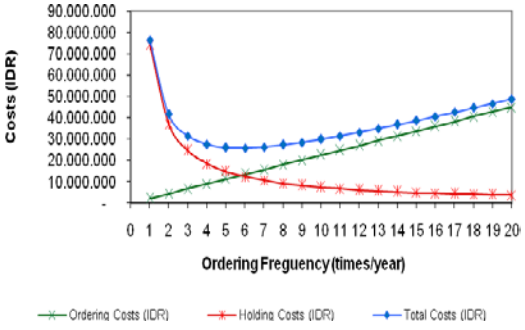
IDR 48.4 million) in Sorong. The result assessment obtained optimum quantity of supply (Q *) for fresh tuna products in Ternate and Sorong approximatelly 36,000 kg/order and 40,000 kg/order respectively.



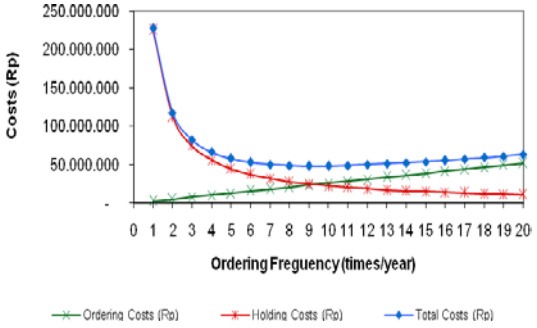
(a) Fresh Yellow-Fin Tuna in Ternate



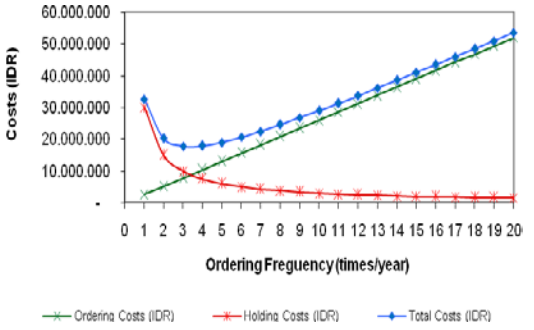
(b) Fresh Mackerel in Ternate



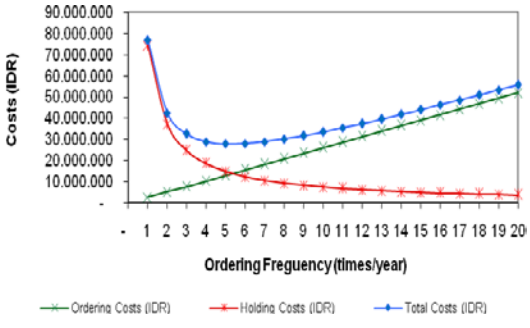
(c) Fresh Skipjack in Ternate



(d) Fresh Yellow-Fin Tuna in Sorong



(e) Fresh Yellow-Fin Tuna in Sorong



(f) Fresh Skipjack in Sorong

Figure 1: Relationship of order frequency and cost which affected the optimum quantity of supply of fresh tuna and tuna-like products

The optimum quantities of supply for mackerel products, in the range of 30,000 kg/order in Ternate and 40,000 kg/order in Sorong that obtained when the frequency of each order 4 times/year (TC = IDR 16.5 million) in

Ternate, and 3 times/year (TC = IDR 17.8 million) in Sorong. Continuing for fresh skipjack tuna products, its optimum quantity of supply 30,000 kg/order in Ternate, and approximatelly 36,000 kg/order in Sorong that obtained when the frequency of each order 6 times/year (TC = IDR 25,875,000) in Ternate, and 5 times/year (TC = IDR 27.85 million) in Sorong. Currently, the total inventory cost incurred by the tuna and tuna-like fisheries business, both for fresh mackerel product, and the fresh skipjack tuna is high. Its phenomenon due to the supply of tuna and skipjack mainly conducted in small scale, while the costs remain similar. In the future, the businesses have to grouped into fresh mackerel and skipjack product delivery that the quantity supply of products can be optimized each time, and the delivery frequency more frequent.

3.1.1 Supply Quantity of tuna and tuna-like Products for Household Scale

In Eastern part of Indonesia, bussiness of tuna products dominated run in household-scale such as smoked skipjack, and boiled mackerel. Potential areas for smoked skipjack are Bitung and Ternate, in order the potential areas of boiled mackerel are Ternate and Ambon. The order frequency and cost are affected the optimum quantity of supply for smoked skipjack and boiled mackerel products in the potential areas (Figure 2).

