



RESEARCH ARTICLE

From Comparative to Competitive Advantage: Value Chain Upgrading and Salt Industrialization in Kabupaten Kupang, Indonesia

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Abstract

Salt production in Kabupaten Kupang has strong natural potential, but weak downstream processing limits local value capture. This study evaluates how comparative advantage can be converted into competitive advantage through value-chain upgrading and salt industrialization. A descriptive quantitative design, supported by interviews, field observations, and secondary data, used 73 valid stakeholder responses from Nunkurus, Merdeka, and Bipolo. Smallholder production showed a Domestic Resource Cost Ratio of 0.55, while the company-level analytical scenario produced 0.61, indicating favorable comparative efficiency. However, technology access, infrastructure, product diversification, farmer institutions, and MSME/cooperative participation remained weak. Smallholders were concentrated in raw-salt activities, and substantial corporate output was processed outside the region. The study's novelty lies in integrating comparative and competitive advantage, value-chain structure, industrial readiness, and welfare-oriented considerations within an island-region context. Policy priorities include local washing/refining capacity, quality upgrading, logistics, stronger cooperatives, and formal farmer-company partnerships to retain more value in coastal communities.

Keywords

Salt Value Added; Salt Downstreaming; Salt Industrialization; Value Chain Upgrading; Comparative Advantage; Coastal Economic Development.

1 | INTRODUCTION

Salt is a strategic commodity for household consumption and industrial activities such as food processing, pharmaceuticals, cosmetics, livestock, and chemical manufacturing. Indonesia nevertheless remains dependent on industrial salt imports because domestic production does not consistently meet required quality and volume standards (Kementerian Perindustrian Republik Indonesia, 2024). Smallholder production is still largely traditional, weather-dependent, and weakly connected to industrial markets. The resulting quality and price gaps limit farmer bargaining power and local value capture. Kabupaten Kupang provides a particularly relevant setting for examining this problem. East Nusa Tenggara has a long dry season, high seawater salinity, and extensive coastal land, while Kabupaten Kupang has the province's largest identified salt potential, approximately 7,000 hectares with a theoretical capacity of 350,000 tons per year (Dinas Kelautan dan Perikanan Provinsi NTT, 2024). Unlike established salt centers in Java and Madura, Kupang combines underutilized resource potential, geographically dispersed coastal production, inter-island logistics, smallholder ponds, and the presence of larger firms. These characteristics make downstream processing and local value retention central development issues rather than production volume alone. The main constraint is the weak transformation of natural advantage into higher-value products. Smallholders remain concentrated in raw-salt production, refining capacity is limited, logistics and storage are costly, and formal farmer-company arrangements are weak. A 2023 field survey also reported seasonal work and limited household earnings among salt farmers in Kupang (Dinas Kelautan dan Perikanan Provinsi NTT, 2023).

This pattern indicates that resource abundance does not automatically create competitive advantage or broad local welfare gains. Policy responses therefore need to connect technology, downstream processing, logistics, and local institutions. Refining and washing facilities, quality upgrading, storage, transport, cooperatives, village-owned enterprises, and small enterprises can help retain a larger share of value within the region. This direction is consistent with the 2025-2029 national development agenda and regional industrial plans for Kabupaten Kupang and NTT (Bappeda Kabupaten Kupang, 2024; Bappenas, 2025; Pemerintah Provinsi Nusa Tenggara Timur, 2020). Previous studies have examined parts of this problem. Research in Madura emphasizes geomembrane technology and production management, while studies in Indramayu, Jenepono, Sumenep, and NTT emphasize farmer empowerment, downstreaming, infrastructure, and industrial clustering. Recent evidence also shows that producer organizations and cooperative arrangements can improve farmer welfare and bargaining power, while salt-market governance remains shaped by competing actor interests (Al'Amani *et al.*, 2024; Maflahah *et al.*, 2024; Prihantini *et al.*, 2024; Sayyidi & Zaini, 2026). These studies identify important interventions, but they usually examine technology, institutions, value chains, competitiveness, or welfare separately. Few studies integrate comparative efficiency, competitive conditions, value-chain structure, regional industrial readiness, investment priorities, and perceived socioeconomic implications at the regency level. The geographical gap is also important because integrated empirical research remains concentrated in Java and Madura, while island regions in eastern Indonesia face different processing and logistics constraints. This study addresses that gap by linking comparative advantage, value-chain upgrading, competitive advantage, regional readiness, and welfare-oriented considerations in Kabupaten Kupang. Its novelty lies in examining how an island-based salt economy can move from resource-based efficiency toward locally retained value through coordinated technological, institutional, and downstream upgrading.

