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Geostatistical Analysis of Yield, Soil Properties and Crop Management Practices in Paddy Rice Fields

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Abstract: We examined the possible benefit of rational site-specific crop management practices in 17 paddy fields located in an area of 2.0 ha for the prevalence of precision agriculture methods on a cooperatively managed large-scale farm in Sakurai, Nara Japan. Data on grain yield, soil physicochemical properties and farmer's crop management practices were collected in each paddy field. Unhulled rice yield was estimated at a resolution of 5m×5m in an area of 1.2 ha using a yield-monitoring combine. The spatial distribution of the variations for the collected data was characterized using geostatistical procedures. The kriged map of the unhulled rice yield drawn from the results of geostatistical analysis indicated the potential value of rational site-specific crop management using the yield-monitoring combine. The ratio of spatially structured variation to the total variation of brown rice yield, that is, the controllable proportion to total variation, was 75.4%. Each yield component i.e., the number of spikelets per square meter, filled-spikelet percentage and 1000-grain weight contributed 33.7%, 54.7% and 11.6%, respectively, to brown rice yield. These three yield components combined contributed to 96.5% of the brown rice yield variation. The agronomic factors (soil fertility factor, early growth factor, N dressing and uptake factor) contributed 79.7%, 52.1% and 41.8%, respectively, to the variation of these three yield components. Therefore these agronomic factors accounted for 58.1% of the total variation of the brown rice yield and 77.1% (i.e. 58.1% out of 75.4%) of the spatially structured variation of the brown rice yield. This controllable proportion may be

a criterion for the prevalence of site-specific crop management in large-scale farm management in general, although only one case study was conducted.

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