TECHNICAL REPORT
First Quarter Progress Report
November 16, 2023 – February 2024

(1) PROJECT PROFILE
Program Title: **Establishment of Asin R&D Center in Pangasinan State University**
Project Title Artisan Salt Technology Innovation and Preservation Project
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(2) COOPERATING AGENCY/IES
Pangasinan State University, Don Mariano Marcos Memorial State University

(3) SITE(S) OF IMPLEMENTATION (Municipality / District / Province / Region)

Base Station: President Ramon Magsaysay Ste University
Other Site(s) of Implementation: Ilocos Norte, Ilocos Sur, La Union, Pangasinan (Region 1)
Zambales (Region 3)

(4) TYPE OF RESEARCH	**(5) R&D PRIORITY AREA & PROGRAM (based on HNRDA 2017-2022)**
_____ Basic __x___ Applied	_____ Agriculture, Aquatic and Natural Resources Sector: _____ _____ Health Sector: _____ __x___ Industry, Energy and Emerging Technology Sector: _____ _____ Disaster Risk Reduction and Climate Change Adaptation Sector: _____ _____ Basic Research Sector:
Sustainable Development Goal (SDG) Addressed	SDG 13(Climate Action), SDG 15 (Life on Land), SDG 2(Zero Hunger), SDG6 (Clean Water and Sanitation)

Project Description

This project targeted to increase artisan salt production output with the highest quality through S&T intervention while keeping the key elements of standard of food safety and preserving the culture of traditional salt making in the Northern and Central Luzon, Philippines. There is a need to transpire artisan salt making to a larger community and enhance if not improve the various processes in salt making to be more efficient and productive. With the promising market and naturally available mineral content particularly the iodine content potential of these Artisan Salts, it is a vital connection to support the industry to its full potential. To date, there is limited information on the extent of the production of Artisan salt in Luzon. More so, while we wanted to uplift the productivity of these promising salts, a database for the target is crucial. To enhance while preserving the (ancient) indigenous methods for the numerous special salt variations, this initiative intends to rehabilitate and innovate the artisan salt production already taking place in the Philippines, especially in Luzon. Furthermore, considering the salinity levels of the local salt water, it aims to supply salt production all year long. Increased production of high-quality salt may result from the application of various S&T knowledge and technologies, such as elevated saltwater concentration in ponds, improved artisanal fractional crystallization process and intervention, and the provision of an improved evaporation system to the Artisan Salt Makers. By enhancing and improving the various methods, it seeks to increase salt output and manufacture salt of the highest quality while keeping the key elements of the manufacturing process following the food safety standards. Furthermore, this intervention in the long run will bring additional profit and source of income to people of coastal communities. Replicability of this intervention to various coastal communities of Luzon is further expected.

The declining number of artisan salt makers is among the many challenges in the salt industry. The revival of this industry will only be attractive when more salt makers encouraging to continue the traditional salt making process with the promise of innovating the salient procedures in production while preserving their culture and tradition.

The productivity of the artisan salt production is also influenced by the health and safety of farmers. The interdependence and balance between an individual's resources and job requirements define their capacity for labor. A person's health status is made up of their biological traits, such as their age, gender, and underlying diseases, as well as their physical, psychological, and social talents and abilities. To offer the required assistance for higher productivity, it is essential to document the health and safety conditions of the farmers. Documenting the conditions of salt farmers and their strategies may be used as the basis for developing policies that would improve the practice and ultimately boost productivity.

Rationale/Significance

The Philippines is endowed with vast coastal waters and the potential for salt production. To date, our country has been importing 93% of its salt supply despite the 36,000 kilometers of shoreline. According to the Department of Agriculture, the decline in production is associated with low-quality control and stunted product development for many years (DA, 2022). Moreover, the limited development including the lack of innovation and interventions, and investment opportunities added to this problem.

As the unsung hero of every kitchen, salt is crucial to enhancing the flavors of most foods provided to different cuisines and in medicine. Based on its place of origin, salt has a distinct flavor in the Philippines. One of the many salts available on the market with potential uses is Philippine Artisan salt. These artisan salts are traditionally manufactured with high-quality salt types in a few specific Philippine regions, including Pangasinan (Asin Sugpo), Zambales (Asin sa Buy-o), Ilocos (Ilocano Asin}, Guimaras (Duldol), and Bohol (Tibuok). Nevertheless, due to a lack of innovations, interventions, and production support, many small industries are gradually losing their ability to operate.

The use of organically harvested salt is becoming the trend worldwide, and only a few regions are producing unique salt that can be shipped or marketed. The Philippines is endowed with vast bodies of water and gifted with unique salt variants. In the Northern part of Luzon, three exceptional premium salt are challenged to extinction that is potential for international markets equally or above the taste of salt commercialized. Ilocano Asin is made the way it has been traditionally done in the northern parts of the Philippines: small scale, manually done, unbleached, unwashed, and no iodine added. Agsana is the Ilokano term for salt making and for generations the technique is kept alive by communities and families living by the sea. Taken from the waters surrounding the Philippines and dried by the sun, further processing is done using sand filtration and evaporation to create an amazing local salt. The Sugpo Asin are hollow crystals that are ever so slightly pink due to the shrimp that live in the salt beds from which this salt is harvested--hence its name. Sugpo Asin, its unusual hue and briny flavor, when used as a finishing salt, remains especially crunchy even when sprinkled on wet surfaces of most cooked delicacies. The production of this delicate salt is a finicky process. The process of making them, although tedious and physically demanding, results in products that are remarkable in look, taste, color, and texture. Meanwhile in Zambales according to preliminary field evaluation, Zambales Buy-o offers iodized salt with a purity of 75%. The periodic manufacture of the Artisanal salt, which is weather-dependent, presents another challenge. To increase output, it's crucial to take into account the availability of the necessary salinity concentration as well as the time frame for crystallization and evaporation.

These identified Artisan salt industries in Luzon are now coming to extinction primarily due to the declining number of salt makers engaging in production because of its traditional tedious preparation, the seasonality of production, changing climatic conditions, laborious method of evaporation and high cost of expense for cooking which traditionally utilize woods for fuel; and low salt productivity/ recovery. Generally, these artisan salt farmers in Luzon produced 50-100 kilograms of artisan salt for each batch of harvesting that only last during the dry periods. This is because, saltwater use for artisan salt making are those seawater entering ponds during dry periods with high salinity concentration. According to the salt makers on personal communication, the salinity of seawater entering the salterns during the wet season are less concentrated, thus, not practical for salt making process. While there are about 400 families benefitting to salt making industry in Pangasinan, limited data is available in terms of the number of farmers going into artisan salt making and land area devoted to artisan salt farming. To date, no more than 10 families for each artisan salt makers continue to pursue in the production. The changing climate added to this challenge, the changing water level and tides that what is usually observed is now experienced by the salt makers. This result to the unpredicted schedule of activities for their salt making process. The artisan salt is extracted using filtration and partial crystallization wherein salted earth is washed several times of brine water at least three times. The concentration of salt concentration is not yet ensured upon extraction since this is dependent on the salinity of the water used for washing and the dried salt crystals attached in the brined soil. The extraction process last for 3-5 days during the dry season and lasts longer when they tried to produce on wet season. Added to this, the salt quantity is not guaranteed by the end of process. For every “tapayan” or claypot-full of filtered brine water, the farmer only recovered on the average one to two gallons of salt during high saline concentration period and one gallon during wet season. The recovery of this salt required about two to three wood bundles to finish one cooking session.

