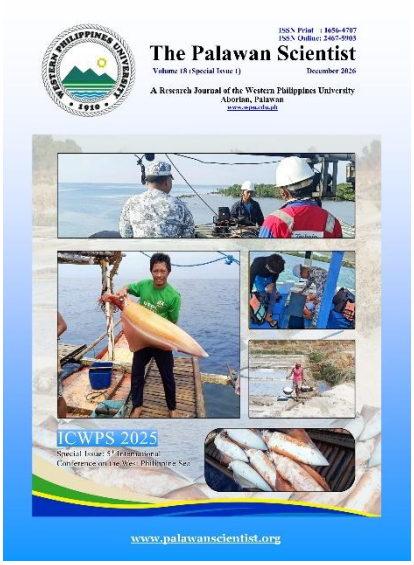

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Baseline characterization of salt-making practices and constraints in selected Philippine coastal provinces

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ABSTRACT

The Philippine salt industry supports coastal livelihoods but has declined amid import dependence, climate-sensitive production, limited modernization, and fragmented support. This descriptive cross-sectional study characterized salt-making practices, producer profiles, post-harvest practices, and reported constraints in selected major salt-producing provinces. Data were gathered from 590 salt producers, owners, operators, caretakers, and workers across Regions I, III, IV-B, VI, and X using a structured, pretested survey, field observations, and site documentation during the early and peak production periods. Data were analyzed using descriptive statistics, frequency distributions, percentages, and province- and region-based cross-tabulations. Most respondents were male (69.5%), married (80.8%), aged 46 years or older (68.8%), and had more than 20 years of salt-making experience (58.1%), indicating a sector largely sustained by experienced, middle-aged and older producers. Salt production was dominated by solar evaporation systems, including conventional crystallization beds and those with high-density polyethylene (HDPE) lined crystallization beds (78.81%), while cooking-based production accounted for 21.19% and was concentrated in the Ilocos provinces. Post-harvest practices showed limited upgrading: sacks were the dominant packaging material (93%), 72% of respondents reported that their products had no farm-level packaging labels, and 35% had no storage facility. The most frequently reported primary production constraint was climate- and weather-related risks (63.39%), while the leading marketing constraint was limited access to large-scale distribution channels (47.97%). The findings provide baseline evidence to inform targeted interventions in climate-resilient infrastructure, improved storage, appropriate technology transfer, traceability, tenure support, and market linkages to promote a more sustainable and resilient Philippine salt industry.

Keywords: coastal livelihoods, Philippine salt industry, production constraints, salt-making practices, solar evaporation

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INTRODUCTION

Salt is an essential commodity used in households, food processing, water treatment, animal feeds, chemical industries, and various agro-industrial applications (EuSalt 2025). Globally, salt production systems differ based on climate, geomorphology, brine sources, energy access, and production technology. Solar evaporation is common in dry coastal and inland areas, while boiling or cooking methods are used where climatic conditions, cultural practices, or small production scales make direct solar crystallization less feasible (Patel 2024; Salt Industry Center of Japan 2026).

In the Philippines, salt production has historically relied on coastal solar evaporation, particularly in areas with dry-seasons, such as Pangasinan and Occidental Mindoro, while cooking-based and artisanal methods persist in some localities. Recent studies have documented production systems, value-chain issues, profitability, and demographic patterns in selected salt-producing areas (Tan et al. 2022; Banicod et al. 2024; Barba and Delos Reyes 2024; Montojo et al. 2024). These studies consistently point to declining production, an aging producer population, low technology adoption, limited market integration, and vulnerability to weather variability. Trade data likewise reflect sustained import dependence for salt and related sodium chloride products (Observatory of Economic Complexity 2024).

