Appendix 4.2

PROJECT:
AI-Based Real Time Analysis and Control of The Monitoring on the Growth of Freshwater Prawn Using Video Image Processing from Underwater Drone

Project Review Meeting &
Research Visit to BRIN Aquaculture Project Farm and Telkom University
Report/Minutes Form

I. Organizer:

Name:	Dr Lim Tiong Hoo
Position:	Senior Assistant Professor
Institution:	Universiti Teknologi Brunei

II. Program:

Date: 05/06/2023 – 06/06/2023
Venue: Telkom University/BRIN

Program Agenda:

Time	Activity
Day 1: Review Meeting at Telkom Universiti (5th June 2023)	
9.00am:	Welcome speech with Telkom Rector
9.30am:	Meeting with management team
10.00am:	Meeting and sharing session with the Dean of the faculty of industrial systems engineering
10.30am:	Tea break
11.00am:	Study visit to Bandung Techno-park (part of Telkom Universiti Research Centre)
12.00pm:	Lunch break
13.00pm:	Sharing session on research study and results from Research Centre for Advanced Creative Network, Telkom Universiti
14.30pm:	Tea break
15.00pm:	Project Review Meeting
16.00pm:	Dinner with Rector of Telkom Universiti (Dean of the faculty of industrial systems engineering)
Day 2: Collaboration Visit BRIN Aquaculture Project Farm (6th June 2023)	
8.30am:	Welcoming Speech from BRIN Head of Research

	Organization
9.00am:	Sharing Session on BRIN aquaculture project and research results from experiment from Aquaculture farm in Cibinong and Ciparay.
12.00pm:	Lunch
13.00pm:	Field Study Visit to the BRIN Research Labs
16.00pm:	End and depart to Jakarta

III. Participants:

No.	Name	Organization
1	Dr. Tiong Hoo Lim	UTB
2	Dk Dr Nurun Najeebah Az-Zahra binti Pg Dato Seri Setia Haji Mohammad Tashim	UTB
3	Dr. Suriayati Chuprat	UTM
4	Dr. Seno Adi Putra	Telkom University
5	Dr. Hanif Fakhrurroja	BRIN
6	Please see attached document for other partici pant attending	

IV. Summary of the activities corresponding to the objectives

Introduction

This is a 2 days project review visit held in Bandung, organized by Telkom Universi ty and BRIN. The purpose of the visit is to update the project with the members from BRIN and Telkom University, and a sharing session with researchers in BRIN. It is also used to understand the existing research works conducted by BRIN and T elkom related to the ASEAN IVO Project titled AI-Based Real Time Analysis and Co ntrol of The Monitoring on the Growth of Freshwater Prawn Using Video Image Pr ocessing from Underwater Drone. The visit included a mid-project review meeting, visit to research facilities and lab, and meeting with the management of BRIN and Telkom Universiti.

Objectives of the visit:

The objectives of this program are as follow:

i. To plan the execution of coming Workshop at UTB (5th June Morning, 8.30am)
ii. Mid project meeting and to discuss in greater detail the progress and challenges, the way forward of the project. (5th June, 3pm)
iii. To share and compare research results and discussion for future research collaboration related to the project (5th June, 10.30am and 1pm)
iv. To visit BRIN Aquaculture Project Sites to study their aquaculture prawn implementations in LIPI Cibanong and hatchery centre in Ciparay, and related issues, and the understand their results. (6th June, am/pm)
v. To visit Telkom University to visit their research facilities and the automated

aquaculture indoor farm. (5th June, 10.30)

Activities and Discussion:

The activities of this program are conducted to achieve the above objectives:

(a) Meeting with the Rector of Telkom University

The meeting was to formalise and strategise, to ensure the continuity of the project through the discussion of grant matching and joint supervision between Telkom University and UTB.

(b) Planning the execution of coming Workshop at UTB (5th June 2023)

Discussions to involve the researchers during this visit in the upcoming workshop as presenters, as we find their project is successful. Their research will be shared with other experts and farmers in Brunei and ASEAN region, which will be held in late October 2023.