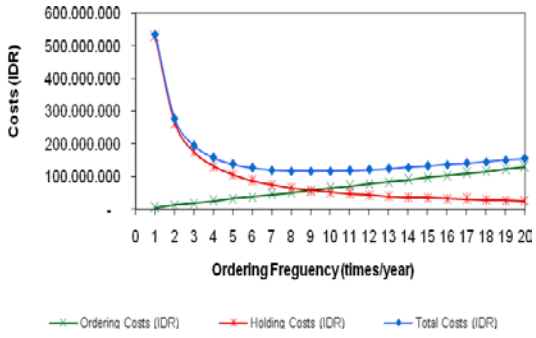
Optimum supply quantity of smoked skipjack occured when the order frequency 4 times/week in Bitung and Ternate with the total supply 263 kg/order. Total inventory cost and total inventory cost occurred minimum respectivelly when order frequency 4 times/week the cost of IDR 826,563 in Bitung, and IDR 906,563 in Ternate.

The optimum quantity of supply (Q *) of boiled mackerel was 583 kg/order, both in Ambon and Sorong, obtained when the frequency of order 3 times/week. Its affected the weekly total inventory cost (TC) minimum in both potential areas respectively, i.e. IDR 376,667, and IDR 361,667.

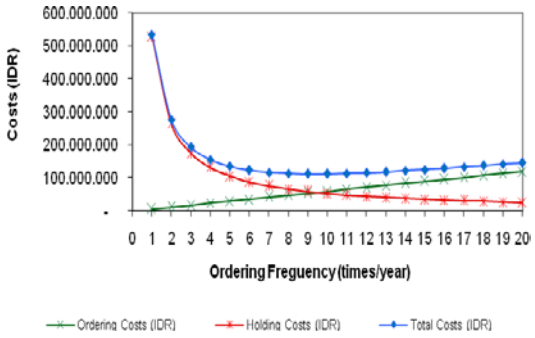
3.1.2 Supply Quantity of tuna and tuna-like Products for Industrial Scale

Among eight tuna and tuna-like products produced in Eastern part of Indonesia, tuna loin, katsuobushi, canned tuna, sashimi, and frozen tuna and tuna alike were produced at industrial scale. The tuna and tuna-like products are widely intended to meet large-scale demand by local, regional and international consumers. Tuna loin and katsuobushi were potentially produced in Bitung and Ambon, sashimi and canned tuna in Bitung, while frozen tuna and tuna alike in Ambon and Sorong.

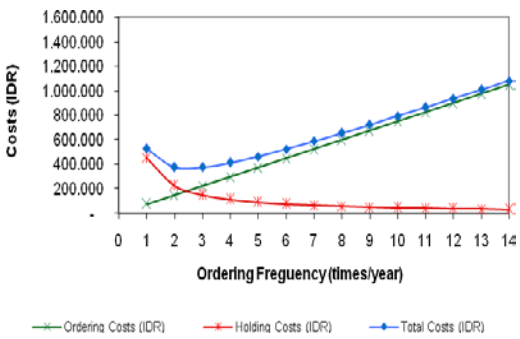
Each potential area has characteristics and particular strategic value in the distribution and ordering of products due to the total inventory cost indirectly determine the optimum quantity of supply for tuna and tuna-like product. Its obtained that the relationship between frequency and cost which affects the optimum quantity of supply of tuna loin products, katsuobushi, canned tuna and sashimi occurred in the region. The optimum quantity supply of tuna loin (Q *) 26,667 kg/order, both in Bitung and Ambon, obtained when the order frequency 9 times/year. furthermore, its order frequency incentive to the total annual inventory cost for tuna loin to the minimum approximatelly IDR 117,242,000 and IDR 112,742,000 in Bitung and Ambon, respectively.



