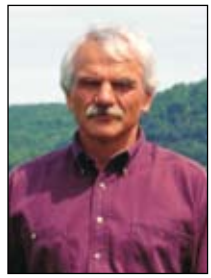
TOP 5 MISTAKES IN FERTILIZER APPLICATION

Experienced eco-farmers have a far more advanced and complex understanding of fertilizer use than the simplistic NPK approach that dominates their industrial ag counterparts — but learning from and working with nature as a partner rather than an adversary is a never-ending process, and there are few better teaching tools than learning from mistakes.

With that in mind, *Acres U.S.A.* asked some of the leading consultants in soil fertility and biological agriculture, "What are the top five mistakes you have observed in terms of fertilizer application?"

Their responses present a wealth of information and considerations that every biologically correct grower will want to contemplate as they develop and refine their own fertilizer management programs.



GARY ZIMMER

Gary Zimmer heads Midwestern Bio-Ag, a manufacturing and consulting company that provides products and services for sustainable agriculture. He is also an on-farm consultant, manages the company's learning center, and is a partner in Otter Creek Organic Farm. He is the author of The Biological Farmer, *the consultant's bible for eco-growing.*

1. *Wrong stuff.* Applying a fertilizer that is too soluble or too insoluble for the soil conditions is a common problem. A good example is calcium. Many farmers overdo lime on soil with a neutral or high pH where not very much of that lime will become available to plants. Another problem I see is when farmers apply a fertilizer that is not balanced, so there is too much of some nutrients and not enough of others. There are four factors I like to see in a good fertilizer: a blend of soluble to slow-release nutrients; a balance of nutrients; concentration (putting fertilizer in the right place); and low pH.

This variable-rate spreader allows for accurate field applications of fertilizers.

2. *Wrong amount.* Overdoing some nutrients will interfere with the uptake of others. For example, applying too much soluble nitrogen can wash available calcium out of the soil. Land that has been depleted of nutrients due to past farming practices and crop removal can have poor production if too little fertilizer is applied. Equipment calibration problems also fall into this category: if farmers miscalibrate their spreader they can get too much or too little fertilizer on their crop.

3. *Wrong place.* If soluble fertilizer is placed on top of the ground it can volatize or erode, and those nutrients are lost. Placing too much soluble fertilizer or a fertilizer with a high salt index next to the seed can inhibit root growth or dry out the roots. Another problem I see is bulk spreading a starter fertilizer that would be better placed down the row where the crop can access it.

4. *Wrong time.* A common mistake in timing is applying nitrogen in the fall when there isn't a growing crop there to capture that nitrogen. Another timing issue I often see is applying a highly soluble fertilizer to a hay crop in the spring, which interferes with crop quality.

5. *Not following a consistent program.* Some farmers are hit and miss with their fertilizer program. They'll apply calcium, sulfur and boron some years but not others, when really those nutrients should be applied every year. If a farmer has a limited budget, they need to look at their major constraints and decide where to spend their dollars to do the most good for the crop and the soils. They should set up a program and determine the best time to take soil tests, then make their soil correctives and determine when and how much crop fertilizer to apply.

Final thoughts:

l. Test to find what nutrients are deficient and add them.

2. Apply soluble calcium, sulfur and boron on all forages and legumes.

3. Use a crop fertilizer placed properly with a balance of all nutrients for all crops grown.

NEAL KINSEY

Neal Kinsey has been called a "consultant's consultant." Through the in-depth courses provided by his company, Kinsey Agricultural Services, Inc., he has trained hundreds of consultants and sophisticated growers in the methodology of soil element balancing utilizing cation exchange capacity. He is co-author of the book Hands-On Agronomy *and lectures frequently around the world.*

1. Too many nutrients are only considered for their short-term effects and not the full benefit for both the life in the soil to do its work of digesting locked-up elements and the full benefit to the nutrient content of the plants being grown. The soil is the plant's stomach. If we expect the plants we grow to supply *our* nutritional needs, then we must use the materials that aid *its* digestive system.

2. You can't manage what you can't measure. Test and properly feed the soil in order not to force the plant to take up elements it does not need instead of those it does, thus creating problems with excesses and deficiencies.

3. Failure to understand that when you add a nutrient to the soil something else will be lost if that material is to remain in the soil and available for plant uptake. Thus, adding too much of anything will assure there is not enough of something else.

4. Trying to average whole fields for fertilizer applications regardless of obvious differences in soil content and plant growth, assuming that one mix will provide all that is needed. For every difference you can observe in a field, there will generally be one or more different nutrient-availability problems that can be detected. If it is large enough to treat separately, supply the right fertilizer for that soil's needs.

5. Failure to seriously study, learn and strive to apply what the real laws of soil fertility require to do the right job. Start small if it requires major changes, but determine to follow through on a nutrient-feeding program for that soil, testing and fertilizing accordingly, for at least three years. Consider the results each year, but make the final judgment by giving the program time to make the changes in the soil that matter most. Even then, when properly tested and fertilized accordingly, the soil and its production should continue to improve for years to the extent that such a program measures and provides the proper nutrients for the soil to feed the plants being grown there.

PHIL WHEELER, PH.D.

Dr. Phil Wheeler is expert in blending Albrecht-method soil fertility balancing, Reams-style agronomy, and subtle-energy techniques including radionics and field broadcasters. His company, Crop Services International, provides advanced soil testing, technology and products to enable farmers and growers of all sizes and types to improve the health of their soils, crops and animals.

