

Assessment of Yield Gaps Using Field-Level Data in Uruguay

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ABSTRACT

Understanding yield gaps and the management practices contributing to them is key for enhancing food security and farmers economic viability . Although rice is an important food crop worldwide, yield gaps remain less investigated in South American rice systems, particularly using field-level farmer data. In this study, we evaluated attainable yield gaps and explanatory crop management factors for rice production in Uruguay using field-level records from 2012 to 2017, covering approximately 70,000 ha (40% of total rice area). Machine learning algorithms were employed due to the large size of the database (approx. 3900 observations) and number of predictor variables (15 management practices or field characteristics). The mean annual attainable yield gap ranged from 19% to 22% in fields with conventional cultivars and from 12% to 17% in fields with hybrid cultivars. Early planting was identified by Random Forest as the most influential variables for reducing yield gaps in both conventional and hybrid fields, while germination and previous crop is uniquely influential in conventional and hybrid field, respectively. The package of uniformity at germination stage plus early planting and effective weed management were summarized by classification and regression trees as a strategy for managing suboptimal fields. This study highlights the use of large-scale field data to quantify yield gaps and develop strategies for improving agricultural productivity.

Key words: rice, yield gaps, field-data, machine learning algorithms