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Determination of Fisheries Production Centers

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Abstract---*Indonesian fisheries production in 2014 reached 20.72 million tons, consisting 6.72 million tons of capture fisheries production and 14.52 million tons of aquaculture production. Fish production centers depend highly on the support of the surrounding production areas, especially in the aspects of supply and demand. The production center acts as a counterweight to the supply chain system. Since the production center serves for the surrounding areas, the availability of storage and transportation infrastructure is very necessary in order to ensure the stable price of fish products for consumers. The study produced recommendations for production centers, namely: Medan City, Kab. Pemangkat, Kab. Indramayu, Kab. Pati, Surabaya City, Mataram City, Kab. Banggai, Makassar City, Bitung City, Ambon City. Sorong City, and Tual City.*

Index Terms---*production center, fish logistics, supply chain.*

I. Introduction

Marine and fisheries resources, besides being potential as the main drivers of the national economy, are also the main food sources intended for human consumption. Indonesia was ranked 2nd for capture fisheries production and ranked 4th for aquaculture production in the world in 2012 (1).

Fisheries production in 2014 reached 20.72 million tons, consisting 6.72 million tons of capture fisheries production and 14.52 million tons of aquaculture production (including seaweed).

This fact can provide an illustration that Indonesia's fisheries potential is very large. Therefore, if managed properly and responsibly, its activities can be sustainable and can be one of the main sources of development in the present and the future.

In order to guarantee the procurement, storage, transportation, and distribution of fish and fishery products for the consumption needs of the community and the fish processing industry, the Ministry of Marine Affairs and Fisheries stipulates Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia Number 5/Permen-KP/2014 concerning the National Fishery Logistics Systems (SLIN). SLIN is a fish supply chain management system and fisheries products as well as information ranging from procurement, storage, transportation to distribution, as a unity of policies to increase capacity and stabilize the upstream-downstream fisheries production system, control disparity and price stabilization, and to meet the needs of domestic consumption. SLIN management is at the production center and/or collection center and distribution center (2).

The production center acts as a counterweight to the existing supply chain system. Therefore, it is expected that the purchase price at the producer level will increase and the selling price at the consumer level is more stable. The success of a fish production center is very dependent on the support of the surrounding production areas, especially in the aspects of supply and demand. Since the production center will serve for the surrounding areas, the availability of storage and

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transportation infrastructure is very necessary to ensure the stable price of fish products for consumers.

In this regard, it is necessary to study the Analysis of Fisheries Production Centers in 20 locations. The results of this study will be used as material for government input in developing policies for supporting facilities and infrastructure for fish availability in production centers.

II. The Method to Locating production Center

The determination of the production center location is carried out using analysis criteria consisting of: the depth of the port pool, the production volume of the district/city, the provincial production volume, and the installed capacity of the Fish Processing Unit (UPI).

The next step is the analysis phase, which consists of: identifying the analysis criteria, determining the analysis criteria/parameters to be used, determining the parameter weight, determining the parameter value interval, determining the score, determining the value, and drawing conclusions and recommendations.

III. Analysis of The Location of production Center

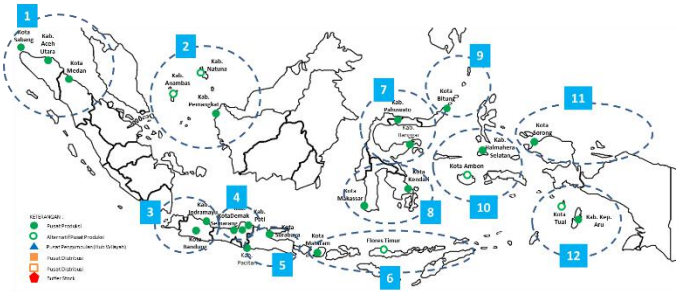

Fig. 1: The mapping of the location of fishery production center

Criteria and principles of proposed analysis location of production centers are seen from several points, including:

- Location in the production area
- Location far from the consumption area.
- The volume of needs at the site is slightly or much lower than the volume of needs.
- Fluctuations in site requirements are low.
- Adequate transportation infrastructure (ports, highways, etc.) available

The principles of production center analysis include:

- Analysis of proposed production center locations is done by grouping adjacent production center locations (clustering).
- For an area where there is only one proposal or alternative production center location, the analysis is also carried out on several locations outside of the proposal given.