2 | BACKGROUND THEORY

2.1 Supply Chain, Value Chain, and Value Creation

The theoretical basis for strengthening salt value added begins with the distinction between supply-chain efficiency and value-chain creation. Supply-chain theory focuses on coordination of physical products, information, financial flows, and relationships from suppliers to final customers. Christopher (2016) conceptualizes the supply chain as a network of interdependent organizations involved in producing, distributing, and delivering products or services. In the salt industry, this network includes farmers, collectors, processing firms, distributors, wholesalers, and industrial users. Long distribution channels, fragmented information, and weak coordination increase transaction and transportation costs and reduce producer competitiveness. Value-chain theory explains how economic value is created and captured at different stages of production. Porter (1985) defines the value chain as a set of primary and supporting activities through which firms or sectors create value. Primary salt harvesting generally produces a low-value commodity, while washing, drying, refining, certification, packaging, differentiation, and marketing can substantially raise value. An efficient supply chain does not necessarily generate equitable value capture if producers remain concentrated in low-value activities. The Global Value Chain perspective extends this argument. Gereffi *et al.* (2005) show that value is distributed unevenly across geographically dispersed production systems and that advanced processing, standards, and market-oriented functions often capture higher returns than

primary production. Humphrey and Schmitz (2002) distinguish product, process, functional, and chain upgrading. These forms of upgrading provide a framework for assessing whether salt producers can move from raw production toward refined, iodized, industrial, packaged, and other higher-value products. Sustainability adds economic, social, and environmental dimensions to supply-chain management. Seuring and Müller (2008) argue that supply-chain performance should incorporate social and environmental outcomes alongside efficiency. The present study therefore uses supply-chain and value-chain theories as complementary frameworks for examining logistical efficiency, value creation, value capture, and opportunities for upgrading among farmers, cooperatives, small enterprises, and industrial firms.

2.2 Comparative Advantage, Competitive Advantage, and Regional Competitiveness

Ricardo's (1817) theory of comparative advantage explains specialization through differences in relative opportunity costs. A region benefits when it concentrates on commodities that it can produce relatively more efficiently because of differences in natural resources, labor, technology, or other productive factors. This perspective is relevant to salt because climatic conditions, evaporation rates, land availability, and seawater quality influence production efficiency. Comparative advantage, however, does not explain why resource-rich regions sometimes fail to build competitive industries. Porter (1990) shifts attention from resource possession to the capacity to transform resources into sustained competitive performance. His Diamond Model emphasizes factor conditions, demand conditions, related and supporting industries, and firm strategy, structure, and rivalry. Natural resources therefore represent only one component of competitiveness. Human capital, technology, infrastructure, market requirements, institutions, and business behavior determine whether resource potential becomes durable competitive advantage. Porter's (1998) cluster perspective further emphasizes geographical concentrations of interconnected firms and institutions. Industrial clusters can lower coordination costs, facilitate knowledge exchange, and support specialization and innovation. Agglomeration theory similarly links geographical concentration to lower transaction costs and productivity gains (Fujita *et al.*, 1999; Krugman, 1991). For Kabupaten Kupang, clustering provides a basis for integrating farmers, processors, logistics providers, cooperatives, research institutions, government, and downstream users. Competitiveness also depends on continuous learning. Lundvall's (1992) innovation-system perspective views innovation as the outcome of interaction among firms, government, universities, research organizations, and other actors. This approach supports the study's treatment of competitive advantage as dynamic rather than inherited, requiring technology, skills, infrastructure, institutions, and collaborative capacity to convert natural salt resources into a competitive regional industry.

2.3 Industrialization, Downstream Processing, and Structural Transformation

Industrialization provides a third theoretical foundation. Kaldor (1967) considers manufacturing a major engine of economic growth because it can generate increasing returns, productivity gains, technological accumulation, employment, and multiplier effects. For resource-based regions, downstream processing provides a mechanism for structural change by expanding economic activity beyond primary commodity production. Downstreaming refers to processing natural resources into intermediate or finished products with greater market value. Resource-based development perspectives argue that dependence on unprocessed resources can constrain development when value creation occurs elsewhere (Todaro & Smith, 2020). The Prebisch-Singer perspective likewise warns that long-term dependence on primary commodities can expose producers to unfavorable trade dynamics and price volatility (Prebisch, 1950; Singer, 1950). Downstream processing therefore changes a region's economic role from primary supplier to value-adding producer. Structural transformation theory provides an explanation for expected employment effects. Lewis (1954) describes development as movement of labor from relatively low-productivity traditional activities toward higher-productivity modern sectors. Salt downstreaming can expand employment from seasonal pond production into processing, quality control, packaging, logistics, distribution, and technical services. Hirschman's (1958) linkage theory distinguishes backward linkages, which create demand for labor, equipment, transportation, and inputs, from forward linkages, which stimulate downstream industries. Salt industrialization can therefore generate demand for local services while strengthening connections with food processing, pharmaceuticals, cosmetics, and chemical industries. Schumpeter (1934) further emphasizes innovation and entrepreneurship in restructuring economies. Yet industrial transformation requires institutions capable of distributing benefits; otherwise, aggregate industry value may rise while gains remain concentrated among a few large actors.

