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A Survey of Sugarcane Soil Salt Content Resulting from Hurricanes Katrina and Rita

Hurricanes Katrina and Rita caused tidal surges and concerns about salt deposition in soil. The unprecedented flooding inundated almost 40,000 acres of sugarcane in the state's coastal parishes. Although considerable sugarcane acreage was damaged or killed by the direct effects of the floodwaters, the extent of the effects on sugarcane from the salt content of sea water is not completely known.

Representatives of several state and federal agencies met in October to discuss the hurricanes and their aftermath. A decision was made to develop a soil sampling protocol to survey the soils in the flood zone for salinity. Initial sampling was limited in scope and specifically sought information on the enormity of the salt contamination problem. Seven sites across Iberia, St. Mary and Vermilion parishes were chosen for the initial round of sampling.

The sites were selected based on soil texture, depth and duration of the flood waters and distance from the coast. Soil cores were taken at depths of zero to 3 inches, 3 to 6 inches and 6 to 12 inches to determine the distribution of salt within the soil profile.

The amounts of salt measured in the first samples varied widely as anticipated. The highest concentration was found at the zero- to 3-inch depth, ranging from 268 to 4,329 ppm. Though salt levels decreased with depth of sampling, the saltiest site contained almost 2,000 ppm in the 6- to 12-inch core. The level of salinity across sites was not predictable and did not appear to be associated with texture or any other variable.

Published reports suggest sugarcane is moderately sensitive to salt, with a saturated-extract electrical conductivity (EC) threshold for yield reduction at 1.7 dS m-1 (multiplying dS m-1 times 640 equals ppm). Research in Texas measured reductions in Brix, pol and purity and increases in fiber with each dS m-1 increase in EC.

Because salt levels for most sites in the survey exceeded that of the salinity damage threshold of approximately 1,100 ppm, an additional 20 sites were sampled across a four-parish area in early November. A couple of the new sites contained levels of over 6,000 ppm in the surface 3 inches of soil.

Twelve of the original sites were re-sampled in early February to find out if sufficient leaching had occurred to reduce the salinity. Surprisingly, despite more than 14 inches of rain at several sites, salinity levels had increased at five of the 12 sites. At the time of the February re-sampling, a majority of the sampling sites contained salt at levels that exceeded that of the damage threshold of 1,100 ppm.

Flooding of agricultural land by hurricane storm surges can have both short- and long-term effects on both crops and soil structure. Although most of the "salt" in sea water is sodium chloride (table salt), sea water also contains appreciable amounts of magnesium sulfate (Epsom salts) and other elements. After heavy rains, sodium and chloride will be preferentially lost in runoff and leachate. Therefore, within the next two years, much of the agricultural land flooded by last season's storm surges should naturally recover and return to previous levels of productivity. Recovery will occur more quickly in fields that received lower amounts of salt. A few areas that accumulated very high levels of salt are possibly at risk of becoming sodic and may not recover without help.

The storm surge analysis offered by the LSU AgCenter's Soil Testing Lab reports both salinity (ppm) and sodium absorption ratio (SAR). Salinity (ppm) is the better indicator of the salt effect on crops; however, if the SAR is greater than 15, this site should be carefully monitored. Not only will it take considerable time for salinity levels to drop, but this field is at risk of collapsing during the process.

Water will not infiltrate a collapsed soil, the pH will rise above 8 and toxic amounts of sodium will remain. Reclaiming such soils is costly and requires addition of large amounts of gypsum plus mechanical drainage.

None of the sites in our initial monitoring studies is currently in need of gypsum, but some sites would benefit from the addition of lime. If a field has an SAR greater than 15 and low pH, application of agricultural lime will ensure that sodium is leached and sodic conditions avoided. Even where the SAR is less than 15, if soil pH is below 6.0 the addition of lime can help offset the effects of excessive salt and accelerate the leaching process.

Monitoring soil salt levels will continue until sugarcane harvest, at which time a yield impact assessment will be made in an attempt to confirm the applicability of the salinity damage threshold for sugarcane in Louisiana.

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