

Chapter 8

Automated Grading of Tomatoes Using Artificial Intelligence: The Case of Zimbabwe

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ABSTRACT

The rate of production of horticultural produce had been seen increasing from the past century owing to the increase of population. Manual sorting and grading of tomatoes had become a challenge in market places and fruit processing firms since the demand of the fruit had increased. Considering grading of tomatoes, color is of major importance when it comes to the maturity of the tomatoes. Hence, there is a need to accurately classify them according to color. This process is very complicated, tiresome, and laborious when it is done manually by a human being. Apart from being labor-demanding, human sorting, and grading results in inaccuracy in classifying of tomatoes which is a loss to both the farmer and customer. This chapter had been prepared focusing on the automatic and effective tomato fruit grading system using artificial intelligence particularly using artificial neural network in Matlab. The system makes use of the image processing toolbox and the ANN toolbox to process and classify the tomatoes images according to color and size.

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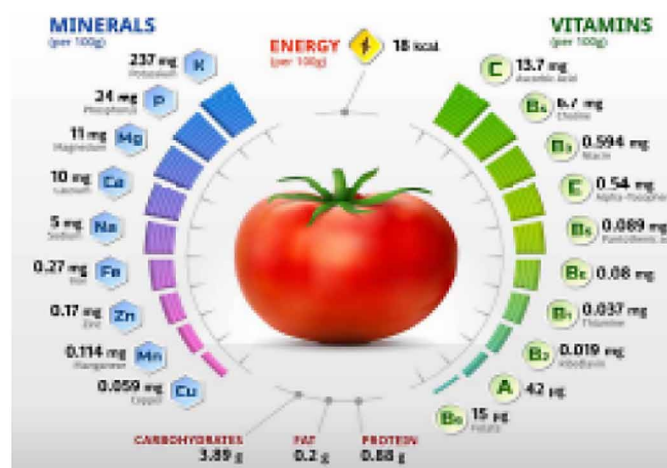
INTRODUCTION

The rate of production of horticultural produce has been increasing over the past century owing to the increase in the world population. Present world statistics show that tomatoes are the second largest produced fruits by volume and represent up to 100 million tonnes produced on 3.8 million hectares (Montanati et al., 2017; BRESOV, 2018; FAO, 2018; BTGA, 2018). Tomatoes are currently cultivated in 144 countries with China being the leading country in their production. The vegetable has the highest global consumption rate due the fact that most meals include the fruit. Figure 1 shows a tomato and its constituent nutrients (Haifa, 2018)

Due to the high rate of production of tomatoes and their perishability it is preferable that immediately after being harvested they are be washed, graded and packed. It is a cumbersome exercise for large-scale stakeholders such as farms and wholesalers to manually sort and grade them. Hence, there is a vital need for machines such as automatic tomato graders to perform this tiresome and repetitive task. Automated tomato graders would group the fruits by size and color; one of the critical stages in the collection and marketing of the fruit (Hernandez-Hernandez et al., 2016). Depending upon the organic attributes of the assortment, the natural product is partitioned into four, five, or more evaluations. Reviewing is manually complete - contrasting with standard examples - or on evaluating machines - as indicated by weight or size. Hand grading is usually combined with sorting or packing; machine grading is done after sorting (Londhe et al., 2013). The machine performs the task at a faster rate with minimum human supervision compared to the manual methods. This helps large farm owners to quickly harvest and dispatch the product to their consumers without delay.

The rate of manually grading tomatoes by small to medium enterprises (SMEs) is very low and inefficient compared to the demand of the fruits both nationally and globally hence there is a need to develop a system of grading tomatoes using artificial intelligence.

Figure 1. Nutritional summary for a tomato



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