Environmental and social policy analysis on traditional salt production in Jeneponto Regency, Indonesia

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Abstract. This study aims to analyze the environmental and social conditions and policies on salt production in Jeneponto. Salt farmers in Jeneponto Regency contribute to national salt production even though they still employ with traditional methods and technology. One of the main challenges in traditional salt production is the dependence of salt farmers on weather and environmental conditions. However, local and regional government policies do not support traditional salt production. This condition makes the social and economic conditions of the majority of salt farmers still in the poverty line.

1. Introduction
Indonesia is an archipelago with a coastline length of 95,181 km and its sea area of about 5.8 million km² or about 70% of the total area of Indonesia. Various economic sectors contribute to regional and national development ranging from coastal communities, particularly sea salt production. The fulfillment of national salt needs is achieved through self-production and imports. The enormous potential of salt from the sea does not provide sufficient national salt needs. With the potential and carrying capacity of the marine nature, Indonesia should be able to produce and fulfill its own salt needs. Indonesia produces salt of around 2.17 million tons, which contributes 0.24 percent of the world's salt production[1]. However, the needs domestic needs are around 3.61 million tons a year. This condition makes the government must import salt with an average of 2 million tons a year, which means that Indonesia depend on salt import [2].

One of the factors that influence salt production is weather factors, low productivity and quality of traditional salts are also caused by inadequate technology, lack of facilities and infrastructure and low marketing capabilities and distribution channels controlled by traders[3]. The low quality of salt has resulted in low prices received by salt farmers, this condition affects the welfare of salt farmers [3].

South Sulawesi Province is one of the provinces that contributes to Indonesia's national salt production. Salt production of South Sulawesi Province is approximately 150 tons per year or around 15 percent of national salt production which mostly produced in Jeneponto, Takalar, and Pangkep.
regencies. Jeneponto Regency is the largest salt producing district in South Sulawesi Province with a contribution of around 110 tons per year. Geographically, Jeneponto Regency is located on the southern tip of the South Sulawesi Province with an area of 749.79 km2. Jeneponto Regency has 114 km coastal line that is economically potential for salt production.

From a historical perspective, the traditional salt mining business in Jeneponto Regency has been operating on since the colonial era and still persists to this day. Currently, the traditional sea salt production in Jeneponto Regency is located in four sub-districts with a total area of 734.34 hectares of traditional salt production[4]. The West Bangkala Sub-district has around 20.41 Ha; Bangkala Sub-district has approximately 378.67 Ha; Tamalatea Sub-district has 68.89 ha; and Arungkeke Sub-district has 266.37 Ha. Jeneponto has uneven rainfall. This condition resulted in some areas experiencing wetness and others experiencing semi-aridity. The dry climate and low rainfall result in most of the region being dry and barren. The highest rainfall falls in January-February while the lowest rainfall is in August, September, October, and November

The objectives of this study are to understand environmental and social policy of sea salt traditional production in Jeneponto Regency and to explore challenges of traditional salt production, considering environmental and social issues.

2. Methods
This research was conducted with a qualitative approach to be able to identify environmental aspect and social- cultural conditions of traditional salt production and farmer community by focusing on one sea salt farmers community location, namely in Bangkala Sub-district, Jeneponto Regency. Environmental aspects are identified based on variables that affect salt production such as land productivity, quality and quantity of salt raw water, and production processes (precipitation, absorption, evaporation and crystallization).

Bangkala Sub-district is the largest area in salt management in Jeneponto Regency, which still maintains traditional salt production as an economic activity. Until now, people in this area are still doing traditional salt production activities and become source of daily livelihood that has lasted for hundreds of years.