2.4 Local Economic Development and Social Welfare

Local economic development theory connects industrial transformation with regional welfare. Arsyad (2015) emphasizes efficient and sustainable use of local resources to raise regional income, employment, and institutional capacity. Blakely and Leigh (2013) similarly stress collaboration among local government, business, and communities. In the salt sector, this logic supports a multi-actor arrangement involving government, academia,

firms, and community institutions. The distributional dimension is explained by Myrdal's (1957) cumulative causation. Growth may generate spread effects that diffuse benefits, but it can also generate backwash effects that concentrate resources and opportunities. This distinction is important for salt industrialization because increased output does not guarantee that small producers capture a larger share of value. Welfare economics and the capability approach further clarify the relevant outcomes. Pigou (1920) links social welfare to aggregate utility and income distribution, while Sen (1999) evaluates development through expansion of substantive capabilities. Applied to salt industrialization, welfare gains concern not only output but also stable income, employment, participation, institutional representation, and the ability of coastal households to make productive economic choices. Rondinelli (1983) emphasizes decentralized development planning, while Chambers (1983) stresses bottom-up participation rather than assuming that growth will automatically reach disadvantaged groups. Sustainable development adds a long-term requirement to balance economic, social, and environmental objectives (World Commission on Environment and Development, 1987). These perspectives justify evaluating salt industrialization through economic performance, social inclusion, institutional capacity, and sustainability.

2.5 Empirical Evidence and Theoretical Positioning

Existing salt-sector studies support individual parts of this framework but remain fragmented. Suryaningtyas *et al.* (2020) reported that geomembrane technology improved sodium chloride content but that quality improvements did not automatically translate into higher prices where market access remained weak. Hidayat and Sari (2021) reported productivity improvements under the Smallholder Salt Business Empowerment Program while also identifying weak farmer institutions and industrial partnerships as sustainability constraints. Rahman *et al.* (2022) emphasized infrastructure and price policy for downstreaming, and Yuliasuti *et al.* (2023) identified financing, logistics, and coordination barriers to regional salt clustering. Value-chain studies point to unequal value capture. Sucipto and Kurniasih (2020) reported that collectors and packaging activities captured a large share of salt value while farmers obtained approximately 30-35% of total economic value. Widiastuti and Rahardjo (2021) found that product innovation could increase selling value by up to 40%, although digital access and business licensing remained constraints. Setiawan and Arifin (2022) reported an average 22% increase in farmer income associated with downstreaming, with management training and cooperatives influencing success. Institutional and competitiveness studies identify related constraints. Mahfudz and Kadir (2023) highlighted deficiencies in roads, warehouses, washing plants, and farmer institutions. Nirmala and Rahayu (2021) emphasized cooperatives as aggregators and price-support institutions. Recent evidence from Madura further links producer-organization membership to farmer welfare and shows that cooperative demand allocation can strengthen bargaining power (Maflahah *et al.*, 2024; Prihantini *et al.*, 2024). These findings support an integrated framework in which natural-resource and cost-efficiency indicators represent comparative advantage; technology, markets, institutions, and Porter Diamond conditions represent competitive advantage; production stages, diversification, distribution, and partnerships represent value-chain upgrading; and skills, infrastructure, institutions, and processing facilities represent regional readiness. Welfare-related indicators are treated as perceived socioeconomic implications rather than causal outcomes.

2.6 Integrated Analytical Framework

The analytical framework connects the theories to the study indicators in a sequential but non-causal structure. Ricardo's comparative-advantage logic is assessed through natural conditions, production efficiency, and DRCR. Porter and value-chain theory are used to assess technology, market access, institutional support, upgrading activities, and value capture. Regional readiness functions as an enabling condition through skills, infrastructure, processing capacity, and institutional coordination. Lewis, Hirschman, Myrdal, and Sen guide interpretation of employment, participation, distribution, and welfare-related perceptions. Because the study is descriptive, these relationships organize the analysis and do not imply statistically estimated causal paths.