Hence, there is a need to transpire artisan salt making to a larger community and enhance if not improve the various processes in salt making to be more efficient and productive. With the promising market and naturally available mineral content particularly the iodine content potential of these Artisan Salts, it is a vital connection to support the industry to its full potential.

To date, there is limited information on the extent of the production of Artisan salt in Luzon. Moreso, while we wanted to uplift the productivity of these promising salts, a database for the target is crucial. To enhance while preserving the (ancient) indigenous methods for the numerous special salt variations, this initiative intends to rehabilitate and innovate the artisan salt production already taking place in the Philippines, especially in Luzon. Furthermore, considering the salinity levels of the local salt water, it aims to supply salt production all year long. Increased production of high-quality salt may result from the application of various S&T knowledge and technologies, such as elevated saltwater concentration in ponds, improved artisanal fractional crystallization process and intervention, and the provision of an improved evaporation system to the Artisan Salt Makers. Another focus is to incorporate the brands of food items sold in the province, like fermented fish/shrimp, among others. By enhancing and improving the various methods, it seeks to increase salt output and manufacture salt of the highest quality while keeping the key elements of the manufacturing process following the food safety standards. Furthermore, this intervention in the long run will bring additional profit and source of income to people of coastal communities. Replicability of this intervention to various coastal communities of Luzon is further expected.

The declining number of artisan salt makers is among the many challenges in the salt industry. The revival of this industry will only be attractive when more salt makers encouraging to continue the traditional salt making process with the promise of innovating the salient procedures in production while preserving their culture and tradition.

The productivity of the artisan salt production is also influenced by the health and safety of farmers. The interdependence and balance between an individual's resources and job requirements define their capacity for labor. A person's health status is made up of their biological traits, such as their age, gender, and underlying diseases, as well as their physical, psychological, and social talents and abilities. To offer the required assistance for higher productivity, it is essential to document the health and safety conditions of the farmers.

In a study conducted by Muyot et. al (2022), among the constraints and challenges faced by salt farmers include climate change and variable weather patterns. The farmers' coping mechanisms and adaptation techniques, however, were not documented.Documenting the conditions of salt farmers and their strategies may be used as the basis for developing policies that would improve the practice and ultimately boost productivity.

Scientific Basis/Theoretical Framework

This project focused on the enhancement of the local salt industry particularly the artisan salt of Northern and Central Luzon while preserving its cultural practices. This focuses on increasing salt production with promising quality through the enhancement of the production process using various techniques and interventions while preserving the artisan salt-making practices of Luzon. This project targets to increase artisan salt production by at least 10% of its current production and revive the dying salt industry in the coastal communities of the province.

The project will be seven major activities/studies namely 1. Profiling of the artisan salt industry; 2. Spatio-temporal (In-Situ) salinity assessment; 3. Elevating Artisan salt production through S&T intervention; 4. Participatory training of fisherfolks for artisanal salt making; 5. Preservation of the artisan salt industry; 6. Identification of Health Status and Safety Condition of Artisan Salt Farmers; and 7 Documentation and Identification of Climate Change Adaptation Practices of Salt Farmers. The project targets to selected sites in the provinces of Northern and Central Luzon for the assessment of the salt industry. Technologies developed priorly for salt making will be implemented in the area.

A set of experimental trials on salinity concentration in impounding ponds will be conducted the establishment of S&T as well designed fractional crystallization set-up and the furnace for salt evaporation will be done and assess the productivity of salt produced. The produced salts will be sent for analysis to compare the quality of products based on interventions implemented.

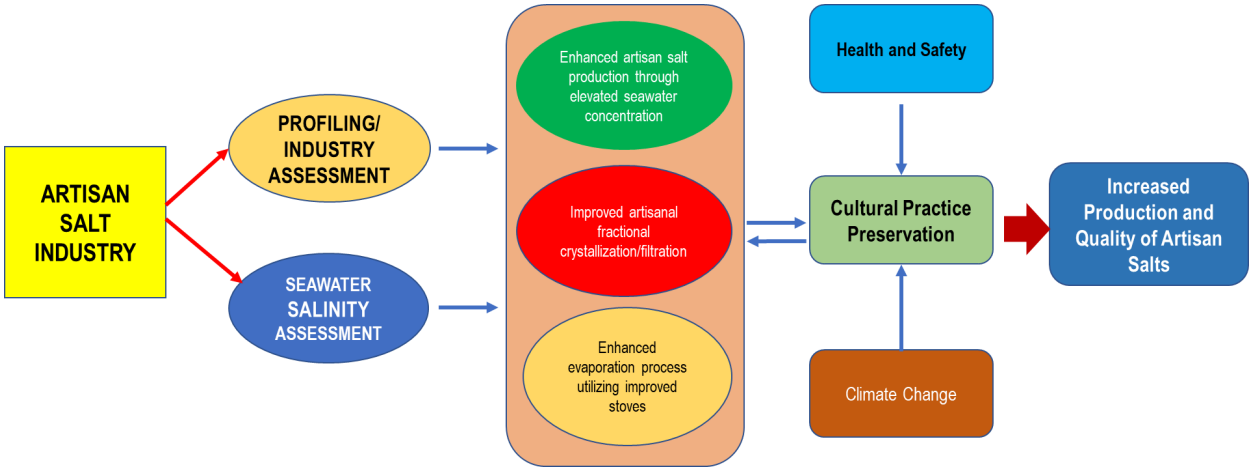

Figure 1. Project Framework

OBJECTIVES

General:

Increase salt output and produce artisan salt of the highest quality while keeping the key elements of the manufacturing process following the food safety standards and preserving the culture.

Specific:

Specifics:

a. Profiling the artisan salt industry and produce in terms of sociodemographic profile, value-chain, and production site biota evaluation.
b. Assess the spatiotemporal salinity of identified coastal areas used for artisan salt production
c. Increase artisan salt production to at least 10% of the current production using elevated seawater concentration, fractional crystallization and filtration using absorbent and enhanced evaporation process using improved clay brick furnace.
d. Develop strategies for the preservation of the traditional culture of salt production.
e. Train at least one community for expansion of improved artisan salt production;
f. Document health status and safety condition of artisan salt farmers; and
g. Document and identify climate change adaptation practices

(8) REVIEW OF LITERATURE (not to exceed three pages)

<u>The Demand for Artisan Salts</u>

As reviewed by Vetayen et al (2022), the increasing competition from imported salt, particularly from China, Australia, and other countries, is affecting the local salt industry in the Philippines. Imported salt is often cheaper and of higher quality than locally produced salt, which makes it more attractive to buyers (Hidayat & Raman, n.d.; Simamora et al., 2021). The prediction of one organization said that 96 percent of salt would be imported to the country if the industry will not be revived (Inquirer, n.d.), and will cause a salt crisis in the country. Among the may salt variants available in the Philippines, the artisan salts is sought to be of high potential for market.

To increase the artisan salt production, like any other salt locally produced in the Philippines, increasing the production through various support mechanisms like providing incentives to small-scale producers, increasing production capacity, and improving quality of salt produced are positive strategies of reducing the country's dependence to importation (Guntur et al., 2018; HeruSusanto et al., 2015; Ravizky & Nadav, 2007; Rodrigues et al., 2011). Added to this, this will create opportunity for local employment and opening of local and even international market to our artisan salt product.

