

# PLANT NUTRITION TODAY

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## THE SCIENCE OF ORGANIC FERTILIZERS... A CLOSER LOOK

“Feed the soil to feed the plant” is a guiding precept of organic soil fertility that I hear repeated from well-intentioned people who have rarely given it serious consideration.

Practices to increase soil organic matter, biological activity, and plant nutrient availability are all desirable goals, but let's take a closer look at organic fertilizers and see how they can best fit into a sustainable crop production system.

Over the past few decades, the principles of organic farming have been accepted into mainstream research, extension, and university classes. While there are commendable outcomes with organic practices, the strict boundaries and prohibitions can cause people to overlook the underlying assumptions that do not always align with good science.

Supplying organically grown crops with nutrients is commonly accomplished by stripping nutrients off a large area of land and then applying them to a much smaller field. For example, as the illustration on the following page shows, when chickens are fed corn and soybeans harvested from a farmer's field, nutrients leave the soil when the grain is harvested (and diminishing the nutrient supply for subsequent crops). As the chicks eat the grain and grow into full-size broilers, they produce nutrient-rich manure. The poultry farmer then collects the manure and prepares it for sale to an organic farmer for fertilizer. The organic

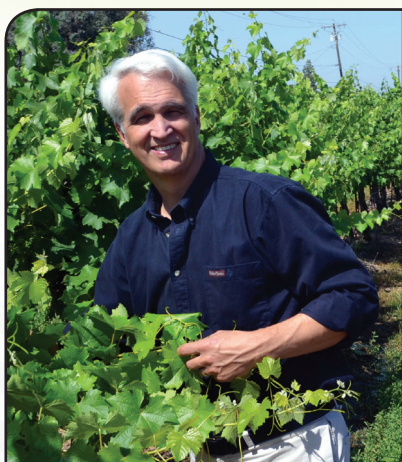
farmer benefits from the manure nutrients at the expense of the farmer who produced the grain, unless all of the manure is returned to the original field (and nutrient losses will still occur as the chickens grow).

When manure and compost is used to build soil organic matter and nutrient availability, it does so at the expense of other fields. Transfer of manure to organic farms also deprives other farmers from the use of the organic manure and its nutrients.

The application of manure can improve soil properties, regardless of the farming system. Manure and compost are not “new” nutrients, but a valuable and scarce resource that can benefit all farmers.

High-yielding organically grown crops rely on large inputs of organic matter, often from intensive animal operations. These organic materials are made available at considerable investment of time, land, water, and nutrient inputs. These basic requirements are too often overlooked in the quest for using “organic nutrient sources.” The true cost of producing these materials and building soil organic matter needs to be considered.

The continued transfer of nutrients and organic matter from a large area to smaller farms is only maintained by replacing harvested nutrients with fertilizers to rebuild the lost fertility... and this does not account for the nutrients transported through food