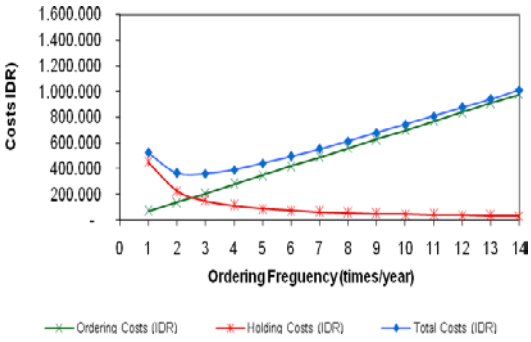
(a) Smoked Skipjack in Bitung



(b) Smoked Skipjack in Ambon



(c) Boiled Mackerel in Ambon



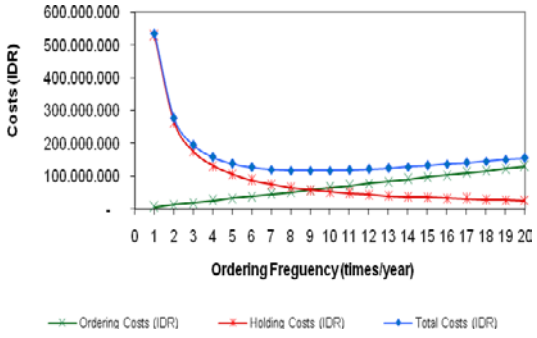
(d) Boiled Mackerel in Ternate

Figure 2: Relationship between order frequency and cost which affects the optimum quantity of supply of smoked skipjack and boiled mackerel.

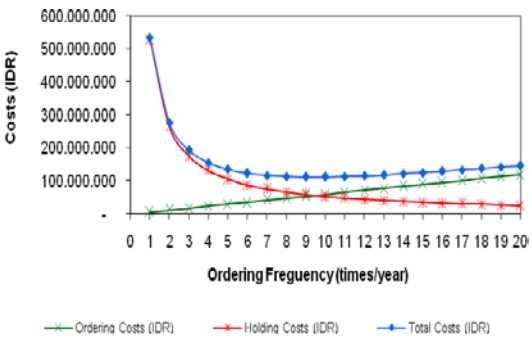
The optimum quantity supply of katsuobushi are 21,429 kg/order in Bitung, and 18,750 kg/order in Ambon. The optimum quantity of supply occurred when order frequency 7 times/year in Bitung, and 8 times/year in Ambon (Figure 3) that indicated the minimum of total annual inventory cost (IDR 49.7 million and IDR 46.968.750, respectively in Bitung and Ambon). While for sashimi product, its optimum quantity of supply (Q *) in the potential area (Bitung) approximatelly 10,000 kg/order or 20,000 pack/order (1 pack = 500 g) (Appendix 17), which occured at an order frequency 6 times/year. At this frequency, the annual total inventory cost (TC) for sashimi product would be minimum (IDR 28.17 million). In order for canned tuna product, its optimum quantity of supply (Q *) in Bitung 3,000 kg/order or 30,000 cans/order (1 can = 100 g), occured at an order frequency 8 times/year (T = IDR 30.175 million) .

The frozen tuna and tuna-like products provided by the fishery in the potential areas (Ambon and Sorong) are frozen tuna, frozen mackerel and frozen skipjack. The analysis result of the order frequency relationship with cost which affects the optimum quantity of supply for the frozen tuna and tuna alike in the potential area is presented in Figure 4. According to this finding, the order frequency of frozen tuna led to a minimum total

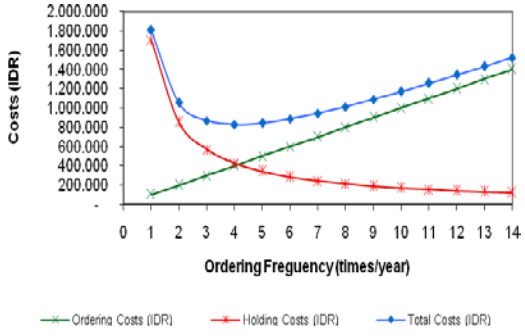
inventory cost (TC) when the optimum quantity of supply was 7 times/year. In this order frequency, the optimum quantity of supply (Q *) of frozen tuna in the potential areas become 68,571 kg/order, while the annual total inventory cost (TC) become IDR 109,071,429 in Ambon, and IDR 112,571,429 in Sorong.



