Unlocking the Future: Harnessing the Power of Smart Technologies for Addressing Challenges of Local Salt Farming Processes
Can you imagine human life without SALT?
Unlocking the Future: Harnessing the Power of Smart Technologies for Addressing Challenges of Local Salt Farming Processes
Dr. Deborah Sumari, PhD
Life Science and Bioengineering,
Ifakara Health Institute, **IHI-Tanzania**

Dr. Jiban Jyoti Panda, NanoBiotechnologist,
Institute of Nano Science and Technology, Mohali, **India**

Dr. Nahla Alhazmi, PhD
GM of hydrogen technologies institute, KACST, **Saudi Arabia**
PI aeronautics and astronauts with Stanford University

Dr. Eng. Osi Arutanti, M.Si
Research Center for Chemistry, BRIN Indonesia
OWSD and OWSD-ID, **Indonesia**
Background

Local Salt Farm
(Samut Songkhram Thailand)

Site Visit

- Farmer Entirely Dependent On Nature
- Bad Weather Drastically Impact Salt Production
The Process Takes Long Time (4 Months)

Non-resilient Process (Depend On Weather Conditions)

Limited/Low yield Products (10 % Edible and 90 % Byproduct)

Salt By-Products into Therapeutic Products

Adjustable Nanoparticle-coated Dome To Protect Salt Ponds From Wind And Rain

Salt Powered Batteries
Solutions

Biomass Derived Photothermal Nanoparticle Coated Shed

Shed From Recycled Polymer

Smart Shed

Biomass

Nanoparticle
1 Value Creation

Medical Applications of Salt Farming Byproducts

Wound Dressing

- Pain-relieving Smart Bandages/Wraps For Arthritis

- Antibacterial Salt
- Adsorbing Layer (Biomass Nanofiber)
- Protective Layer

- Anticancer Agents

- Anti-Psoriasis Agents
Value Creation

Salt Powered Batteries

Diagram showing the components of a salt powered battery:
- Current collector
- Sodium ions
- Electrolyte
- Separator

Battery charging and discharging processes are illustrated.
Conclusion

- Developing Environment-Friendly Technologies for Improving Salt Production Efficiency
- Newer Value-Added Products from Intermediate Byproducts/Wastes of Salt Farming (Waste to Wealth)
Alignment with BCG Model

Biomass Derived Product

Intelligent Usage Of By-products For Circular Economy

Eco-friendly Smart Technology
Thank you!

There must be something sacred in salt. It is in our tears and in the ocean.

Khalil Gibran
Capacity Building from enhanced local salt farming.

Male involvement in the salt farm

Female- involvement in medical product processing and salt collection

Other people's involvement in tourism and collaboration and Global Networking
**RHQD synthesize process**

1. **Rice Husk Waste**
2. Mix 3 mL DI water + 10 mL H$_2$SO$_4$
3. Ultrasonic for 5 h
4. Mixed Black dispersion
5. Add 20 mL HNO$_3$
6. Ultrasonic for 10 h
7. Filtered
8. Adjusted pH with NaOH
9. Autoclave at 200°C for 10 h

**Rice Husk Quantum Dot (RHQD)**
Investment analysis

**Materials**
- Bamboos ($66)
- Screws ($18)
- Polymers ($135)

Total Less than ($220)/64 square meter

**Lifetime**
Salt farmer can reuse the shed and reassemble it (lifetime of polymers more than 200 years).

**Assembly**
Three salt farmer with minimal training should be able to assemble it.

**Productivity**
It can improve productivity compared with traditional technology. (compare with producing salt every 4 months)
Resources

Stakeholders
- Researcher
- Power in research and innovation development

- Engineer
- Power in technology development

- Industry
- Technology development partner

- Startup
- Logistic and supplier

Human Resources

Development

- Ifakara Health Institute, IHI-Tanzania
- Institute of Nano Science and Technology, Mohali, India
- Hydrogen Technologies Institute, KACST, Saudi Arabia
- Research Center for Chemistry, BRIN Indonesia

- Farma Industry
- Energy Industry
- Plastic Industry
Biomass Derived Photothermal Nanoparticle
Preliminary design of a low-cost greenhouse for salt production in Indonesia

A A Jasiri, Gunarti, W Setiawan, A A Prihanto, A Kurniawan

1Department of Fishery Product Technology, Faculty of Fisheries and Marine Science, Universitas Brawijaya, Veteran Street, Malang 65145, East Java, Indonesia
2Faculty of Fisheries and Marine Science, Universitas Brawijaya, Malang 65145, Indonesia
3Center for Marine Research Center, Universitas Brawijaya, Malang 65145, Indonesia
4Kawan Tanah Gerbang, PT, Malang 65153, Indonesia

E-mail: sali_ks@yahoo.com

Abstract. Salt is an essential material of industry, not only in food industry point of view but also in various industries such as chemical, oil drilling, and animal feed industries, even less than half of salt needs used to household consumption. It is crucial to ensure salt production in Indonesia reaches the national target (3.7 million tons) due to relatively low technology and production level. Thus salt production technology is developed to facilitate farmers consisted of greenhouse and filtering-threaded technology. However, the use of those technologies in producing salt was proved less effective due to unpredictable weather conditions. Therefore, greenhouse technology is proposed to be used for salt production for several good reasons. This paper describes the preliminary design of a low-cost greenhouse designed as a pyramid model that uses bamboo, mono-layer and high density polyethylene plastics. The results confirmed that the yield of salt produced by greenhouse significantly increased compared with prior technology and the NaCl content increased as well. The cost of greenhouse was IDR 5,600,000 and easy to assembly.

