Abstract

India is an agriculture based country and world’s second largest producer of sugarcane. Sugarcane is the most remunerative crop and has a very high economic biomass to total biomass ratio in Indian economy. Due to critical conditions of water and labor it is recommended that Precision Farming practice may be applied to this setup.

Precision Farming is generally defined as information and technology based farm management system to identify, analyze and manage variability within fields for optimum profitability, sustainability and protection of land resources.

The sugarcane is propagated by stem cuttings, containing one or more buds and grows in different soil and climatic conditions. There are many varieties of the sugarcane available in India but selection of variety for planting based on planting seasons. Good quality seeds are selected for planting for higher yield. In different types of planting methods, Spaced Trans-Planting with single eye bud, is most widely used planting method for sugarcane. Generally, the growth stages of sugarcane are Germination, Till-ring, Grand Growth Phase and Maturity.

To increase the average sugarcane yield per hectare with minimum cost it is necessary to adapt advanced technologies. Thus advancement in sugarcane agriculture starts from the quality seed selection and crop status management that includes monitoring of growth for efficient fertilization, measurement of chlorophyll to identify nutrient deficiencies and measurement of diseases for proper use of pesticides.

Recent advances in Precision Farming using image processing tool have resulted in significant improvement in the areas of agriculture by increasing crop production, with good quality and low operating cost. Digital Image Processing deals with manipulation and analysis of images by using computer algorithm, so as to improve pictorial information for better understanding and analysis.

Now a day’s sugarcane planting machines are used to reduce the human force and time. However, these machines do not have control on cutting location. This ultimately results into more population of sugarcane stalk which affect the yield. Sometimes, cut may appear on the bud as well, which results into no germination of the bud and we lose the seed. Also, it has no facility to identify diseased node, so planting of diseased nodes affects the yield and quality of the sugarcane. To overcome these problems image processing algorithm is developed and implemented for identification of node location on sugarcane stalk. Further, algorithm checks the condition of the node whether the
node is stressed or affected by disease.

For crop status management, algorithm is developed for growth measurement of sugarcane plant and tested on different conditions of the +1 dewlap. The results of the experiment are compared with the growth measured by using meter scale. Comparison of results indicates that there is a good agreement between growth measured by using meter scale and proposed method.

In determination of chlorophyll content of sugarcane leaves using HSV colour space, linear mathematical HSV model is proposed to co-relate with the chlorophyll content apart from the simple correlation analysis. The results of experiment are compared with chlorophyll measured by chlorophyll meter. Resultant of comparison indicate that there is a good agreement between chlorophyll measured by chlorophyll meter and proposed method.

Disease symptoms of the plant vary significantly under the different stages of the disease. Hence the accuracy of measurement depends to some extent upon segmentation of the image therefore different segmentation techniques are used for leaf region and disease region segmentation. The average accuracy of the algorithm is tested using known area diagram. Measured accuracy of the algorithm indicates that the designed algorithm can measure the disease severity of the leaf more accurately.

Thus, emphasis given on applied research rather than classical research proved that image processing is useful tool for Precision Farming.