Central California is losing $3.7 billion in crop yield every year

December 4 2017, by Adam Dove

From 2011 to 2014, the state of California experienced the worst drought in its recorded history. With that drought came a shortage of agricultural water supplies—in a state that produces nearly half of the fruits, nuts, and vegetables grown in the United States. Though the area has since seen a slight rebound, the central California region is still experiencing a significant loss of agricultural yield and revenue. The primary culprit? Soil salinity.

"Soil salinization is a global phenomenon that threatens the sustainability of agricultural production," says EPP Assistant Professor Meagan Mauter, "at a time when food demand is increasing."

While salts naturally occur in soil and water, they build up in the soil when irrigation water is saline and the rate of evaporation is high. Under Mauter's advisement, Ph.D. student Paul Welle has been studying just how heavy the impact of soil salinization has been on California's annual agricultural yield.

Taking advantage of high-resolution satellite data for crops grown in CA and recently released information on soil salinity, Welle was able to estimate the effect of soil salinity on crop yield. What the data revealed was shocking.

"Using this data, we can implement field scale models to predict how individual crops would be effected by ongoing, increased salinity levels," Welle said. "What we found is that the central California region is losing

approximately $3.7 billion in annual agricultural revenue due to salinity levels in the soil. This is about 10% of the region's annual agricultural revenue."

This is a tremendous loss, but surprisingly, Welle's analysis reveals that this may not be a problem worth fixing—at least not now. And it's not because it isn't good for the environment. In the end, it all comes down to money.

"Current de-salinization technology, unfortunately, is very expensive," he says. "Even with this high $3.7 billion loss of revenue, the cost of current desalinization technology would be even more expensive. Barring substantial cost reduction, policymakers should not rely on current desalination tech to offset salinization."

More than anything, however, Welle's research highlights the importance of high-resolution data when modeling agricultural systems. Because the mechanisms of yield reduction impact different crops differently, modeling yield loss due to soil salinization at the level of individual fields produces much more accurate results than estimating yield losses at the county level.

Continuing innovation in both high resolution data collection and models for agricultural decision making has the potential to significantly improve our understanding and management of agricultural systems.

Provided by Carnegie Mellon University, Department of Civil and Environmental Engineering