1. The biggest and oldest mistake made is not liming because of neglect, lack of knowledge or the mistaken concept of pH as basis for liming rather than percent base saturation. Since calcium is the prime nutrient in all living systems, this mistake has caused immeasurable loss of production and incredible amounts of economic and environmental damage when rescue chemistry had to be applied. The fact that calcium is not biologically available (as indicated by LaMotte soil tests) to the extent needed for nutrient dense food under conventional farming techniques adds to the problem. The lack of fungi in general prevents the "holding" of calcium in the root zone.

2. Using high applications of nitrogen and potassium (from KCl) to push/force a plant to grow instead of creating healthy biological soils. The excess N shuts down the natural processes of the cycle that fix atmospheric nitrogen. The KCl interferes with soil biology. Excess N also interferes with the most basic function of nutrient exchange involving mycorrhizal fungi. The fungi exude sugars to soil bacteria that exchange the sugars for macro- and micronutrients back into the plant. Again, the loss of the

fungi or their function does not allow for nutrient-dense food.

3. Using highly concentrated, processed phosphates that tie up quickly with soil calcium, making it unavailable to the crop, and shut down mycorrhizal fungi. See numbers 1 and 2 for explanations.

4. Assuming that plants grow from nutrients, rather than *the energy produced by the nutrients*, the biology, the sun, the moon, the lightning and the cosmic forces. Many growers don't realize how much oil-based energy went into the production of those NPK fertilizers and that this energy is released back into the soil. A grower may also assume that larger amounts of this high-energy material will result in greater yields. That can be true, up to a point, but since this source of energy is tied to fossil fuel and overpowers free, natural sources of energy, the system is unsustainable. It also destroys soil carbon instead of sequestering it, resulting in the weakening of one of the most valuable sources of national wealth, our nation's soil.

5. Assuming that just using starters every year is cost efficient, when in fact it is very inefficient if you have major or minor mineral shortages that go uncorrected. Each major or minor mineral deficiency can cause loss of yield. About 99 percent of soil tests coming through our lab are severely short of boron, and about 95 percent are short of Zinc. Boron begins the whole process of moving silica and calcium into a crop. Zinc is responsible for growth functions. By planting each year without replacing or supplementing the crop in the start, a grower meets Einstein's definition of "insanity", *i.e.,* doing the same thing over and over again and expecting a different result. Test your soil and replace your missing minerals!

MIKE AMARANTHUS, PH.D.

Dr. Mike Amaranthus has published more than 80 scientific papers on soil and fungi and has conducted research and presented invited scientific papers in England, Italy, Spain, Costa Rica, Australia, New Zealand, China, Mexico and Canada. His awards include the Secretary of Agriculture's Highest Honors Award for scientific achievement in 1996. Dr. Mike is an associate professor (adjunct) at Oregon State University and the president of Mycorrhizal Applications, Inc.

Farmers can reduce their fertilizer inputs and costs managing the timing of fertilizer application and encouraging microbial life in the soil. When fertilizer availability is timed with plant nutritional needs and root activity, then fertilizer use efficiency is greatly improved. Microbes are like little sacks of fertilizer that store and slowly release nutrients when plants need them the most. Use carbon inputs and inoculants to improve microbial populations and activity. Remember, it is microbial activity that makes phosphorus available, so don't waste money on phosphorus fertilizers that get tied up immediately. Avoid overwatering and erosion, which result in fertility losses into surface and ground waters.

The five most common mistakes would thus be:

1. Overuse of fertilizers.
2. Off-site pollution.
3. Tied-up phosphorus.
4. Over-watering.
5. Erosion.

JON FRANK, INTERNATIONAL AG LABS

Jon Frank is a principal in the lab/consulting group International Ag Labs, where he helps growers through phone consultations, fertility recommendations, and product development.

1. Not applying enough nitrogen in organic grain production. Organic grain producers are notoriously squeamish about applying nitrogen. Our standard recommendation for corn is 50 gallons of 5-1-1 liquid fish and 100 pounds Chilean nitrate. Cost is the biggest concern.

2. Trying to fix a calcium deficiency with NPK. Much of production agriculture focuses only on NPK, and consequently most soils are low on available calcium. Most farmers don't appreciate the value calcium brings to the volume of harvest. As a result, calcium is not properly addressed while production is pushed mostly with nitrogen and potassium.

3. Organic gardeners fertilizing soils with far too much compost or manure. This is a classic problem with garden-scale growers. Since people know compost is good for the soil, most put on 100 times too much. The result is cumulative poorer quality, insect pressure and dropping brix — all because gardeners put on what they have plenty of rather than what the soil needs.

4. Not understanding the supreme role calcium plays as a soil amendment and crop nutrient. Calcium is what all other elements in the soil react against to create energy. Having the proper level and ratio of available calcium guards against wasting nitrogen that can be dissipated from the soil into the atmosphere. Adequate soil calcium is needed just as much by soil biology as by plants

5. Trying to use biology to break loose locked-up nutrients rather than actually applying the needed nutrients. This is a classic approach taken by people "under the influence" of one too many compost tea applications. We have seen many farmers totally bankrupt phosphate levels, all the while stimulating soil biology to break loose more phosphates. To say that all any soil needs is biology and stimulation because all soils are well endowed with plenty of nutrients is a big mistake. Nature just doesn't work that way. A better approach is to apply biology, stimulate biology, and apply moderate amounts of the nutrients in short supply.

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