This study employs two methods of data collection, namely an in-depth interview and policy document study. The study interviewed two groups of informants, namely the salt farmers group and stakeholder groups related to sea salt production. For the salt farmer group, the study categorizes into two groups namely farmers and landowners. Subjects who have carried out salt management activities are groups that have had important positions in salt production management, such as karaeng or local elite who are mainly landowners and tenant farmers. In this study, we interviewed 14 key informants consisting of 10 farmers and four landowners. The stakeholder group focuses on local government agencies and policy makers, which are related with traditional salt production in the Jeneponto Regency. This study interviewed key informants at seven government agencies.

In this study, data processing and analysis are carried out simultaneously in a process that is carried out continuously since data collection is carried out, especially in the process of organizing, selecting, and categorizing data in the form of narrative descriptions or thick description.

3. Results and discussion

3.1 Traditional salt production method
Traditional sea salt production in Jeneponto is preceded by two stages, namely land preparation and salting process. Beside these production stages, several factors influence salt production, namely; salting techniques, land conditions, community habits, and weather. In the preparation process, dried ponds are given embankments and plots. The moss contained in the land must be cleaned thoroughly. Otherwise it will have an impact on the quality of the salt produced. This process needs a month or more. This process can take place quickly if done in cooperation. For land owners who are not able to do it usually pay other people to do it. For large-scale landowners, they will usually partner with
farmers with a two-thirds distribution system for farmers and one-third for landowners. The cost of processing land remains the responsibility of farmers. The owner usually gives loans or working capital to the farmers, in the form of money and daily food needs such as rice, sugar and others. These costs will be paid by farmers when the land is already in production.

The land preparation process is usually carried out before the entry of the production season, which is around May - July. In this process a variety of equipment is used to dig soil, clean moss, repair waterways and prepare windmills, forming embankments to harden the soil at the crystal table. The purpose of hardening this soil is to make salt production can stay clean and not contains mud. If there is a small amount of mud absorption from below, the color of salt is darker and its price will be lower than cleaner salt. The quality of the salt produced will depend on how well the soil hardening process is carried out. A landowner will usually be very strict in emphasizing to the farmers so that the salt table should be well formed.

After this salt field has been prepared, the next step is the production process. It starts with moving water from the main channel into the first salt plots (boezem) or the local term known as je’ne dingi which literally means cold water. The water level in boezem should be at least 25 cm from the bottom of the pond. At this time the fishpond community has not considered the concentration (°Be) in the flow of water from boezem to seeding and from harvesting to the salt table. The pond farmers only store water for 4 - 7 days in boezem, then the water is channeled to the second pond (seeding) or the mine pool or old water, until it reaches a minimum height of 10 cm and is stored for 4-5 days. Water is flowed into the third pond (salt table) until it reaches a height of about 3 cm, and is stored for 2 days of water in the salt table until salt crystals are formed and ready to be harvested.

The production of salt produced for one harvest in Bangkala Sub-district in general for a 5 x 12 m salt table size can produce 5 sacks (250 kg) of salt. So, that in one production one ton can produce 25 sacks. But this will depend on the season. If the weather does not support the amount of production it will be far from the ideal number. In one long cycle (4 months), with an area of 24 acres, 1,000 sacks of salt can be produced or about 50 tons, meaning that for 1 hectare of land it can produce salt up to 200 tons. But when the cycle is short, only one month, only a few tens of sacks are produced.

The best season for salt cultivation in Jeneponto Regency is during the dry season, June - October, because the evaporation process at that time was rapid. A regular cycle lasts 3-4 months. Seasonal anomalies will significantly affect salt production, for example in 2011 very high and prolonged rainfall made salt production decrease, as well as in 2015, prolonged droughts made the salt
production stage long. This condition causes the salt production cycle to last until November or December.

