



Original article

Demographic patterns and socio-economic drivers of salt production in the Philippines

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ABSTRACT

The Philippine salt industry faces multifaceted challenges which led to high dependency on imports. This study deals with demographic characteristics and socio-economic factors driving salt production. Data collection was carried-out through semi-structured interviews, focus group discussions, and key informant interviews. Findings reveal a predominantly male workforce, with substantial family involvement, limited education, and an ageing demographic that threatens long-term sustainability. The industry is fragmented and dominated by individual, small-scale producers reliant on traditional methods, with limited collective bargaining power. While there is a wealth of experience in salt production, this does not translate into regulatory compliance and modernization. Land tenure issues, which are common among tenants, impedes long-term investments in infrastructure and technology. Salt distribution and logistics are largely influenced by the country's archipelagic geography and regulations on non-iodized salt trade. In terms of economic returns, the cooking method exhibited highest profitability despite higher labour and cost intensity, attributed to year-round production. Solar salt production using clay tiles entails high capital investment but provides long-term returns. The use of PEP sheets offers short-term investments with lower entry barriers, making it suitable for small producers. The lack of access to formal financial institutions exacerbates producers' plight due to the investment required for salt farm development. Strategic solutions, including comprehensive educational and training programs, enhanced regulatory support, improved access to technology and financial services, and fostering cooperative models, will attract younger generations, empower producers, and create a more resilient and competitive industry.

KEY WORDS: salt production, Philippine salt industry, demographic patterns, socio-economic drivers, economic viability

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1. Introduction

The importance of salt in global economies cannot be over emphasized due to its diverse and indispensable applications, from food preservation and industrial processes to its role as a fundamental dietary mineral (DURACK ET AL., 2008). Salt production was once a thriving industry in the Philippines,

meeting approximately 85% of the national demand in the 1990s (FRANCISCO ET AL., 2022). Despite a vast resource base supported by one of the world's longest coastlines, domestic salt production has significantly declined in recent years (REYES ET AL., 2021). Currently, local production accounts for only 16.78% of national demand, with an estimated annual output of 114,623 metric tons (MONTOMO ET AL.,

2024). This production shortfall has led to increased importation, thereby raising concerns about food security and economic sustainability.

Salt production in the Philippines is largely reliant on traditional methods suited to the country's diverse geographic and socio-economic landscape. Solar evaporation, which leverages natural drying processes, is the most common method that accounts for 88.31% of total production. This method requires intensive manual labour and is vulnerable to environmental fluctuations. Brine cooking involves energy-intensive heating and produces a consistent output year-round, albeit with higher operational costs due to fuel inputs. Artisanal methods, which preserve unique mineral profiles, cater to niche markets but remain limited in scale (MONTJO ET AL., 2024).

The decline in Philippine salt production is primarily attributed to the industry's classification as an orphan sector, limited adaptability to climate-related challenges, stringent regulatory impacts under Republic Act No. 8172 (ASIN Law), economically driven land-use conversions, and intensified market competition. Furthermore, salt production in the Philippines is predominantly labour-intensive, seasonal, and yields relatively low economic returns, which has led to a growing disinterest among younger generations (MONTJO ET AL., 2024). This trend poses a long-term threat to the sector's sustainability by constraining labour availability, operational resilience, and adaptive capacity, ultimately undermining the industry's ability to meet production demands and adopt necessary advancements for sustained growth.

The challenges faced by the Philippine salt industry are not unique, given that labour shortages, reduced productivity, and limited adoption of modern techniques are persistent issues in agro-food sectors globally, including in Indonesia, Nepal, North Africa, Nigeria, and China (AFOLABI, 2007; LI & SICULAR, 2013; MACHÍN & PARDO, 2014; NGADI ET AL., 2023; SIBAYAN, 2016; TIMSINA, 2024). Studies consistently show that demographic factors, such as workforce age distribution, educational attainment, and migratory patterns, significantly affect the sustainability and productivity of labour-intensive industries (AMARANTE ET AL., 2021; MIFTARI & MUSARAJ, 2019). For instance, a balanced workforce age structure is positively correlated with aggregate productivity, with research

indicating that optimal age distribution enhances output and operational efficiencies (BENHARD ET AL., 2013; FEYRER, 2007; LALLEMAND & RYCX, 2009). Moreover, intellectual capital, including human and structural assets, has been shown to influence labour productivity in small and medium-sized enterprises (KHALIL ET AL., 2024). In Brazil's construction industry, low educational attainment among workers has been linked to increased waste and reduced operational efficiency (PARIZI ET AL., 2013). Similarly, studies in Indonesia confirm that higher education and skill levels substantially boost productivity and stimulate economic growth (PERMANA ET AL., 2023).

Prior study has primarily addressed production statistics and operational challenges (MONTJO ET AL., 2024), with limited focus on how demographic and socio-economic factors influence production efficiency and sustainability. Given the regional variations in these characteristics, a comprehensive analysis within the Philippine salt industry is crucial for understanding the sector's capacity to maintain productivity and resilience amidst evolving challenges. A region-specific approach will help identify targeted interventions, such as addressing workforce shortages, enhancing skill levels, and supporting generational continuity, which are vital for mitigating critical production deficiencies and fostering a sustainable, inclusive, and responsive industry. This study also contributes to the broader discourse on sustainable practices within traditional industries in the Philippines by providing strategic insights to revitalize the salt industry in response to changing economic and environmental conditions.

2. Materials and methods

2.1. Study areas and selection of respondents

The study encompassed all provinces in the Philippines actively engaged in salt production (Fig. 1). The initial lists of salt producers were obtained from the Bureau of Fisheries and Aquatic Resources-Regional Fisheries Offices (BFAR RFOs) and Local Government Units (LGUs). Prior to conducting survey interviews, area assessments were conducted to verify and refine the consolidated lists of salt producers.