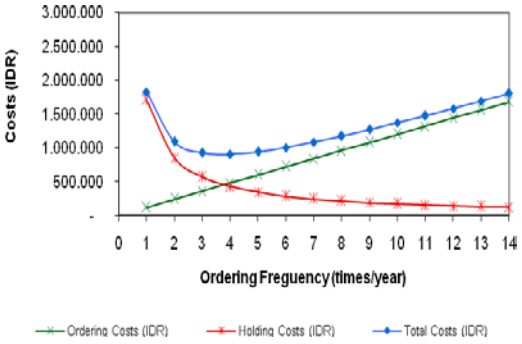
(a) Tuna Loin in Bitung



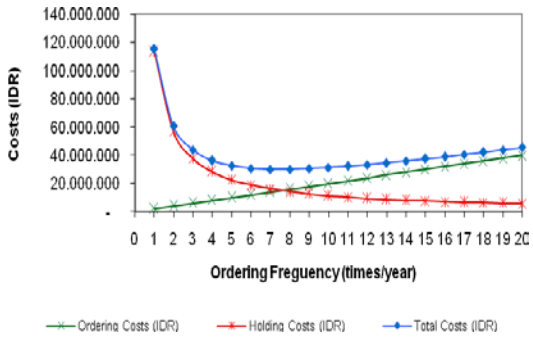
(b) Tuna Loin in Ambon



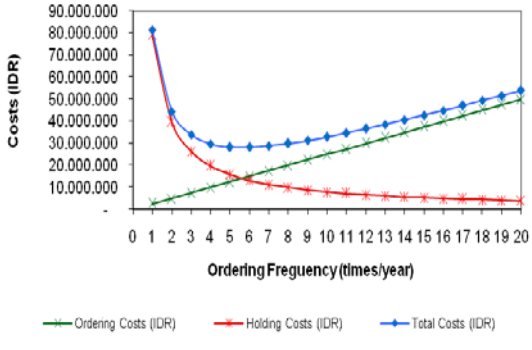
(c) Katsuobushi in Bitung



(d) Katsuobushi in Ambon

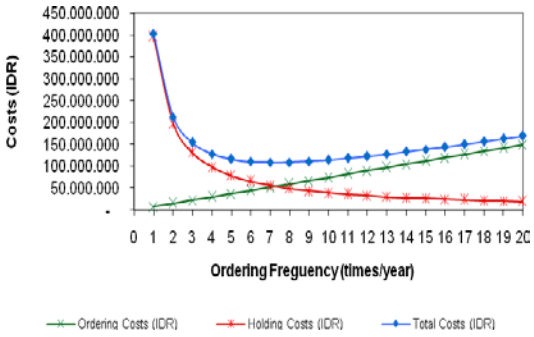


(e) Canned Yellow-Fin Tuna in Bitung

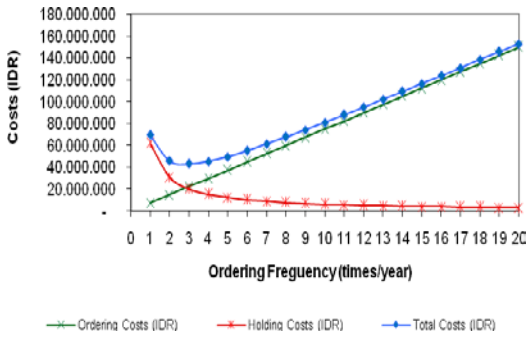


(f) Sashimi in Bitung

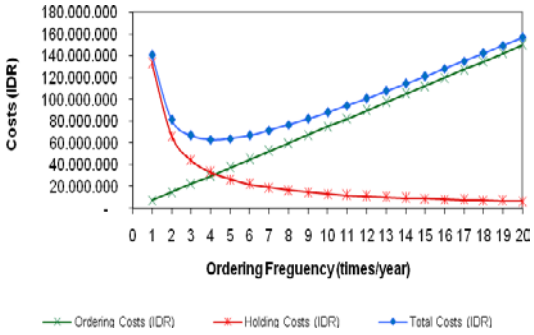
Figure 3: Relationship between order frequency with cost that affected the optimum quantity supply of tuna loin products, katsuobushi, canned tuna and sashimi.



