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Nota di contenuto   Foreword by Prof. Zhao Zhang -- Preface -- Progress and development on biological information of crop phenotype research applied to real-time variable-rate fertilization -- Precision Variable-Rate Fertilization for Rice-Wheat Cropping Using Outer-Grooved Wheel Mechanism Based on Multi-Layer Perceptron Model -- Design and Modeling of the Centrifugal Variable-Rate Fertilizer Spreader -- Mechanical properties of fertilizer particles and crop straw under discrete element modeling -- Performance Analysis and Optimization of Centrifugal Variable-Rate Fertilizer Spreaders -- Performance Evaluation and Lag Compensation of Actuators in Variable-Rate Fertilizer Spreaders -- Research on Fertilizer Discharge Flow Rate Detection System -- Field Evaluation and Efficiency Analysis of Centrifugal Variable-Rate Fertilization in Precision Agriculture.

Sommario/riassunto

This book features interdisciplinary of agricultural engineering and precision agriculture, focusing on real-time variable-rate fertilization (VRF) based on crop phenotypic biological information. It systematically presents cutting-edge research on intelligent sensing, inversion modeling, actuator optimization, and practical system validation. Key scientific methods include hybrid neural network models (such as LFA-PSO-MLP), discrete element modeling (DEM), and deep learning-based flow detection (YOLOv5s-seg). These approaches are illustrated with clear diagrams, data tables, and experimental results, linking theoretical insights with practical engineering applications. The book introduces innovative designs like centrifugal VRF spreaders and phenotypic sensing systems, validated through field trials to improve fertilization accuracy, reduce input waste, and enhance sustainability. It offers a comprehensive technology framework integrating "crop–sensor–decision–actuator" into a closed-loop control system. For researchers and practitioners in smart farming, crop sensing, and equipment development, this book serves as a valuable reference bridging theory and field applications. Target readers include graduate and undergraduate students in agricultural engineering, precision agriculture researchers, intelligent equipment developers, and agricultural extension professionals.