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MANAGING PLANT NUTRIENTS FOR THE WORLD FOOD CRISIS

Price increases in crop commodities have precipitated a world food crisis. The forces driving the price increases call for ecological intensification of cropping systems. A recent scientific conference in Montreal, Canada, featured four leading minds who brought out important implications for managing plant nutrients.

1. Better crops demand better science. Professor Ken Cassman, University of Nebraska, pointed out that current rates of gain in crop yields are not adequate to meet the expected demand for food, feed, fiber, and fuel. Future yield increases need to be achieved in the context of declining supplies of water for irrigation, and a higher relative cost of N fertilizer. Expansion of crop area is limited by lack of good quality soils and by concerns about loss of wildlife habitat and biodiversity. Ecological intensification—accelerated yield gain while reducing agriculture’s environmental footprint—is the path forward, but depends on getting scientific breakthroughs in basic plant physiology, ecophysiology, agroecology, and soil science.

2. Healthy ecosystems are crucial. Professor Cal DeWitt, University of Wisconsin, spoke on plant and soil management in the context of the biosphere – the layer of life in the soil, water and air that surrounds the globe. Exploring the issue of climate change, he showed how healthy ecosystems are central to the aspirations of humankind, and that a combination of science, ethics, and praxis is needed to conserve the biosphere. Science explains how the world works, ethics describes what ought to be, and praxis defines what we must do. The triad of science, ethics, and praxis applies to the management of plant nutrition.

3. Biofuels link energy and climate change. Professor Don Smith, McGill University, noted that biofuels address two great challenges of the 21st century: energy and climate change. Climate change is an energy issue since it is largely driven by use of fossil fuels. Science and technology are striving to improve biofuel crops to produce more energy per unit of energy consumed in their production. The design of biofuel production systems requires rigorous life-cycle analysis.

4. Are we “starving Peter to drive Paul”? Professor Tom Powers, University of Delaware, discussed the ethical questions that biofuels provoke, including violation of distributive justice, political instability, and harm to the interests of future generations. Our inability to resolve these problems may waste the precious social and political momentum that is attempting to address the challenge of global climate change. Moving beyond a “zero-sum game” requires that crops be more productive.

So what are the implications for managing plant nutrients? The linkages among food, fuel, and climate change mean that a choice between producing food and fuel is not realistic. Ecological intensification of cropping systems will be the path forward, and plant nutrient management needs to support it. The key is to work with a nutrient management system that appropriately applies global scientific principles to local crop management; a system that seeks to apply the right nutrient source at the right rate, time, and place. Crop producers and their advisers need to be selecting practices, on a site-specific basis, for their ability to preserve natural ecosystems by growing more on less land, with less loss of nutrients, recognizing longer-term effects on the soil ecology, and supporting profitable production.

As cropping systems intensify, plant nutrient management will need to adapt. What’s right for past cropping systems will not suffice. As crop genetics, rotations, and end-uses change, agronomists, crop advisers, and producers must apply science to assess best management practices for their contribution to an intensification that is ecological and sustainable.

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For more information, contact Dr. Tom Bruulsema, Northeast Director, IPNI, 18 Maplewood Drive, Guelph, Ontario N1G 1L8, Canada. Phone: (519) 821-5519. E-mail: Tom.Bruulsema@ipni.net.

Abbreviations in this article: N = nitrogen.