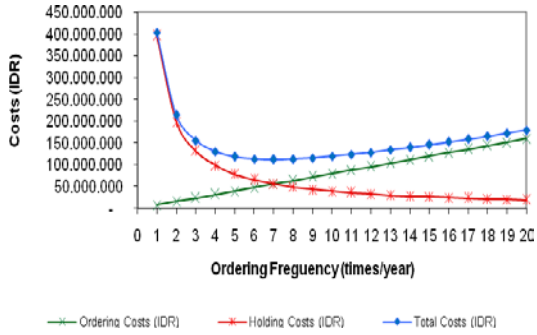
(a) Frozen Yellow-Fin Tuna in Ambon



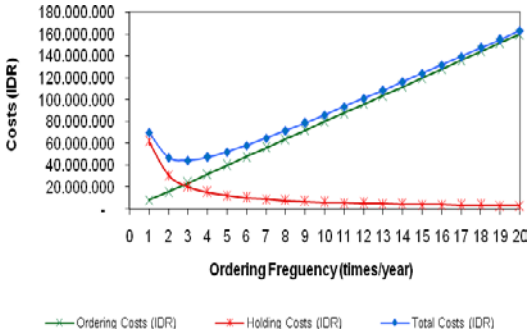
(b) Frozen Mackerel in Ambon



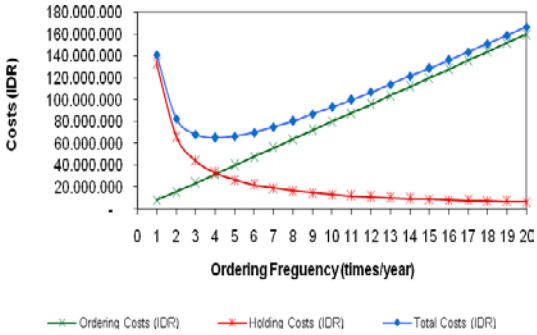
(c) Frozen Skipjack in Ambon



(d) Frozen Yellow-Fin Tuna in Sorong



(e) Frozen Mackerel in Sorong



(f) Frozen Skipjack in Sorong

Figure 4: Relationship between order frequency and cost that affects the optimum quantity of supply for frozen tuna and tuna-like products

For frozen mackerel product, its optimum quantity of supply 60,000 kg/order, both in Ambon and Sorong, occurred at an order frequency of 3 times/year, with minimum annual total inventory cost (TC), i.e. IDR 43.2 million in Ambon, and IDR 44.7 million in Sorong. The optimum quantity of supply (Q *) for frozen skipjack

product also about 60,000 kg/order in two potential areas. However, the value of Q * occured at a higher frequency (4 times/year), thus, makes the total inventory cost (TC) for frozen skipjack product annually become IDR 63.3 million and IDR 65.3 million in Ambon in Sorong, respectively.

3.2 Discussion

3.2.1 Urgency of tuna and tuna alike Products Supply Quantity

The optimum quantity of supply is important in establishing a value chain of tuna and tuna-like products. Its supply quantity to guarantee the availability of products in every value chain and to minimize total cost of inventory to fullfill the market demand and gain the margin of the players. In production and marketing level, the optimum supply is required both in production and marketing, and as performance determinant of the business [10]. In production side, raw materials supply affected the performance of the production line that less supply will decrease the performance of production. Opposite, over supply of raw material increasing production cost (storage cost). Furthermore, on marketing activities, the optimum supply of products will ensure the availability of products in the market, minimize the shipping costs/marketing, and competitive prices.

Tuna and tuna-like players in potential area have to produce in optimum quantity and control the availibility. According to the researcher, the optimum quantity of supply not only direct benefit to the players but also to ensure the availability of the products in the markets and the subsequent fishery businesses chain can meet optimum raw material, particularlly for fresh tuna supply [16]. In Ternate and Sorong, fresh tuna supply obtained at the number of 36,000 kg/orders and 40,000 kg/order with order frequency respectivelly 10 times /year, and 9 time/ years. In order, its optimum supply of raw material indicated to minimize the total inventory cost to IDR 45 million and IDR 48.4 million respectivelly in Ternate and Sorong. Meanwhile, if supply quantity increase by half, the total annual inventory cost occured higher at IDR 56.25 million in Ternate and IDR 58 million in Sorong. Furthermore, if the supply volume reduced by half, the total annual inventory cost also tend to increase to IDR 48.75 million in Ternate and IDR 52,471,429 in Sorong. The phenomenon of increasing of the total annual invetory cost when the supply increase or decrease have to avoid by the players to maintain their business.

