ABSTRACT

A flat-plate collector was designed so that the natural convective air movements lead to large temperature differences between its ends. This collector was used to study the two dimensional temperature profiles of the absorber cover and working fluid under steady-state conditions. The collector had a constant absorber-cover spacing and was free of any hydraulic resistance that would have been offered by a drying chamber. The temperature profiles and air flow rates of varying slopes up to 50^{o} were recorded. It was found that with slopes less than 20^{o}, the efficiency was undesirably low.

Simultaneously, a natural convection solar crop drier was built in which the primary collector and drying chamber were separate units. The roof of the drying chamber was used as an additional collecting surface. The drying chamber housed a rock bed heat storage unit and the primary collector had a step in order to increase the air flow rates in the upper section of the collector. The performance with the primary collector at slopes of 5^{o}, 10^{o}, 15^{o}, 20^{o}, 25^{o} was determined. The longitudinal and transverse temperature profiles of both the primary and secondary collectors were recorded so as to verify the earlier results. Finally sorrel and bananas were dried. The dried product at 5^{o} and 10^{o} primary collector slopes was degraded beyond edibility.