Artisan salt, known more in the international market as Artisan Sea salt is a natural/organically produced salt with many health benefits. The premium quality of these salts and its exquisite taste make it distinguishable to the market. The growing awareness about the health risks associated with excess sodium consumption is boosting the market for artisan sea salts. In addition to its culinary applications, sea salt can aid digestion and reduce fluid retention. It is also increasingly popular as an ingredient in certain coffee flavours and desserts. Furthermore, it helps reduce blood pressure, which is another reason why more consumers are turning to sea salt. The artisan salts have a promising potential to proliferate the local and the world market since the common trend of healthy living is towards consciousness to taking naturally produced products. According to the Artisan Sea Salt Market Research Report (2022) the global market for the artisan salt is projected to have a constant growth rate of more than 11% over the next seven years. Major drivers are the increasing demand for natural ingredients in cooking, a growing awareness of health benefits, and the growing incidence of chronic diseases. In addition, the increasing demand for natural products in the food and beverage industry is anticipated to increase market share.

<u>Artisan Salt Making</u>

Artisanal salt production is an ancient activity, which has become a completely integrated part of saline ecosystems. Artisan salt can be considered a particular ecosystem, where human intervention is tolerated and even necessary to maintain its characteristics, preserving the landscape and protecting the environment, while simultaneously generating economical profit.

In general, the salt production process involves (i) stabilization to remove large particles in seawater and as a reservoir of feed, (ii) evaporation, (iii) concentration, (iv)crystallization, and (v) harvesting of salt product. The problems found in this process are low quality of raw seawater (due to high TSS and other impurities), open transport of concentrated sea water into the crystallization pond, high penetration of pre-crystallized water into the soil in the crystallization pond, and batch crystallization process (all seawater in crystallization pond is crystallized).

Agsana is the Ilokano term for salt making and for generations the technique is kept alive by communities and families living by the sea. Taken from the waters surrounding the Philippines and dried by the sun, further processing is done using sand filtration and evaporation to create an amazing local salt.
Production of Sugpo Asin requires intensive care to maintain the ponds used to raise prawns during the rainy season as these, in turn, are used as salt beds during the dry season. Seawater is funneled into the shallow ponds

where, in the intense heat, the crystals evaporate quickly, resulting in a moderately moist, delicately tinged salt with a sweet, briny flavor. The manufacture of these salts is unique to the Philippines.

Sea salt from Botolan, Zambales made using a traditional process unique to the Northern coast. Earth soaked in seawater during high tide is placed in a large wooden filter lined with leaves. More saltwater is poured through to produce a concentrated brine. Using a large pan, the brine is cooked down into fine sea salt. An unusual feature of the technique employed is the repeated spreading of loose dry earth on the surface of the salt-bearing deposits, thus absorbing salty moisture from the ground surface which is in turn evaporated by the sun, gradually increasing the salt content of the loose earth. It is this earth which is subsequently leached and then recycled to be used again and again in the so-called “salt gardens”

Improving the salt productivity of artisan salts is critical since preservation of the long-time culture is a must. Thus, enhancing the salient processes will be practical and efficient to boost productivity. A study has shown that modifying the concentration of seawater in the evaporation pond followed by fractional crystallization can increase the quality and quantity of salt production in traditional salt production (Santosa, 2015). According to Mohandas et al. (1997), the evaporation of brines from their initial densities to 29-30°Be’ density change in the quality of salts crystallized at various density levels with changing ionic composition of brines provided high-quality salt.

In Indonesia, the main problem of salt production is low productivity and quality because the technology used commonly by Indonesian salt farmers is traditional method. To address the problem, the prism greenhouse method is a salt production system with a combination of several salt production technologies, including geomembrane, threaded filter, and prism greenhouse technology. The results of this study were the productivity increased threefold, and the quality of salt produced also increased in terms of the content of NaCl from 85% to 95%. In addition, salt production with the prism greenhouse method has several advantages, such as faster harvest time, weather resistance, easy to use, and higher profit than traditional methods (Guntur et al., 2018).

Biomass fuels, commonly wood, leaves, twigs, straws, cow dung, and agricultural residues are collected from the indigenous environment. These have become a traded commodity as cooking fuel as access to local biomass is getting more difficult than ever. The natural growth of forests, as well as afforestation measures, is too low to meet the consumption of the population due to the inefficient burning of biomass for cooking purposes and high population growths, putting pressure on the economic situation of biomass-purchasing households. The use of energy-saving stoves is economically affordable and environmentally sound. The literature revealed that the use of improved stoves can reduce fossil utilization to 25-30% while increasing thermal efficiency to about 30%(Hossain et al. 2016; MacCarty et al,2008; Comsawang et al., 2020). Studies revealed that rocket stoves compared to the traditional three- and clay stove has 28% thermal efficiency, 43% reduction specific fuel consumption, 42% CO and 81% PM2.5 emission (Mekonnen, 2020).

Parabolic solar cookers perform better than other solar cookers such as box solar cookers since higher temperatures are achieved in a shorter duration. These higher temperatures allow most types of cooking processes such as boiling, frying, roasting, and baking to be possible. The major problem with most conventional solar cookers is that cooking is not possible during off-sunshine periods. Integrating solar cookers with thermal energy storage (TES) makes cooking during off-sunshine periods possible (Kaundal, Powar & Dhar, 2018). In Mexico, the developed solar stove stores heat from the parabolic reflector to be used by the insulated cylinder. The values obtained through the simulations indicate a sustained heat from 220°C to 210°C for 360 minutes (6 hours), also 9 hours heat between 210-120°C which enough time to cook food with high caloric demand for cooking. After this time, the solar stove decreases 10°C within 4.4 hours, a space in which it can heat enough previously cooked food (Portillo et al., 2021). The use of parabolic solar cooker can reduce dependency on firewood. A solar cooker was proposed by Keith et al in 2019 that a collapsible parabolic solar cooker with 12 panels and a phase change material-incorporated cooking pot is a viable alternative to firewood. The phase change material allows food cooked during the day to be kept warm and subsequently consumed as an evening meal.

Project Update

1. Pre-engagement Activity

Before the commencement of the activity, the team coordinated with local government units and concerned agencies/ associations and discussed the intent of the project. During the discussion possible collaboration thru Memorandum of Agreement were discussed for identified beneficiaries of intervention to the localities. Among the areas coordinated and identified individual salt makers are as follow:

LIST OF ARTISAN SALT MAKERS IN SURVEYED AREAS

NAME	SEX	ADDRESS
MARCELINO GALE	MALE	VICTORY, BOLINAO PANGASINAN
JOHN MC HAOUDINE	MALE	CABUNGAN, ANDA PANGASINAN
FELIX TACADENA	MALE	CABUNGAN, ANDA PANGASINAN
BERLITO CASULA	MALE	CABUNGAN, ANDA PANGASINAN