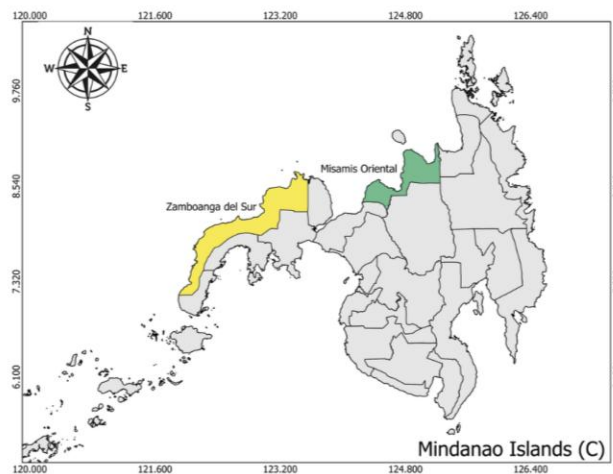
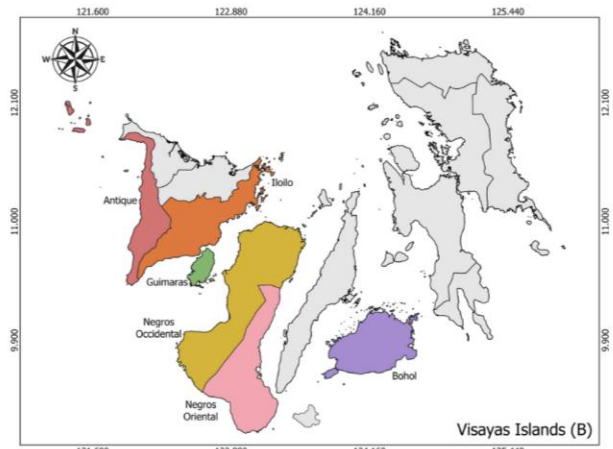
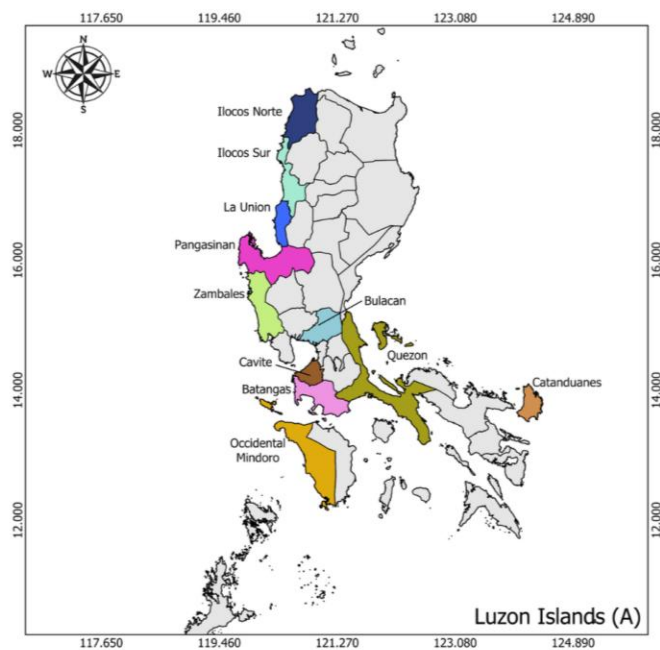


Fig. 1. Distribution of salt producers in the Philippines: (A) Luzon, (B) Visayas, (C) Mindanao

Respondents were selected based on the following criteria to ensure the accuracy and relevance of the data collected:

- Direct engagement in salt production: Only individuals actively involved in salt production activities were included, such as registered owners, primary operators, or designated farm managers responsible for daily operations.
- Experience and knowledge: Respondents were required to have at least two years of experience in salt production to ensure familiarity with the industry's operational and labour practices. In cases where the registered owner was unavailable, the most knowledgeable caretaker or farm worker was selected to provide insights.
- Operational knowledge: Selected respondents had to possess a thorough understanding of both technical and economic aspects of salt production, including production methods, business classification, regulatory compliance, and financial operations.

- Decision-making authority: Preference was given to individuals with decision-making authority as they could provide deeper insights into business strategies, investment decisions, and sustainability challenges.

This selection process was designed to ensure that respondents could provide detailed and reliable information on both technical and economic aspects of salt production, as well as on regulatory, environmental, and labour dynamics affecting the industry.

2.2. Data collection

Data collection took place from October to December 2022, using primary data obtained through structured interviews, key informant interviews (KIIs), and focus group discussions (FGDs). These data gathering methods include representatives from BFAR RFOs, LGUs, business organizations, and both government and non-government institutions involved in the salt

production sector, including management, regulation, and policy development.

A structured survey interview was randomly administered to a total of 1,084 salt producers to capture firsthand and specific information on demographic, operational, and business profiles. The survey instrument was pre-tested with purposively selected respondents to ensure question clarity and accuracy. Demographic details collected included sex, age, civil status, and education levels. Operational data covered years in operation, production methods, scales of production, business classification, regulatory permits, and land ownership status. The survey also gathered financial information on fixed capital investment, revenue, and cost structures to analyze the economic returns of salt production activities.

2.3. Data processing and analysis

Data from structured interviews, FGDs, and KIIs were encoded into Microsoft Excel spreadsheets, where they underwent a rigorous cleaning process to identify and correct inconsistencies, errors, and missing values. Cross-verification with multiple data sources was conducted to enhance data integrity and ensure accuracy.

Both quantitative and qualitative analyses were performed. Quantitative data were analyzed using descriptive statistical tools such as measures of central tendency, frequency, and percentages. For economic analysis, key financial metrics were calculated as follows:

Gross Profit: Total Revenue–Total Variable Costs

Net Profit: Gross Profit–Total Fixed Costs

Gross Profit Margin: Gross Profit/Total Revenue × 100

Net Profit Margin: Net Profit/Total Revenue × 100

Return on Investment: Net Profit/Fixed Capital Investment × 100

Payback Period: Total Investment/Net Profit

The Chi-Square test was applied to examine associations between categorical variables, such as region and demographic factors, as well as operational attributes. This test identified statistically significant regional differences in demographic and operational characteristics to provide insights that could inform region-specific interventions. Statistical

significance was determined at a 95% confidence level using R Programming version 4.3.2 (R CORE TEAM, 2023).

