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Setup for measuring surface runoff velocity under a rainfall simulator

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Surface runoff velocity is one of the key values for hydraulic calculations. When all other members for Chézy or Manning equations are known than the velocity is easy to be calculated. But for the cases when some of the parameters are to be calibrated the velocity is an important value to be measured. All uncertainties appearing during the measurement are to strongly influence the resulting calibration and should be minimized. Rainfall simulators are widely used to calibrate and validate mathematical soil erosion models input parameters including the surface roughness. This rises up the need of measuring the runoff velocity. The usual way of measuring surface runoff velocity consists of manual dosing of colored tracer along a transect of the experimental plot and measuring the time intervals needed for the tracer wave to reach known distance. For plots longer than 2 m the tracer wave needs to be "refreshed" as the tracer concentration is strongly dispersed along its way. Every "time reading" of the wave passing chosen line and manual dosing of the tracer induce unknown uncertainties into the measurement that are desired to be minimized. The manual spraying of the tracer limits the use only for plots without or with very limited presence of vegetation. Presented setup consists of arbitrary number (up to 8) of "reading-dosing" transect mounts that are installed across the plot and controlled by Arduino board. The dosing part is designed to produce a discreet tracer signal that is distributed evenly along the transect while the time of the dose is recorded. The reading part consists of up to 8 RGB color sensors (TCS34725) whose signal is real-time evaluated to record the time of the tracer wave pass and arbitrarily execute next dose to be input. This poster presents the hardware setup, calibration issues and wave-pass evaluation approaches. The subtle design of the setup allows the device to be used (and runoff velocities to be measured) also for plots with dense and grown-up crops and vegetation.