NESTOR CONTA	MALE	CABUNGAN, ANDA PANGASINAN
ROSALINDA CAOLE	FEMALE	TUNDOL, ANDA PANGASINAN
CESARIA DE GUSMAN	FEMALE	TUNDOL, ANDA PANGASINAN
ALBERTO JALLORINA	MALE	DILI, STA CRUZ ILOCOS SUR
SHERWIN LAORENTINO	MALE	DILI, STA CRUZ ILOCOS SUR
FELINO JALLURINA	MALE	DILI, STA CRUZ ILOCOS SUR
LARRY BANIAGA	MALE	BRGY. SAOTI BURGOS, ILOCOS NORTE
ODITTE L. RAGRAGULA	FEMALE	CALLAGUID, PAOAY ILOCOS NORTE
EUGENE L. RAGRAGULA	MALE	CALLAGUID, PAOAY ILOCOS NORTE
MICHAEL CAROLINO	MALE	PILAR BOLINAO PANGASINAN
MAE ABUAN	FEMALE	DANAC BUNGA, BOTOLAN ZAMBALES
HELEN ABUAN	FEMALE	DANAC BUNGA, BOTOLAN ZAMBALES
EDITHA ACIENTO MORAYAG	FEMALE	DANAC BUNGA, BOTOLAN ZAMBALES
GLORIA DEVERA DOLYAS	FEMALE	DANAC BUNGA, BOTOLAN ZAMBALES

LIST OF REFINERY SALT MAKERS IN THE PHILIPPINES

NAME	SEX	ADDRESS
LARRY MONTENEGRO	MALE	PANGAPISAN ALAMINOS PANGASINAN
WILFREDO DEL ROSARIO	MALE	BARANGAY STO TOMAS, PALAUIG ZAMBALES
RUBY CAL	FEMALE	BARANGAY STO TOMAS, PALAUIG ZAMBALES
JOSEPH FRIAS	MALE	BARANGAY STO TOMAS, PALAUIG ZAMBALES
NIDA ANITO AMAYO	FEMALE	BARANGAY STO TOMAS, PALAUIG ZAMBALES
QUINDRICK ONG	MALE	IBA, ZAMABALES

LIST OF SOLAR SALT MAKERS IN THE PHILIPPINES

NAME	SEX	ADDRESS
JESSICA	FEMALE	PANGAPISAN ALAMINOS PANGASINAN
JOEL CALI	MALE	VICTORY, BOLINAO PANGASINAN
MARCELO CAAYA	MALE	PILAR BOLINAO PANGASINAN

Activity 1. Assessment of the various Artisan Salt Industries in Selected Coastal Provinces of the Philippines

The project covered selected provinces in the Philippines where Artisan salts are present to comprehensively document the current status and practices and the potentiality of the different provinces for enhancement and expansion of production for traditional salts.

As an initial implementation prior to formal assessment, probable artisan salt makers were identified. The following initial documentation were noted as part of the benchmarking activity:

Salt samples and soil samples were collected from the different areas initially assessed as potential artisan salt making farms and will be subjected for laboratory analysis to wit:

Province	**Number of Potential Farm Areas**	**Samples Collected from Potential Artisan Salt Making Area**	**Number of Samples**
Zambales	1 (Botolan)	Soil, Salt	1
Pangasinan	3 (Anda, Bolinao, Alaminos)	Soil, Salt	3

Ilocos	4 (Burgos & Paoay, Ilocos Norte; Dili, Sta Cruz, Ilocos Sur)	Soil, Salt	4
		TOTAL	**8**

The following substances to be analyzed summarize as follow with the corresponding prospect analytical laboratories:

Parameter	**Target Laboratory for Analysis**
Magnesium and Calcium	ITDI
Microflora determination	Biotech/ FNRI
Iodine content and purity	ITDI
Heavy metals (Pb, Hg, Cr, As)	ITDI
Microbial load (Aspergillus, *Penicillium* and *Cladosporium)*	DOST/ Third party
Salinity level /concentration	ITDI

Artisan Salt Making *in Zambales*

The socio-demographic profile of salt makers in Zambales includes individuals such as Mr. Quinrick Ong, a 45-year-old male, residing in Iba, Zambales, who is known for his expertise in salt production. He owns and operates his own salt production site and provides employment opportunities for others. Mr. Wilfredo Del Rosario, a 62-year-old male, lives in Barangay Sto Tomas, Palauig Zambales. His income level places him in the poor-class bracket but has an ability to afford essential necessities for his family. Mrs. Ruby Cal, a 56-year-old female, also resides in Barangay Sto Tomas. She works as a salt producer and is married to Gerald Cal. Similarly, her income level classifies her as poor-class. Mae Abuan, Helen Abuan, Editha Aciento Morayag, and Gloria Devera Dolyas are other female salt makers in Zambales, living in Danak Bunga Botolan. They are well-known for their production, passed down through generations, and are popular for their packaging, known as "asin sa buy-o". Their income from salt production enable them to provide for their families' essential needs. The salt makers' profiles demonstrate the human side of the traditional salt production industry in Zambales.

Socio demographic profile of salt makers in Zambales

Name	Address	Sex
1. Wilfredo Del Rosario	Barangay Sto Tomas, Palauig Zambales	Male
2. Ruby Cal	Barangay Sto Tomas, Palauig Zambales	Female
3. Quindrick Ong	Palanginan, IBA Zambales	Male
4. Mae Abuan	Danac Bunga, Botolan Zambales	Female
5. Helen Abuan	Danac Bunga, Botolan Zambales	Female
6. Editha Aciento Morayag	Danac Bunga, Botolan Zambales	Female
7. Gloria Devera Dolyas	Danac Bunga, Botolan Zambales	Female

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The salt production processes in each area of Zambales vary slightly depending on the source of the brine water and the equipment used but they follow a similar overall procedure. In Palanginan IBA, Zambales the process begins with the collection of filtered brine water with a salinity of 21ppt, which is then mixed with Rock salt (Barara) and melted before being transported to large cooking pots. The water starts to boil after 4 hours, leading to the formation of salt crystals, which are then collected using a sieve mesh and placed into Tiklis. Once dried, the salt crystals are ready for storage, packaging, and distribution. In Palauig, the process starts with the collection of Nawasa water, which is mixed with Barara and gradually melted before being boiled, leading to the formation of salt crystals. Similarly, in Danak bunga Botolan, the process involves creating pond beds, allowing water to evaporate to form salt crystals, collecting the surface soil, filtering the brine solution, and finally boiling the brine water to obtain salt crystals.

The salt production processes in Palauig and Palanginan, IBA also involve the use of large talyasi (cooking pots) and the improvised brick stove to provide a stable and even heat source, along with the use of IPA (Rice hull) as fuel to ensure a consistent temperature during the cooking process. Both processes also include the careful collection of salt crystals using a sieve mesh harvester and subsequent drying, storage, packaging, and distribution of the salt crystals. Additionally, the production in Danak Bunga Botolan involves the use of large circular talyasi (cooking pots) and brick stove involves the careful design of pond beds to maximize exposure to sunlight and wind for evaporation along with the use of traditional tools such as rakes and shovel to collect the surface soil from the

pond and with the use of the wheel borrow it transfer the collected soil in production area and transfer to the filter made of Nipa leaves for collecting salt crystals and filtering the brine solution.

Overall, the salt production processes in all three locations involve a series of meticulous steps, including the collection and mixing of water with rock salt, boiling the brine solution to form salt crystals, careful collection of the crystals, filtering and drying, storage, packaging, and distribution of the salt. Each location has its unique elements, such as the source of water, the quantity of rock salt used, and the specific details of the boiling and crystallization processes.

In filtration process, various types of materials are used, in palauig the common material used in filtration are fine mesh net and clothes, in IBA they used bag filters while in the Botolan they use a crafted Nypa leaves filtration. The use of Nipa leaves in salt production is a testament to the ingenuity and resourcefulness of ancient civilizations, showcasing how traditional methods in botolan zambales can still be effective in modern times.