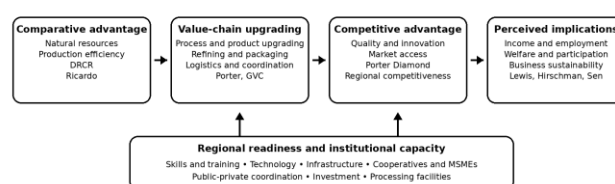


Figure 1. Integrated analytical framework linking comparative advantage, value-chain upgrading, regional readiness, competitive advantage, and perceived socioeconomic implications

3 | METHOD

3.1 Research Design and Study Area

This study employed a descriptive quantitative design supported by qualitative evidence to examine salt value-added development in Kabupaten Kupang, East Nusa Tenggara, Indonesia. The design was appropriate because the study sought to describe production efficiency, competitiveness, value-chain structure, industrial readiness, and stakeholder perceptions rather than estimate causal effects. Survey evidence was integrated with interviews, field observations, secondary statistics, company information, and policy documents to provide numerical and contextual interpretation (Sugiyono, 2022). Fieldwork was conducted from 25 October to 25 November 2025 in Nunkurus, Merdeka, and Bipolo. The sites were purposively selected to capture variation in production systems, accessibility, institutional participation, and movement toward industrial development. Nunkurus represented established traditional production, Merdeka combined substantial salt potential with relatively better transport access, and Bipolo represented an expanding area associated with private-sector and downstream initiatives. This selection was intended to capture different value-chain positions within Kabupaten Kupang rather than produce district-wide statistical representation.

3.2 Population and Sampling

The study population comprised actors directly or indirectly involved in the salt supply and value chains, including smallholder farmers, collectors, processors, cooperatives, small and medium enterprises, salt companies, government agencies, community representatives, and coastal households. Purposive sampling was used because relevant information was concentrated among actors directly involved in salt production, processing, distribution, or policy (Sugiyono, 2022). Eligibility criteria included direct sector involvement, at least two years of experience, willingness to provide information, and representation of the study locations. The field protocol initially targeted approximately 96-100 participants to obtain representation across relevant stakeholder categories. Because purposive rather than probability sampling was used, the final analytical sample was defined by eligible sector actors who provided complete and usable responses during the field period. Seventy-three responses met these analytical requirements and were retained. The sample should therefore be interpreted as an information-rich stakeholder sample, not a probability-representative sample of the Kabupaten Kupang population. Item-level denominators varied where questions were not applicable or data were unavailable; landholding information, for example, was available for 64 respondents. Key informants were additionally identified through snowball sampling and included government officials, firm representatives, cooperative or village-owned enterprise representatives, experienced farmers, community leaders, and local academics.

3.3 Primary Data

Primary data were collected through questionnaires, semi-structured interviews, and direct field observation. The questionnaire contained closed and open-ended questions on production and productivity, cost and income structures, market and technology access, institutional support, downstream opportunities, and socioeconomic conditions. Perceptual indicators used a five-point Likert scale. The instrument covered four domains: comparative and competitive advantage, value-chain development and downstreaming, regional readiness, and perceived socioeconomic implications. Semi-structured interviews were conducted with government officials, salt-company representatives, cooperatives, village-owned enterprises, farmer groups, community leaders, and local academics. Interviews lasted approximately 30-60 minutes and, where permission was provided, were recorded to support accurate transcription. Field observation documented pond conditions, production methods, processing and storage facilities, road and transport access, washing facilities, institutional activity, and evidence of product innovation or downstream processing.

3.4 Secondary Data and Triangulation

Secondary data were obtained from the NTT Marine and Fisheries Service, regional industry agencies, Statistics Indonesia, planning documents, company records, and relevant academic literature. Variables included potential and utilized land, production capacity and output, employment, regional gross domestic product, investment, distribution, and policy information. Relevant planning documents included the Kabupaten Kupang Industrial Development Plan and national and regional salt-industry policies. Data credibility was strengthened through source and methodological triangulation. Farmer information was compared with evidence from firms and government institutions, while questionnaire responses were assessed alongside interviews, observations, and official records. This approach follows Denzin's (1978) triangulation principle, which combines sources and methods to reduce dependence on a single perspective.

3.5 Variable Measurement and Research Instruments

Four analytical constructs guided measurement. Comparative and competitive advantage captured land and seawater conditions, productivity, production-cost efficiency, technology, market access, and institutional support. Value chain and downstreaming captured production stages, value-added potential, product diversification, participation of small

enterprises and cooperatives, distribution efficiency, and private-sector partnerships. Regional readiness covered labor skills, training, natural resources, infrastructure, supporting institutions, and processing facilities. Perceived socioeconomic implications covered reported changes or expected benefits related to household income, employment, regional economic contribution, welfare, participation, and business sustainability. These perception items were not treated as causal impact measures. All perceptual indicators used a five-point Likert scale.

