ABSTRACT

At this time, Indonesia is one of the biggest tea producers in the world and has around 103 thousand hectares of tea plantation. The tea plantation in Indonesia divided into three holders, that is a big estate(government estate and private estate) and smallholders. Currently, the area of tea plantation owned by smallholders is greater than big estates, but the productivity owned by big estates is greater than smallholders. That is because the smallholders still calculate the tea population manually, so it requires a lot of time and the possibility of miscalculation that causes the tea at smallholders tea plantation is very small and the farmers do not know the best steps to maintain their tea plantations so that it affects the level of productivity of the tea produced.

In this Final Project, a system is designed to calculate the area of tea plantations using DeepLabV3+ as the method. The DeepLabV3+ method aims to do semantic segmentation of the image so that it can separate between tea and pathway of the processed image and then implement an algorithm for calculating the area of tea plantation. After that, the output system is an image, and the estimation of tea plantation will be uploaded automatically to the cloud and connected with the apps for real-time updates.

The parameter configurations used in designing the system are step trining and batch size. The process of creating the model is using a dataset that is a picture of tea plantation taken at a height of 30 meters and then separated into training data with a total of 2240 images and validation and test data with a total of 560 images. In the testing phase, five blocks of tea images were used previously has been done to calculate the tea population manually by the field technician to compare the output of the system. In this final project, in the mIoU parameter, the highest mIoU is 79.98% at 300.000 step training, where mIoU is an average value from area of overlap between the predicted segmentation and the ground truth divided bu the area of union between the

predicted segmentation and the ground truth. In the accuracy parameter, an accuracy of 80% is obtained where four images have a difference under 8% between manual calculation and output system and one image have difference over 8% between manual calculation and output system with the lower difference is 1.19% and the highest difference is 8.42%. In the precision parameter, the best precision value is obtained 0.61% in the second test data and the highest is 6.33% in the third test data using augmentation test scheme based on rotation, flip, and initial dimention. In time parameter, an average time of images with 512 x 320 is 15.85 seconds and 20.71 seconds in the image with 3840 x 2160.

Keywords: *Image Processing*, *Semantic Segmentation*, *Deep Learning*, DeepLabV3+, *Spatial Pyramid Pooling*, *Encoder-Decoder Networks.*