As for some criteria for assessing the location of production and distribution centers, include:

TABLE 1: PORT

Parameter	Interval	Score	Explanation of Parameter Interval Determination
Pool depth (draft)	<6m 6-9m 9-12m 12-15m >15m	2 4 6 8 10	Determination of interval based on the depth of the local port pool between the highest and lowest

TABLE 2: PRODUCTION

Parameter	Interval	Score	Explanation of Parameter Interval Determination
District/ City Consumption	<30.000 30.000-60.000 60.000-90.000 90.000-120.000 >120.000	2 4 6 8 10	Determination of intervals based on the highest and lowest number of production City/District.
Provincial Production	<200.000 200.000-300.000 300.000-400.000 400.000-500.000 >500.000	2 4 6 8 10	Determination of intervals based on the highest and lowest production amounts of the Province.

TABLE 3: CONSUMPTION

Parameter	Interval (kg/kapita/year)	Score	Explanation of Parameter Interval Determination
District/ City Consumption	<20 20-40 40-60 60-80 >80	2 4 6 8 10	Determination of intervals based on the level of consumption of fish from the highest and lowest cities.

TABLE 4: UPI CAPACITIES

Parameter	Interval (ton/year)	Score	Explanation of Parameter Interval Determination
Province	<120.000 120.000-240.000 240.000-360.000 360.000-480.000 >480.000	2 4 6 8 10	Determination of intervals based on the installed capacity of the province's highest and lowest fish UPI.

Analysis of Cluster 1

Based on the three proposed production centers (Sabang City, North Aceh District, and Medan City), the most suitable location to be a production center is Medan City, for these reasons:

- Based on the production data of the province, the production of North Sumatra Province is 484,313 tons (score = 8) that is much higher than Prov. Aceh with 157,944 tons (score = 2)
- Based on production data per region, Medan City's production is 104,289 tons (score = 8) that is far higher than Sabang City with 7,339 tons (score = 2) and Aceh Utara Regency with 11,526 tons (score = 2)
- Based on consumption data, Medan City consumption is 35.25 kg/capita/year (score = 4)
- UPI installed capacity in North Sumatra Province is 97,320 tons (score = 2)
- Ports in Medan City, namely Belawan, is more modern and it serves containers for domestic & export/import purposes. Belawan Port connects the city of Medan to Indonesia's major cities and several neighboring countries.

Cluster Analysis 2

Based on the three proposed production centers (Pemangkat Regency, Natuna, and Anambas Regency), the most suitable location to be a production center is Pemangkat Regency, for these reasons:

• Based on the province's production data, the production of West Kalimantan Province is 206,156 tons (score = 4) higher than the Riau Islands Province production data of 139,331 tons (score = 2).

• Based on production data per region, Pemangkat Regency's production is 37,249 tons (score = 4), higher than Natuna Regency's 22,269 tons (score = 2) and Anambas Regency's 21,940 tons (score = 2)

• Based on Pemangkat Regency's rank is 35.12 kg/capita/yr (score = 4)

• UPI installed capacity in West Kalimantan Province is 4,350 (score = 2)

• Have a port with facilities that can be passed by large ships

• It has an Archipelago Fishery Port, namely VAT Pemangkat as a fishery center that has several advantages, namely:

1. Strategic location, close to Fishing Ground (South China Sea, Natuna) and close to marketing areas (Pontianak, Sarawak (Cats) and Batam);

2. Directly adjacent to Malaysia, Singapore, Thailand and Vietnam;

3. Land access that can connect directly with Malaysia (Sarawak) and Brunei Darussalam;

4. Is the Core Zone of the Minapolitan District Sambas;

Analysis of Cluster 3

Based on the two proposed production centers (Indramayu Regency, and Bandung City) the most suitable location to be a production center is Indramayu Regency, for these reasons:

• Based on the provincial production data, the production of West Java Province is 206,156 tons (score = 4)

• Based on production data per region, the production of Indramayu Regency 126,784 tons (score = 10)

• Based on consumption data, Indramayu Regency's consumption is 23.17 kg/capita/yr (score = 2)

• UPI installed capacity in West Java Province is 94,030 tons (score = 2)

• The location of Indramayu Regency which is directly adjacent to the Java Sea is compared with Bandung, as well as land access along the north coast of Java.

• Kab. Indramayu has a lot of Offshore Fish Base (PPI) Ports (14 PPI) compared to other cities in West Java.