Despite renewed national attention under the Philippine Salt Industry Development Act of 2024 (Republic Act No. 11985 2024), important knowledge gaps remain. Comparative baseline documentation linking producer characteristics, production systems, post-harvest practices, and reported constraints across selected salt-producing provinces remains limited, particularly documentation using a common survey instrument and field observation protocol. This gap is important because developing interventions for the salt industry requires location-specific baseline evidence. Such evidence provides information about the people engage in salt production, the method they use, and the operational and market constraints they encounter at the production level.

This study is therefore framed as a baseline characterization and documentation study rather than a direct assessment of empowerment outcomes or industry development impacts. It does not assess household income effects, market value, or intervention effectiveness. Instead, it generates descriptive evidence that can inform subsequent socioeconomic, technological, and policy studies and guide the prioritization of industry support initiatives.

The study links the production context, producer profile, salt-making systems, post-harvest practices, and reported constraints to potential intervention areas. It is premised on the assumption that systematically documenting these baseline conditions can help identify gaps in technology, infrastructure, market linkages, and institutional support. However, the actual effectiveness of these interventions requires separate evaluation, which falls outside the scope of the present study.

The general objective of this study was to document and characterize salt-making practices and constraints in selected major salt-producing provinces in the Philippines. Specifically, the study aimed to: (1) describe the socioeconomic profile and respondent role/land access arrangement of salt makers; (2) document production systems, including solar evaporation, HDPE-lined solar crystallization beds, and cooking-based production, as well as packaging, storage, and marketing-related practices; and (3) identify the primary production, processing, distribution, and marketing constraints reported by salt producers.

METHODS

Research Design, Study Areas, and Respondent Selection

The study used a descriptive cross-sectional research design supported by field observation and site documentation. The documentation and assessment were conducted in selected salt-producing provinces in the following regions: Ilocos Norte, Ilocos Sur, La Union, Pangasinan, Zambales, Bulacan, Occidental Mindoro, Iloilo, Guimaras, Negros Occidental, and Misamis Oriental. These provinces were purposively selected because they are recognized salt-producing areas and were included in the project field documentation plan.

Two data sources were used to guide respondent coverage. The BFAR master list (N=1079) was first used to identify the indicative population of salt producers and farm-size categories in the target provinces. This list provided the basis for estimating the minimum sample requirement using Slovin's formula at a 5% margin of error: $n = N / (1 + N e^2)$, where n is the required sample size, N is the population size, and e is the margin of error. The formula was applied to the BFAR-listed population and farm-size categories to determine the minimum target coverage. During field implementation, however, the Provincial Local Government Unit (PLGU) and municipal/city agriculture offices provided updated operational lists and assisted in locating active producers. The final 590 respondents (Table 1) therefore represent the actual number of accessible and consenting salt producers identified during PLGU-assisted fieldwork, exceeding the minimum sample size (n = 292) estimated from the BFAR list.

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Table 1. Number of respondents by region and province based on field implementation assisted by Provincial Local Government Units.

Region	Province	Respondents
I	Ilocos Norte	33
I	Ilocos Sur	54
I	La Union	20
I	Pangasinan	132
III	Bulacan	13
III	Zambales	8
IV-B	Occ. Mindoro	35
VI	Iloilo	41
VI	Guimaras	71
VI	Negros Occ.	136
X	Misamis Or.	47
TOTAL		590

Respondents were selected through stratified purposive sampling to maximize coverage of accessible active producers in each province. Large, medium, and small operations were represented where present. The criteria for respondents selection included: (1) at least 18 years old; (2) currently involved in salt production, post-harvest handling, or farm operations as an owner, co-owner, renter, caretaker, or worker; (3) knowledgeable about the production process and farm practices; (4) located in one of the selected provinces; and (5) willing to participate. Persons who were not directly involved in salt production, were unavailable during the survey visits, or did not provide consent were excluded from the survey. The field survey was scheduled within the approved research period and covered early and peak production stages so that production practices could be observed under different seasonal operating conditions. The exact field visit dates, however, varied by province depending on the production calendar, LGU coordination, farm accessibility, and weather conditions.