Table 2. Field testing results in producing salt.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature</td>
<td>45 °C</td>
</tr>
<tr>
<td>Productivity</td>
<td>150 kg/day</td>
</tr>
<tr>
<td>Sodium chloride/NaCl</td>
<td>95 %</td>
</tr>
<tr>
<td>Colour</td>
<td>white</td>
</tr>
</tbody>
</table>
How much does a Growing Dome cost?

You are wondering how much do they cost? The base price for a Growing Dome greenhouse kit ranges from about $9,990 for a 15-foot diameter dome to about $48,950 for a 42-foot diameter dome. All of our sizes and prices can be found here. These prices do not include Shipping, Installation and Owner Supplied items. You will also need to add your raised beds, soil or talk to us about Customization options.

GERMANY’s Covestro, a US$12.3 billion material science company that makes some of the world’s strongest coating and adhesives, is promoting the benefits of what it calls a breakthrough product that can boost the incomes of farmers and fishermen in Thailand.
<table>
<thead>
<tr>
<th>Materials</th>
<th>Lifetime</th>
<th>Total</th>
<th>Price per item (IDR)</th>
<th>Total (IDR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screws</td>
<td>5</td>
<td>800 pcs</td>
<td>350</td>
<td>280,000</td>
</tr>
<tr>
<td>Bamboos</td>
<td>5</td>
<td>20 pcs</td>
<td>50,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Labourage</td>
<td>-</td>
<td>3 people</td>
<td>200,000</td>
<td>600,000</td>
</tr>
<tr>
<td>Geomembranes</td>
<td>5</td>
<td>15 kg</td>
<td>119,000</td>
<td>1,785,000</td>
</tr>
<tr>
<td>UV plastics</td>
<td>5</td>
<td>17 kg</td>
<td>119,000</td>
<td>2,023,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>5,688,000</strong></td>
</tr>
</tbody>
</table>

The benefits of the low-cost greenhouse of salt production, as follows:

- **Greenhouse costs**: Less than IDR 5,688,000 for an affordable greenhouse with a minimum planting area of 64 square meter.
- **Ease of assembly**: Three individuals with minimal training should be able to assemble the greenhouse from the ground-up in a day.
- **Lifetime**: Minimal lifetime of five years for the greenhouse structure and five years for the glazing; only limited maintenance should be required by the salt farmer.
- **High productivity**: It can improve productivity compared with traditional technology.
- **Purity of salt**: Sodium chloride can reach more than 95%.

300 USD
**SWOT ANALYSIS**

**Strengths**
- Sustainable biomass resources
  - Scale up the NPs-based biomass is feasible
  - A glass dome is effective to protect salt ponds from rain and strength wind
  - Less electrical used
- Salt products demand is continuously increasing
- The utilization of intermediate salt processing products for medical fields application is wide

**Opportunities**
- Open the opportunities for collaboration in technology development and utilization of processed product outcomes

**Weaknesses**
- Competing with the modern salt industry
  - There are several aspects that need to be developed, such as talent and facility development

**Threats**
- Less electrical used
Outcomes and Conclusion

The process took long time
4 months
Steps of salt farming

1. **Evaporation of sea salt**
2. **Drying**
3. **Salt forming**
4. **Flower stage**
5. **No taste salt (gypsum)**
6. **Black salt (fertilizer)**
Strategi Kunci dan Implementasi

- Pengembangan teknologi membutuhkan multidisiplin keilmuan
- Peningkatan benefit dapat dicapai dengan persiapan mitigasi yang jelas
- Penentuan market industri yang tepat
- Melibatkan stakeholder dan Lembaga terkait dalam proses penjualan produk
Background

Local Salt Farm (Samut Songkhram Thailand)

26,977 rai farmed by 490 families from Samut Sakhon and near areas.

- Price salt for A-grade is 10 baht/kg, B-grade 5 baht/kg, C-grade 2.5 baht/kg, Inferior quality 30—40 baht/sack. 90% of salt is for industrial businesses 10% is table salt.

Farmer completely dependent on Nature
Bad weather is drastically impacting salt farming production

<table>
<thead>
<tr>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dryland</td>
<td>Fleur salt 18-20</td>
<td>White salt 22-23</td>
<td>Black salt / Bittern 24 - 25</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>Cosmetic and skin care.</td>
<td>For food</td>
<td>Cleaning and antibacterial activity/ For detox</td>
</tr>
</tbody>
</table>

Salt farming Production

- Farmer completely dependent on Nature
- Bad weather is drastically impacting salt farming production