Resilient AIoT Green Energy System with Real-time Solution for Effective Aquaculture

(REAS-SEA)

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Shrimp Farming: $45B USD Market

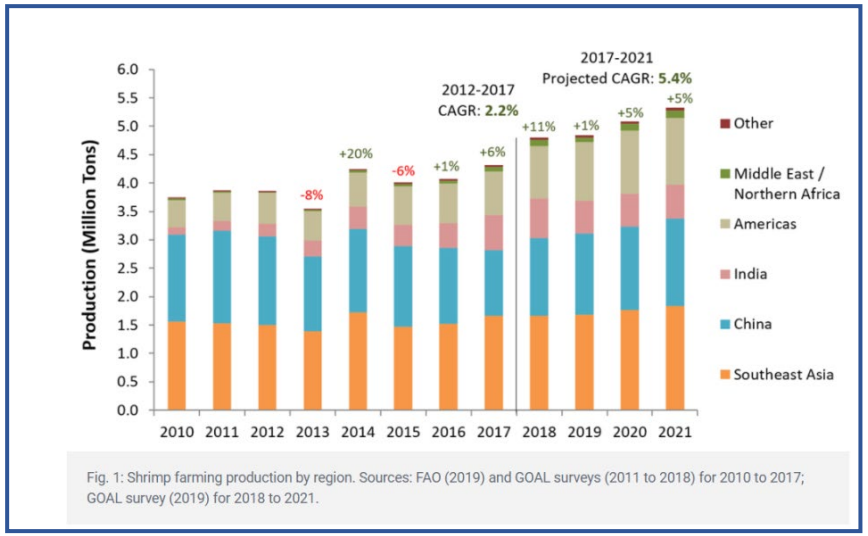


Fig. 1: Shrimp farming production by region. Sources: FAO (2019) and GOAL surveys (2011 to 2018) for 2010 to 2017; GOAL survey (2019) for 2018 to 2021.

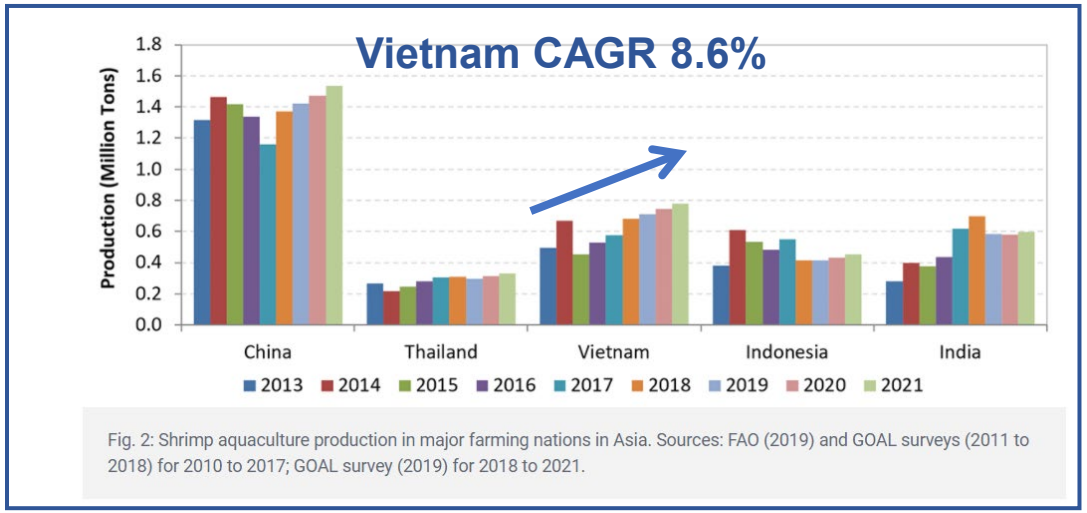
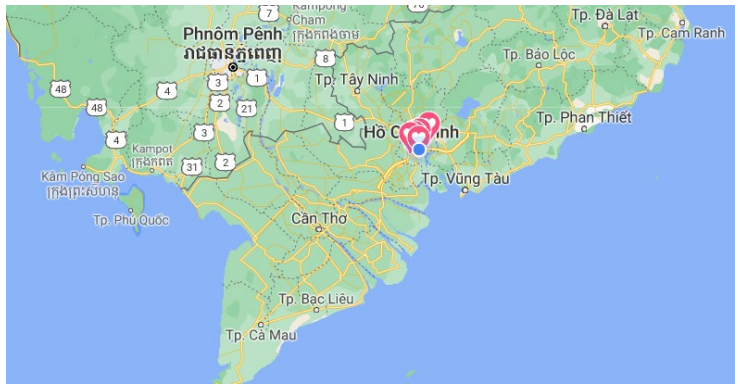