In palauig and IBA the packaging materials commonly used are sacks and plastic bags, while in the Botolan the packing materials is made up of nipa leaves and bamboo shell cylindrically formed into a Buy-o. This unique technique makes them popular to other people and increases their market demand.

Across the different locations in Zambales, a common practice emerges regarding the lack of proper health and safety measures in salt production. The absence of personal protective equipment, such as gloves and masks, is a shared practice, posing potential risks to the workers' well-being. Additionally, the presence of open storage areas without proper containment measures is a concern, as it can lead to environmental contamination and impact the quality of the salt produced. The use of open brine water tanks and the reliance on basic filtration methods also contribute to the potential compromise of salt quality. These findings underscore the need for improved health and safety protocols in salt production across the region to ensure the well-being of workers and the environmental sustainability of the industry.

Different salt production sites in Zambales faced varying environmental conditions that impact their production. Those in IBA face issues of groundwater depletion and contamination from their deep well system, requiring effective monitoring and filtering. Producers in Palauig use municipal water supply but those with mangrove sites experience changes in weather conditions that affect evaporation and salt crystallization. During low tide, limited seawater access forces them to use freshwater. While those in Danak bunga Botolan with mangrove sites face impacts from extreme temperatures during summer that accelerate crystallization while heavy rainfall slows evaporation and can destroy their sand beds, requiring them to restart in summer time. Overall, prevailing environmental conditions pressed challenges that salt producers must adapt for sustainable production.

The market potentials for salt production in various areas of Zambales varies. In IBA, producers can harvest 800 kilos of salt per day at Php 17 per kilo (market price). They sell their salt products in local supermarkets and use tricycles to deliver the products. In Palauig, producers can harvest 5 to 13 sacks of salt per day weighing 90 kilos each and sold at Php 800 to 1,000 per sack. They sell to local grocery stores and supermarkets and use tricycles for delivery. In Danak bunga Botolan, producers can harvest 4 to 5 large cans of salt per cooking process sold at Php 200 per kilo. Bulk of their product are sold to direct buyers (wholesales) and some directly to grocery stores and supermarkets. Whole sales usually pick-up the salt while tricycles are used to deliver to grocery stores and supermarkets.

The key challenges faced by salt producers in different areas of Zambales includes lack of modern equipment and technology, insufficient capital, environmental constraints, limited fuel supply, and lack of government support. The suggested interventions focus on providing modern equipment like automatic feeders, replacing traditional materials with sturdier options for pots and stoves, integrating new technology, replacing fuel sources with more sustainable and cheaper options, providing proper storage, improving sanitation and hygiene, and allocating government funds to support salt producers. Measures like constructing deep wells for water supply and using pumps and hoses to collect seawater are also recommended. Overall, the interventions aim to improve efficiency, sustainability, and working conditions for salt producers through technology upgrades, infrastructure development, and policy support.

Artisan Salt Making in Pangasinan

The socio-demographic profile of salt makers in Pangasinan province includes several individuals and their backgrounds. Mr. Marcelino Gale from Barangay Victory, Bolinao Pangasinan, is a 59-year-old married man who has been working as a salt producer for 10 years and belong to the poor-class economic status but despite of his economic status he is able to provide the basic needs of his families. Similarly, Mr. John Mc Houdibe Tacdena Casula from Cabungan, Anda Pangasinan, is a 37-year-old salt producer who also falls within the poor-class category. Mrs. Rosalinda Caole residing in Tuntol, Anda Pangasinan who is dedicated her life to the traditional craft of salt making. Mr. Larry Montenegro from Pangapisan Alaminos, Pangasinan who used to work as a salt producer but had to stop two years ago due to personal problems. Mr. Michael Carolino has been a salt producer for 20 years living in Pilar, Bolinao Pangasinan, while Mrs. Jessica's family owns Ignacio Aqua farm in Pangapisan Alaminos Pangasinan, which provides jobs to the community. Mr. Joel Cali owns the Barangay Victory, Bolinao

farm, and Mr. Marcelo Caaya is the owner of a salt farm in Pliar Bolinao Pangasinan for 40 years. Lastly, Mr. Nestor Batalla assistant of provincial agriculturist who managed the government pacific salt farm in Pilar, Bolinao, Pangasinan.

Socio demographic profile of salt makers in Pangasinan

Name	Address	Sex
1. Marcelino Gale	Barangay Victory, Bolinao Pangasinan	Male
2. John Mc Houdibe Tacdena Casula	Barangay Cabungan, Anda Pangasinan	Male
3. Rosalinda Caole	Barangay Tuntol, Anda Pangasinan	Female
4. Michael Carolino	Barangay Pilar, Bolinao, Pangasinan	Male
5. Larry Montenegro	Pangapisan, Alaminos Pangasinan	Male
6. Jessica	Baranggay Pangapisan Alaminos Pangasinan	Female
7. Joel Cali	Barangay Victory, Bolinao Pangasinan	Male
8. Marcelo Caaya	Barangay Victory, Bolinao Pangasinan	Male

The salt production process in various barangay of Pangasinan province have minor variations, but the overall process follows similar steps. First, the salt ponds are prepared by cleaning and drying them. Then, the ponds are filled with either seawater or brine from a deep well. The water is left to evaporate under the sun for several days, leaving behind concentrated brine. Next, the brine solution is cooked in large pots over a stove to facilitate crystallization. As the water evaporates, salt crystals form on the surface and at the bottom of the pots. Workers then collect the salt crystals. The salt is placed on tiklis to further dry before being packed into sacks or containers for distribution and consumption. Rock salt (Balara) was added to the brine water to aid the production process. In summary, the salt making process involves preparing the ponds, concentrating the salt water through evaporation, crystallization through cooking, harvesting the salt crystals, and finally drying and packing the salt for sale.

Salt producers in Pangasinan province exhibit varying practices in salt production. Many have inadequate health and safety measures and proper storage for salt storage. Open storage areas allow salt to be easily carried away during windy or rainy conditions, potentially contaminating nearby soil and water bodies. Workers often do not wear proper personal protective equipment like gloves and masks. Those that filter salt for further processing sometimes use clothes that can affect the purity and quality of the final product. While some producers have strict protocols to prevent contamination between salt types and use proper storage to prevent moisture absorption, many workers in the salt ponds are barefoot, which can impact product quality. Overall, most salt producers in Pangasinan have inadequate health and safety measures in their workplaces.

There are two main types of eco-zones in different locations in Pangasinan, the mangrove and pond. In both conditions, changes in weather patterns particularly temperature and rainfall affect salt production. During summer with high temperatures, evaporation is accelerated which increases brine concentration and shortens crystallization time, thereby boosting production. However, increased rainfall slows down evaporation, decreases brine concentration and lengthens crystallization, negatively impacting salt production.

Salt producers in different barangays of Pangasinan province are able to harvest various amounts of salt per production or cooking process depending on weather conditions and the availability of their water sources. They mainly sell their salt products to local grocery stores and supermarkets in their areas. The salt producers utilize tricycles to transport and deliver the finished salt products to their customers. The harvested salt is sold at prices ranging from PHP 150 to PHP 270 per large can or sack depending on the type and quality of salt used. The market potentials for salt products seem promising in these areas of Pangasinan.

Salt producers in various barangays in the province of Pangasinan faced similar challenges including lack of modern equipment and technology, limited resources and supplies, environmental factors, and lack of government support. There are several suggested interventions to help address these challenges including providing sturdier cooking pots and storage drums, integrating modern technology, building more efficient stoves, providing hygiene kits and storage facilities, allocating government funds to support salt producers, and improving transportation and packaging of finished salt products. If these interventions are implemented, the potential to improve the efficiency and sustainability of artisanal salt production in the region is high.

