World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:19, No:07, 2025

Design, Prototyping and Testing of Manually Operated Teff Seed Cum Fertilizer Drill for Ethiopian Farmers

Authors : Fentahun Ayu Muche, Yonas Mitiku Degu

Abstract : Ethiopian farmers traditionally sow Teff seeds using the broadcasting method. However, row sowing offers higher grain yields compared to broadcasting. Despite being introduced to row sowing techniques, many farmers prefer broadcasting due to its simplicity; without proper technology, row sowing is time-consuming, labor-intensive, and physically demanding. The use of suitable row Teff seeder technologies can save time, reduce labor requirements, facilitate weed control, and increase productivity. Unfortunately, previously promoted technologies have not gained significant acceptance due to various limitations. This research aims to design, fabricate, and test a Teff seed-cum-fertilizer drill while addressing the shortcomings of earlier technologies. During the conceptual design phase, eight alternatives were proposed, with the rail-type row Teff seed-cum-fertilizer drill selected for its technical and economic feasibility. The chosen design features five rows with adjustable spacing between 15 cm and 25 cm. It also includes an interchangeable metering mechanism for seeding rates of 5 kg/hectare and 10 kg/hectare. A key focus was placed on the metering mechanism to eliminate power transmission via ground traction, thereby mitigating performance issues caused by wheel skidding. The new design uses pinions that roll over two parallel racks suspended by four posts to transmit motion to the metering unit. A detailed analysis of the selected concept and working mechanism was conducted, and the prototype was manufactured according to specifications from the detailed design. Laboratory and field tests of the fabricated prototype demonstrated good metering mechanism efficiency, with no significant differences between rows. However, the performance of the Teff seed-cum-fertilizer drill is highly sensitive to the seed level in the hopper. Therefore, maintaining the recommended seed level is crucial for ensuring uniform seed distribution during farm operations.

Keywords : row teff planter, disc metering, scoop metering, rack and pinion, fertilizer applicator, seed drill
Conference Title : ICMSE 2025 : International Conference on Mechanical and Systems Engineering
Conference Location : Ottawa, Canada
Conference Dates : July 03-04, 2025