Fig. 2: Shrimp aquaculture production in major farming nations in Asia. Sources: FAO (2019) and GOAL surveys (2011 to 2018) for 2010 to 2017; GOAL survey (2019) for 2018 to 2021.

Worldwide market 5.2MT, $45B USD, CARG 5.4%



Vietnam's aquaculture market – **faster growth potential:**

Vietnam market share – **16%** (0.8MT, $7.2B) with **CAGR 8.6%**

- **National focus** on shrimp aquaculture → **faster growth**
- Climate change increase rate of **salt water penetration** → **increase production of shrimp aquaculture**
- 3M farmers and 720,000 hectares → **fragmented, small scale farmers** → **high sales potential**

Data source: Global Aquaculture Advocate report Nov. 2019

Limited Solutions for VN's Shrimp Aquaculture

- Vietnam's shrimp aquaculture is one of the **top producers** and fast rising (2nd overall, 1st black tiger shrimp). However, many shrimp farms are fragmented, small and labor intensive
- Imported monitoring systems are **expensive** and **not suitable** for VN's current environment and lack of local service and technical support.
- Existing and locally developed systems are **atomistic** and **lacking AI** with holistic solution
- Some systems use Lora RF band which is **not yet approved** by VN's policy

Existing shrimp-farm monitoring systems

Previous works	Advantages	Disadvantages
S. A. H. Z. Abidin *et al.,* 2015	• Online monitoring through web based and mobile platform • Wireless communication	• Non mobile platform and no alert triggering system • Less significant for outdoor communication • Non model for multiple sensing parameter decision • Non auto-feeding and AI processing
C. Z. Myint *et al.*, 2017	• Online monitoring through web based and mobile platform • Wireless communication	• Fixed installation • Less significant for outdoor communication • Non auto-feeding and AI processing • Non multiple sensing parameter-based model
Widad Ismail *et al.,* 2019	• Online monitoring with alarm system • Wireless with active RFIDtags • Solar energy harvesting	• Non model for multiple sensing parameter decision • Non auto-feeding and AI processing

Existing shrimp-farm monitoring systems

Local Company	Solution name	Features	Price
Eplusi (*https://eplusi.net/*	E-Sensor Aqua	• Sensing parameters: t°, pH, salinity, dissolved oxygen DO and reduction–oxidation (ORP) • SMS alerting system, monitoring on web/mobile app. • Shrimp pond control system.	- 5300USD/ set / pond - Licensing app + web: 77USD/year
NextFarm (*https://www.nextfarm.vn/)*	NextFarm NMC	• Sensing parameters: t°, pH, DO, ORP • SMS alerting system, monitoring on web/mobile app. • Shrimp pond control system. • Integration between IoT devices & NextFarm products	- 3200USD/set - Licensing diary: 80USD/year - Server cloud: 80USD/year