Qualitative data from FGDs and KIIs were analyzed through thematic analysis to identify key themes related to labour practices, such as family involvement, labour-sharing arrangements, and income distribution among workers. This approach also captured producers' perceptions of regulatory and business environment, which enabled the identification of barriers and potential policy interventions. A triangulation approach was employed to enhance the validity and credibility of the findings by integrating quantitative results with qualitative insights for cross-verification across different data sources.

3. Results and discussion

3.1. Demographic profile of salt producers

3.1.1. Gender distribution

It can be inferred from Table 1 that salt production in the Philippines is largely male-dominated. The analysis revealed a statistically significant association between gender distribution and region (Table 2), suggesting that gender influences labour patterns within the industry. This is particularly evident in provinces like Pangasinan and Occidental Mindoro, where the physically demanding tasks associated with solar salt production on clay tiles align with traditional male labour roles, involving activities such as constructing and maintaining salt beds, harvesting, and transporting large quantities of salt. Despite the male-dominated workforce, women play crucial roles in certain types of salt production and business operations. In Luzon, particularly Ilocos Norte and Ilocos Sur where cooked salt production is prevalent, female producers typically manage the entire process from cooking to marketing. This concentration of women in cooked salt production reflects cultural and economic factors shaping gender roles within the industry and highlights the significant contributions of women in sustaining regional salt production.

Table 1. Socio-demographic profile of salt producers

Characteristics	Percentage (%)			
	Luzon n=579	Visayas n=442	Mindanao n=63	Total N=1084
Sex				
M	64.08	70.14	57.14	66.14
F	35.92	29.86	42.86	33.86
Age distribution				
18-30	3.11	5.88	9.52	4.61
31-45	28.67	29.19	30.16	28.97
46-59	41.62	38.91	39.68	40.41
≥60	26.60	26.02	20.64	26.01
Civil status				
Single	8.63	23.53	19.05	15.31
Married	83.94	70.81	79.36	78.32
Widowed	7.43	5.66	1.59	6.37
Educational attainment				
Primary	16.75	26.70	34.92	21.86
P-Undergrad	7.60	2.94	6.35	5.63
Secondary	46.81	52.26	39.68	48.62
S-Undergrad	9.50	3.62	7.94	7.01
Tertiary	15.37	11.54	9.94	13.38
T-Undergrad	3.97	2.94	3.17	3.51

Table 2. Chi-Square analysis of demographic and socio-economic factors associated with regional variation in salt production

Variable	X ² cal	X ² α	Degrees of freedom (df)	p-value
Age	8.97	12.59	6	0.1750
Gender	6.53	5.99	2	0.0382
Civil status	46.07	9.49	4	2.38 x 10 ⁻⁹
Education	46.37	18.31	10	1.23 x 10 ⁻⁶
Classification of salt producers	73.90	12.59	6	6.46 x 10 ⁻¹⁴
Land ownership	228.48	18.31	10	0.0000

Variables with p-values < 0.05 indicate a statistically significant association with regional variation

Similar patterns are observed in other countries, where women play substantial roles in labour-intensive and traditionally male-dominated industries. For instance, in Nigeria's Ebonyi State, rural women are heavily involved in traditional salt production using pan evaporation with firewood (IWUCHUKWU ET AL., 2021). Similarly, women at Pink Lake in Senegal contribute significantly to the local salt industry, albeit with limited access to decision-making roles and receive lower wages (MOR, 2024).

Recognizing the unique roles and contributions of women in the salt industry allows policymakers to foster a more inclusive, gender-balanced sector. Targeted support programs that provide training, financial access, resources, equipment, and market opportunities can empower women and enhance operational efficiency. Moreover, policies that improve safety and working conditions could further encourage female participation across regions.

3.1.2. Civil status and family-based labour dynamics

The highly significant association for civil status underscores the role of family dynamics in shaping production practices. Luzon demonstrates a strong reliance on family labour, given the highest percentage of married producers. Salt producers in this region leverage family support, enabling them to handle labour-intensive tasks without hiring external labour. During peak harvest seasons, families often relocate closer to salt farms, thereby saving on labour costs and involving children in salt production from an early age. This emphasizes the critical role of family labour in sustaining traditional salt-making practices in Luzon.

In contrast, Visayas and Mindanao show a relatively higher percentage of single producers. This demographic trend may explain the preference for the use of polyethylene plastic (PEP) sheets in these regions, as this method is less labour-intensive and does not require as many family members. Producers can hire temporary labour for tasks like ground levelling and sheet installation, allowing them to manage operations with a more flexible workforce structure.

Given these distinct labour dynamics, region-specific policies could enhance operational resilience. Family-oriented policies in Luzon, such as subsidies for family-based training programs or family labour incentives during peak production periods, could support traditional practices. Conversely, Visayas and Mindanao may benefit from labour subsidies or seasonal hiring support programs.

3.1.3. Age distribution

The analysis of age distribution across regions showed no significant association, indicating a consistent ageing workforce trend across Luzon, Visayas, and Mindanao. As shown in Table 1, nearly 70% of respondents are aged 46 and above, with only 4.61% in the 18–30 age group. This demographic imbalance suggests limited engagement among young adults and highlights the challenges associated with sustaining labour-intensive operations over the long term. This lack of significant regional variation in age distribution highlights that this ageing trend is an industry-wide issue rather than region-specific.