Table 1. Operationalization of the main study variables

Construct	Main measurement domains	Scale
Comparative and competitive advantage (X1)	Land and seawater quality; productivity; cost efficiency; technology; markets; institutions	Likert 1-5
Value chain and downstreaming (X2)	Upstream-downstream activities; value added; diversification; MSMEs/cooperatives; distribution; partnerships	Likert 1-5
Regional readiness (X3)	Skills; training; natural resources; infrastructure; institutions; processing facilities	Likert 1-5
Perceived socioeconomic implications (Y)	Perceived income change; employment; regional contribution; welfare; participation; sustainability	Likert 1-5

Before field administration, the questionnaire was pilot-tested on 10 respondents outside the main analytical sample. Item validity was evaluated using product-moment correlation and internal consistency using Cronbach's alpha. An alpha coefficient of at least 0.70 was treated as evidence of acceptable reliability. The questionnaire design and score interpretation followed the five-point perception measurement approach described by Levis (2013).

3.6 Data Analysis

Quantitative analysis began with frequencies, percentages, means, and distributions. Likert scores were averaged and transformed into percentage-based perception categories (Levis, 2013). Comparative advantage was assessed through resource potential, production efficiency, and the Domestic Resource Cost Ratio (DRCR), where a ratio below one indicates that domestic resource costs are lower than the tradable value added generated. The smallholder DRCR case used 2025 field information on output, selling price, tradable inputs, and domestic resource costs collected through questionnaires and interviews and triangulated with agency records. The company-level case used reported production and selling-price information, while the 30% tradable-input and 70% domestic-cost shares were analytical assumptions because an audited cost decomposition was unavailable. Competitive conditions were assessed using Porter's Diamond framework and a scenario-based Revealed Comparative Advantage (RCA) calculation. The RCA values were constructed from scenario quantities to illustrate specialization and were not treated as observed trade-performance statistics. Value Chain Analysis mapped actors and activities from production through collection, processing, transportation, distribution, and marketing (Porter, 1985). Regional readiness was evaluated descriptively across human resources, natural resources, infrastructure, institutions, and processing capacity. Perceived socioeconomic implications were analyzed descriptively. Interview and observational evidence underwent thematic reduction, organization, and interpretation and was used to triangulate survey and secondary evidence.

4 | RESULTS AND DISCUSSION

4.1 Results

4.1.1 Respondent Characteristics and Descriptive Statistics

The 73 valid respondents were predominantly male and had substantial practical experience in salt production. Elementary education was the most common educational category, and the largest age group was 30-39 years. Landholding data were available for 64 respondents, most of whom managed one hectare. Table 2 summarizes the dominant respondent characteristics to keep the descriptive profile concise.

Table 2. Summary of respondent characteristics

Characteristic	Dominant category	n/valid N	Percentage (%)
Gender	Male	72/73	98.63
Educational attainment	Elementary school	41/73	56.16
Age	30-39 years	19/73	26.03
Salt-sector experience	6-10 years	30/73	41.10
Salt-pond area	1.0 ha	56/64	87.50

Note. Source: Primary data, processed in 2025. Landholding denominator = 64; other characteristics = 73.

Comparative and competitive advantage showed its strongest score for production-cost efficiency (89.59), followed by market and distribution access (75.21) and productivity (74.79). Access to technology and innovation (54.11) and farmer institutions and policy support (54.52) were substantially weaker. Value-chain performance was more uneven. Perceived value added per unit of production reached 89.73 and private-sector or regional-enterprise partnerships reached 98.49, while upstream-downstream integration, product diversification, distribution efficiency, and participation of small enterprises and cooperatives remained weak.

Table 3. Comparative and competitive advantage

Indicator	Aggregate score	Category
Land availability and seawater quality	66.44	Fairly good
Salt productivity per hectare	74.79	Good
Production-cost efficiency	89.59	Very good
Access to technology and innovation	54.11	Fairly good
Market and distribution access	75.21	Good
Farmer institutions and policy support	54.52	Fairly good

Table 4. Salt value chain and downstreaming

Indicator	Aggregate score	Category
Upstream-downstream production stages	45.34	Poor
Value added per unit	89.73	Very good
Product diversification	40.96	Poor
MSME and cooperative involvement	24.38	Very poor
Distribution and supply-chain efficiency	43.29	Poor
Private-sector/BUMD partnerships	98.49	Very good

Note. Source: Primary data, processed in 2025.

Regional readiness was strongest in salt-pond quality and availability (99.86), followed by education and training (89.86), processing facilities (89.45), supporting institutions (78.63), and labor skills (72.47). Energy, roads, warehouses, and transportation received only 52.19. Perceived socioeconomic implication scores were uniformly high, with all six indicators above 99 on the percentage-based perception index. These figures describe respondent perceptions and should not be interpreted as independently identified causal impacts.

