Chapter 13
Identification, Classification, and Grading of Crops Grain Using Computer Intelligence Techniques:
A Review

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ABSTRACT

India is the second-largest food producer globally, trailing only in China. However, significant agricultural losses occur because of the lack of skilled laborers. Harvested commodities often go into waste. Additionally, the imprecise nature of crop identification, classification, and quality inspection, which is influenced by human subjectivity, poses challenges. To address these issues and reduce labor costs, the agricultural sector must embrace automation. Developing an automated system capable of distinguishing between various crops based on their texture, shape, and color is feasible by employing appropriate image-processing techniques and machine-learning methods. This study focuses on advancing the state-of-the-art research in this field. It briefly explores recent research publications' methodologies, comparing them using diverse techniques, such as k-nearest neighbors (KNN), artificial neural networks (ANN), random forest (RF), naive bayes (NB), backpropagation neural networks (BPNN), support vector machines (SVM), and convolutional neural networks (CNN).

INTRODUCTION

It is impossible to think about life without agriculture as it is to breathe without oxygen because sustaining food is essential. Agriculture is not only a primary source of food, but also has a huge impact on employment and income across the world. Agriculture is an integral part of the world economy, mainly for developing countries, including India, China, the United States, Brazil, Mexico, Russia, Japan, Germany, and France. Agriculture is the main sector in the world economy as well as the essence of human life. It plays an important role in the economic growth of a country. Owing to India's varied environment, various types of crop grains are always available. After China, it produces different types of crops, such as rice, lentils, and wheat worldwide. Grains are important because they provide the best nutrients, such as carbohydrates. Approximately 58% of India's total land is dependent on agriculture. India is the 6th largest country in terms of food marketing and land production worldwide. The agricultural industry in India is increasing at a high pace and is contributing to global trade in a continuous manner. According to FAO (2021), agriculture employs 67 percent of the total population and accounts for 39.4 percent of GDP and 43 percent of all exports. In India 158.25 million number of people will be employed in the agriculture sector in the financial year 2022. Figure 1 shows the GDP share of agriculture in different countries in 2022 (Anwer et al., 2015).

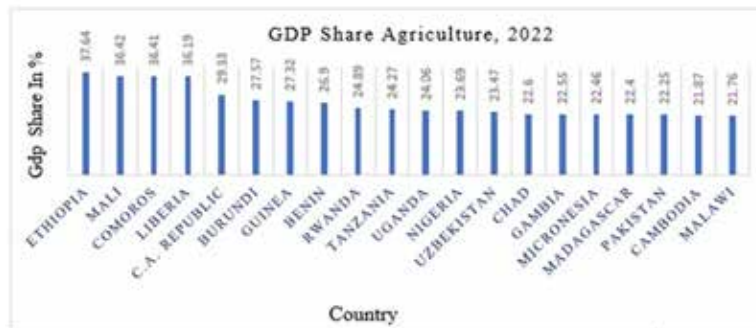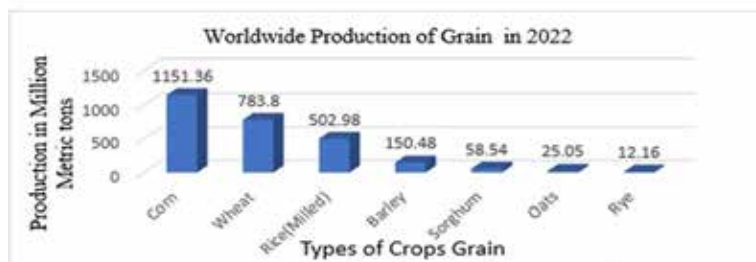*Figure 1. Top 20 countries on the basis of GDP share of agriculture*

Figure 2. Worldwide production of grain in 2022

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