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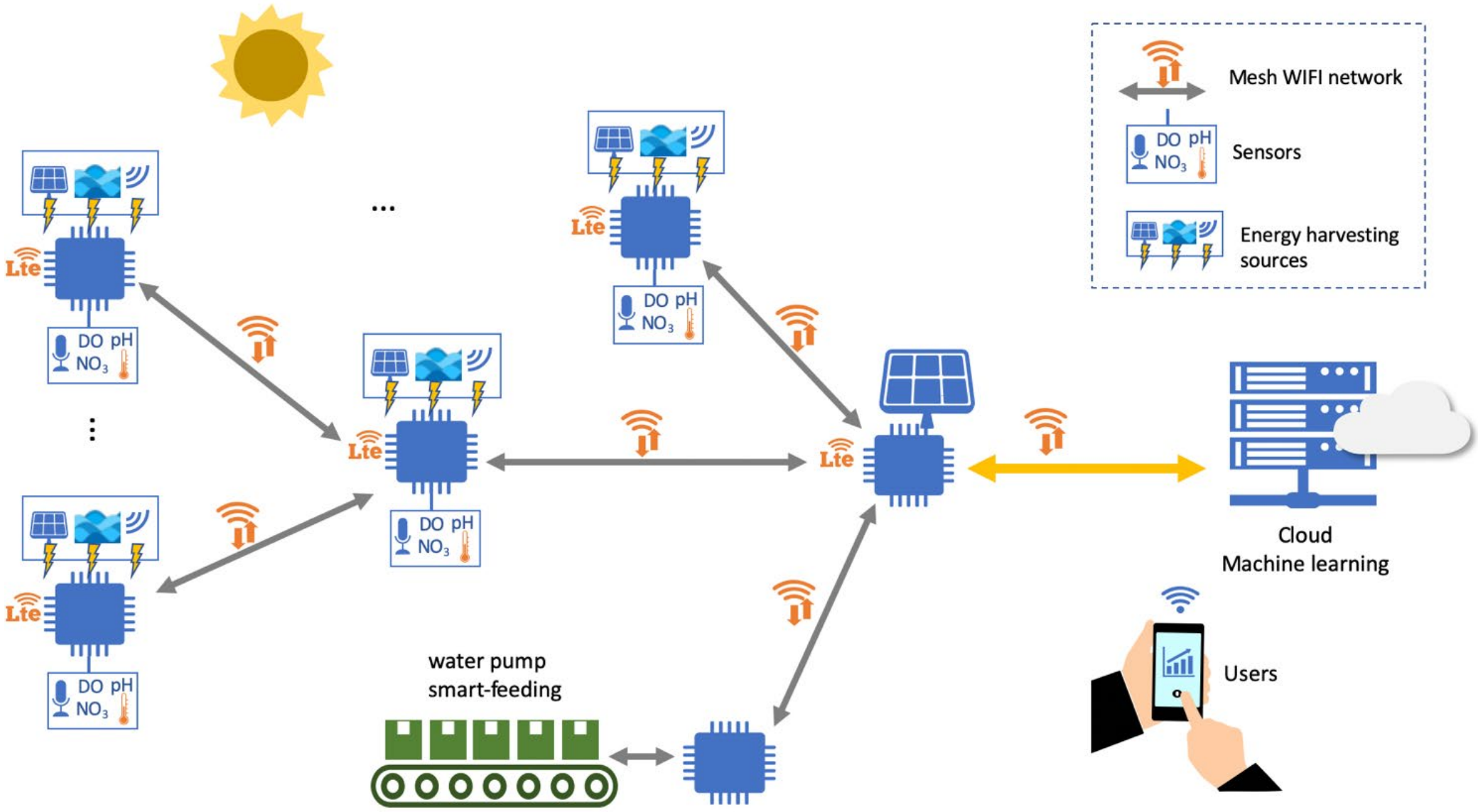


