

Techno- Economic Analysis of a Refractance Window Dryer Prototype Developed by Kenya Industrial Research and Development Institute

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Abstract

The Refractance window dryer (RWD) is a fourth generation dehydration technology. RWD is used to dry heat-sensitive materials because it retains high nutrient content, colour, flavour, aroma and bioactive compounds. The dehydrated products have a high sensory quality. There were no RWD in East Africa despite their excellent performance hence need for local fabrication of RWD Prototypes that can meet the technical, economical and socio-economical requirements. This paper describes the performance evaluation and economic analysis of the RWD prototype developed at the Kenya Industrial and Development Institute (KIRDI), Kenya. Indicators such as drying rate and drying time were used to assess its technical performance. The economic performance of the dryer was appraised using Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR), and Payback Period (PBP). Mango pulp and African leafy vegetables were dried using the RWD prototype at KIRDI between May-July, 2021. During drying process, moisture content of mango pulp was reduced from 88% to 15% in one hour while African leafy vegetable from 88% to 5% in 40 minutes. The economic evaluation of the dryer revealed an IRR of 31%, NPV of 808223.515 @ 24% and PBP of 3.6 years. KIRDI RWD prototype is a versatile technology that can be deployed in remote settings resulting to reduction of post-harvest losses as well as carbon emission. Currently, sun drying, solar drying, cabinet drying, spray drying, drum drying, fluidized bed drying and freeze drying are available in Kenya. They possess various advantages and equally significant drawbacks. Therefore the adoption of KIRDI's Refractance window dryer would be beneficial to Micro Small and Medium enterprises in providing timely drying services and improve their socio-economic status.

Keywords: KIRDI Refractance Window dryer, economic analysis, technical performance