

**DEVELOPMENT OF IMAGE PROCESSING ALGORITHM TO DETECT CROP MATURITY OF SCOTCH BONNET PEPPER (*Capsicum chinense*)**A.A. Lakshitha<sup>1\*</sup>, M.R. Liyanage<sup>1</sup> and E.R.J. Samarakoon<sup>2</sup><sup>1</sup>*Department of Electrical and Electronic Engineering, Faculty of Engineering and Technology, CINEC Campus, Sri Lanka*<sup>2</sup>*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka***Abstract**

Sri Lanka is a luxuriant tropical land with the potential for the cultivation and hence agriculture is considered as one of the best prospect sectors of the country. To maximize the yield from the crops, a proper classification of harvest which aids in determining the storage conditions and the export quality is essential. Deep learning technologies facilitate crop recognition by enabling a computer to automatically detect a crop and determine its ripeness level. This study introduces a real-time image processing algorithm utilizing Convolutional Neural Networks (CNNs) to identify the maturity stages of scotch bonnet peppers. The algorithm is designed to classify the scotch bonnet peppers into three maturity stages as unripe, moderately ripe, and ripe, by training the CNN aid of dataset of labelled images of scotch bonnet peppers at different maturity stages. Training the CNN through backpropagation minimizes categorical cross-entropy loss, resulting in a testing accuracy of 89.04% and training accuracy of 91.6%. These results underscore the algorithm's real-time effectiveness in discerning the maturity stage of scotch bonnet peppers. For scotch bonnet peppers, the algorithm holds significant potential to substantially reduce postharvest losses and cut production costs tied to exporting top-quality produce. Precisely discerning the maturity stages of scotch bonnet peppers ensures the delivery of high-quality products to consumers, concurrently optimizing storage conditions and export quality. The real-time image processing algorithm, developed using CNNs and Python, proves to be an efficient approach for detecting the maturity stage of scotch bonnet peppers and the approach can be extended to diverse crops, establishing its versatility in the agricultural sector.

**Keywords:** Convolutional neural network, Crop maturity detection, Deep learning, Image processing, Scotch bonnet

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