Potential for compost to improve potato production soil
by Tracy Hmielowski

Maintaining soil health in agricultural systems can be a challenge for any crop, but potatoes are particularly hard on the soil. Growing potatoes requires tillage and soil disturbance to plant and harvest, and limited plant residues are left to replenish soil organic matter and nutrients. One way to reduce the negative impact of potato farming is to have a three- to four-year rotation between potato crops. However, in some regions, high demand for the crop and limited land for increased production limit this option. Bernie Zebarth, a Research Scientist with Agriculture and Agri-Food Canada, explains that in eastern Canada, where potatoes are grown primarily for french fry production for the export market, producers were concerned that stagnating potato yields would make the region less competitive in global markets.
Knowing that declining soil health may be an important limitation, the potato industry asked soil scientists to collaborate with them to find solutions.

Research from other potato-producing regions demonstrated how compost can improve soil health and increase yield. The addition of compost immediately increases soil organic matter, and the greater soil organic matter increases water-holding capacity. Water-holding capacity is important in rainfed agriculture, like that in eastern Canada, and improved water-holding capacity can subsequently boost potato crop yields. Zebarth and colleagues in eastern Canada designed an experiment to test the effects of compost addition, and the results of this research are reported in the *Soil Science Society of America Journal* (https://bit.ly/2CqoheZ).

The field experiment was established in 2014 at the research center in New Brunswick, Canada. The experiment compared five compost products and a non-amended control. The compost products were locally available and varied in composition including forestry residue, poultry manure, forestry residue and poultry manure combined, a marine compost with shells, and source-separated organic waste. Experimental plots mimicked the potato production practices in eastern Canada, including being rainfed.

The researchers measured soil quality variables after one and two years of annual compost applications. The data set included a suite of soil properties, including pH, cation exchange capacity (CEC), plant-available nutrients, soil water-holding capacity (WHC), soil aggregate stability, total C, total N, microbial biomass carbon (MBC), particulate organic matter (POM), and soil respiration among others.

The authors determined that the addition of compost products did improve soil quality in the two years of this experiment. A 24% increase in soil organic carbon, and in some cases a doubling of particulate organic matter carbon, compared with the non-amended control, demonstrated that compost can improve both the quantity and quality of soil organic matter. The researchers also observed an increase in soil pH and the concentration of Mehlich-3 extractable K, Ca, Mg, and S in both years of the experiment.

While these results were promising, the improvement in soil health did not immediately increase potato yields (yield response results will be reported in a separate article currently in preparation). “It was expected that the increased soil organic matter would increase soil water holding, and by this means, increase yield in this rainfed production systems,” Zebarth says. “Surprisingly, the increased soil organic matter did not increase water-holding capacity, at least in the short term.” It could be that it takes more time for crops to benefit from compost additions or that different types of compost would have a faster response time.

While unable to make clear recommendations to potato growers in eastern Canada, the research did gain valuable insight into compost sources. For growers who want to add compost to improve soils, the authors suggest they seek out mature compost that has high dry matter and high carbon (low ash).