**Chapter 1**

**INTRODUCTION**

Rice grains are the main staple food of the most Filipino in the Philippines. Cultivation of rice is also the common source of living in the provinces. Flooding of paddy fields is one of the current method used in rice cultivation. Since rice is semi-aquatic in nature, it can be submerged in a long period of time. According to the Authority Philippine Statistics, it is estimated that in the first half of 2015, the national production reached 7.6 million metric ton with the most of the total production is from Central Luzon region. In the Philippines, there are also different types of rice grains. The most common rice grains are Sinandomeng and Dinorado. These rice grains have their own classifications when it comes to size, shape, color and other physical properties that makes them different from one another. However, with all of the harvested rice, the rice grains are need to be graded according to the Philippine Grains Standardization Program.

There are a lot of research has been performed to develop a technological aid for grading rice grains to help them classify its kind. Classification and grading of rice using image processing techniques has been developed to become easier to identify the type of rice through its physical features. Based on the past study (Mahale, 2014), the solution for grading rice grains is based on its size and shape with the use of image processing. The researchers used the edge detection as a main algorithm of the system. It is used to find out the region boundaries of each sample grain. Using this technique, the researchers were able to find the endpoints of each grain that requires minimum time and low cost. Another study (Abirami, 2013) focuses on digital imaging with neural network. The researchers state that, digital imaging is an efficient technique to extract the characteristics of rice granules in a non-contact manner. Using Neural Network, the researcher’s device can be trained to identify specific features that can be extracted from the grains to perform the grade classification. Their image acquisition is done by using CCD camera under uniform lighting setup. In improving the quality of the image, the researchers used pre-processing techniques, such as Averaging and Gaussian filters, to reduce the noise and become a smooth image. Afterwards, they continue the stages in image analysis techniques with histogram equalization, segmentation, thresholding, edge detection techniques and feature extraction. The extracted features are then being graded by the use of neural network. This network used back propagation algorithm. The researchers created this device to prevent grains that consists of several impurities, such as stones, seeds, damaged and broken granules etc.

With a specialist in examination of rice grains, the Philippine Grains Standardization Program could grade these grains to their respective category and determine if it is still acceptable to deliver in the market. Grain evaluation is done manually that can lead to varying results. Such method with varying results can be time consuming and costly. To avoid such errors, this study aims to determine the grade of the rice grains using image processing. Also, the Edge Detection, which is the main method to be used, can be further studied to detect other qualities of the grains, such as texture and color by applying other algorithms.

The general objective of this study is to apply the Edge Detection in rice grains grading through image processing. The specific objectives are the following: (1) To design a portable prototype device using a camera that is linked to the microcontroller. The device will acquire the image of the sample rice grains and inform the user of its grade. (2) To implement the different types (\*specify types?) of Edge Detection algorithm to determine the grade of the rice grains by the use of the image acquired. (3) To verify results using \*insert statistical method\* to show and verify the accuracy of the algorithm in grading rice grains.

This study will contribute in grading rice grains by providing a portable device that can perform the evaluation. It will be time efficient, cheap and has reliable results. This can also contribute to the advancement of technology when it comes to the grain industry. In the Philippines, most of the people who has a status of below average tend to buy cheaper rice grains. Since, there are reportedly fake rice grains that are cheaper from other countries, this portable device can prevent such grains in entering the Philippine market and has assurance that the rice grains in the market are healthy to consume. This study can also be relevant to future researchers to further develop this technology by integrating to other applications.

The study will focus on grading rice grains using image processing through edge detection algorithms. The researchers will only collect sample rice grains and place it into the portable device that has an enclosure with a constant lighting. The sample is limited to \*insert number of grains\* to accurately evaluate the grading system.