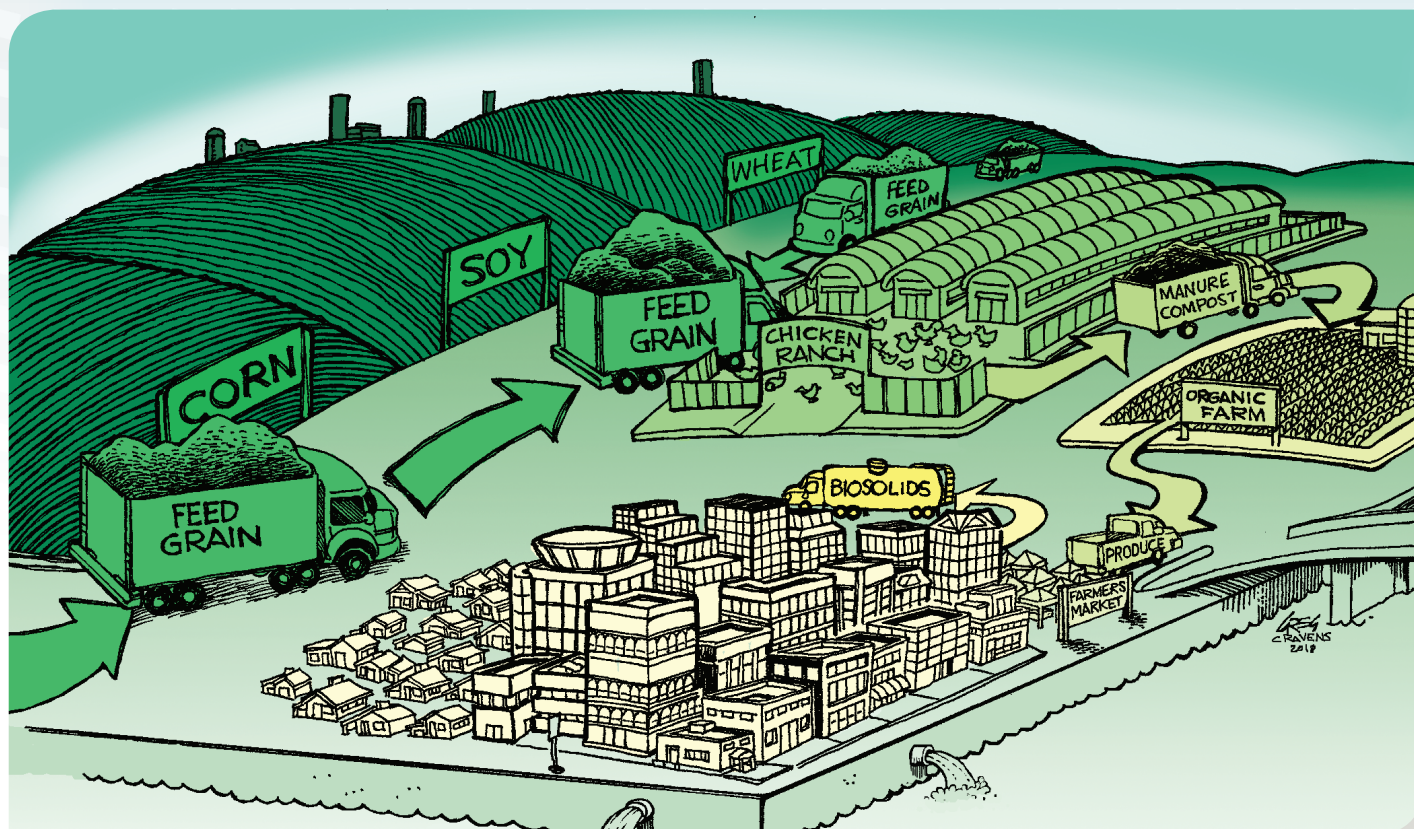


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*“The inevitable result of farming is always to diminish natural fertility because portions of the total supply of plant nutrients... are removed.”*

(G.W. Cooke, 1967)



exports to cities and are then only partially returned to non-organic fields as biosolids.

All sustainable cropping systems must eventually replace the nutrients removed in harvested materials. This replacement should be carefully managed to close the nutrient cycles as much as possible, produce healthy and nutritious crops, protect the soil, and minimize adverse environmental impact. Accomplishing these goals simultaneously is not a simple matter!

By-products of the meat industry such as dried blood, feather meal, fish emulsion, and ground bone are freely used as organic fertilizer without much thought of where their inherent nutrients came from. The animal by-products only contain nutrients obtained from the soil where the feed or forage was grown. Similarly, products such as worm castings merely concentrate and transform soil nutrients, while making it convenient to transfer to another location.

Cover crops and green manures will make valuable additions to the nutrient supply of the following crop, especially when

N<sub>2</sub>-fixing crops are grown. But even legumes (such as alfalfa) require an abundant supply of phosphate and potassium in the soil for vigorous nitrogen fixation and vegetative growth. If harvested, an average-yielding alfalfa crop (3 ton/A) will remove 45 lb phosphate/A and 180 lb potash/A from the soil. Additionally, the time the field is being used for green manure production, a cash-producing crop is not being grown.

There are clearly many benefits from using organic materials as sources of plant nutrition. The addition of organic matter to soil can stimulate soil biology, enhance soil porosity and structure, aid water and air infiltration, reduce soil density, and benefit root health. However, let's be clear about where the nutrients in these organic materials come from. Recognize that accumulating organic materials from a wide area to fertilize a few fields is sustainable only by replacing the harvested nutrients to avoid gradual soil degradation.

## References

1. Cooke, G.W. 1967. The Control of Soil Fertility. Crosby-Lockwood, London, 526 pp.