Analysis of Cluster 4

Based on the findings of this research, amongst the three proposed production centers, the most suitable location to be a production center is Pati Regency, for these reasons:

• Based on the province's production data, the production of Central Java Province is 242,072 tons (score = 4)

• Based on production data per region, production of Pati Regency is 22,585 tons (score = 2)

• Based on consumption data, Pati Regency's consumption is 27.40 kg/capita/yr (score = 4)

• UPI installed capacity in Central Java Province is 2,400 (score = 2)

• It has a class III port that allows it to accommodate the production of this area

• Regencies bordering the Java Sea to the north, Rembang Regencies to the east, Blora Regencies and Grobogan Regencies to the south, and Kudus Regencies and Jepara Regencies to the west

Analysis of Cluster 5

Based on the two proposals in East Java, Pacitan Regency is more suitable as a production center compared to Surabaya, for these reasons:

• Based on the province's production data, the production of East Java province is 385,878 tons (score = 6), higher than the production in Central Java which is 242,072 tons (score = 4) and Prov. West Java 206,156 tons (score = 4).

• Based on production data per region, production data of Pacitan Regency is 8,000 tons (score = 2) higher than Surabaya City 7,803 tons (score = 2)

• Based on the consumption data, Surabaya City consumption is 24.50 kg/capita/year (score = 2)

• UPI installed capacity in East Java Province 578,650 tons (score = 10)

Analysis of Cluster 6

Based on the two proposed production centers (Mataram City and East Flores Regency), the most suitable location to be a production center is Mataram City, for these reasons:

• Based on the provincial production data, the production of West Nusa Tenggara Province is 227,084 ton (score = 4), higher than production in East Nusa Tenggara Province with 111,415 tons (score = 2)

• Based on production data per region, the city of Mataram produced 1,673 tons (score = 2)

• Based on consumption data, Mataram City consumption is 27.03 kg/capita/year (score = 4)

• The installed capacity of UPI in NTB Province is 40,860 tons (score = 2)

• Located between West Lombok Regency and the Lombok Strait.

• It has a large port, Gili Mas Port to accommodate large ships (can distribute to a number of regions in Nusa Tenggara).

Analysis of Cluster 7

Based on the two proposed production centers (Pahuwato Regency and Banggai Regency), the most suitable location to be a production center is Banggai Regency, for these reasons:

• Based on the province's production data, the production of Central Sulawesi Province is 263,887 tons (score = 4), higher than production in Gorontalo Province 102,534 tons (score = 2)

• Based on production data per region, production of Banggai Regency is 21,094 tons (score = 2), higher than the production data of Pahuwato Regency 16.604 tons (score = 2).

• Based on the consumption data, Banggai Regency's consumption is 36.91 kg/capita/yr (score = 4)

• UPI installed capacity in Central Sulawesi Province is 5,100 tons (score = 2)

• Location Directly adjacent to Tomini Bay to the north, Tolo Bay to the south, Peling Strait to the west, and Maluku Sea to the east

Analysis of Cluster 8

Based on the two proposed production centers (Makassar City and Kendari City), the most suitable as a production center is Makassar City, for these reasons:

•Based on production data, the production of South Sulawesi Province is 287,897 ton (score = 4) which is higher than production in Southeast Sulawesi Province that is 150,588 tons (score = 2).

- Based on production data per region, the production of Makassar City is 12,481 tons (score = 2)
- Based on the consumption data, Makassar City' consumption is 39.10 kg/capita/year (score = 4)
- UPI installed capacity in South Sulawesi Province is 7,800 tons (score = 2)
- It has the Soekarno-Hatta Port of Makassar, which has 6 docks, Container Terminal services, domestic & export/import (connecting the city of Makassar with Indonesia's major cities and several neighboring countries)

Analysis of Cluster 9

Bitung is chosen as a production center, for these reasons:

•Based on provincial production data, North Sulawesi Province's production is 295,204 tons (score = 4), higher than production in Central Sulawesi Province 263,887 tons (score = 4), South Sulawesi 287,897 tons (score = 4), and Southeast Sulawesi 150,588 tons (score = 2)

- Based on production data per region, Bitung City's production is 142,627 tons (score = 10)
- Based on the consumption data, Bitung City's consumption is 49.10 kg/capita/year (score = 6)
- The installed capacity of UPI in North Sulawesi Province is 380,878 tons (score = 8)
- Bitung Port consists of a passenger port and container port, and is the only port in North Sulawesi that is visited and anchored by passenger ships between major cities in Indonesia and International (International East Gate).