Artisan Salt Making in Ilocos Region

In Barangay Dili, Sta. Cruz, Ilocos Sur, there are three salt producers who are members of the Dili Asinan Association - Mr. Alberto Jallorina who is 53 years old and has been producing salt for 10 years, Mr. Sherwin

Laorentino who is 37 years old and has 4 years of experience, and Mr. Felino Jallurina who is 60 years old and has been producing salt for 40 years. In Barangay Saoti, Burgos, Ilocos Norte, Mr. Larry Baniaga who is 50 years old and the president of the Mariposa Salt Makers association with 35 members, though only 25 are currently active. Last year, the DOST conducted training for their association and introduced HDPE beds to aid their salt production. Mrs. Odite L. Ragragula a 59-year-old female salt producer from Barangay Callaguip, Paoay has been producing salt for 50 years

Socio demographic profile of salt makers in Ilocos Sur and Ilocos Norte

Name	Address	Sex
1. Alberto Jallorina	Barangay Dili, Sta Cruz Ilocos Sur	Male
2. Sherwin Laorentino	Barangay Dili, Sta Cruz Ilocos Sur	Male
3. Felino Jallurina	Barangay Dili, Sta Cruz Ilocos Sur	Male
4. Larry Baniaga	Barangay Saoti, Burgos Ilocos Norte	Male
5. Oditte L. Ragragula	Barangay 25, Callaguip paoay Ilocos Norte	Female

The salt production process in different areas of Ilocos involves preparing a sand bed and pouring seawater onto it. The seawater seeps through the sand and stays in ponds where evaporation occurs due to sunlight and wind. This leaves behind salt crystals on the surface of the ponds. The salt crystals are then collected and further filtered using a bamboo sieve or other methods to remove sand particles. The brine solution undergoes a cooking process where it is boiled to allow further crystallization. The salt crystals are then collected, dried, and packed for distribution and use. Specific variations exist in the materials and tools used, such as using HDPE pond liners instead of sand beds and different types of stoves and containers for the cooking process. However, the overall salt production method is similar across regions with preparation, evaporation, filtration, crystallization, drying, and packing being the key steps.

Salt producers in Ilocos provinces have inadequate health and safety measures during production. None of them wear proper personal protective equipment like gloves and masks during salt production. In Barangay Saoti, Burgos Ilocos Norte they use proper storage facilities to prevent moisture absorption, but the other two have open storage areas that can lead to contamination and loss of salt due to wind. Improving health and safety standards through the use of personal protective equipment and covered storage facilities would benefit salt producers in the region.

All locations have coastal environments for their production sites. They experience changes in weather patterns that affect salt production. During summer with high temperatures, evaporation is accelerated which speeds up crystallization. However, increased rainfall can slow down evaporation and crystallization. Heavy rainfall can also destroy the sand beds used for salt production, requiring them to start over in summer time. Changes in weather conditions, particularly temperature and rainfall, have a significant impact on the salt production process and output.

There are market potentials for salt production in several barangays in Ilocos Sur and Ilocos Norte provinces in the Philippines. In Barangay Dili, they can produce 4-5 large cans of salt per cooking process sold a t Php 60-70 per can. They sell directly to local grocery stores and supermarkets using tricycles for delivery. In Barangay Saoti, they can produce 10 sacks of salt from 7 plots and also sell to local stores using tricycles as transport vehicles. In Callaguip, they can produce 20 kilos of salt per cooking process sold at Php 500 per can, and can do 2-3 cooking processes per day. Like in Barangay Dili, they sell directly to local stores. However, since they are located in coastal areas, they walk long distances for salt delivery instead of using transportation due to unpassable road condition for transport vehicles. Overall, there seem to be good market potentials for salt producers in these areas in terms of demand from local stores and supermarkets.

Salt producers in Barangay Dili, Sta Cruz Ilocos Sur, Philippines face several challenges, including lack of modern equipment, distance from water sources, rented cooking pots, insufficient capital for expansion, environmental constraints, limited market demand, annual exchange of cooking pots, and lack of government support. To address these issues, they need reliable water pumps, larger cooking pots made of sturdy materials, drums for brine water storage, sustainable fuel alternatives, modern equipment integration, and efficient cooking stoves. The government should allocate funds to support salt producers, provide proper storage facilities, promote cleanliness in salt-making facilities, and ensure efficient transportation and packaging. In the salt production process in Barangay Saoti, Burgos Ilocos Norte, producers faced challenges related to environmental constraints, limited market demand, the annual exchange of cooking pots, limited availability of hardwoods, and transportation. Similar interventions can be implemented, such as the use of reliable and efficient water pumps, integration of modern equipment and technology, replacement of cooking pots with sturdy materials, providing drums for brine water storage, building larger or more efficient cooking stoves, promoting cleanliness in salt-making facilities, and ensuring efficient transportation of the salt.In Callaguip, Paoay, Ilocos Norte, producers face transportation issues, lack of modern equipment, insufficient capital, environmental constraints, limited market demand, annual exchange of pots, and distance from a reliable water source. Interventions include using reliable water pumps, replacing

cooking pots with sturdy materials, integrating modern equipment, and promoting cleanliness in salt-making facilities.

Activity 2. In-Situ Salinity Assessment

For the experimental se-up of the various intervention for improving artisanal salt making, specific areas in Zambales, Pangasinan and Ilocos provinces were identified. The following assessed locations will be coordinated for MOA:

PROVINCE	SPECIFIC TARGET LOCATION
Ilocos	Burgos and Paoay, Ilocos Norte
Pangasinan	Bolinao and Anda, Pangasinan
Zambales	Danacbunga, Botolan, Zambales

Thorough coordination with local government units, responsible association and stakeholder will be done through a binding memorandum of understanding/agreement. The process of assessment and improvements to the current practices will be discussed thoroughly and clearly prior to intervention of the project.

The initial salinity of the target coastal sites in selected provinces were initially assessed spatially and temporally. Using submerged data loggers, sea water temperature, conductivity, and salinity were noted for the months of January - February as baseline information.

NAME	LOCATION	DATE	TIME	WEATHER CONDITION	WATER SOURCE	BRIX (%)	SALINITY (%)	TEMPERATURE (◦C)	CONDUCTIVITY (µS/cm)	MAIN WATER SOURCE FOR COOKING BRIX (%)	Salinity (%)	TEMPERATURE (◦C)	CONDUCTIVITY	REMARKS
Marcelino Gale	Victory, Bolinao Pangasinan	01/18/24	9:49 AM	Sunny	Mangrove	6.3	5.9	29.5	92040	N/A	N/A	N/A	N/A	Low tide
Rosalinda Caole	Tondol, Anda Pangasinan	01/19/24	2:21 PM	Sunny	Mangrove	6.4	6.1	31.3	95160	14.5	13.1	27.4	204360	Low tide
Michael Carolino	Pilar, Bolinao Pangasinan	01/18/24	10:30 AM	Sunny	Mangrove	N/A	N/A	N/A	N/A	4. 3	3.7	30	57720	Low tide
Alberto Jallorina, Sherwin Laurentino, Felino Jallorina	Dili Sta Cruz Ilocos Sur	01/23/24	11:25 AM	Sunny	Coastal	4.9	3.9	30.1	60840	23.9	22.9	27.8	357240	Low tide
Larry Baniaga	Burgos, Ilocos Norte	01/24/24	2:06 PM	Sunny	Coastal	4.2	3.6	26.2	56160	17.4	15.2	24.6	237120	Low tide
Odette L. Ragragula	Brgy 25 Callaguip, Paoay Ilocos Norte	01/25/24	12:45 PM	Sunny	Coastal	4.1	3.5	30.1	54600	24.9	20.2	33.3	315120	Low tide

