Reductions in nitrogen and phosphorus runoff

Since fertilizer and water are typically not a large portion of operating expenses, growers may be over applying these inputs to maximize growth. There is evidence that application rates of nutrients are higher than plant requirements (Majsztrik, 2011). This practice leads to negative environmental consequences as excess fertilizers exit the root zone and enter ground or surface waters causing nutrient pollution in these water bodies. Sensor networks would provide real-time information about soil and substrate fertility levels to help growers make more informed decisions about fertilizer application rates. The potential benefits of sensor networks for fertilizer reductions are highlighted in the next few pages.

In order to estimate nitrogen and phosphorus savings, we constructed two different scenarios for each type of operation. A "conservative scenario" (Table 3) assumed that N and P application rates would be reduced by 25% for greenhouse operations (through reduced water application), with no change in container and field operations. By irrigating more efficiently, runoff rates were assumed to be reduced by 25% for all operation types. The "Optimistic scenario" (Table 4) had larger reductions in application rate for greenhouse and container, with larger reductions in runoff rate for all 3 operation types. Reductions in nutrient runoff rate were not measured as part of this project, and the runoff rates presented here are meant to be illustrative. These scenarios were then used to estimate potential reductions in N and P runoff across the country.

Table 3. Conservative scenario for adjusting nutrient application and runoff rates with the use of wireless sensor irrigation networks (WSIN), compared with current baseline values without WSIN.

	With WSIN	
Operation type	**Application rate**	**Runoff rate**
Greenhouse	25% less than baseline	25% less than baseline
Container	Unchanged from baseline	25% less than baseline
Field	Unchanged from baseline	25% less than baseline

Table 4. Optimistic scenario for adjusting nutrient application and runoff rates with the use of wireless sensor irrigation networks, compared with current baseline values without WSIN.

	With WSIN	
Operation type	**Application rate**	**Runoff rate**
Greenhouse	40% less than baseline	40% less than baseline
Container	25% less than baseline	40% less than baseline
Field	Unchanged from baseline	40% less than baseline

Majsztrik, J., D King, and E. Price. 2014. Understanding the public benefits of sensor networks. *In*: Managing Irrigation through Distributed Networks Knowledge Center, M. Chappell, P. Thomas, and J.D. Lea-Cox (Eds.). Published online at: https://myelms.umd.edu/courses/1110348 17p.