The fluctuation of the quantity of fresh fish products supply directly affected the income of fishermen, the cost of raw materials ordered by the processing business (household and industrial), retailers, wholesalers/collectors and exporters [3 and 5]. For large trader/collector and exporter, change in the quantity of supply increase the storage cost of products (due to the time uncertainty), shipping cost, and decrease consumer trust. It is related to requirement from industries sector that implement the standard not only on product quality but also continuity on raw materials and products. To maintain the business environtment on tuna and tuna-like, the government have to support and provide the access of the palyers to optimum supply quantity in every level of marketing chain such as licence, infrastructure, and retribution tariff or costs proportionally.

In household business scale, the optimum supply quantity of smoked tuna was obtained on 263 kg/order and order frequency 4 times/week to maintain the weekly total inventory cost (TC) in the range IDR 826,563 and

906,563 respectivelly in Bitung and Ternate. Furthermore, the optimum supply quantity of boild mackerel in both area maintain at the level 583 kg/order with the frequency 3 times/week. Its supply decreasing the total inventory cost to minimum (IDR 376,667 and 361,667). The condition stated that small businesss/domestic scale are generally easily influenced by product market conditions, and weak position in product pricing [9]. The conditon pursue the government to contribute special attention to small business to increase their bargaining position in tuna and tuna alike marketing chain. In this situation, the government have to guarantee of the market of small scale business through promotion, minimum price, and quality assurance [11].

Contrary in industrial-scale fisheries, the small fluctuation in the number of poduction siginificantly affected the total cost. Their strong position in pricing of product not affected on increasing total cost that occured. In industrial scale, if supply the frozen tuna only 64% from optimum supply quantity, their total annual inventory cost increase sharply to IDR 124,000,000.00. its cost not include labor and other operational cost. Approximately 65 to 68% of the fishing industry in the country are active in the fishing season (5-8 months) [7 and 14]. When off season, some of production line will stop operation but maintenance cost run as ussually to maintain the performance of their machinery. It remain not only on the production line, its condition affected also to suspend the labor activities.

Its phenomenm indicated that the optimum quantity of the product supply is necessary to pursued and supported by all parties in accordance with their position and role to avoid the loss and the value chain of tuna and tuna alike in the region contribute to the local economy. Its contribution related to the increasing of the contribution of fisheries sector is by developing a strong marketing network in each potential fishery area, accompanied by sufficient infrastructure and access amenity to the capital for small scale [3 and 18]. And its contribution stresed that the number of fishermen, processors, and retailers who are engaged in tuna and tuna-like fisheries in the region approximatelly 88-91% of the total fishery stakeholders in the country [2 and 6]. Business sustainability of tuna and tuna-like fisheries in assessment area tend to develop to support the value chain.

4. Conclusion

The optimum quantity of supply in Ternate and Sorong respectivelly occured 36,000 kg/order and 40,000 kg/order for fresh tuna, 30,000 kg/order and 40,000 kg/order for fresh mackerel, and 30,000 kg/order and 36,000 kg/order for fresh mackerel. Smoked fish of skipjack in average 263 kg/order (Bitung and Ternate), and for boiled mackerel 583 kg/order (Ambon and Sorong). Tuna loin was 26,667 kg/order (Bitung and Ambon), for katsuobushi 21,429 kg/order (Bitung) and 18,750 kg/ order (Ambon), sashimi in range of 20,000 packs/order (Bitung), and for canned tuna was approximately 30,000 cans/order (Bitung). The optimum quantities of supply for frozen tuna, mackerel, and skipjack in the potential areas (Ambon and Sorong) respectively were 68,571 kg/order, 60,000 kg/order, and 60,000 kg/order.

Tuna and tuna-like fisheries in the region continued to develop and contribute to the local economy and people welfare improvement when their optimum quantity supply sustain and the number of the products maintain available in all season.

References

[1] Andri, K.B. 2009. Pengantar Pemahaman SCM dan VCA Komoditas Pertanian. Bahan Lokakarya Value Chain Analysis (Analisis Rantai Nilai) Tanggal 5 – 7 Juni 2009 di Mataram, NTB. Badan Litbang Pertanian.

