Commission releases white paper on soil health

May 16, 2012—The Michigan Potato Industry Commission today released a new "white paper" on soil health, which is a critical factor in maximizing productivity not only in the potato industry but in all commodities.

The document explains the issue and the Commission's action plan for addressing the issue including long-range steps that need to be implemented. The white paper will be distributed to other commodity groups and agricultural organizations for their feedback as part of a general effort to continue enhancing the role of Michigan agriculture as a vital positive force within the state's economy.

The full text of the white paper is published below...

Michigan Potato Industry Commission
White Paper on Michigan Soil Health
The Issue

Healthy soil is the critical component undergirding crop productivity. Attention is increasingly turning to soil health as many Michigan producers question if they are achieving their highest possible yields and crop quality. Some potato growers are experiencing stagnant or even declining yields in particular fields. Corn farmers are concerned that superior new varieties may not be performing everywhere to their potential. Growers of other field crops are likewise sensing that productivity should be better. Fruit growers are nagged by the suspicion that planting new trees in old orchards without making soil amendments may reduce yields and tree life.

Soil impairment is a limiting factor in productivity. Inputs including technological innovations may boost yields relative to past performance, but if the soil is not in optimal condition, stress on the plants exacts a toll. Growers are aware of this relationship and are increasingly seeking soil analyses to determine precise data for representative fields. However, the biodynamics within the organic portion of the soil are still not adequately understood, and soil management suffers as a result. Many growers now perceive a need for a stronger grower-university partnership to expand soil research and demonstration projects applicable to the broad spectrum of Michigan commodities. Improvement in soil-management practices should spur productivity and elevate the numbers on the "dashboard" that tracks the growth and development of Michigan agriculture.

Michigan Soils

Soil management is more difficult in Michigan than most other places because action of Ice Age glaciers resulted in a highly complex mixture of soils. As many farmers well know, several soil types can exist within a relatively small field. Slow glacial melting deposited the ice sheet's mixed rock contents directly downward to serve as parent material for subsequent soil formation. Faster melting led to rushes of water that distributed coarser materials across the landscape forming sandy and gravelly plains. Areas of ponded water led to the extensive swamplands that hindered early Michigan settlement before drainage made them tillable.

It was in Michigan that early soil "science" foundered. The rule of thumb as settlers pushed westward was "the thicker the forest, the more fertile the land." They knew that soils under the wider tree spacings in an oak forest were inferior to those cleared from a dense stand of eastern hardwoods like maples and ash and elm. Their theory began to fall apart when the openings of treeless grassy prairies in Michigan's southern tier of counties proved to be the most fertile of all. The final disastrous blow to conventional beliefs came with the felling of the heavy growth of white and red pine of the north. That land was cleared in full confidence in the pioneers' principle of "after the forest, the farm." The farmers who followed the lumberjacks were quickly doomed to failure. As we now know (but none did then), those pineland soils were too acidic to support the common field crops.

Today the chemistries and physical properties of soils are well understood. The biological components remain less so, particularly because so much of the extraordinarily complex interactions are invisible to the unaided eye. "Micro" is a common prefix in soil biology, which studies microorganisms, microflora and microfauna—a full range of microbiota.

Soil Biology

Primitive agriculturists early learned that animal manures can enrich their soils and improve their crop production. Soil research today increasingly provides explanations of why. The manures act on and positively stimulate the processes of soil microbiota.

According to one estimate, hundreds of billions of microorganisms can exist in a handful of soil. The species included in this diverse community of organisms may range to thousands for bacteria, hundreds for fungi and dozens for nematodes. Animal manures can increase the populations within this biomass and enhance their activity in a process that is helpful in nutrient cycling and overall soil-quality building and maintenance. Soil enzymes, mostly produced by microbes, also contribute to improving chemical and physical characteristics of the soil. Likewise, beneficial nematodes and mites and other microarthropods play crucial roles in building soil quality and health.

Within this amazing complex of organisms are also species that cause crop diseases. However, research has indicated that the biota composition of healthy soil reduces populations and impacts of plant pathogens although not to the point of eradication. Obviously soil biology is a field ripe for much more study that can yield new strategies for optimizing crop production.

A Soil-Health Initiative

The Michigan potato industry has become concerned enough about productivity stagnation that it has begun an effort to address the issue. On January 11, 2012 an ad-hoc "soil-ecology group" comprising growers, marketers, consultants, agronomists and university specialists from various disciplines met to discuss possible causes of the problem and lay the groundwork for a practical response. The focus was on physical impairments such as soil compaction and on disruptions to beneficial soil microbes, microflora and microfauna. A follow-up meeting on March 29-30 included three out-of-state soil scientists prominent in advancing new concepts and new understandings about soils. The outcome of this meeting was a Michigan Soil Health Plan of Action geared to the potato industry but adaptable to other commodities as well.

The Soil-Health Action Plan

The Michigan potato industry has outlined a three-phase action plan:

1. In 2012, 120 soil samples from Michigan potato fields will be collected and analyzed at the Cornell University Soil Health Laboratory in New York.

2. In 2013, a more comprehensive potato soil-health research project is anticipated. A grant has been applied for under the 2008 Farm Bill Specialty Crop Block Grant program. If the competitive grant is awarded, more extensive soil sampling will be conducted in fields in various stages of productivity. Results will be correlated with an existing database of a variety of field factors. Microbial lab analyses will expand the knowledge base about relationships of soil health and chronic disease complexes. If the grant proposal is not approved, scaled-back efforts will be undertaken using Michigan Potato Industry Commission funds.

3. The Commission's Research Committee and the Michigan State University team of potato researchers will provide leadership for development of a major multi-state and multi-commodity soil-health research and education initiative for 2014 and beyond.

Michigan potato growers are already employing practices aimed at improving soil health. Many are adding organic soil amendments. Crop rotations disrupt pest life cycles and reduce pesticide needs. Cover crops are chosen to build soil organic matter.

However, documentation of the complex of biological activities within the soil and the benefits of particular practices is still at a rudimentary state. The need is for added research-confirmed information so that longer-term soil-management strategies can be developed for adoption by growers.

Unfilled MSU position. To meet the need cited above, the action plan presupposes that a currently vacant soils-specialist position at Michigan State University must be filled. The ad-hoc "soil-ecology group" is an example of the long-standing record of strong collaboration between the Michigan potato industry and MSU researchers, but its composition exposes a critical void, the lack of anyone with a specialty in soil biology and biogeochemistry. As a stopgap measure, experts are brought in from out of state as consultants on an irregular basis. If Michigan agriculture is to advance on the soil-health issue, relying on the strengths of the land-grant tradition, MSU must add a full-time soils specialist to its staff to serve all commodities with their complex needs for soil improvement. This position is essential to achieving developmental progress on the Michigan agricultural "dashboard."

MICHIGAN POTATO INDUSTRY COMMISSION
13109 Schavey Road, Suite 7 | DeWitt, MI 48820
(517) 669-8377 | FAX: (517) 669-1121 | info@mipotato.com
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