The impending loss of experienced labour raises concerns for production efficiency and output, as retiring producers leave without sufficient younger workers to replace them. Consequently, the industry may face a skill gap that impacts both production capacity and the continuity of traditional salt-making practices, which are an integral part of the sector's cultural heritage. Moreover, an ageing workforce may lack the inclination or capacity to adopt modern, efficiency-enhancing practices due to limited exposure and familiarity with newer technologies. Younger generations, however, may be more open to innovation and adopting new methods that could enhance operational efficiency.

To address these challenges, intergenerational knowledge transfer programs and mentoring initiatives could be implemented across regions to ensure that traditional skills are preserved while creating pathways for younger individuals to enter the industry. Establishing training programs that balance traditional methods with incremental modern practices could also encourage technology adoption, thereby improving operational efficiency while preserving essential cultural practices.

3.1.4. Workers' mobility and labour availability

Data from the Philippine Statistics Authority (PSA) show that workers are increasingly drawn to urban-based sectors with higher income potential, particularly in service and sales roles, where employment has risen steadily from 14.99% in 2018 to 21.96% in 2021 (Fig. 2). Meanwhile, employment in skilled agricultural and forestry work has remained relatively stable, indicating a consistent but limited interest in traditional labour-intensive roles like salt production.

This trend toward urban jobs is largely driven by wage disparities. In 2023, the average daily wage in agriculture was US\$ 5.50, which is the lowest among major industries (Fig. 3). The appeal of urban jobs is further reinforced by structured career paths and perceived job stability, which are often lacking in agricultural roles. Consequently, salt production is becoming increasingly reliant on an ageing workforce. The out-migration of youth to urban areas poses challenges to productivity and the preservation of artisanal skills essential for sustaining traditional salt-making methods.

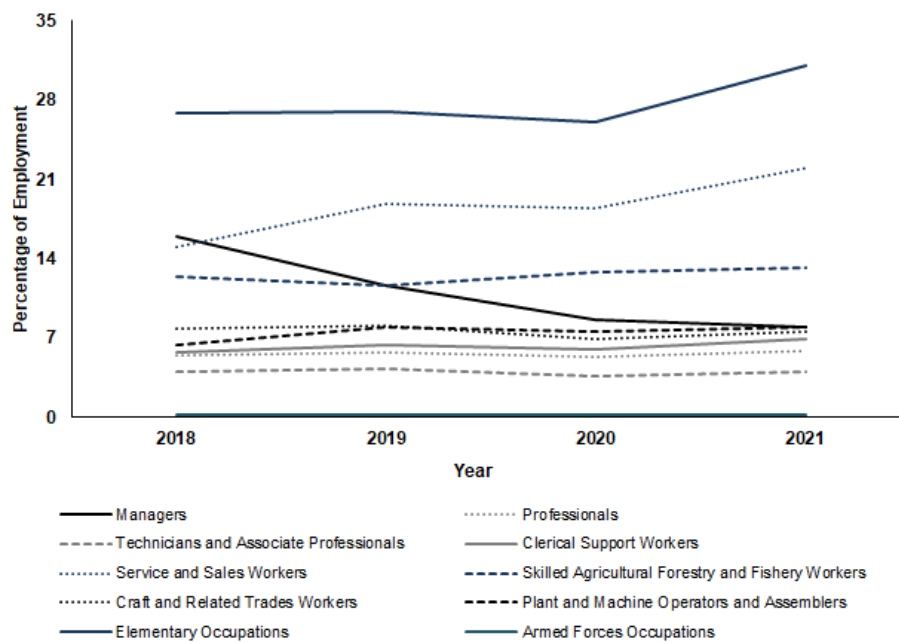


Fig. 2. Employment trends by occupation in the Philippines (2018-2021) (Source: Philippine Statistics Authority (PSA))

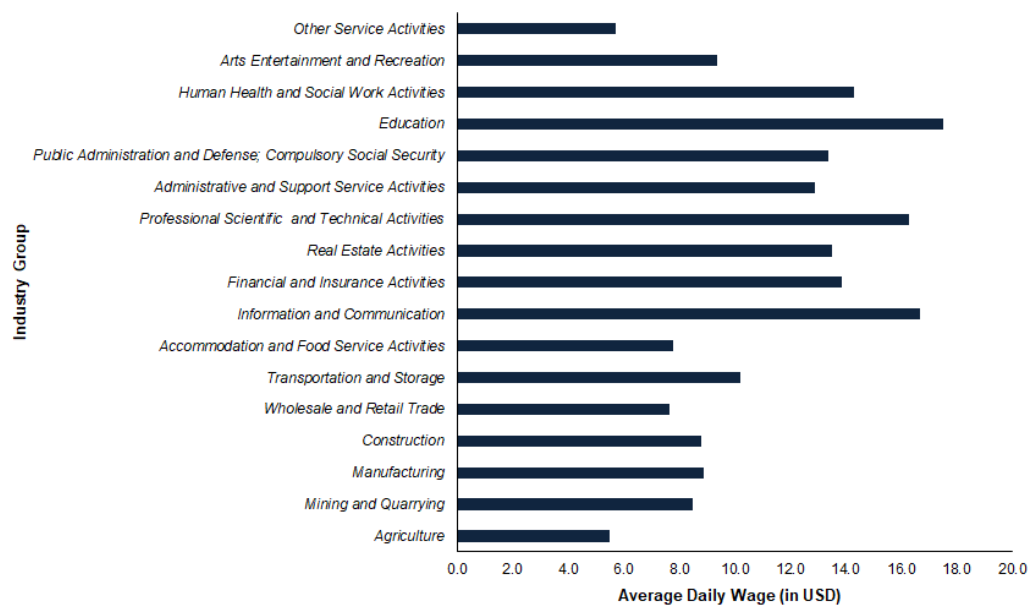


Fig. 3. Average daily wage by industry group in the Philippines, 2023 (in US\$) (Source: Philippine Statistics Authority (PSA))

The difference in employment preferences between urban and rural sectors reflects broader socio-economic issues. While urban areas report high youth employment rates in service-oriented and technical occupations, rural industries like salt production face declining interest and participation among the younger demographic. This migration trend perpetuates regional economic disparities, as rural communities reliant on salt production experience labour shortages, hindering local economic growth and operational resilience.