[2] Bintoro, G. 1995. Tuna Resources In Indonesia's Waters : Status, Possible Management Plan, and Recommendations for The Regulation of Fishing Effort. Hull University. Hull England. M.Sc Dissertation. Unpublished.

[3] Dobrzykowski, D.D,, Bhattacharya, S. and Chakraborty, S. 2014. Impact of Supply Chain Collaboration on Value Co-creation and Firm Performance: A Healthcare Service Sector Perspective. Procedia Economics and Finance, Vol 11 : 676-694.

[4] Gaspersz. V, 1992. AnalisisSistemTerapanBerdasarkanPendekatanTeknikIndustri. PenerbitTarsito, Bandung.

[5] Guillotreau, P and Toribio, R.J. 2011. The price effect of expanding fish auction markets. Journal of Economic Behavior & Organization, Vol 79 (3) :211-225.

[6] Hasanuddin, A. 2012. ProspektifIndustrialisasi Tuna di SulawesiTengah. Gaviglio, A, Demartini, E,Mauracher, C, andPirani, A. Consumer perception of different species and presentation forms of fish : An empirical analysis in Italy. Journal of Food Quality and Preference, Vol36 (1) : 33-49.

[7] Kekenusa, J.S. 2006. AnalisisPenentuanMusimPenangkapanIkanCakalang (*Katsuwonuspelamis*) Di PerairanSekitarBitung Sulawesi Utara. JurnalProteinVol 3 (1) : 103-109. Univ. Sam Ratulangi.

[8] Kindangen, J. G dan Bachtiar, M. 2012. Penerapan Analisis Rantai Nilai (*Value Chain Analysis*) Dalam Rangka Akselerasi Pembangunan Sektor Pertanian Di Sulawesi Utara. Prosiding Seminar Regional Inovasi Teknologi Pertanian, mendukung Program Pembangunan Pertanian Propinsi Sulawesi Utara. Hal 196 – 207.

[9] Liao, S.H and Kuo, F. 2014. The study of relationships between the collaboration for supply chain, supply chain capabilities and firm performance: A case of the Taiwan′s TFT-LCD industry. International Journal of Production Economics, Vol : 156 : 295-304.

[10] Long, L.K, O. Flaaten, and N.T.K. Anh. 2008. Economic Performance of Open-Access Offshore Fisheries-The Case of Vietnamese Longliners in The South China Sea. Journal of FisheriesResearch, Vol. 93 (3) : 296-304.

[11] Makino, M, Matsuda, H, danSakurai, Y. 2009. Expanding Fisheries Co-management to Ecosystem-Based Management : A case in the Shiretoko World Natural Heritage Area, Japan. Journal of Matine Policy, Vol 33 (2) : 207 – 214.

[12] Ministry of Marine Affairs and Fisheries Republic of Indonesia (MMAF). 2012a. Statistik Perikanan Indonesia Tahun 2011.Jakarta

[13] Ministry of Marine Affairs and Fisheries Republic of Indonesia (MMAF). 2012b. SumberDayaPerikanansebagaiTulang Punggung Perekonomian Indonesia. http://ekonomi. kompasiana.com/agrobisnis/2012/06/16/sumber-daya-perikanan-sebagai-tulang-punggung-perekonomian-indonesia/

[14] Nurhakim, S. 2007. Status Perikanan Menurut Wilayah Pengelolaan. Pusat Riset Perikanan Tangkap Badan Riset Kelautan dan Perikanan Departemen Kelautan dan Perikanan. Jakarta

[15] Raras, A.T.S. 2009. Menjadi Manager Sukses, Melalui Empat Aspek Perusahaan. Alfabeta Press. Bandung.

[16] Selvarajah, E, Caron, R.J, dan Ashtab, S. 2014. A Binary Quadratic Optimization Model for Three Level Supply Chain Design. Elsevier, Vol 17 : 635 – 638.

[17] Stringer, R. 2009. Value Chain Analysis. Workshop Value Chain Analysis Tanggal 5 -7 Juni 2009 di Mataram NTB. Badan Litbang Pertanian.

[18] Tunner, R.K. 2000. Integrating Natural and Social-Economic Science in Coastal Management. Journal of Marine Systems, Vol. 25 p 447-460

[19] Wandarso, D. 2012. Pola Pengembangan Investasi Perikanan Ekonomis Penting di Kendari. STP Jakarta. Jakarta.