The success of salt production depends on the weather conditions and the conditions of the salt ponds. When rainfall is high, the salinity of seawater will decrease where the NaCL level will be low so it cannot be used as salt raw water. In addition, the condition of waterlogged land also cannot be used as a media or table for making salt crystals, because it affects evaporation process. The flow of traditional salt production processes can be seen in table 1 below.

| Preparation | Second Month | Third and Fourth Months |
|-------------|--------------|-------------------------|
| a. Making or repairing embankments (salt table) | a. The initial harvest is done if the salt crystals are good (Be 30), | The peak harvest is done before the rain starts to fall |
| b. Drying for landfill | b. If the salt crystals have been produced and the process has gone well, then the salt is harvested every 2-3 days | |
| c. Land collision (two to five replications to solid soil) | | |

| Salting Stage | Preparation | Second Month | Third and Fourth Months |
|--------------|-------------|--------------|-------------------------|
| a. Entering water with a pump and traditional system to enter boezem with Be 3.5 | | |
| b. Entry of water from boezem to plots with Be 11 | | |
| c. The entry of water from minimization to salt table when Be has reached 22. | | |
| d. Crystallizing salts in salt tables when Be reaches 30 for harvesting the first stage. | | |

3.2 Social and economic issues of traditional salt farmers

The socio-economic conditions of the people living in Bangkala Subdistrict, Jeneponto Regency are very dependent on natural resources where the majority of the population in this Subdistrict have a profession as farmers and fishers. In general, Jeneponto Regency is one of the most deprived areas compared to other regions in South Sulawesi, with around 15 percent of the population live in the poverty line[5]. The majority of regions in Jeneponto are in dry areas compared to other regions in South Sulawesi with rainfall occurring only in April to November. As a result of this long dry season, rice can only grow from December to March. At some points in the Bangkala Sub-district area, although most of the land is fertile, it will be difficult to develop agriculture such as rice and other crops, because relatively low rainfall throughout year.

The presentation of the population in Bangkala Sub-district experienced an increasing trend in the period of 2011-2015 [6]. This population composition makes Bangkala Sub-district as one of the highest density areas in Jeneponto for the last five years.

The economic activities of the people in Bangkala Subdistrict can be classified into several categories based on livelihood sources. The Jeneponto Statistical Bureau reports that there are 9,401 paddy farmers, 6,011 stock farmers, 256 fish ponder and 1,256 fishermen. In addition, some people who work outside the agricultural sector. The population working in the trade sector is 1,899 people and those who work in the industry are 313 people. The number of workers with a significant number in the public transport sector is 1,770 people and services amount to 445 people[6].

The dry climate and low rainfall are the causes of most areas in the dry and barren Bangkala District. The primary food source is rice, which can only be planted once a year during the rainy
season. However, in the western part of Jeneponto Regency is a productive agriculture area because it has a proper irrigation that sustainably produce rice and vegetable throughout the year.

For the best period salting is usually done between June and October because at this time it is the period of the dry season. The process of cultivating this salt can only be done when the weather is hot, because when the rainy season arrives, of course salt production activities must stop. When the rainy season arrives, farm owners change the function of their land by developing fish or shrimp ponds so that even though the production process is stopped, landowners are still able to get income. Different things are faced by farm workers when the rainy season arrives. Surely, they have to find alternative jobs to meet their daily needs. Generally, these salt production workers, when entering the rainy season, they move to urban areas as a pedicab or work as a construction worker.

3.3 Environmental issues of salt production land

Natural resources are everything that exists in the surrounding environment as a result of natural forms that can be used to meet the needs of human life. Natural resources at sea salt productions area as following:

3.3.1 Sea water. Sea water is the main ingredient used in salt production. Several factors should be considered are related to sea water resources.

First, salinity factor. Salt-producing regions in Indonesia generally have ranged salinity around 31.5 – 33.6‰ as raw saltwater with varying levels of boume approximately 2 – 3 Be degree where the specific gravity of saltwater in this boume around 1,014 – 1,021 kg/L. To find out the concentration of salt in sea water can be done by measuring with a measuring device Baume meter / Refractometer.

Second, water quality and quantity. The coastal waters around the mouth of the river are generally very turbid and have low salinity. The high turbidity of salt water will slow down the salt production process, while the limited volume of raw water will slow down the production cycle process. Therefore, raw water supply channel infrastructure is vital to maintain effectiveness and efficiency in ensuring the continuity of the production process.