Salt farming is often viewed by younger generations as a temporary stepping stone until they complete their studies and pursue better-paying careers (FRANCISCO ET AL., 2022). The labour-intensive nature of salt production, along with limited economic returns, shapes younger generations' perspectives, resulting in low interest in continuing this traditional livelihood. The continuity of long-standing artisanal salt varieties is at risk, with some nearing extinction due to a lack of skilled artisans willing to sustain the craft.

Similar trends have been observed in other Asian countries such as China, Thailand, Japan, and Indonesia, where younger generations are increasingly abandoning labour-intensive agricultural work in favour of more lucrative urban employment (AKDEMIR ET AL., 2021; GUO ET AL., 2015; NGADI ET AL., 2023; POUNGCHOMPU ET AL., 2012). Addressing this challenge requires the creation of competitive economic opportunities within the salt industry. Policies, such as improving rural wage structures, skill development programs, and infrastructure support, could make salt production more attractive to younger workers. Enhancing access to technology and promoting product marketing could further elevate the industry's appeal by providing the income stability and career prospects necessary to retain a sustainable labour force in rural areas.

3.1.5. Educational attainment

Salt producers in the Philippines generally have limited formal education, with only 16.89% reaching tertiary levels. This disparity in educational attainment is statistically significant across regions, with Luzon, particularly Occidental Mindoro having a higher concentration of tertiary-educated producers. These individuals are typically involved in managing medium to large enterprises and leverage their education and resources to access and implement advanced technologies in salt production, thereby positioning Occidental Mindoro as a leading production hub. Conversely, provinces in Visayas and Mindanao rely on traditional methods due to limited technical skills and access to capital.

Higher education levels play a crucial role in driving innovation and development in agriculture by facilitating technological adoption, risk tolerance, and sustainable practices in agriculture (DAVIS ET AL., 2008; KNIGHT ET AL., 2003). While salt production relies heavily on physical labour and production experience, advanced education provides insights into production efficiency and technical innovations that can enhance industry resilience.

To support these regional differences, policies in Luzon could focus on advanced technical training and access to cutting-edge equipment to maintain its competitive production levels. In contrast, introductory training on modern techniques,

subsidized technology access, and partnerships with educational institutions in Visayas and Mindanao could help bridge productivity gaps. Establishing regional training centres and career pathways in salt production across all regions would further strengthen industry resilience, attract younger workers, and promote balanced growth.

3.2. Socio-economic conditions

3.2.1. Operational and business characteristics

It can be inferred from Table 3 that the majority of salt producers operate individually, while only 1.38% are organized as corporations and 0.74% as cooperatives or associations. This highly fragmented industry structure limits opportunities for collective bargaining power and resource pooling that cooperatives typically provide. This fragmentation has enabled a few traders to control salt trading and pricing, thus reducing market leverage for individual producers. The lack of cooperative models also impedes efforts to standardize production practices and enhance productivity. Establishing cooperatives could address these challenges by enhancing access to funding, government support, and streamlined business transactions. Cooperatives could also address market power imbalances by improving farm-gate price negotiations, similar to the successful collective bargaining seen in Ethiopia's banana sector (WOLDIE & NUPPENAU, 2008).

In terms of production scale, production volumes not exceeding two MT per year are classified as subsistence, two MT to 300 MT as small, >300 MT to 2,000 MT as medium, and >2,000 MT as large. Statistical analysis revealed a highly significant association between the classification of salt producers and region, indicating distinct regional differences in production scale. Luzon has a higher concentration of medium and large-scale producers, while Visayas and Mindanao are primarily composed of small and subsistence producers. This finding highlights Luzon's comparative advantage in production capacity, where larger producers benefit from economies of scale, access to advanced technologies, and extensive market networks. They play a crucial role in driving economic activity and meeting broader market demand.

Table 3. Business and operational profiles of salt producers

Characteristics	Percentage (%)			
	Luzon n=579	Visayas n=442	Mindanao n=63	Total N=1084
Business classification				
Individual producers	97.07	98.87	98.41	97.88
Association/cooperative	0.86	0.68	0.00	0.74
Corporation	2.07	0.45	1.59	1.38
Classification of salt producers*				
Subsistence	13.82	5.95	15.87	10.75
Small	74.78	93.59	80.95	82.76
Medium	10.19	0.46	3.18	5.84
Large	1.21	0.00	0.00	0.65
Years operational**				
>10	21.59	30.77	6.78	24.54
<11-20	15.37	18.10	6.78	16.02
21-30	13.47	12.67	15.25	13.24
31-40	7.60	11.99	1.70	9.07
41-50	8.64	9.28	6.78	8.80
<50	6.56	2.71	6.78	5.00
NR*	26.77	14.48	55.93	23.33
Availability of permits and licenses				
YES	42.66	15.39	3.17	29.24
NO	55.09	83.71	93.65	68.82
NR	2.25	0.90	3.17	1.94
Land ownership type				
Registered owner/ titled lot	14.34	11.76	4.76	12.73
Tenant	57.69	86.43	90.48	71.31
FLA	3.63	0.00	0.00	1.94
Public land/coastal areas	24.01	1.13	4.76	13.56
Cultural heritage site	0.17	0.68	0.00	0.37
Foreshore land	0.17	0.00	0.00	0.09

NR – No Response

*Excluding 5 Asin Tibuok producers since the product is traded per piece

**Excluding 4 salt producers from Zamboanga City since they have stopped their operation since 2006

In contrast, the predominance of small and subsistence producers in Visayas and Mindanao reflects limited access to resources and modern technology. Producers in these regions often rely on traditional, labour-intensive methods due to financial constraints and restricted access to capital, which limits productivity and the potential for scaling operations. The varying scales of production reflect different needs within the industry. Small and

subsistence producers would benefit from micro-financing, training programs, and improved access to technology, while medium to large-scale producers require policies that would facilitate technological advancements, infrastructure development, and market expansion.