Table 5. Readiness of human resources, natural resources, and infrastructure

Indicator	Aggregate score	Category
Salt-worker skills	72.47	Good
Education and training	89.86	Very good
Salt-pond quality and area	99.86	Very good
Energy, road, warehouse, and transport access	52.19	Fairly good
Supporting institutions	78.63	Good
Processing facilities	89.45	Very good

Note. Source: Primary data, processed in 2025.

Table 6. Perceived socioeconomic implications

Indicator	Aggregate score	Category
Household income change	99.45	Very good
Local employment absorption	99.18	Very good
Contribution to marine-sector PDRB	99.45	Very good
Household welfare change	99.32	Very good
Community participation	99.32	Very good
Business sustainability	99.45	Very good

Note. Source: Primary data, processed in 2025.

4.1.2 Comparative and Competitive Advantage

The Domestic Resource Cost Ratio indicated favorable comparative efficiency in the smallholder analytical case. Production reached 70 tons per hectare per season at a tradable price of Rp900/kg, generating an output value of Rp63 million. Tradable inputs amounted to Rp12 million and domestic resource costs to Rp28 million. Tradable value added was therefore Rp51 million, producing a DRCR of 0.55. Because the ratio is below one, the case indicates comparative advantage under the study criterion.

For PT Timor Livestock Lestari, the analytical calculation used reported production of 8,000 tons, a selling price of Rp1,600/kg, and total cost of Rp1,100/kg. The calculation then imposed a 30% tradable-input and 70% domestic-cost split, producing a DRCR of 0.61. Because the cost split was an analytical assumption rather than an audited firm-level decomposition, this ratio is a scenario estimate and should not be interpreted as a definitive measure of company efficiency. The competitive analysis likewise used a scenario-based Revealed Comparative Advantage calculation. Scenario quantities of 25,000 tons of outward salt distribution, 100,000 tons of total outward industrial commodities, 2 million tons of national salt trade, and 100 million tons of total national exports produced an illustrative RCA value of 12.5. The value demonstrates how specialization would be interpreted if the assumed trade structure held, but it is not an observed RCA and should not be used as verified evidence of actual trade competitiveness. Porter's Diamond assessment therefore provides the main qualitative interpretation of competitive conditions.

Table 7. Summary of Porter's Diamond assessment

Determinant	Strength	Weakness
Factor conditions	Climate, land, and high salinity	Weak technology and infrastructure
Domestic demand	Large national demand	Unstable salt quality
Related/supporting industries	Presence of large firms	Weak cooperatives, MSMEs, and refining
Firm strategy and rivalry	Increasing investment	Oligopsonistic market and weak coordination

Note. Research analysis, 2025.

4.1.3 Salt Value Chain and Supply Chain

Two distinct value-chain systems were identified. Smallholder farmers in Nunkurus, Merdeka, Bipolo, Oeteta, and Sulamu mainly produced coarse and non-iodized salt for household consumption and fish preservation. Larger firms used geomembranes and more structured systems and supplied higher-quality salt primarily to industrial markets outside NTT. The corporate chain involved PT Garam Persero, PT Garam Terang Indonesia, PT Timor Livestock, CV Agrovast Timor Mandiri, and PT Twawara Timor Sejahtera, together with collectors, logistics providers, and regional agencies. Systematic partnerships between the smallholder and corporate chains were not observed.

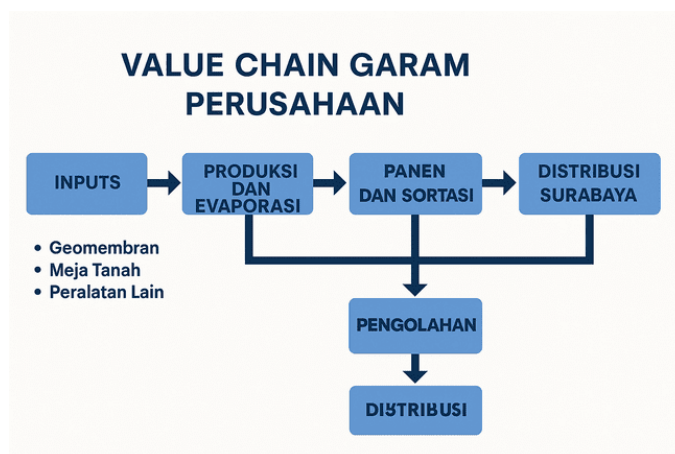


Figure 2. Corporate salt value chain in Kabupaten Kupang: inputs, production and evaporation, harvest and sorting, preliminary processing, and distribution

Corporate producers operated on government-managed land and reported regional revenue obligations of Rp5/kg to the provincial government and Rp5/kg to Kabupaten Kupang. The source report also recorded HPL rent of Rp639 million per year and land and building tax of Rp7 million per year. Although corporate production was more structured than smallholder production, much of the output continued to leave the region for industrial processing, limiting the amount of downstream value retained locally.