Third, salt production process. In the initial process, the mechanism of sedimentation (precipitation) works a lot on plots of raw/boezem reservoirs (boume 4 – 5° Be), the process of absorption of compounds dissolved by mud will occur a lot in the plot of young water into old water (boume 12 – 14° Be), evaporation process will occur at a later stage in the boume range of 18-20 ° Be and a map of boume heating 22 - 24 ° Be, and the crystallization process occurs at the crystal table where NaCl crystals will be formed at a volume of 25 - 29° Be. By concentrating raw water and increasing the correct volume of boume in the production plot, quality salt products (NaCl 92 - 94%) will be produced by the traditional salt farmers.

The last factor is water pollution. Conservation land should be located quite far from industrial areas, ports, settlements, agriculture and big cities to avoid water pollution. Pollution due to industrial waste around salt production areas is a serious consideration. This study indicates that this pollution is the impact of the existence of a coal-fired power stations which was built around the salt production area. The existence of this industry poses a serious threat to the sustainability of traditional salt production if efforts are not made to prevent the impact of greater pollution.

3.3.2 Climate and weather. Climate is an average weather condition in one year that occurs in a long time and covers a large area. Several elements that affect the weather and climate of an area or region, namely: temperature or air temperature, air pressure, wind, air humidity, and rainfall. Determination of the start of the salt making season is by observing climate behavior as follows:

• Annual rainfall is close to or exceeds the average annual rainfall in each of the conservation areas.
• Rainfall in two consecutive decades below 50 mm / decade.
• Minimum wind speed of 5 mm / second.
• Direction of wind from the east.
• Air humidity below 70%.
Seawater concentration > 2 °Be

Air temperature or temperature is the degree of heat from molecular activity in the atmosphere. The air arises because of the solar radiation that the earth receives. Geothermal is very influential on the growth of salt crystals, so that the release of old water is expected during the day.

The process of forming salt crystals is the evaporation process in salt ponds caused by sunlight, so that to get a good salt production, the location of salt ponds in one region should be chosen with a long dry season or more than 5 months in one year. Because if one salt pond area is too high rainfall or the long rainy season will get low salt production or it can be said that the area is not suitable for the location of salt ponds.

3.3.3 Tide of sea water. Tidal phenomena are interpreted as periodic ups and downs of the sea due to the attraction of celestial bodies, especially the sun and moon to the mass of water on earth. Sea tides at salt pond locations do not exceed 1 meter because it will be difficult to get seawater stocks to be accommodated in salt-making reservoirs. Salt produced in traditional salt ponds comes from natural tendons with characteristics as shown in the following table 2:

| Water quality parameters     | Value | Range Unit | Ideal value       |
|------------------------------|-------|------------|-------------------|
| High waves                   | cm    | 30 - 40    | < 50              |
| Flow Speed                   | c/seconds | 26.3 - 37.5 | 20-3 seaweed     |
| Tide ride                    | cm    | 114        | 5 - 10 seaweed    |
| Deepness                     | M     | 5.5 - 10.0 | sand and coral fragments |

Source: [7]

3.3.4 Wind. The wind is one of credential elements of weather and climate. Wind is air that moves from high-pressure areas to low-pressure areas. In the area of wind salt ponds, it is very influential on the process of the formation of salt crystals in addition to irradiating the sun, because the wind is able to carry water vapor both during the day and night.

3.3.5 Rainfall. Rainfall is the amount of rain water that falls in an area within a certain time. This rainfall is very influential on the evaporation process of seawater that is located in salt ponds, because if rainfall is high in an area it means that this area is not suitable for salt pond areas.
3.3.6 Evaporation. The process of forming salt from seawater is one of the processes of evaporation which is aided by solar radiation. Evaporation is the process of changing molecules in a liquid state (for example water) by spontaneously becoming a gas (for example water vapor). The remaining evaporation in a solution containing certain minerals will become crystals of mineral salts. This process is the opposite of condensation. Generally, evaporation can be seen from the gradual disappearance of fluids when exposed to a significant volume of gas.