Compliance remains a challenge, with 68.82% of the respondents lacking the financial and administrative capacity to secure necessary permits,

thereby limiting their market access and ability to scale up operations. This underscores the need for improved regulatory support and streamlined processes to help producers obtain the necessary documentation. Furthermore, data reveal that 24.54% of producers have over a decade of experience in salt production, yet this experience has not necessarily translated into regulatory compliance or modernization.

3.2.2. Land ownership

There is a strong association between land tenure and regional salt production practices. The majority of producers (71.31%) are tenants, while only 12.73% are registered owners, and smaller fractions operate on public land or coastal areas (13.56%), under Fishpond Lease Agreement (FLAs) (1.94%), or at cultural heritage sites (0.37%) (Table 3). These regional differences in tenure types influence salt production methods. In Luzon, particularly in Ilocos Norte and Ilocos Sur, salt producers use the traditional leached brine boiling method along riverbanks and seashores, where they filter soil with salt deposits (apaya) to produce concentrated brine for boiling. This method is closely tied to the coastal environment and relies on natural resources. Similar practices are observed in the province of Antique and Iloilo.

Producers under FLAs, particularly in Occidental Mindoro and Pangasinan, use their land for salt production during the dry season and repurpose it for milkfish farming in the rainy season. This dual-use approach maximizes land productivity but requires seasonal adjustments and regulatory compliance. In addition, salt production sites designated as cultural heritage areas in Cavite and Bohol are subject to preservation regulations under the National Cultural Heritage Act of 2009. This includes the revival of Asin Tibuok in Bohol, where restrictions on technological interventions ensure the preservation of traditional practices.

Land ownership greatly influences production capacity, with titled landholders better positioned to invest in advanced infrastructure and technology. Conversely, the uncertainty of continued access on rented land limits the ability of the tenants, particularly in Pangasinan and Misamis Oriental, to make long-term investments. Rental payments are based on yield, with sharing agreements ranging from 50–50 to 65–35, where the higher share compensates landowners for development costs.

Such arrangements lack standardized valuations, as products exchanged for rent do not necessarily match the cost of materials and rental fees (MONTJO ET AL., 2024).

Research shows that tenure security is essential for investment in land improvements. In Papua New Guinea, tenure security fosters higher productivity through economies of scale and reduced income sharing (CHAND & YALA, 2009). Likewise, farmers in Swaziland and Ghana leverage tenure security to access credit and make land improvements (DLAMINI & MASUKU, 2011; GREGA ET AL., 2015). For Philippine salt producers, the uncertainty of land tenure discourages tenants from investing in infrastructure, thus perpetuating low-yield, traditional methods. Tenure reform that provides tenants with long-term leases or ownership pathways could improve security and incentivize investment. Cooperative ownership models could further support tenant producers by collectively securing land, enhancing bargaining power, and sharing resources. For cultural heritage sites, policy provisions could support traditional practices while balancing heritage preservation with sustainable production techniques.

3.2.3. Market and regulatory environment

The passing of the Republic Act No. 8172 (ASIN Law) in 1995 to combat high iodine deficiency has crippled the thriving salt industry. The law requires all local producers to iodize the salt they produce for both human and animal consumption. Heavy sanctions were imposed but the government failed to provide adequate assistance to ensure compliance. The majority of producers had to cease operation owing to lack of training, available funds, or resources to comply with iodization requirement. Salt farms were converted into fishponds, residential, and commercial properties in order to create profit avenues. Trading of non-iodized salt was restricted within municipalities or province-wide, leading to intense market competition, over supply during peak season, and drastic decline in farm gate prices. Traders take advantage of the situation by controlling the prices of non-iodized salt. Since then, salt production has become a seasonal, low-income enterprise characterized by unregulated prices.

Given that iodization is an expensive, complex process that requires economies of scale, equipment, and marketing support, making it optional for producers could be beneficial. Instead of mandatory iodization, grants and incentives, such as fortificants

for enriching salt with iodine, tax breaks, and iodizing machines could be introduced to encourage producers to iodize salt. Moreover, demand creation, promotion, monitoring, and certifications from relevant agencies would boost the demand for iodized salt, thereby providing consumers with education and choice in the market.

The recent enactment of RA No. 11985 addresses these challenges by easing regulatory burdens on small producers and enhancing support for compliance. This law introduces flexibility by making iodization optional for artisanal and non-food grade salt. It allows the use of artisanal salt by food manufacturers, removes the automatic categorization of all produced salt as food grade, and relieves producers of the iodization burden.

The archipelagic geography of the Philippines adds complexities to logistics, marketing, and distribution. As illustrated in Figure 4, Pangasinan dominates the markets in Luzon due to proximity and ease of access to transportation networks. Meanwhile, Occidental Mindoro, an island province, primarily serves major markets in nearby provinces such as Palawan, Iloilo, extending as far as Mindanao. Large salt traders with head offices in Batangas and Metro Manila have established buying stations in the area. Logistic costs are high due to the geographic isolation of the islands, making it financially impractical for small producers to market in neighboring provinces; thus, they heavily rely on a few major traders who monopolize and control the market.

Efficient transportation and logistics are vital for linking producers to markets, enhancing productivity, lowering costs, and boosting trade competitiveness (BLANCAS ET AL., 2014; RAMIREZ-ASIS ET AL., 2022; TANAINO ET AL., 2019). Investing in port facilities, road networks, and transportation services can alleviate the costs and challenges of transporting salt from production sites to markets, especially in island provinces. Establishing regional hubs where salt can be aggregated, processed, and distributed will also help streamline the supply chain and enhance market access. Furthermore, market development initiatives and certification programs can help producers differentiate their products and access premium markets. Establishing cooperatives can enhance the bargaining power of producers, allowing them to negotiate better prices and access larger markets collectively.

