EVALUASI KINERJA OPERASIONAL TRAKTOR SEMI OTONOM DENGAN IMPLEMEN BAJAK PIRINGAN PADA PENGOLAHAN TANAH SAWAH

INTISARI

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Penelitian ini mengevaluasi kinerja operasional traktor semi otonom berbasis sistem pemanduan presisi GNSS-RTK dengan implemen bajak piringan pada pengolahan tanah sawah, mencakup kinerja mekanis, efisiensi kerja lapang, dan deviasi jalur terhadap lintasan ideal. Pengujian dilakukan pada lahan sawah datar 0,0455 ha bertekstur liat berdebu dalam kondisi kering lembab menggunakan traktor roda empat Quick A360 (36 HP) yang dimodifikasi dengan sistem pemandu FJDynamics dan bajak piringan Quick 3x22, dengan parameter terukur berupa kecepatan kerja, lebar dan kedalaman olah, slip roda, kapasitas lapang teoritis dan efektif, efisiensi lapang, konsumsi bahan bakar, serta RMS deviasi jalur. Hasil menunjukkan traktor mampu beroperasi stabil pada kecepatan sekitar 1,8 km/jam dengan kedalaman olah ±14 cm, lebar kerja 0,805 m, slip roda sekitar 7%, dan deviasi jalur rata-rata 5–6 cm yang mengindikasikan akurasi lintasan orde sentimeter, namun efisiensi lapang sekitar 62,44% dan kecepatan kerja aktual belum sepenuhnya memenuhi standar SNI 7416:2023 terutama akibat waktu hilang saat manuver belok dan pengaruh slip roda, walaupun konsumsi bahan bakar sekitar 1,456 L/jam masih mendukung penerapan pada skala lahan kecil.

Kata kunci: traktor semi otonom, bajak piringan, GNSS-RTK, *auto-steering*, pertanian presisi, deviasi lintasan, effisiensi kerja lapang, kapasitas lapang

OPERATIONAL PERFOMANCE EVALUATION OF A SEMI-AUTONOMOUS TRACTOR WITH DISC PLOW IMPLEMENT FOR PADDY FIELD TILLAGE

ABSTRACT

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This study evaluates the operational performance of a semi-autonomous tractor equipped with a precision guidance system based on GNSS-RTK and a disc plow implement for paddy field tillage, covering mechanical performance, field efficiency, and path deviation from the ideal trajectory. The field tests were carried out on a 0.0455 ha flat paddy field with silty clay soil in a moist-dry condition, using a four-wheel tractor Quick A360 (36 HP) retrofitted with an FJDynamics guidance system and a Quick 3x22 disc plow as the primary tillage implement, with measured parameters including working speed, working width and depth, wheel slip, theoretical and effective field capacity, field efficiency, fuel consumption, and RMS path deviation. The results showed that the semi-autonomous tractor was able to operate stably at a working speed of about 1.8 km/h with an tillage depth of approximately 14 cm, an actual working width of 0.805 m, wheel slip of around 7%, and an average path deviation of 5–6 cm, indicating centimeter-level guidance accuracy; however, the field efficiency of about 62.44% and the actual working speed did not fully meet the performance requirements of SNI 7416:2023, mainly due to time losses during turning maneuvers and the effect of wheel slip, while the fuel consumption of about 1.456 L/h still supports the applicability of the semi-autonomous tractor with a disc plow on small-scale fields.

Keywords: semi-autonomous tractor, disc plow, GNSS-RTK, auto-steering, precision agriculture, path deviation, field efficiency, field capacity