Field Visits, Survey Instrument, and Ethical Safeguards

Field visits were undertaken in coordination with LGUs. Prior to interviews, the purpose of the study was explained to respondents, and voluntary informed consent was obtained. To ensure compliance with ethical standards, the respondents were assured that their participation was voluntary and that they could refuse to answer any question. The information gathered from the study would be reported in aggregated form to protect confidentiality.

The survey instrument covered the respondents' profile, roles or land access arrangements, salt-making experience, production systems, packaging, storage, marketing-related practices, and problems encountered in production, processing, distribution, and marketing. The instrument was pretested with salt farmers and operators in Dasol, Pangasinan, and Pasuquin, Ilocos Norte. This was done to ensure the clarity, appropriate sequencing, and completeness of the instrument in capturing the required information and data. In addition, field observations were recorded during the field survey to validate and supplement survey responses on production and post-harvest practices.

The study protocol was reviewed by the University Research Ethics Review Board of Mariano Marcos State University. Ethical clearance was granted for the approved study period.

Data Processing, Statistical Analysis, and Limitations

The data gathered from the survey were encoded, cleaned, and tabulated in MS Excel. The data were analyzed using descriptive statistics, while frequencies and percentages were computed for categorical variables. Cross-tabulations by province or region were used for production systems and selected practice variables. Because the study was a baseline characterization and field implementation depended on the accessibility of and willingness to participate among salt producers, inferential tests were not applied. Overall, the analysis emphasized descriptive patterns rather than population-level causal inference.

Meanwhile, pooled analysis was used to describe overall patterns across selected producing provinces. Province- and region-level summaries were presented where the data supported meaningful comparison, particularly for production systems. However, the pooled results of this study should not be interpreted as a statistically representative estimate of all Philippine salt producers because the sampling frame and field access varied by site. Nonetheless, to reduce potential bias, the study used updated local lists, field observations, pretested instruments, and respondent inclusion criteria that required direct knowledge of salt production. Some variables, including storage duration, were recorded using categorical response options. Therefore, they are interpreted as survey-recorded categories rather than precise continuous measurements.

For constraints, respondents were asked to identify the primary problem they experienced in each domain. After review by the research team, responses were grouped into thematic categories. This coding approach simplified complex constraints and is interpreted as a ranking of the most salient issues rather than a complete inventory of all problems experienced by each respondent.

RESULTS

Respondent Profile and Salt-making Experience

A total of 590 respondents were included across Regions I, III, IV-B, VI, and X (Table 1). Region I accounted for the largest number of respondents because it included Ilocos Norte, Ilocos

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Sur, La Union, and Pangasinan. Western Visayas also contributed a large share through Iloilo, Guimaras, and Negros Occidental.

Most respondents were male (410, 69.5%), while females accounted for 180 (30.5%) of the sample (Table 2). Married respondents comprised the largest share (477, 80.8%), followed by single respondents (78, 13.2%) and widowed respondents (35, 5.9%). The age distribution further showed that salt production was largely undertaken by older working-age respondents. The largest proportion belonged to the 46–59 age group (245 or 41.5%), followed by those aged 60 years or older (161 or 27.3%) and those aged 31–45 years (159 or 26.9%). Only 25 (4.2%) respondents were 18–30 years old. This age structure suggests that the salt-making workforce is sustained mainly by middle-aged and older producers, with relatively limited participation from younger workers.

Educational attainment was concentrated at the elementary and high school levels. High school graduates formed the largest group (193 or 32.7%). This was followed by elementary graduates (149 or 25.3%), respondents with a high school-level education (80 or 13.6%), respondents with elementary-level and college-level education (60 or 10.2% each), and college graduates (45 or 7.6%). Only one respondent reported postgraduate education, while two reported having vocational training. These results indicate that most respondents had basic to secondary-level education, which may reflect the experiential and practice-based nature of salt-making knowledge in the surveyed communities.