3.2.4. Labour practices

Generally, medium to large producers employ caretakers to manage salt beds from pond preparation to harvest. Each caretaker typically oversees 25 to 40 salt beds, equivalent to one to two hectares, with their entire families contributing to tasks like pond preparation, harvesting, and hauling. The usual income-sharing agreement allocates 70% of gross sales to producers and 30% to caretakers. Payments are issued at the end of the production season, so they often borrow money from producers to cover household expenses, with repayments deducted from their earnings. They normally earn between US\$ 1,440 and 2,160 per season (October to May), equating to about US\$ 180 to 270 monthly. Despite decades of work on the farms, many still struggle to make ends meet and support their families.

Salt farm workers lack job security and benefits that labour laws guarantee to workers in other industries. They can be replaced at any time, regardless of their tenure, due to the absence of binding contractual commitments that define the terms and conditions, such as contract duration, grounds for termination, and compensation. These issues point to broader socio-economic problems in the agriculture sector that lead to economic hardship and difficulty in attracting and retaining younger workers, who often seek more stable and better-paying jobs. Tackling these problems involves equitable treatment for salt farm workers by providing employment contracts, benefits, incentives, and other legally required work entitlements, akin to standards in other industries.

3.2.5. Economic returns

Economic returns for salt production vary by method and region, as shown in Table 4. Two types of liners are commonly used in solar salt production: clay tiles and PEP sheets, with notable regional differences in adoption and financial dynamics. The use of clay tiles in Luzon is prevalent. Establishing a one-hectare salt farm with clay tiles requires a substantial investment of US\$ 5,625, with a projected seasonal output of 62.5 MT. For registered owners, this method provides a 17.79% ROI and a payback period of 5.62 years. Although the high upfront cost results in a moderate ROI and an extended payback period, clay tiles have a useful life of 30–50 years, making this method economically viable over time. After the initial six-year recovery period, producers

can benefit from long-term returns with minimal reinvestment. In contrast, tenant producers in Luzon, who rely heavily on family labour, face different financial dynamics as they bear no initial investment but pay high rental fees that claim 60% of gross income, yielding a lower net profit margin of 3.11%. To support producers, policies that reduce rental fees,

provide accessible loans/subsidies, or grant essential equipment could alleviate upfront costs and improve economic stability. Moreover, promoting cooperative models would enable producers to pool resources, share equipment, invest collectively in infrastructure, and enhance market bargaining power.

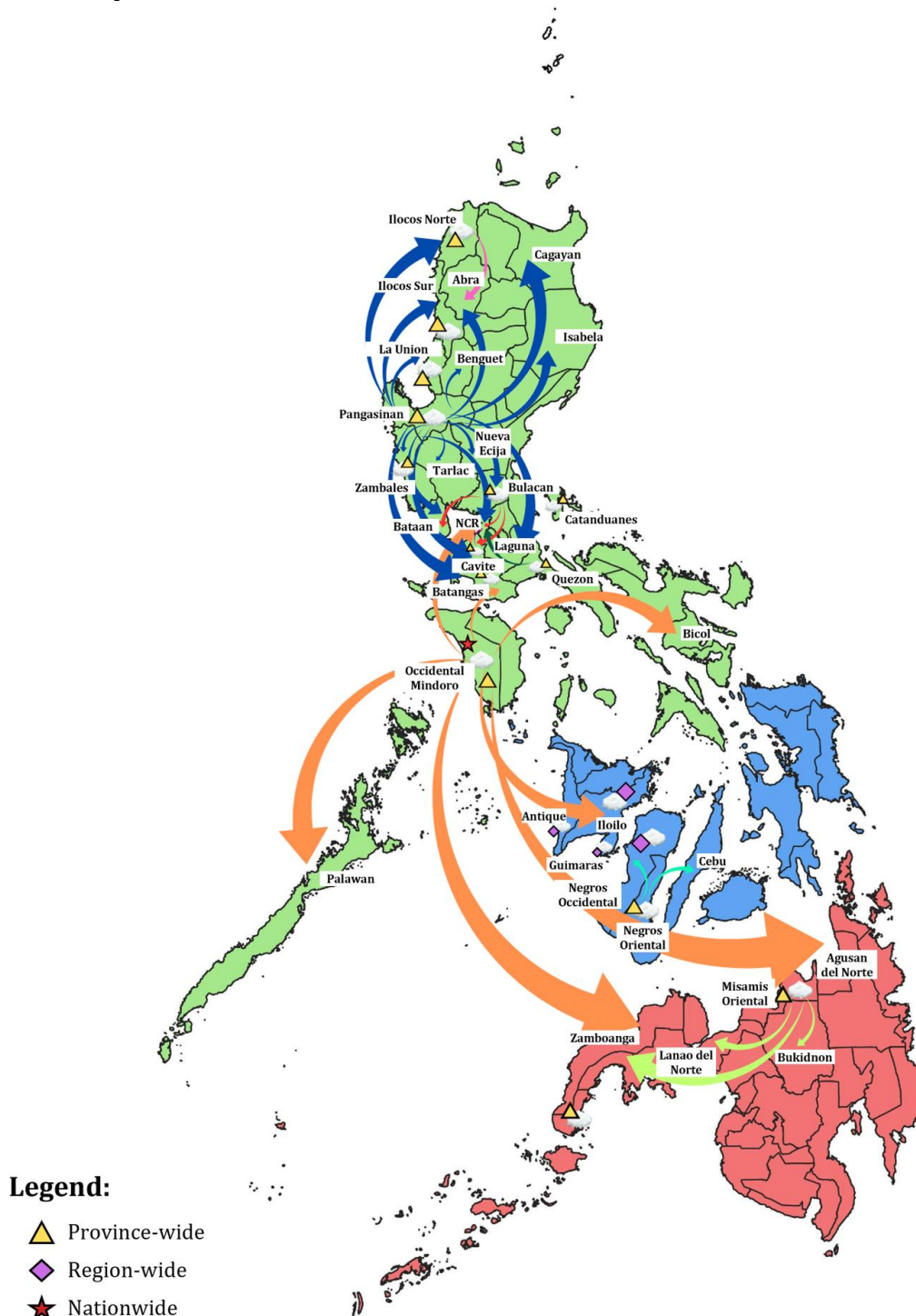


Fig. 4. Geographical distribution of locally produced salt in the Philippines

Table 4. Comparative analysis of economic returns (in US\$) for various salt production methods in the Philippines

