MODELING TEA HARVEST IN A SRI LANKAN ESTATE USING LAGRANGE'S INTERPOLATION METHOD

Rathnayaka R. M. N. S. and Faham M. A. A. M*

Department of Mathematical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka, Sammanthurai, Sri Lanka *aamfaham@seu.ac.lk

Precise tea harvest forecasting is essential to the effective operation of Sri Lanka's tea estates since it allows for the best possible allocation of resources and productivity. This paper presents a novel method for forecasting tea harvest yields using Lagrange's interpolation based on historical data from a Sri Lankan tea estate. It analyzes multiple seasons of harvest data, comparing forecasts with actual yields to evaluate the method's accuracy and reliability in capturing seasonal and annual fluctuations in production. The interpolation model, developed using historical harvest data from a Sri Lankan tea estate, employs Lagrange's method to create polynomial functions that represent harvest trends over various time intervals. This approach enables projections for future harvest seasons by accounting for both short- and long-term patterns. The model's effectiveness was evaluated by comparing its predictions to actual harvest results and other forecasting methods. It demonstrated strong accuracy in forecasting harvest volumes and adaptability to temporal and seasonal fluctuations. The findings indicate that Lagrange's interpolation provides a reliable and cost-effective framework for predicting tea harvests. In this study, we used monthly tea production data from 2018 to 2023 and used them as monthly wise data and yearly wise data for analysis. There are, 1) Monthly wise extrapolation from 2018 to 2023, from January to November and predicted tea harvest for December, 2) Monthly wise interpolation from 2018 to 2023, from January to September and November, December and predicted tea harvest for October, 3) Yearly wise extrapolation from 2018 to 2022, from January to December and Predicted harvest for 2023 and 4) Yearly wise interpolation from 2018 to 2020 and 2022,2023, from January to December and predicted harvest for 2021. This study enhances agricultural modeling by introducing an improved technique for predicting tea production using Lagrange's interpolation with time considerations. It demonstrates the method's practical benefits for strategic planning in tea farms, ultimately promoting efficiency and sustainability in tea production through better predictive analytics.

Keywords: Lagrange polynomial interpolation techniques, Mathematical modeling, Sri Lankan tea industry, Tea harvesting.