Among the respondents, owners comprised the largest group (193 or 32.7%), followed closely by renters (178 or 30.2%). Laborers accounted for 115 respondents (19.5%), caretakers for 71 (12.0%), and co-owners for 33 (5.6%). Since these categories encompass both land-access arrangements and operational roles, they are interpreted as positions or roles of the respondents rather than as a strict land-tenure classification.

Table 2. Sociodemographic characteristics, respondent classification, and salt-making experience of salt makers (n = 590).

Characteristic	Category	Frequency	Percent
Sex	Male	410	69.5
	Female	180	30.5
Civil status	Married	477	80.8
	Single	78	13.2
	Widowed	35	5.9
Age group	18–30	25	4.2
	31–45	159	26.9
	46–59	245	41.5
	>60	161	27.3
Educational attainment	Elementary level	60	10.2
	Elementary graduate	149	25.3
	High school level	80	13.6
	High school graduate	193	32.7
	College level	60	10.2
	College graduate	45	7.6
	Postgraduate	1	0.2
	Vocational	2	0.3
Respondent classification	Owner	193	32.7
	Renter	178	30.2
	Laborer	115	19.5
	Caretaker	71	12.0
	Co-owner	33	5.6
Years of experience	<5 years	72	12.2
	5–10 years	66	11.2
	11–20 years	109	18.5
	>20 years	343	58.1
Farm size	Small	413	70.0
	Medium	160	27.1
	Large	17	2.9
Type of ownership	Owned	407	69.0
	Cooperative	141	23.9
	Tenant	40	6.8
	Government	2	0.3

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The results also revealed that respondents had extensive experience in salt-making. More than half (343 or 58.1%) had more than 20 years of experience in the salt industry, 109 (18.5%) had 11–20 years, 66 (11.2%) had 5–10 years, and 72 (12.2%) had less than five years of experience. This confirms that salt production in the surveyed provinces is largely sustained by experienced producers. The low proportion of younger and newer entrants may also indicate challenges in ensuring the intergenerational continuity of the salt industry.

Furthermore, the farm and ownership characteristics underscore the dominance of small-scale, privately owned production arrangements. Small farms accounted for 413 respondents (70.0%), followed by medium farms (160, 27.1%) and large farms (17, 2.9%). In terms of ownership type, most respondents were associated with privately owned farms (407, 69.0%), followed by cooperative-based operations (141, 23.9%), tenant arrangements (40, 6.8%), and government-owned areas (2, 0.3%). These patterns suggest that the surveyed salt industry remains largely small-scale and locally managed, with cooperative arrangements also playing an important role in selected production areas.

Production Systems and Post-Harvest Practices

The study classified salt production systems into two primary categories: solar evaporation and cooking-based methods (Table 3). Solar evaporation was the dominant system, accounting for 465 respondents (78.8% of the total). Of these, 445 respondents used conventional solar beds or platforms, while 20 used HDPE-lined crystallization beds. The cooking-based production method accounted for 125 respondents (21.2%).

The results showed clear geographic patterns in the use of production systems. The solar evaporation method was reported by all respondents in Western Visayas and Misamis Oriental and by most respondents in Pangasinan and Occidental Mindoro. In contrast, cooking-based production was dominant in Ilocos Norte and Ilocos Sur. La Union showed a distinct pattern, with most respondents using HDPE-lined solar crystallization beds and a smaller proportion using cooking-based production. Differences in salt-making practices across provinces may reflect differences in local production traditions, site conditions, and available production facilities.

Table 4 shows the post-harvest practices of the respondents. Farm-level packaging was predominantly done using sacks (93.1%). Plastic bags were used by 40 respondents (6.8%), while other packaging materials were rarely reported. This suggests that there is minimal variation in packaging materials at the farm level and that most producers continue to depend on basic bulk packaging rather than adopting differentiated or value-enhancing packaging formats. Regarding packaging costs, most respondents reported costs of PHP 10-20 (63.1%), while 5.1% reported costs below PHP 10. Meanwhile, 188 (31.9%) of the respondents reported that the materials were free, because they were provided by buyers or the government. Of these, 27.5% reported that packaging materials were provided by buyers and 4.4% provided by the government.

