A Study on the Field Application of Autonomous Driving Agricultural Machinery Agricultural Work

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Abstract

Korea's agricultural population is continuously decreasing. In 2024, it was about 2 million, down 50.4% from 4.03 million in 2000. In particular, the proportion of farmers aged 65 or older was 55.8% in 2024, about 2.6 times higher than 21.7% in 2000. Under these circumstances, domestic farmers' strong will to introduce digital technology-based autonomous driving agricultural machinery is increasing. According to a 2024 survey of farmers at the Korea Rural Economic Research Institute on their intention to introduce autonomous driving agricultural machinery, 59.8% of farmers with agricultural machinery expressed interest in using atonomous driving agricultural machinery. The main reasons were labor cost reduction, work speed improvement, and work safety. Recently, domestic agricultural machinery manufacturers such as Daedong, TYM, and LS Mtron are conducting research and development on level 3 autonomous tractors, and technology is being commercialized around level 2 detachable autonomous driving kits. However, specific field demonstration data on the performance and effectiveness of Autonomous driving agricultural machinery are insufficient. Therefore, in this study, field application and verification were promoted, focusing on plowing into lidges agricultural work. The autonomous driving function was implemented by attaching an autonomous driving kit using a general tractor .In addition to this, a comparative analysis with the manual driving agricultural work of skilled farmers was promoted. On July 3, 25, Jeonbuk-State was promoted on two test beds in Gimje City. On each test bed, the agricultural work of the flowing into ridges through autonomous and manual driving was carried out, respectively. The spacing between ridges was set as 1.5 m and the height was set as an index of 0.1 to 0.2 m. After that, each test bed's shape was analyzed using drone images. As a result of the field demonstration of autonomous and manual driving plowing into ridges agricultural work, a total of 17 ridges (A: 10 and B: 7) for each treatment of A and B test beds were investigated. Testbed A showed a 2.8% improvement over manual driving 391.2m, and testbed B showed a 3.4% improvement over manual driving 242.9m, with 402.1m as a result of autonomous driving farming. The route tracking accuracy of autonomous agricultural work was measured with an average route tracking error (RMSE) of 2.1 cm, proving the realization of high-precision agricultural work. It is judged that the effect of agricultural production will be maximized if it is used for outdoor agricultural work such as plowing into rigdes, tillage and sowing through autonomous driving agricultural machines capable of such precise agricultural work.

Keywords: Autonomous Driving, plowing into rigdes, agricultural work