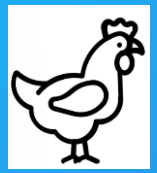
Highly Productivity and Healthy Livestock–Environment Interactions in Smart Poultry Farming



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CONTENTS

01. INTRODUCTION

- Globally, the growth of population, incomes and rapid urbanization process has driven the development of livestock industry, including poultry industry (through both layer and broiler farming).
- As reported by the Orissa International in 2017 [1], poultry consumption around the world was predicted to grow by 27% to 28 million tons by 2023 – with 40% of that growth in Asia.
- Although poultry is the largest livestock sector in Malaysia, Thailand, and Indonesia, among the concern that has been highlighted in this region is lack of efficiency and technology in production.
- Other important factors towards the successful of poultry industries management include disease control and food safety.

In Malaysia, poultry meat per capita consumption is among the highest in the world [1]. Malaysians consume about 1.8 million chickens and 2.8 million chicken eggs daily. Despite of the high demand in poultry industry in Malaysia, there are many issues remain as challenges for the farm operators, nation and country.

- Among the issues are the farming activities from sheds which are built near housing area have affected the surrounding community with bad odour and flies.
- Unorganized farming managements have resulted in pollution, ease of disease outbreaks and heat stress.

Inefficient nutritional composition and poor manure handling practices are among factors that has changed the pattern of harmful gas emissions in the atmosphere [2].

Among them are carbon dioxide (C_2O), nitric oxide (N_2O), ammonia (NH_3) and nitrogen oxide (NO_x) that have caused air pollution and increased the risk to human health due to eutrophication and acidification

The release of nitrates (NO_3-) and organic N has also increased, resulting in water pollution and biodiversity loss.

ISSUES

Most of the pollutant gases come from the breakdown of faecal matter.

Ammonia is found as the most harmful gas that could affect the human and chicken growth at more than 20ppm.

The gas concentration is directly affected by the efficiency and rate of ventilation, humidity and temperature in the poultry farm, nitrogen content of the litter or manure, as well as density and movement of poultry

Taking the consideration of the stated issues..

It is very important to control the release of these pollutant gases in order to maintain a healthy environment conducive to the well-being and health of poultry, conservation of natural resources and improvement of production efficiency.

The Federation of Livestock Farmers Association of Malaysia, which works to maintain good agricultural practices and compliance in Malaysia, has recommended for farmers to improve the efficiency and technology of poultry production, moving towards modernization which includes transformation into a closed house system while raising hygiene standards.

Impacts from the COVID-19 cases and current economic situation have also forced farm operators to find a way further to automation in order to achieve the growing production targets at sufficient number of farm workers [3]

Based on the facts that the high productivity of poultry industry is mutual dependent on the environmental survival and human health, this proposal therefore focuses on the development of monitoring systems in smart poultry farming in Malaysia.

The project will also involve researchers from other ASEAN countries who are also the main players in poultry industries.

02. OBJECTIVES

The project objectives are:

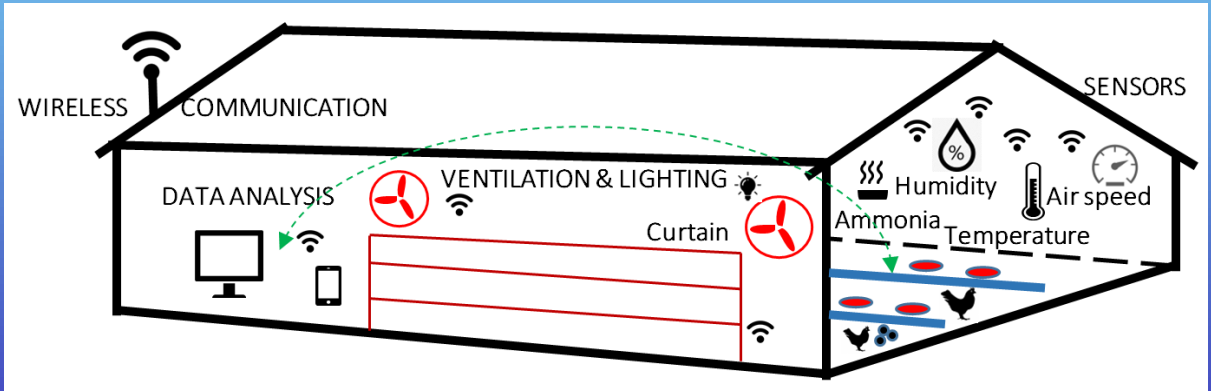
- To develop a smart poultry farm system for a closed-house farm
- To monitor the closed-house condition with respect to the ammonia emission.
- To analyse the chicken growth with respect to factors of ammonia emission.
- To evaluate the impact of the developed system on environmental and health status at the animal-ecosystem interface with respect to the production performance.