Storage practices also highlighted key post-harvest constraints among respondents. Although 64.7% of respondents reported having storage facilities, a substantial 35.3% had none. The most commonly used storage materials were plastic sacks (54.4%), burlap sacks (17.8%), woven baskets (14.4%), and other materials (13.4%). In terms of storage duration before marketing, 35.3% of the respondents stored salt for one week or less, 24.4% for one to two weeks, 4.2% for two to three weeks, 22.4% for more than three weeks or months, and 13.7% reported no definite storage duration. Storage duration was recorded as categorical responses rather than exact numbers of days; hence, these values should be interpreted as survey categories rather than precise continuous measurements.

Table 3. Documented salt production systems and crystallization-bed/lining material in selected salt-producing provinces.

Province	Solar Evaporation		Total solar evaporation	Cooking-based production	Total
	Conventional beds/platforms	HDPE-lined beds			
Ilocos Norte	0	0	0	33	33
Ilocos Sur	0	1	1	53	54
La Union	0	15	15	5	20
Pangasinan	105	1	106	26	132
Central Luzon (Zambales, Bulacan)	13	0	13	8	21
Occidental Mindoro	32	3	35	0	35
Western Visayas (Iloilo, Guimaras, Negros Occidental)	248	0	248	0	248
Misamis Oriental	47	0	47	0	47
Total	445	20	465	125	590
Percent	75.4	3.5	78.8	21.2	100.0

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Primary Constraints in Production, Processing, Distribution, and Marketing

Tables 5 and 6 present the primary problems reported by each respondent. The categories are mutually exclusive because each respondent was coded according to the most salient problem within each domain. In this study, climate- and weather-related production risks refer to direct weather hazards such as untimely rainfall, typhoons, and rainfall-induced disruptions to evaporation and crystallization. By contrast, seasonality and operational vulnerability refer to the short production window and operational stoppages associated with seasonal production limits. Location- and site-related constraints include broad site suitability issues such as flood exposure, land-use conflict, or difficult access. In marketing, inconsistent pricing, weak bargaining power, and the absence of a standardized pricing system were kept as separate categories because they refer, respectively, to price fluctuations, the producer's limited negotiating position, and the lack of a formal or commonly accepted pricing reference.

Climate- and weather-related production risks were the most frequently reported primary problems in production and processing, cited by 374 respondents (63.39%). Increased production costs were reported by 99 respondents (16.78%), followed by seasonality and operational vulnerability (55, 9.32%), location- and site-related constraints (39, 6.61%), and the absence of significant production or processing problems (23, 3.90%). Location and site-related constraints included general concerns about physical suitability, exposure, access, or site conditions, as reported by respondents.

In distribution and marketing, inadequate access to large-scale distribution channels was the most frequently reported primary problem (283, 47.97%), followed by inconsistent pricing and

Table 4. Farm-level packaging, packaging source/cost, storage facility, storage material, storage duration, and packaging information reported by respondents (n = 590).

Characteristics	Frequency	Percent
Packaging Material Used		
Sack	549	93.1
Plastic bag	40	6.8
Others	1	0.2
Packaging Cost		
< PHP 10	30	5.1
PHP 10-20	372	63.1
Source of Free Packaging Material		
Provided by buyer	162	27.5
Provided by government	26	4.4
Farm Storage Facility		
With storage	382	64.7
Without storage	208	35.3
Storage Material Used		
Plastic sack	321	54.4
Burlap sack	105	17.8
Woven basket	85	14.4
Others	79	13.4
Storage Duration Before Marketing		
1 week or less	208	35.3
1 to 2 weeks	144	24.4
2 to 3 weeks	25	4.2
More than 3 weeks or months	132	22.4
No definite duration	81	13.7
Information Marked in Farm-Level Packaging		
Yes	165	28.0
No	425	72.0

Table 5. Primary problems reported in salt production and processing.

