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5. Soil Security and Food Security
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Soil Moisture Sensor Combined with Straw Mulching Improves Water Use Efficiency and Yield of an Upland Crop under Conditions of Drought and Saline Water Intrusion in the Vietnamese Mekong Delta

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Climate change-induced sea level rise, drought and freshwater scarcity have together caused substantial challenges to agricultural production in the Vietnamese Mekong Delta. Farmers have been turning to alternative crops and cultivation technologies to adapt to these challenging conditions. The Chameleon Soil Water Sensor System has been applied to monitor crop soil water levels to inform better management decisions. A greenhouse study was conducted to investigate the effects of an integrated application consisting of soil moisture sensors and straw mulching on soil salinity, beetroot growth and yield. The study was designed with four straw mulching treatments [no-mulching (T1), mulching at 3.5 t ha-1 (T2), mulching at 7 t ha-1 (T3), and mulching at 10.5 t ha-1 (T4)]. The watering of these treatments was regulated with the Chameleon sensors. In addition, there was a control treatment that was irrigated daily. All treatments were irrigated with saline water (2 dS cm-1). Relative to the control treatment, the combination of soil moisture sensors with straw mulch saved 51% (T1), 67% (T2), 73% (T3) and 71% (T4) of irrigation water. Monitoring soil moisture with the sensors combined with the surface mulch also decreased salt accumulation in the soil. Compared to the plants that were watered daily, 50 days after sowing EC values in the soil had decreased by 30% (T1), 37% (T2), 43% (T3) and 42% (T4). Similarly, soil-soluble sodium decreased significantly from 34-45% in the respective treatment T2, T3, and T4. The soil exchangeable sodium dropped to 39% in the T4 treatment compared to the control treatment while soil nitrogen and phosphorus. Despite these changes in water application, beetroot yield was unaffected. Taken together, these findings suggest that the use of soil moisture sensors in conjunction with appropriate mulching in drought and seawater intrusion areas can ensure food security and sustain households' livelihoods in the context of increasing climate change.