Table 8. Realized regional own-source revenue from salt production

Company	Land (ha)	2022 (Rp)	2023 (Rp)	2024 (Rp)
PT Timor Livestock Lestari	600	7,232,750	38,183,130	18,304,800
PT Tjakrawala Timor Santosa	300	8,248,900	58,628,100	59,225,000
PT Garam Terang Indonesia	300	-	4,875	16,115,000
PT Timor Garam Lestari	300	-	-	-
Total		15,481,650	96,816,105	93,644,800



Figure 3. Field documentation of industrial salt activities at the study sites in Kabupaten Kupang during fieldwork, 25 October-25 November 2025

The smallholder chain was considerably shorter. Inputs were followed by pond production, harvesting, and direct or collector-mediated distribution to local markets. Products were dominated by non-iodized consumption salt and salt for fish preservation. Limited sorting, refining, storage, packaging, and interregional marketing reduced value capture at producer level.

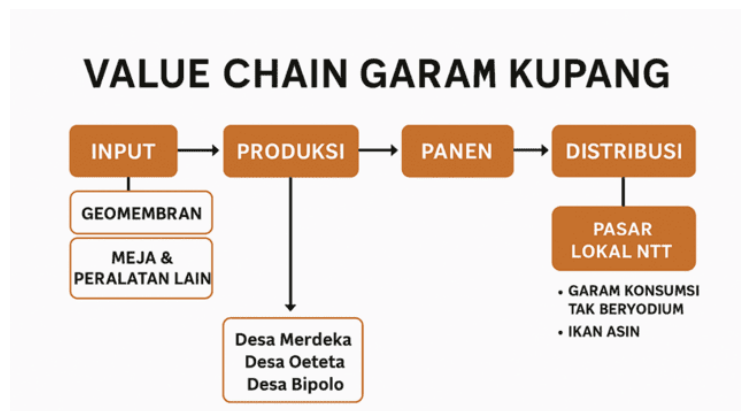


Figure 4. Smallholder salt value chain in Kabupaten Kupang, showing input, production, harvesting, and distribution to local NTT markets



Figure 5. Field documentation of smallholder salt-farming activities at the study sites in Kabupaten Kupang during fieldwork, 25 October-25 November 2025

The principal constraints were low smallholder technology, absence of farmer-company partnerships, poor coastal roads, limited transport, inadequate common storage, high shipment costs to Surabaya, and the absence of a modern refinery in NTT. Opportunities identified in the field included small-scale geomembrane adoption, quality-standard training, cooperative or village-owned enterprise aggregation, structured farmer-company partnerships, and establishment of local washing or refining facilities.

4.1.4 Readiness of Human Resources, Natural Resources, and Infrastructure

Local workers possessed extensive experience in traditional salt production but weaker skills in quality control, geomembrane use, sodium chloride management, and mechanical operation. Large firms employed more specialized supervisors and equipment operators, yet some technical positions still required workers from outside the region. Natural-resource readiness was strong because of the eight-to-nine-month dry season, high salinity, and extensive coastal land. Smallholder salt produced on soil-based crystallization beds was reported at approximately 75-85% sodium chloride, while firms using high-density polyethylene geomembranes and improved water systems achieved approximately 94-97%. The principal technological gap was the absence of a full industrial washing or refining facility in NTT. Infrastructure remained a major constraint. Road access to production centers such as Oeteta, Sulamu, and Nunkurus was inadequate in several locations, storage capacity was limited, and maritime transport to Surabaya depended on general cargo services. Electricity and clean-water access were comparatively better for firms than for smallholders. These conditions increase transaction costs and weaken integration between primary production and higher-value processing.

4.1.5 Investment and Socioeconomic Implications

Investment requirements covered production technology, downstream processing, logistics, and institutional strengthening. Priority needs included geomembranes, pumps, salinity-measuring equipment, storage, sorting equipment, production roads, warehouses, loading facilities, and cooperative management systems. A medium-scale washing plant or refinery represented the largest downstream requirement. The source assessment estimated that an integrated medium-term program involving pond expansion, farmer upgrading, refining, and logistics could require investment amounting to hundreds of billions of rupiah distributed among government, private investors, and financial institutions. Potential regional effects would arise directly through higher salt output and local processing and indirectly through transportation, warehousing, trade, financial services, repair services, and other supporting activities. These effects remain projections rather than measured post-investment outcomes. Their distribution would depend on whether smallholders participate in downstream value creation as suppliers, cooperative members, or processing partners rather than remaining isolated at the primary-production stage.