Primary problem reported: production and processing	Frequency	Percent
Climate- and weather-related production risks	374	63.39
Increased production costs	99	16.78
Seasonality and operational vulnerability	55	9.32
Location and site-related constraints	39	6.61
No significant problem reported	23	3.90
Total	590	100.00

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Table 6. Primary problems reported in salt distribution and marketing.

Primary problem reported: distribution and marketing	Frequency	Percent
Inadequate access to large-scale distribution channels	283	47.97
Inconsistent pricing and unstable profit margins	188	31.86
Weak bargaining power against buyers	33	5.59
No significant problem reported	33	5.59
High transport costs	25	4.24
Absence of standardized pricing system	20	3.39
Vulnerability to local economic conditions and regional oversupply	8	1.36
Total	590	100.00

unstable profit margins (188, 31.86%). Weak bargaining power (33 or 5.59%), the absence of significant marketing problems (33 or 5.59%), high transport costs (25 or 4.24%), absence of a standardized pricing system (20 or 3.39%), and vulnerability to local economic conditions or regional oversupply (8 or 1.36%) were reported less frequently.

DISCUSSION

The study provides a descriptive baseline of salt-making practices and constraints in selected Philippine coastal provinces. The results should be interpreted as documentation of observed and reported patterns rather than evidence of causal relationships, empowerment outcomes, or intervention impacts. Within this scope, the study contributes by linking respondent characteristics, production systems, post-harvest practices, and reported constraints using a common field instrument across multiple producing areas.

The demographic pattern is consistent with recent research findings concerning the Philippine salt industry. Banicod et al. (2024) reported a predominantly male and aging salt-production workforce with substantial family involvement and limited formal education. The present study yielded similar findings: 69.5% of respondents were male, 68.8% were 46 years or older, and 58.1% had more than 20 years of experience. These results suggest that current production depends heavily on experienced, middle-aged, and older producers. However, because the study did not measure youth attitudes, household labor allocation, or succession plans, youth engagement is treated only as a possible policy implication rather than as a directly measured outcome.

The results regarding respondents' classification and farm size also indicate the small-scale and locally managed character of the surveyed salt farms, which may reflect a broader characteristic of the Philippine salt industry. Owners and renters represented the largest respondent groups, while laborers, caretakers, and co-owners were also present. This pattern shows that production involves both land access arrangements and operational roles. Thus, these categories should not be interpreted as a strict land-tenure typology. The dominance of small farms and privately owned or cooperative arrangements suggests that interventions may need to be tailored to smallholder realities, including limited capital, labor constraints, and uneven access to formal markets.

The findings on the dominance of solar evaporation production systems are consistent with Montojo et al. (2024), who identified solar evaporation as a major production system in the country. The provincial pattern of cooking-based production in Ilocos Norte and Ilocos Sur, and of solar evaporation in Western Visayas, Misamis Oriental, Pangasinan, and Occidental Mindoro, also reflects the diversity of salt-making systems in the Philippines. These patterns are documented descriptively. Further analysis would be needed to test whether they are associated with climate type, brine source, land availability, labor, cultural practice, market demand, or access to capital. Cost-and-return comparisons among conventional solar beds, HDPE-lined beds, and cooking-based systems were not conducted; therefore, the study does not draw conclusions about the relative profitability or economic superiority of these systems. This caution is important because site-specific profitability may vary with input costs, scale, production season, labor requirements, and market prices (Barba and Delos Reyes 2024).

