



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
College of Engineering
Computer Engineering Department



CMPE 30193

Methods of Research

TITLE PROPOSAL

Proponents

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Title:

Development and Implementation of a Low-cost Sensor Device for Detecting and Repelling Insect Pests and Rats in the Rice (*Oryza sativa*) Crop

Rationale:

Plant pests and diseases disrupt plant development and inflict harm on both cultivated and wild plants. Plants are unable to reach their genetic potential because of interference and harm. As a result, pre-and postharvest pests and diseases are expected to devastate 30–40% of global agricultural productivity. Losses are higher in less developed nations, where high-input management is less widely adopted and implemented, and weather factors may be more conducive. In addition, people invest a lot of time and money in creating and administering new pesticides to manage or control pests and diseases. Incorrect use of these pesticides might have a serious impact on the environment and human health.

In the Philippines, white stem borer and rice leaf folder are the most common pests encountered in rice fields, followed by rice bug and black bug (Cabasan, et al., 2019). Rats were another major pest that rice farmers encountered, especially during the main harvest season when the rodents will wreak havoc on crops by scavenging for food and nibbling on them. When it comes to rodents, seeds, leaves, roots, young plants, fruit, and grain are all on the menu. Birds, particularly pigeons, are also a problem. Peas, beans, brassicas, and fruit – especially plums, cherries, and currants – are the most regularly attacked crops by these birds. They will attack crops in flocks all year, but they are especially problematic in late spring and early summer when vulnerable green leafy crops are plentiful.

Farmers lose an estimated 37 percent of their rice harvest each year due to pests and diseases, which has a significant impact on farmers' lives as well as the economy. Rice has become more costly in the Philippines than in most other Asian countries throughout time. This

has reduced the purchasing power of the poor's earnings, particularly among landless farmers and urban poor employees, who spend around 22% of their entire family expenditure on rice. The growing pest population has become a major issue and a major source of lower agricultural yields, resulting in significant losses for farmers.

Crop losses due to plant pests and diseases are a global problem. Rural poverty must be reduced, and global food security must be increased. Therefore, productive production is critical. With this in mind, the researchers believe there is a need to create a solution that would aid in the control and reduction of losses. Farmers will be able to use the rice plant's pest detection system as a pest detector, repellent, and way to keep track of their crops.

Statement of the Problem:

The study aims to develop a device that will aid in detecting and repelling insect pests and rats in rice fields. Specifically, it sought to answer the following questions:

1. How do the pest detector and repellent device contribute in terms of:
 - 1.1. Controlling insect populations?
 - 1.2. Minimizing environmental impact?
 - 1.3. Reducing loss and crop damage?
2. What is the effectiveness of the designed and implemented pest detector and repellent device in terms of the following indicators:
 - 2.1. Accuracy; and,
 - 2.2. Functionality; and,
 - 2.3. Precision; and,
 - 2.4. Sensitivity?

3. What is the significance of the device in the following sectors:

3.1. Agriculture; and,

3.2. Farmers

Scope and Limitations:

The study is focused on developing a device that can both detect and repel pests such as white stem borer, rice field folder, rice bug, rice black bug and rats. It also intends to have a tracking app that will notify the farmer if either of the two is detected by the sensor. There will be two sensors: one for insect pests, which will activate the bell, and another for rats, which will activate the buzzer. The program will alert the farmer which sensor identifies the pest, allowing the farmer to determine what type of pest is present in the crop field.

The study is only limited to a prototype setup in which the device will be made up of Arduino, sensors, a servo motor, bells, and a buzzer. Furthermore, the study is limited to detecting, repelling, and tracking insect pests and rats.