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# *Food, Fuel, and Plant Nutrient Use in the Future*

The question of how to feed mankind by 2050 is a very important one. Three major components deserve special attention:

- Estimation of food needs
- Availability of land to grow food
- Nutrients that are required to increase world food production

The world has had cheap food in no small part because it has had cheap energy, led by cheap oil.

- Plant matter—particularly cellulosic materials—is now much less expensive than oil.
- Grain-based biofuels are competitive with oil without subsidies.
- Large amounts of crop and forest residues are available for cellulosic biofuel production without any new land required.
- Efficient use of land to grow plants for biofuel production will require increased nutrient inputs overall and possibly limit the potential of biofuel production.

Managing what is beneath the surface is a major part of the 2050 challenge.

Plant nutrients are essential inputs for all forms of crop production, and meeting future societal needs will require careful attention to plant nutrition.

- The primary roles of commercial fertilizer use are to supply plants with the nutrients they cannot obtain from the soil or other sources and replace the nutrients removed by crop harvest.
- Livestock manure is another potentially significant nutrient source for crop production.

Escalating population is the primary driver in increasing crop production and nutrient use.

- In order to increase current scale of production under decreasing amounts of land, a reliable supply of plant nutrients to replace those removed by cropping is essential.
- The increased demand for biofuels has a direct impact on the use of nutrients.

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