Using the sun to dry fruit and vegetables has been practiced for generations. It is one of the oldest agricultural techniques for food preservation. With the advancement of technology and the demand for healthy, low-cost natural food and the need for sustainable income, new techniques are being developed. According to the South African Department of Energy: "Most areas in South Africa average more than 2 500 hours of sunshine per year, with an average solar-radiation level range of between 4.5 and 6.5kWh/m2per day", providing a huge opportunity for South Africa to tap into this natural resource.

Florian Willfort (Scaled Impact) sought to collaborate with UJ-PEETS and UJ's Department of Mechanical Science to assess the operational performance and efficiency of its Umoya Dryer prototype. The equipment is aimed at rural development projects and remote African small holder farms, taking into consideration the selection of materials, operation simplicity and robustness of design and structures.

The Umoya Yard Dryer is a 2100 x 1600 x 500 mm polycarbonate tunnel with active airflow and temperature control. The solar on-farm drying introduces a solution to address the risk of contamination from dust, animals, insects and UV degradation of traditional sun-drying. Designs and technology are adapted to the African climate and use minimal and low/no maintenance components.

Heat generation is the most expensive operating cost for dehydrating products. The effective capture of heat from solar radiation converts the solar dryer technology into a low operating cost solution. On a clear sky summer day, the tunnel internal temperature reaches 60 – 65°C vs external 25 – 30°C. The electricity used to operate the fans and controls is a fraction of commercial electrical dryers. The Umoya Dryer can be provided with Photo Voltaic systems to decrease the dependency on commercial electricity supply.

Willfort notes that the application of the technology presents an opportunity to generate more income to rural farmers. Drying at the farm not only secures the harvest from spoilage, but it simplifies logistics and saves costs on the route to market, since storage and transport does not require refrigeration. Sometimes farmers are forced to sell at very low prices during the harvest season, because they cannot store or preserve their surplus products. In addition, the notable benefit is food security for households and the ability to produce and sell more product, because there is more time and new markets to sell in. This in turn leads to rural employment opportunities for a sustainable income.

UJ-PEETS Engineer, Zelda Rasmeni highlights the benefits for Solar dehydration of agricultural produce at source: minimised post-harvest waste; a significantly simplified storage requirement; prolonged shelf life and the 80% reduction of weight and volume reduces logistic complexity from farm to user. Rasmeni comments: "During the research, assessment, design and development phases we will also be seeking to enable the unit to function 100% off grid for an even more practical and economical system."

Umoya Dryers is a venture of Scaled Impact (a not for profit company), with the mission to "raise rural income making markets". The objective is to build efficient value chains that benefit rural farmers. This means introducing enabling technology (on-farm solar drying) and building linkages to markets and finance.

Says Willfort: "It all started with the dream to bring neglected nutritional traditional food (morogo) to modern markets. Amaranth leaves – more nutritious than spinach – are well known and grow as a weed in Southern Africa, but is a neglected modern food. Scaled Impact collaborated with ARC to farm the plant and introduced on-farm drying to turn it into an industrial ingredient for Umoya foods (www.umoyafoods.com) another Scaled Impact venture.

In preparation to deploy the on-farm drying technology across Africa, Umoya Dryers collaborates with UJ/PEETS to assure that the solution is optimized and best suited for the rural African requirements."

The use of solar radiation to provide the drying heat significantly outperforms traditional electrical dryers in its carbon footprint and operation costs. Furthermore, it addresses today's global and specific South African challenges of sustainable rural development and food security.

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