SUSTAINABLE MANAGEMENT OF WATER IN VEGETABLE PRODUCTION SYSTEMS

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Water is one of the most essential resources necessary for crop production and its stewardship is becoming more critical with continued population growth and shifts in land management. Agriculture, or food production, is responsible for 70 to 80% of the water consumption across the landscape. Even in Wisconsin with annual precipitation in excess of 30" on average, sustainable water use is becoming more critical. Increasing number of irrigation pivots and more acres of irrigated vegetable production across Wisconsin have led some to believe that increased irrigation pumping is impacting depth to groundwater. Declines in water table can have adverse effects on surface waters and lakes.

Sustainable water management can be defined by multiple metrics, including energy use in irrigation, impacts of irrigation on water quality, and amount of water used in crop production. Irrigated vegetable growers have adopted multiple strategies to decrease energy use in irrigation. Use of low pressure wells and drop nozzles greatly reduces energy required for pumping water. Irrigation systems are typically managed on schedules to minimize electricity use during peak demand periods as well. We are currently working with growers to assess current strategies to optimize energy efficiency in the operation of irrigation systems in Wisconsin.

Due to concerns about water use by vegetable crop producers in Central Wisconsin, we have initiated research to evaluate means for improving water use efficiency. We have conducted trials on snap bean and potato with intermittent drought stresses. These trials serve two purposes: (1) identify ways to reduce water use in production of irrigated crops, and (2) determine the yield and quality impacts of reduced irrigation and increased drought stress on vegetable crops. Preliminary results in snap beans showed that drought stress during flowering and pod development had negative impacts on yield. Yield reductions led to poorer nutrient use efficiency and potential for increase nitrogen losses. In potato, several varieties seemed to have less yield response to drought stress than others.

We are also evaluating use of drip irrigation in field scale trials in potato. Previous research suggested drip irrigation led to improved water use efficiency and decreased need for irrigation. However, irrigation efficiency in Wisconsin is quite high suggesting minimal benefits for use of drip irrigation. Precise placement of water in the potato hill allows for placement of fertilizers in the crop production zone as well. Potato crops yielded similarly between drip and sprinkler irrigated treatments with 40 to 60 lb/a less nitrogen fertilizer.

One thing is clear, if crops are irrigated, the water should be managed to maximize crop productivity. Failing to do so will lead to decreased resource use efficiency and require planting of addition acres. This leads to increased costs to the grower, processor, and dramatically impacts production efficiency.

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