3.4 Policies issues of salt production management

3.4.1 National policies of salt trade and production. Government policies at the national level are regulated in the National Medium-Term Development Plan (RPJMN), especially in the area of increasing food sovereignty, formulated that to continue to improve and strengthen food sovereignty, the main target of the national priority in the food sector for the period 2015-2019. In the national policy document, it states that salt production was specifically intended to meet needs of household salt consumption.

Thus, it can be said that salt production is one of the main agendas of national policy although this policy has not specifically explained traditional salt production and industrial salt production. The issue of salt is part of the national food sovereignty policy. In the general policy of food sovereignty in the 2015-2019 RPJMN national goals are set, namely: strengthening food security towards food independence by increasing staple food production, stabilizing food prices, ensuring safe and quality food with increased nutritional value, and increasing welfare of business actor’s food, especially farmers and fishers.

In more specific, the national government made several policies regarding salt management but it merely focuses on salt trade system. All policies on the salt trade system basically regulate the trade system of imported salt, while those concerning the salt of the people are only inserted into an integral part of the policy. That way, until now there has never been a policy that specifically and autonomously regulates the trade system of traditional salt production.

3.4.2 Regional policies of salt production. Regarding the policy of salt production management at the regional level, the planning policy of the South Sulawesi Provincial Government refers to the Regional Medium-Term Development Plan (known as RPJMD). In the RPJMD document of South Sulawesi Province, the government concern on improving production in main commodities, which are shrimp, milkfish and seaweed. These primary commodities are dominant commodity in fisheries production in the province of South Sulawesi. From 2010 to 2014, fluctuating production of main commodities increased, and in 2013 adjustments were made to main commodities production targets in accordance with the 2013-2018 RPJMD.

In the main issues of the RPJMD in South Sulawesi Province, especially in the field of food security, it does not include the issue of salt commodities as a strategic issue for the RPJMD of South Sulawesi Province. In the strategic issue of food security, the province of South Sulawesi focuses more on the main food supply, namely rice. Furthermore, the issues of salt in the field of maritime affairs and fisheries, trade and industry are not explicitly mentioned in strategic issues in the field. So, this study identifies that regional policy of South Sulawesi Provincial Government does not focus on salt production as a strategic issue of the RPJMD.

3.4.3 Local policies of salt production. In policies at the local level, the government policy foundation of the Jeneponto district refers to the Jeneponto Regency Regional Medium-Term Development Plan (RPJMD). In the RPJMD policy document, specifically in the discussion of the analysis of the Medium-Term Development issues in Jeneponto Regency, documented this document only addresses seaweed production. Likewise, with the main issue section in the field of maritime affairs and fisheries, this policy document only discusses seaweed commodities as a potential area of Jeneponto Regency. This document does not actually become salt production as the main issue. Likewise, in the fields of trade and industry, this policy document also does not review the management of the salt
trade. Based on the analysis of planning policy documents at the local and regional levels, the Jeneponto Regency RPJMD follows the policy of the Provincial Government to further develop the production of seaweed commodities.

4. Conclusion

Salt farming in Jeneponto Regency has been carried out for generations managed jointly or individually. Generally, land is owned by several people with a profit-sharing system. The socio-economic conditions of the people involved in salt production are mostly in the poverty line. Meanwhile, salt production in Bangkala Subdistrict is still very traditional and is very dependent on weather conditions, water quality and the quality of land to be used, which depends on the formation program. In addition, government policies at both the provincial and local levels have not made salt production the goal of their main commodity. Thus, special intervention is needed to increase the capacity of farmers and their social institutions and production technology to improve the quality of people's salt production.

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