NAME	LOCATION	DATE	TIME	WEATHER CONDITION	WATER SOURCE	BRIX (%)	SALINITY (%)	TEMPERATURE (◦C)	CONDUCTIVITY (µS/cm)	HARVESTED WATER POND BRIX (%)	Salinity (%)	TEMPERATURE (◦C)	CONDUCTIVITY	REMARKS
Jessica	Pangapisan, Alaminos Pangasinan Ignacio Aqua Farm	01/17/24	10:20 am	Sunny	Mangrove	15.2	14.6	22	227760	N/A	N/A	N/A	N/A	Low tide
Marcelo Caaya	Pilar, Bolinao Pangasinan	01/18/24	10:54 am	Sunny	Coastal	6.1	5.4	31	84240	N/A	N/A	N/A	N/A	Low tide
Joel Cali	Brgy Victory, Bolinao Pangasinan	01/18/24	9:03 am	Sunny	Mangrove	6.5	6.1	25	95160	28.7	26.5	27.8	413400	Low tide
NAME	LOCATION	DATE	TIME	WEATHER CONDITION	WATER SOURCE	SHALLOW WELL 1 BRIX (%)	SALINITY (%)	TEMPERATURE (◦C)	CONDUCTIVITY (µS/cm)	SHALLOW WELL 2 BRIX (%)	Salinity (%)	TEMPERATURE (◦C)	CONDUCTIVITY	REMARKS
Mae Abuan Helen Abuan Editha Aciento Morayag Gloria Devera Dolyas	Danac Bunga, Botolan Zambales	01/18/24	N/A	Sunny	Mangrove	4.4	3.7	29	57720	4.6	3.9	27.5	60840	Low tide

Enhanced Filtration/ Crystalization Method

A simulated micro- experiment is currently set-up to test the effect of utilizing various filtration substrates on the quality of salt water recovered during the filtration process commonly practiced by artisan salt makers. The following material substrates being tested as filter for the filtration set-up:

1. Dried sargassum
2. Dried sargassum char
3. Bamboo char (biochar)
4. Carbonized ricehull

Activity 3. Enhanced Evaporation System

To date, the fabrication of the of the two stove design is on-going and projected to be on field on the second quarter of project implementation

a) Rocket Stove – The rocket stove made of galvanized steel currently designed by PRMSU will be embedded to the clay brick furnace as improvement to the current design of the improved clay brick stove introduced by DOST-ITDI that will give complete combustion of biomass with hyper-efficient heat production. This rocket stove is designed with V-shaped orientation and made up of metal to prolong longevity and maintain heat transfer. The aim of the built-in design is to further increase efficiency. With this method, it is not as easy to be miserly with the wood, but there is an efficiency trade-off. The vertical arrangement holds the wood in a more ideal position for efficient burning, with a lot less operator intervention; as the fuel burns away, fresh biomass comes down automatically to replace the old. The principle behind built-in design is to sandwich the metal stove allowing safe cooking and longer life span of the stove without putting away the traditional salt cooking process of artisan salt makers. This stove can be utilized by the salt makers anytime of the year with minimal use of biomass. In addition, the stove is designed to use biomass of grasses and shrubs as fuel input.

b) Salt solar cooker – a solar-generated heat designed by PRMSU under the DOST 3- GIA project will be utilized for natural energy source during the summer periods. This solar powered salt cooker will purely use light energy coming from the sun using the parabolic –shaped reflector. The heat will be collected from sunlight using a parabolic-shaped reflector. This built-in stove will be adjustable/movable to be altered for real-time position to face the sun. This will be developed for dry season production to take advantage of the natural energy source.

STOVE DESIGN

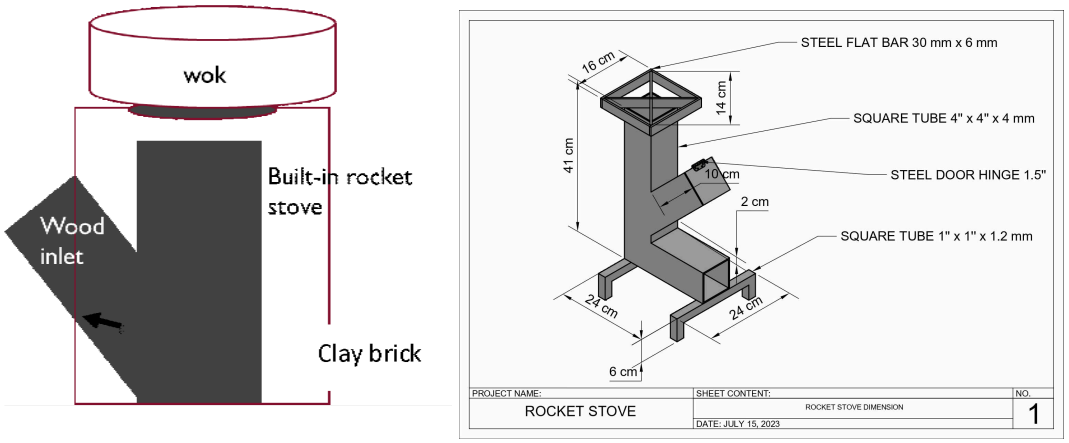


Figure 2. Rocket stove basic design

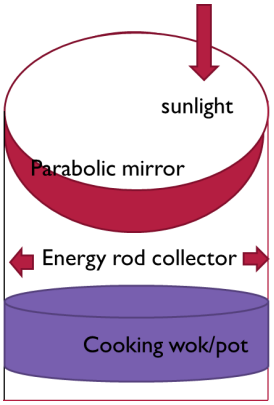


Figure 3. Salt solar Cooker illustrative design

The prototype stoves specifically the rocket stove will be tested for various biomass sources as fuel. The biomass consumption using the traditional/ conventional stove and the proposed rocket stove and parabolic stove will be differentiated in terms of fluid flow, combustion, turbulence and heat transfer to establish the design features, stove physics and stove thermal performance.

Since parabolic solar stove is dependent on light energy, there will no energy cost or fuel cost associated with it. Thus, energy consumption, fuel cost, initial cost of fabrication and maintenance cost will be evaluated for the acceptability of the stove/cooker

The performance of the two proposed stoves will be compared with the existing cooker utilized of the artisan salt makers. The shelf-life, affordability and performance of the technology will be evaluated and validated.

