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Performance of zigzag corrugated furrows in Bolivia

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In Bolivia, irrigation area is estimated in more than 250000 ha, being surface irrigation the most common method. In highland areas (Altiplano) and in interandean valleys, traditional and ancestral irrigation systems such as flood irrigation, contour furrows, zigzag corrugated furrows, suka kollus and irrigation by kanis, are the most important.

In the case of very steep terrains and shallow soils, the zigzag corrugated irrigation method is very frequent. This irrigation method has been used for a long time but their low application efficiency and the shortage of water justify this work devoted to their characterization and to study their performance.

The experimental study was conducted southeast of the city of La Paz in the community of Cebollino located at 2600 meters above sea level. Furrow characteristics vary in function of crop type and soil slope, so that the larger the slope the greater the separation between furrows.

In our case, the crop chosen was the lettuce and the experimental plot had an area of 800 m2 with a slope ranging between 14 and 18%. Blocks of corrugated furrows were identified and experimental measures were made during each irrigation, once per week, in the central blocks to avoid border effects.

To determine advance curves 15 stations were used spaced 18 m. At each station, advance and recession time and infiltration depth were measured. Inlet and outlet flow were controlled each 5 min. To calculate the reference evapotranspiration, the Hargraves-Samani equation was used.

Due to the very high terrain slopes, the advance curve takes a linear form rather than the typical exponential form. This hinders the proper calculation of the parameters of the Kostiakov-Lewis equation used to determine the infiltrated depth values. The inlet flow range, along irrigation events, between 0.01 and 0.085 L/s due to the uncontrolled use of water in fields located upstream. The large variability of inflow flow difficult irrigation management especially in regard to the system organization and operation.