(c) Sharing research results and discussion for future research collaboration related to the project and visit to the automated aquaculture indoor farm at Telkom Universiti green house (5th June 2023)

This sharing session was conducted at the Research Centre for Advanced Creative Network, where they presented their work on the development of precision aquaculture system for optimization of lobster spawning based on IoT and AI. The researchers highlighted the issues which can affect lobster spawning, including the water quality and unpredictable weather and environment condition. Sudden extreme changes in temperature and oxygen can cause seed death. Thus, their objective was to maintain the pond temperature and pH stability to help reduce the number of prawn mortality, increase oxygen content of water to stimulate growth and to monitor the overall pond environment, including the prawns for data collection, analysis and modification purposes. Researches implemented an IoT based monitoring system that measure all these parameters. Any sudden changes to the parameters will automatically alert the automation system (automatic temperature controller) and adjust to the preferred settings. The monitoring and automation system managed to induce lobster spawning and reproduction all year round, reduce the potential of diseases due to water quality which eventually lowered down the mortality of lobsters. The system helps to understand the water parameters and it is one aspect that the current aquacutlure ASEAN IVO is keen to further investigate and implement at the ODE aquaculture farm in Brunei.

(d) Project review meeting and to discuss in greater detail the progress and challenges, the way forward of the ASEAN IVO project. (5th June 2023)

During the project review meeting we shared our current progress regarding the AI model training, using the multi-label approach to be incorporated in the existing

model we have. The next step is to implement the suggestions made by the members. A member from Universiti Teknologi Malaysia (UTM) suggested to prepare a paper article based on the work we have done so far.

(e) Visit to BRIN to study their aquaculture prawn implementations in LIPI Cibanong and hatchery centre in Ciparay and sharing session of related projects (6th June 2023)

Project leader from Research Centre for Limnology and Aquatic Resources - BRIN, Dr Fauzan Ali shared his work in Cibanong, Bogor on prawn aquaculture farming. The setup for an outdoor farm used in that project is similar to the ODE farm in Brunei. Dr Fauzan shared several issues that had led him to conduct this project. Several of the issues highlighted was low spawning activity, prawn behaviour - cannibalism, design and construction of ponds and high mortality rate of prawns which leads to low prawn production.

Dr Fauzan introduced the concept of "Apartments for Prawns" – 1 x 1 x 1 m of a 5-storey shelter for prawns made from bamboo plant stakes. Based on Dr Fauzan's research, this 5-storey shelter had accomplished in reducing cannibalistic behaviour of prawns as it manages to hide and take shelter from other prawn individuals in the 'apartment'. It had also increased the survivability of prawns which leads to the increased prawn production from 2 – 3 tonnes per hectare to 7 tonnes per hectare. Moreover, the installation of the apartments did not disrupt the water flow within the pond. The concept of "Apartment for Prawns" had shown great success, which could be potentially implemented at the ODE aquaculture farm in Brunei to help increase the prawn production, while simultaneously, the design of the shelter can be further modify to install a monitoring platform by using AI detection model to estimate the overall survivability of prawns.

Another related project shared by the BRIN researchers was the usage of nanotechnology bubbles. These are artificially manufactured fine bubbles of sizes smaller than 100 micrometers. The project – Shrimp recirculating aquaculture system (RAS) farming, are using excellent combination of ultrafine bubbles (UFBs) with plasma for the RAS farming. This technique had proven effective in water treatment processes of pond water. The nanotechnology bubbles managed to increase dissolve oxygen levels, improve the pond water quality, increase shrimp growth and reduce shrimp mortality. This method can help in our IVO project to reduce the turbidity for AI prawn detection.

Action Plan

- Signing of CRDA and AA Agreement
- Signing of MoU between UTB And BRIN for joint online supervision and sharing of research lab usage.
- Purchase and Delivery of Equipment for ASEAN IVO (UTB)
- Deployment of the IoT Pond Water Quality Monitoring Systems and also the development of the AI based monitoring systems based on the lesson learned from this visit

- Field testing of the Prawn Growth Model in the real pond.
- ASEAN-IVO Aquaculture Knowledge Sharing Workshop. (ALL Members and invited researchers, Oct/Nov 2023)

V. Others (Photo)

Figure 1 Meeting with the Rector of Telkom Universiti

Figure 2 Meeting with the Dean of the Faculty of Industrial Systems Engineering

Figure 3 Photo session with the Bandung Techno-Park team, Telkom Universiti

Figure 4 Discussion with the Director and team members of Bandung Techno-Park at Telkom Universiti

Figure 5 Sharing session at Research Centre for Advanced Creative Network, Telkom Universiti

Figure 6 Visit to the greenhouse at Telkom Universiti

Figure 7 Internal project review meeting with ASEAN-IVO team members

Figure 8 Sharing session at BRIN – National Research and Innovation Agency.

Figure 9 Photo session with the Head of BRIN and team members.

Figure 10 Visiting one of the laboratories at BRIN