Analysis of Cluster 10

Based on the two proposed production centers (Ambon and South Halmahera), the most suitable location to be a production center is Ambon City, for these reasons:

•Based on the province's production data, the production of Maluku Province is 538.121 tons (score = 2), which is higher than the production of North Maluku Province 218,097 tons (score = 2).

- Based on production data per region, Ambon City's production is 150,211 tons (score = 10), which is higher than the production of South Halmahera Regency that is 48,059 tons (score = 4).
- Ambon City consumption is 50.56 kg/capita/year (score = 6)
- UPI installed capacity in Maluku Province is 95,940 tons (score = 2)
- Maluku Province is planned to be the National Fish Barn 2030, considering that Maluku Province is a maritime archipelago in the archipelago and has potential fisheries resources.
- It has Nusantara Fishing Port.

Analysis of Cluster 11

Sorong City is chosen to be a production center, for these reasons:

- Based on the province's data, the production of West Papua Province is 119,984 tons (score = 2)
- Based on production data per region, the production of Sorong City is 37,561 tons (score = 4).
- Based on consumption data, Sorong City's consumption is 42.91 kg/capita/year (score = 6)
- UPI installed capacity in West Papua Province is 84,100 tons (score = 2)
- It has a public port that has a capacity of Pier I (1,440 T/m2) and Pier I & II (1,760 T/m2)

- It is in a strategic location because it is the entrance and transit door to West Papua Province.

Analysis of Cluster 12

Based on the two proposed production centers (Aru and Tual Islands Regency), the most suitable location to be a production center is the Tual City, for these reasons:

- Based on the province's production data, the production of Maluku Province 538.121 tons (score = 10)
- Based on production data per region, Tual City's production is 32,277 tons (score = 4)
- Based on Tual City consumption data, its consumption is 40.48 kg/capita/yr (score = 6)
- UPI installed capacity in Maluku Province is 95,940 tons (score = 2)
- There is a Tual VAT which has a dock depth of 6 to 10 meters, which is able to serve moorings of size > 1000 GT.

IV. Conclusion

Choosing the fisheries hub location considers several characteristics of certain locations.

The summary of the determination of the production center location is shown in the following table:

TABLE 5: PROPOSED LOCATION OF THE PRODUCTION CENTRE

Cluster	*Proposed Location of the Production Center*	*Production Center Recommendations*
1	*Sabang City*	*Kota Medan*
	Aceh Utara Regency	
	Medan City	
2	*Pemangkat Regency*	*Pemangkat Regency*
	Natuna Regency	
	Anambas Regency	
3	*Bandung City*	*Indramayu Regency*
	Indramayu Regency	

Cluster	*Proposed Location of the Production Center*	*Production Center Recommendations*
4	*Semarang City*	*Pati Regency*
	Demak Regency	
	Pati Regency	
5	*Surabaya City*	*Surabaya City*
	Pacitan Regency	
6	*Mataram City*	*Mataram City*
	Flores Timur Regency	
7	*Pahuwato Regency*	*Kab. Banggai*
	Banggai Regency	
8	*Makassar City*	*Makassar City*
	Kendari City	
9	*Bitung City*	*Bitung City*
10	*Halmahera Selatan Regency*	*Ambon City*
	Ambon City	

Cluster	*Proposed Location of the Production Center*	*Production Center Recommendations*
11	*Sorong City*	*Sorong City*
12	*Kepulauan Aru Regency*	*Tual City*
	Tual City	

Thus, the production center recommendations are: Medan City, Pemangkat Regency, Indramayu Regency, Pati Regency, Surabaya City, Mataram City, Banggai Regency, Makassar City, Bitung City, Ambon City. Sorong City, and Tual City.

The recommendations and policy implications of this study are: (1) improving port infrastructure and facilities in accordance with the needs of production centers and distribution centers, mainly including: pond depth and dock length (according to vessel size, frequency, etc.) and port infrastructure for handling fish catches, especially cold storage; (2) increasing logistical services; (3) increasing cooperation with logistics service providers; (4) highway access, including: increasing road access between ports, location of production centers and distribution centers, and location of fish processing industries; (5) provision of sufficient land at the port and location of production centers and distribution centers; and (6) supporting infrastructure, including: increasing availability of electricity at ports and locations of production centers and distribution centers, as well as increasing availability of clean water in ports and locations of production centers and distribution centers.

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