4.2 Discussion

The findings highlight that Kabupaten Kupang has a strong natural foundation for salt production, but this advantage has not yet been transformed into a sustainable competitive edge. The smallholder DRCR of 0.55 indicates efficient use of domestic resources relative to tradable value added, and the company-level ratio of 0.61 supports this, though caution is needed in interpreting cost shares. These results align with Ricardo's theory that specialization becomes economically viable when resources are used efficiently. However, the distinction between comparative and competitive advantage becomes clearer when comparing these ratios with other indicators: production-cost efficiency was rated very high, while access to technology and farmer institutions was moderate. This suggests that natural resource advantages alone are insufficient for sustained competitiveness, which depends on technology, infrastructure, supporting industries, institutions, market conditions, and firm strategies. The scenario-based RCA underscores potential for specialization but should not be mistaken for a verified trade index, especially given that Indonesian salt remains less competitive than major suppliers due to issues like quality, logistics, and market integration. Therefore, Kabupaten Kupang's local resource strengths can only be sustainable if quality, processing, and market integration are improved.

Regarding value chain upgrading and institutional integration, there is a notable coexistence of high value-added potential with weak downstream integration. While the region perceives high value-added per unit, product diversification, distribution, and cooperative participation remain limited. This reflects Porter's concept of capturing value across activities beyond production and aligns with global value chain theories, which note that primary producers often capture a smaller share of value when processing and marketing occur elsewhere. The separation between corporate and smallholder chains further emphasizes this, with firms utilizing modern logistics and processing, yet much output still leaving the region for further processing, leading to missed opportunities for functional upgrading. Previous studies in other regions, such as Madura, show that cooperative membership and technology adoption can significantly enhance farmer income and productivity, suggesting that technology works best when combined with organizational and market coordination. The low involvement of MSMEs and cooperatives in Kupang is a strategic constraint, not a secondary issue. In terms of human resources, technology, and infrastructure, there is an imbalance: natural resources like salt-pond quality are rated highly, but infrastructure such as transport, energy, and storage are weaker. Labor skills are adequate for traditional methods but lacking for refining and quality control. The technological gap between firms and smallholders is

evident, with smallholders producing lower-quality salt compared to geomembrane-equipped firms. Market and value-chain conditions also limit price improvements despite technological upgrades. Infrastructure deficiencies, including poor roads, storage, and logistics, further hinder industrial development, especially considering the island logistics penalty, which increases costs and complicates processing and distribution. Socioeconomic perceptions of benefits from salt industrialization are high, but these are based on perceived importance rather than causal effects on income or employment. Investment in processing could generate demand for labor, equipment, and services, contributing to regional development, but benefits depend heavily on institutional arrangements. Without better access for smallholders to processing, contracts, and quality upgrading, benefits may remain concentrated among larger firms and government actors. Investments must therefore be complemented by strengthening farmer institutions, logistics, and market linkages to ensure equitable distribution of gains. Policy priorities for downstream salt development include reducing physical costs through improving roads, warehouses, and testing facilities, as well as establishing a local refining or washing plant with a clear public-private investment plan. For cooperatives and MSMEs, the focus should be on moving beyond administrative roles toward active economic functions like output aggregation, quality grading, storage management, and collective marketing. In the medium term, organizations should develop capabilities in iodization, packaging, and certification. For private companies, formal partnerships based on quality standards, technology transfer, and predictable off-take agreements are essential. Investment should aim at developing local suppliers and co-investing in processing facilities, bridging the gap between smallholders and firms, and ensuring quality assurance and market access for farmers.

5 | CONCLUSIONS AND FUTURE WORK

Kabupaten Kupang has favorable comparative efficiency for salt production, reflected in a smallholder DRCR of 0.55 and a company-level scenario of 0.61. The central development problem is not resource scarcity but weak conversion of that advantage into competitive and locally retained value. Technology access, infrastructure, farmer institutions, product diversification, logistics, and downstream integration remain the main constraints, while smallholders are still concentrated in raw-salt activities. Policy should therefore prioritize local washing or refining capacity, production roads and storage, quality upgrading, stronger cooperative aggregation, and transparent farmer-company partnerships. The very high socioeconomic scores describe respondent perceptions and should not be interpreted as causal impacts. Future research should use audited firm-level cost and trade data, longitudinal or quasi-experimental designs, refinery feasibility and environmental assessment, and comparative evaluation of cooperative and contract-farming models.

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