Agri-mats: Enhancing sustainable agriculture through an advanced bio-mat technology

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Agri-mats laid on wooden pallets for natural air-drying

Collecting sugarcane bagasse

Sieving sugarcane bagasse

Crushing cow dung

Smallholder agriculture faces critical challenges, including soil degradation, water scarcity, and the need for sustainable, high-yield farming practices. Agri-mats, a type of bio-mat technology applied on agricultural fields offers an innovative solution to these problems. The ARC-NRE is piloting the use of Agri-mats for soil surface mulching in rainfed farming systems of Sekhukhune District, Limpopo province. The project continues into its second year during the 2024/2025 rainfall season. Agri-mats represent an emerging technological innovation in agriculture, providing practical solutions for soil health, soil-water conservation, and crop yield enhancement. The ARC-NRE Agricultural Engineering campus manufactures the Agri-mats. The main input is sugarcane bagasse which is mixed with cow dung, a binding chemical and water. This mixture is hot-pressed. The sugarcane bagasse comes from sugarcane milling factories such as Illovo's Eston Sugar Mill in KZN and Molatek (Selati) Sugar Mill in Malelane, Mpumalanga. The raw bagasse is air-dried to remove excess moisture and then cleaned by sieving to eliminate foreign materials and impurities, which helps in producing a mat with uniform texture and better structural integrity. The additive cow dung is in machine crushed form. Accurate proportioning of the ingredients and thorough mixing are particularly important for the desired quality and weight. Mixing is done using an electric-motor-driven mixer. The mixture is loaded into a form and then heat compressed at 30kPa and a temperature of 155°C for 7 minutes. The compressed board measures approximately 0.5 m ×0.3 m × 0.03 m and weighs 580g wet weight. The Agri-mats are stacked on wooden pallets and allowed to dry naturally before transporting them to beneficiary locations. The current project aims to demonstrate the environmental and economic impact, and benefit of Agri-mats on small scale agricultural practices. The future of Agri-mats looks promising, and they are likely to become a staple in both traditional and precision farming, contributing to a more resilient agricultural sector. Continued research and innovation will further optimize Agri-mats, making them accessible to a wider range of farmers and regions. Research focusing on improving the raw materials for better biodegradability, enhanced water retention, and increased durability is essential.

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Weighing the ingredients

Mixing the ingredients

Loading the mixture into the form

Loading the form into the heat compressor

Retrieving the compressed Agri-mat