03. PROPOSED SYSTEM

PROPOSED SYSTEM:

The project will be implemented at the potential poultry farm located at Koperasi Permodalan Sahabat Terengganu Berhad in Terengganu, Malaysia.

The sensory network system will be developed by deploying sensors on humidity, air speed, temperature and ammonia concentration using **Wireless Sensor and Actuator Network (WSAN).**



The devices include actuators which increase the capability of WSN from monitoring to control. The control systems of curtain and fan for ventilation will react to adjust for the optimum quality of the closed-house condition corresponding to the ammonia concentration threshold at 20ppm.

The chicken growth and eggs quality will be recorded in real-time and then analysed for evaluating the impact of the developed system.

The system will have the following characteristics:

- Measurements systems for humidity, temperature, air speed and ammonia gas
- Interpretation of the measurements
- Identification of critical measurements, and
- Built-in automatic control systems for controlling the closed-house conditions and ammonia concentration.

Real time monitoring will be done on the feed intake and chicken weight, and the nutritional composition will be adjusted based on the data analysis from the manure and ammonia gas measurements.

As the ammonia concentration is also directly proportional to the humidity, temperature and air speed conditions; all these parameters will be analysed and used for prediction on the future patterns of chicken growth.

04. PLANS FOR CONNECTED PROJECT

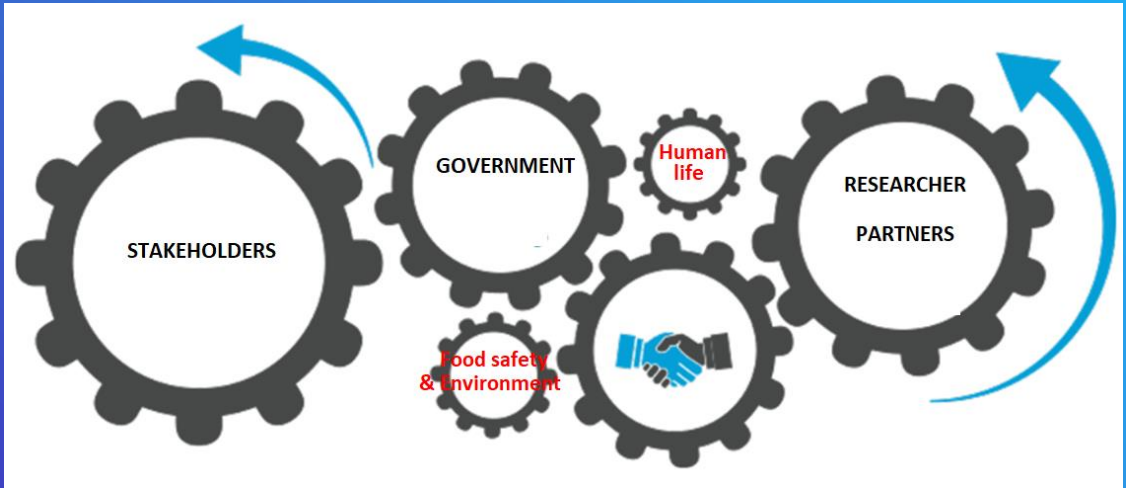
The project has strong connections among the following parties:

Researchers across multidiscipline (computer and communication engineering – as smart system developers, agriculture, animal science, biotechnology – as chicken experts, and business – as business model developer). UPM (as the project team leader) has established networking with UNISZA and UiTM, and Shibaura Institute of Technology, Japan.

Government / institutional body – the project will be engaged with the Malaysia government as the policy maker and The Federation of Livestock Farmers Association of Malaysia who would advise on good agricultural practices and compliance in Malaysia

Stakeholders – UPM has established networking with poultry farm operators such as Koperasi Permodalan Sahabat Terengganu Berhad and in the process of collaboration with other partners in implementing the project.

The successful of the project is much dependent on the active engagement of all parties and the impact is not only benefited to the involving partners, but has significant contribution to the human life, food safety and the environment system as the whole.



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THANK YOU!