Component	Solar evaporation-clay tiles (owner)	Solar evaporation-clay tiles (tenant)	Solar evaporation-PEP sheets (Visayas)	Solar evaporation-PEP sheets (Mindanao)	Cooking method
Revenue streams					
Local sales	5,625	5,625	315	270	19,440
Cost structure					
Fixed Capital Investment	15,530				8,161
Fixed costs					
Permits and licenses		-	-	-	18
Maintenance and repairs		-	-	-	216
Depreciation	611	-	-	-	1,066
Variable costs					
Labor	1,688	1,440*	126*	47*	1,296
Production materials	-	72	34	29	12,884
Utilities	-	-	-		65
Indirect cost	563	563	32		1,425
Rental fees (land lease)		3,375	63	162	-
Profit margins					
Gross Profit	3,374	175	60	33	3,770
Net Profit	2,763	175	60	33	2,470
Gross Profit Margin (%)	59.98	3.11	19	11.85	19.39
Net Profit Margin (%)	49.12	3.11	19	11.85	12.71
Financial performance					
Return on Investment (ROI)	17.79	-	-	-	30.27
Payback period (years)	5.62	-	-	-	3.30
Productivity metrics					
Estimated annual yield per unit area	62.5 MT/ha	62.5 MT/ha	2.5 MT/roll of PEP sheet	1.75 MT/roll of PEP sheet	72.0 MT/cooking structure

*Non-cash cost

-Production supplies and materials for solar evaporation using clay tiles is shouldered by the contractor or farm worker

-Computation of gross sales was based on the prevailing market price of salt during the conduct of the study. Prices of salt may vary depending on various factors such as negotiation between buyers and producers, seasonality, and product quality

-Conversion based on an exchange rate of PHP 1 = US\$ \$0.018. All figures are rounded to two decimal places

In Visayas and Mindanao, where small producers typically use PEP sheets, production setups are comparatively low-cost, involving minimal ground preparation. These temporary, seasonal structures allow for low-risk and flexible investments ideal for producers with limited capital, though materials generally last for only one or two seasons. Economic analysis highlights regional differences in rental fees and profitability. In Visayas, producers achieve

a net profit margin of 19% as rental fees are fixed at 10 sacks per roll per season, which is equivalent to roughly 20% of gross sales. By contrast, higher rental fees consume 50% of production output in Mindanao, resulting in a lower 11.85% net profit margin. Reducing rental costs and providing training on sustainable material use would benefit small producers, while research and subsidies on eco-friendly alternatives could reduce dependency

on short-lived sheets, thus supporting both economic and environmental sustainability.

The cooking method practiced mainly in the provinces of Ilocos and Pangasinan uses large vats to boil seawater and produce salt crystals. This method enables year-round production and is less impacted by seasonal weather changes. With a 72 MT annual yield from a single cooking structure, it provides the highest profitability, with a 30.27% ROI and a payback period of only 3.30 years. However, this method demands high investment costs of around US\$ 8,161 and operating expenses due to the need for imported rock salt and rice hulls as fuel. Government support for fuel diversification and energy-efficient training could enhance its profitability by reducing dependency on volatile fuel sources.

3.2.6. Access to financial services

Financial constraint emerged as the main limiting concern during FGDs across regions due to the high investment required for farm development. Producers often rely on microfinance, informal lenders, and private individuals for credit, as these sources do not demand collateral but come with high-interest rates. Agricultural lands are generally not accepted as collateral by banks, which restricts access to formal financial services. Consequently, producers continue to use traditional, labour-intensive methods, despite low productivity. Enhancing the sustainability and growth of the industry necessitates improved access to government credit programs. By providing accessible, affordable, and flexible credit options, producers can invest in necessary infrastructure and technology to enhance productivity and improve operational efficiency.

4. Conclusions

The Philippine salt industry is largely male-dominated, with substantial family involvement and limited education. The ageing demographic and growing disinterest among younger generations threatens the continuity of salt production and necessitates strategies to attract and retain younger workers. The majority are individual producers with limited collective bargaining power and resource pooling, and are predominantly operating on a small-scale basis due to limited resources. Regulatory compliance is low which limits market access and ability to scale up operations. Decades of production

experience do not necessarily translate to regulatory compliance and modernization. The absence of secure land tenure discourages long-term investments, resulting in dependence on traditional, less efficient production methods. The archipelagic geography of the Philippines introduces logistical and distribution challenges. Strategic advantages allow top-producing provinces like Pangasinan and Occidental Mindoro to dominate the markets in Luzon and Visayas, respectively. The ASIN Law's limitations on non-iodized salt has reduced market opportunities for many producers, but recent adjustments under RA No. 11985 offer more flexible regulations, which alleviate restrictions and enhance market access.

Profitability varies across production methods. Despite higher labour costs, the cooking method exhibits highest profitability due to year-round production. Solar salt production using clay tiles, while requiring significant initial investment, provides substantial long-term returns. PEP sheets, with their lower entry barriers and short-term investment requirements, offer flexibility and reduced financial risk, making it more accessible to small producers with limited capital.

The sustainability of the Philippine salt industry is largely influenced by demographic and socio-economic drivers that shape operational practices and growth potential. Achieving sustainable development and inclusive growth will require comprehensive education and training programs, strengthened regulatory support, infrastructure investments, enhanced access to modern technology and financial services, market expansion, and cooperative models. These strategic initiatives can attract younger generations, drive investment, and foster innovation that will ultimately lead to a more resilient and competitive salt industry.

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