

An In-Depth Comparative Analysis of Dempster-Shafer and Certainty Factor Approaches for Precision Cassava Disease Diagnosis

Sufiatul Maryana¹, Irma Anggraeni², Muhammad Mahdavikia²

¹Vocational School, Pakuan University, Bogor, Indonesia

²Computer Science Department, Pakuan University, Bogor, Indonesia

sufiatul.maryana@unpak.ac.id, irmairhamna@unpak.ac.id,

mahdavikia.065119233@unpak.ac.id

Abstract

Cassava (*Manihot esculenta* Crantz) is a vital staple food and industrial raw material, particularly in Indonesia, where it holds significant economic importance. Despite its adaptability, cassava cultivation faces serious threats from plant diseases, leading to reduced productivity and quality. Traditional agricultural methods, often lacking modern technological interventions, exacerbate these challenges. To address this, a web-based expert system was developed to assist farmers in diagnosing and managing cassava diseases. The system integrates the Certainty Factor (CF) and Dempster-Shafer (DS) methods to handle uncertainty in disease diagnosis. Using the Adira 1 cassava variety, data was collected from a 2-hectare area in Bogor, focusing on five types of cassava diseases: Brown Leaf Spot, Blight Leaf Spot, Bacterial Blight, Anthracnose, and Root Rot. The CF method quantifies the certainty of specific facts, while the DS method combines evidence from various sources to determine the belief level of potential diagnoses. A comparative analysis of these models was conducted using 20 case studies. The results showed that the CF model achieved a 95% accuracy rate, slightly outperforming the DS model's 90% accuracy. Additionally, the system's usability was evaluated using the USE Questionnaire, which rated it as "Highly Suitable" with an overall score of 84.5%. This study demonstrates that while both CF and DS models are effective in diagnosing cassava diseases, the CF model offers slightly higher accuracy. The developed expert system is not only accurate but also user-friendly and accessible, making it a valuable tool for improving cassava disease management practices.

Keywords

Cassava, Disease Diagnosis, Certainty Factor, Dempster-Shafer, Expert System, Agriculture Technology.

Biography

Sufiatul Maryana is a dedicated academic and researcher in the field of computer science, teaching at Pakuan University in the Department of Computer Science and Vocational School. Currently, she is completing her doctoral studies at Bogor Agricultural University (IPB). In her academic journey, Sufiatul Maryana has made important contributions in various research areas, including software engineering, artificial intelligence, expert systems, and decision support systems. She is committed to continuing to develop knowledge and innovation in the field of technology, while making a positive impact on the world of education and the wider community.