PHOTODOCUMENTATION

Visiting the production site and conducting interview with artisan salt makers in Pangasinan Region

Salt Production site of salt makers in Pangasinan Region

Conducting Salinity Analysis of salt production, site of salt makers in the Ilocos Region

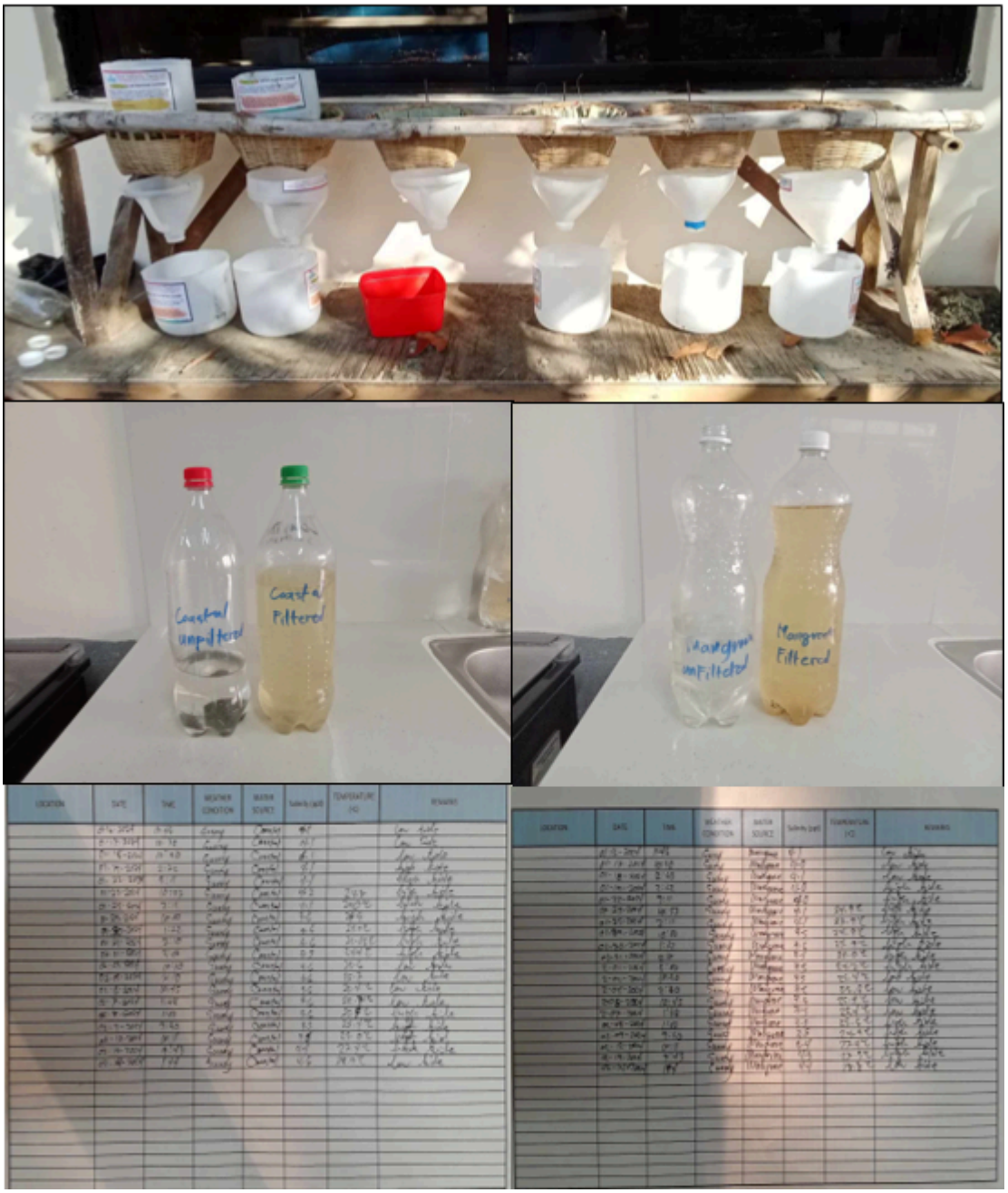
Visiting the production site and conducting interview with artisan salt makers in Ilocos Region

Visiting the production site and conducting interview with artisan salt makers in Zamables

Salt Production site of salt makers in Zambales

Conducting Salinity Analysis of salt production, site of salt makers

Conducting survey assessment of salt makers in Zambales



Setting up the filtration system and conducting observation and data gathering of filtered water

Coordination with LGUs and local Communities in Zambales

Coordination with LGUs and local Communities in Pangasinan

Cooperation with LGUs and Local Communities in Ilocos

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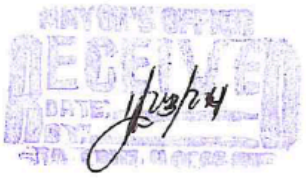
(Formerly Ramon Magsaysay Technological University)
Main Campus, Iba, Zambales
Tel./Fax No. (047) 811-1683; rmtupresident@yahoo.com
www.rmtu.edu.ph

23 January 2024

Hon. Tercelita C. Valle.
Municipal Mayor
Sta. Cruz, Ilocos Sur



THRU: The Municipal Agriculturist

Dear Mayor Valle:

Greetings from the President Ramon Magsaysay State University!

This is to inform your good office that our institution has an approved National project on **Artisanal Salt Preservation and Innovation funded by the DOST-GIA under the NICER-ASIN Program of the Department of Science and Technology -PCIEERRD.** Briefly, this two years' project scoped to establish the foundation of production of Artisan Salt makers in the Philippines. For the first year, the focus of the project will be Regions 1 and 3.

With this, our institution would like to seek permission and assistance from your good office in determining the various artisan/ Traditional salt makers in your municipality. Assessment on the still existing traditional way of producing salt may later provide vast opportunities for upscaling and expanded markets for our traditional products/ organic products through the support of our government for the Salt Industry.

Your positive response to this concern is highly appreciated.

Thank you and Godspeed!

Very truly yours,

JANICE M. BAYSA, PhD
Project Leader – NICER ASIN Project 3 Component
University Director, Research and Publication

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(Formerly Ramon Magsaysay Technological University)
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3 January 2024

ON. JOSH EDWARD S. COBANGBANG
unicipal Mayor
ABUGAO, ILOCOS SUR

OFFICE OF THE MUNICIPAL MAYOR
RECEIVED
BY: [illegible]
DATE: [illegible]
TIME: 0941H 1/12/24

THRU: The Municipal Agriculturist
Edgar Balangatan

ear Mayor Cobangbang:

reetings from the President Ramon Magsaysay State University!

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939 -954 -4677

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MUNICIPALITY OF PAOAY
OFFICE OF THE MAYOR
DATE: JAN 25 2024
TIME: 11:47
BY:

January 2024

HIELLA A. GALANO
unicipal Mayor
AOAY
OCOS NORTE

THRU: The Municipal Agriculturist
GERMELINE BASCUG

ar MAYOR GALANO

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23 January 2024

SHEILLA A. GALANO
Municipal Mayor
PIDIG
ILOCOS NORTE

THRU: The Municipal Agriculturist
GERMELINE PASCUA

Dear MAYOR GALANO

Greetings from the President Ramon Magsaysay State University!

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Very truly yours,

JANICE M. BAYSA, PhD
Project Leader – NICER ASIN Project 3 Component
University Director, Research and Publication

ACTION TAKEN
☑APPROVED ☐DISAPPROVED

MAD,
for your assistance,

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ED	

COBANGBANG

Republic of the Philippines
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ormerly Ramon Magsaysay Technological University)
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anuary 2024

Josh Edward S. Cobangbang
icipal Mayor
ngan, Alocon Sur

09414/612524

THRU: The Municipal Agriculturist
Edgar Balangatan

Mayor Cobangbang :

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GE M. BAYSA, PhD
t Leader – NICER ASIN Project 3 Component
rsity Director, Research and Publication
0934-957-4677

90520 - Edgar Balangatan

Oct 1/25/24