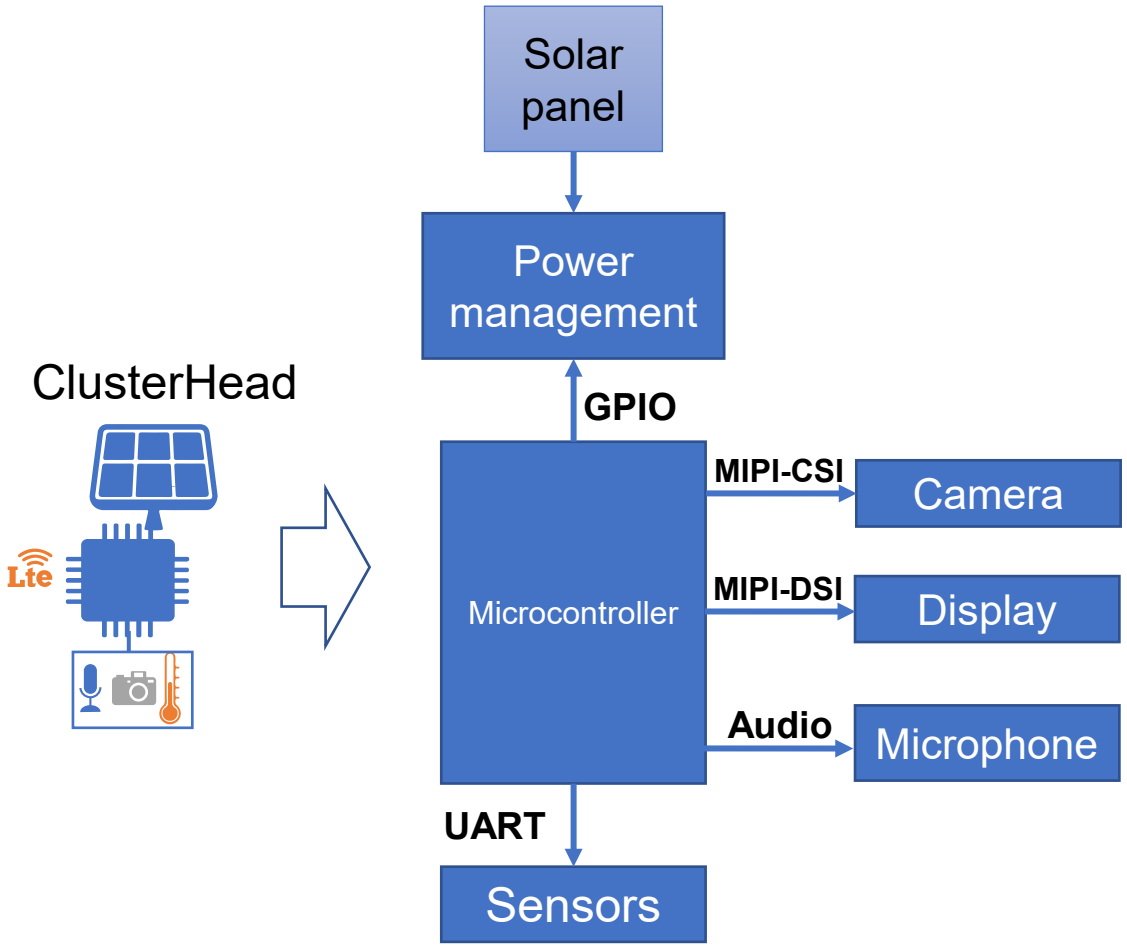
Resilient AIoT Green Energy System with Real-time Solution for Effective Aquaculture (REAS-SEA)

Technology and Solutions

- Effective **real-time** environmental and health monitoring, tracking and updating
- **Automated** controlling systems for **stabilizing** and optimal environment for health and growth
- Mesh WiFi for **auto-reconfiguration** to prevent loss of data and communication

Benefits

- ✓**Prevent** of environment disaster (e.g. sudden oxygen deficiency)
- ✓Increase **survival rate** and prevent disease proliferation
- ✓Improve **growth rate** and **quality**
- ✓**Control** use of chemical and antibiotics
- ✓Improve **revenue** productivity

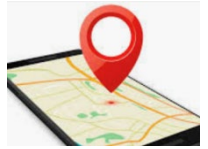


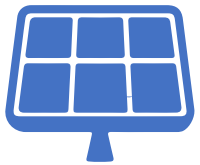
Microcontroller

- **Highlighted features used for RANASYS**
- DSP Technology
  - Machine learning accelerator
  - Audio signal processing
- LTE cellular modem
- Wi-Fi 802.11 ac
- Image signal processor (ISP)
- Audio recording
- Touch screen controller (MIPI)
- Satellite systems (GPS, Glonass, BeiDou, Galileo)
- UART

Uniqueness of **REAS-SEA**

- **Technology**
  - Resilient and autonomous systems
  - Mesh WiFi for efficient data transfer and real-time and effective response
  - Solar energy for powering up
  - Artificial Intelligence (AI) model: multivariate environmental biological sensing parameters
    - nitrate sensor data (excess feeding)
    - optical data (water clarity, shrimp physical)
    - sound sensor (shrimp eating activity): waterproof microphone
  - Integrated GPS for anti-theft, location and map record
- **Aquaculture** ClusterHeads
  - Collaboration with experts in aquaculture field
  - Applied Machine Learning
    - Stabilizing environment parameters
    - Accurate alarm systems
    - Effective food feeding





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Aquaculture of Artificial Intelligence of Things

Conclusions

- AIoT system with Connect, Compute and Communication functionalities will enhance Vietnam's aquaculture farmers' economic and promote industry growth
- Vietnam's aquaculture landscape is ripe for AIoT system with explosive growth and high market potential

AIOT


Thank you