Post-harvest results indicate limited farm-level packaging differentiation and substantial storage gaps. The dominance of sacks as packaging material and the absence of farm-level packaging information among 72.0% of respondents may constrain producer-level traceability, although consumer perception cannot be inferred because retail labeling may be handled later by traders, processors, or distributors. The result is nevertheless relevant to value-chain upgrading because food traceability systems support product identification, quality management, and information flow across supply chains (Aung and Chang 2014). For salt moved in bulk or non-retail containers, appropriate container-level information is also consistent with the purpose of Codex guidance on non-retail container labeling, which seeks to facilitate harmonized information for food moving through

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supply chains (Codex Alimentarius Commission 2021).

The lack of storage facilities among 35.3% of respondents is a practical constraint that may affect the ability of salt farmers to protect product quality and time their sales decisions to obtain better prices. Similar issues of market access and value-chain constraints have been observed in agricultural and salt value chains, where limited storage, weak organization, dependence on buyers, and limited value-adding capacity can reduce producers' bargaining power (Ton 2008; Reardon et al. 2019; Tan et al. 2022; Lat et al. 2024). However, the present study did not measure selling price, margins, or income. Thus, economic implications are discussed only as plausible pathways for future research and intervention design rather than as measured impacts.

Moreover, climate- and weather-related risks emerged as the most frequent production constraints. This pattern is consistent with the dependence of solar salt production on predictable dry conditions for evaporation and crystallization and with constraints reported in salt-farming areas such as Occidental Mindoro (Muyot and Asuncion 2022). Weather disruptions, such as unexpected rainfall, prolonged cloudiness, high humidity, and storms, can reduce brine concentration, dissolve crystallized salt, delay harvesting, damage pond structures, and shorten the effective production season. The results therefore reinforce the need to examine climate-resilient infrastructure, improved drainage, protected or covered crystallization systems, flexible production scheduling, and localized weather advisories. These are feasible intervention areas, but their cost-effectiveness, technical suitability, and adoption by different farm-size groups should be evaluated separately.

Findings on marketing constraints highlight the dominance of limited access to large-scale distribution channels and unstable pricing. While these findings do not constitute a full market opportunity assessment, they identify priority areas for further value chain and feasibility studies. Potential areas for further study include cooperative aggregation, improved quality consistency, producer-level recordkeeping, storage improvements, traceability systems, and stronger linkages with institutional buyers. Collective action can help smallholders address coordination problems, reduce transaction costs, and improve market access, especially when they are supported by appropriate institutional arrangements and external facilitation (Markelova et al. 2009). For salt producers, this suggests that strengthening cooperation should be studied not simply as an organizational goal but as a potential mechanism for aggregation, quality control, negotiation, and access to formal buyers.

Overall, the findings showed that selected Philippine salt-producing communities retain strong experiential knowledge and diverse production practices. Yet they face various practical constraints related to climate-sensitive production, post-harvest handling, storage, and market linkages. The study provides baseline evidence for prioritizing climate-resilient infrastructure, storage support, appropriate technology transfer, improved packaging and traceability, tenure-related assistance, and market-linkage interventions. These priorities should be pursued through targeted and evidence-based programs rather than uniform interventions across all provinces. Future research should move beyond descriptive profiling by measuring income contribution, employment generation, production volume and value, youth participation, gender roles, youth participation, cost-and-return performance, willingness to adopt improved technologies, and the effectiveness of specific storage, traceability, and market-linkage interventions. Such evidence will help determine which interventions can most effectively strengthen the sustainability, productivity, and market participation of small-scale salt producers.

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GENERATIVE AI STATEMENT

Generative AI (ChatGPT) was used to improve the clarity and concision of the manuscript. The authors reviewed and edited the suggested wording and take full responsibility for the final content.

ETHICAL CONSIDERATIONS

The study used a pretested survey instrument and field observation protocol. Informed consent was obtained from respondents before the interviews. Participation was voluntary, confidentiality was maintained, and results were reported in aggregated form. The study was reviewed by the University Research Ethics Review Board of Mariano Marcos State University, and an Ethical Clearance Certificate was secured for the period from 21 February 2024 to 21 February 2025.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no competing interests.

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