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For: Next Step Produce

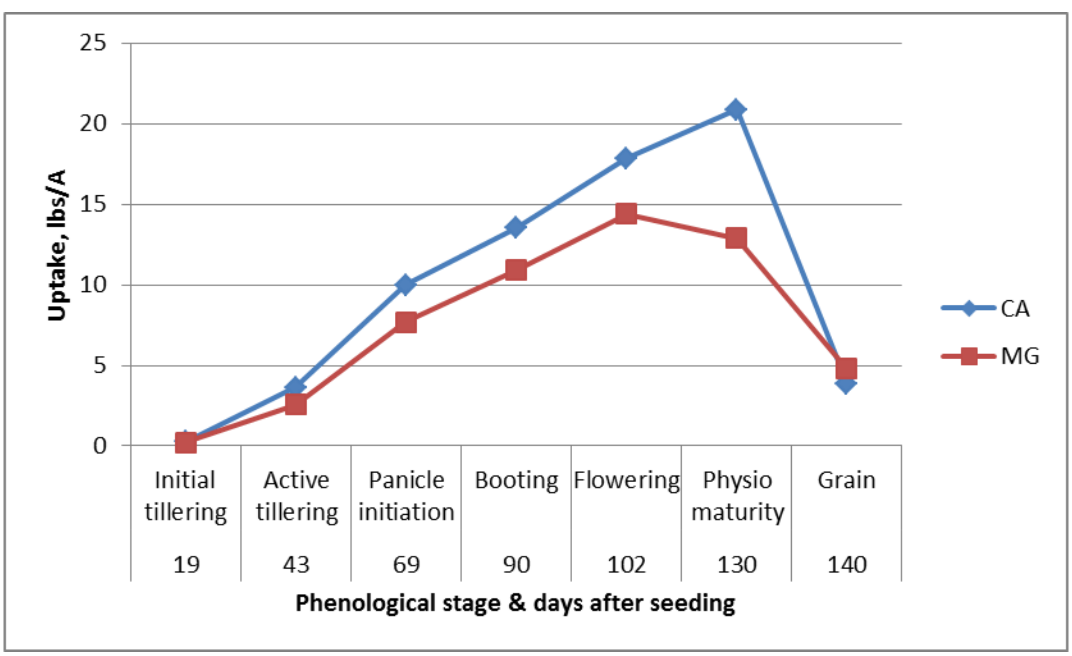
Heinz,

I will address your questions in several parts. The first follows, and is specific to the soil test dated **01/17/2011:**

Of all the tests you sent me, this one in general has the highest levels of nutrients relative to the others. If this can be considered a "baseline" test, it suggests soils generally high in calcium and potassium, with acceptable, slightly acidic pH's, and low CEC's. The buffer pH values are all 7.0, and when you couple this with the low CEC, you have a situation where raising the pH (if necessary) will require lower amounts of lime than would be necessary in soils with higher CEC values. In short, proceed with caution when liming.

For the test dated **9/17/2012**:

My initial reaction to the test-result for the "Carrots II" block into which rice will be transplanted is that it's a "good" soil for growing produce. I believe it also will provide a good foundation for growing rice, too. It is rich with phosphorus, and shows base saturation levels that are acceptable, although high in potassium. This may be due to the nature of the clays in the soil, and most likely will NOT affect calcium, potassium, or magnesium availability in the soil solution. Ideally, for optimal soil "tilth" the calcium would be around 70%, and potassium would be about 5% base saturation. In your case, though, the pH is 6.8, which is higher than the 6.2 that has been shown to maximize some upland rice grain and straw formation. Moreover, Fageria (2014) has reported that rice crops rarely exhibit calcium deficiencies. See the chart below:



Upland rice clearly has a requirement for calcium and magnesium that increases sharply from initial tillering, through flowering and into grain maturation. Your soil tests give me no indication of how much calcium is in the soil solution, that is potentially available to meet the rice's need. These data are most likely from rice grown in soil very different from yours. But I still look at it as an estimate and guideline, until we learn more about how your rice is responding to inputs. The sap-testing will give us some indication of that. In short, I do NOT recommend adding calcium to this soil ahead of planting. The micronutrients reported will probably be less available than they would be at a lower soil pH. Again, I anticipate the sap testing showing us more about that as we go.

In "Oak", where the organic matter does not persist, you have described active cover-cropping, addition of leaves, ample moisture and minimal tillage. The soil pH in that block is 6.1. All of these conditions point toward a soil rich with fungal activity. I can't say without some biological testing to what extent that diversity exists, but I can safely conjecture from what is known that the fungi–and other microbes–are making short work of the leaves you're adding. You will notice that the soil test is showing that block to be higher in nitrogen than the others too. The Logan test does not yield any information about how much of that nitrogen is water-soluble, or microbe-available. It is possible that there is indeed a high amount of nitrogenous microbial and fungal food there. If the fungi and microbes are as active as your observations suggest, your system is carbon-limited, and you will have to continue to add quickly-digestible organic matter to feed the fungi and microbes so they do not start using that 4.02% you've been able to build up.

Soil tests dated 2/20/2013:

I don't know where these four sites are, relative to the sites in the test dated 9/17/2012. But the pH's and CEC's are roughly the same as in the older test. Organic matter is lower. With the exception of those in "Marsh North" the base saturations are closer to what is considered "ideal" than in the earlier test. Phosphorus and sulfur are both lower, in this test than in the older test. Interestingly, the "Orchard" block is not much different here than it was in 2011. pH values are all relatively low, and at the "bottom" end of the range considered conducive for most crop production (*i.e.,* pH 6.0 to 7.0). The three exceptions to this are "M.F. North", "Orchard", and "H. T. 4." You will notice that the corresponding Ca base saturations are higher than those in the other blocks; and that the exchangeable hydrogen is also lowest in these three blocks, compared to the others. Comparing these with the other base saturation metrics will indicate how the base saturation is related to soil pH. In essence, higher hydrogen ion saturation on the CEC represents more hydrogen ions in the soil in general, displacing other ions, and resulting in lower pH values. Phosphorus levels vary, but sulfur levels are consistently low, as they are in the other tests you sent me.

Soil tests dated 3/26/2015:

I will focus on the blocks designated for rice production, on this test. The pH's are acceptable, and the calcium levels are excessive, so there's no need for lime in these blocks. When this land isn't in production, I'd suggest cover crops to start building up organic matter. My suspicion is that there's a good amount of microbial activity in this soil, which is starting to eat into the organic matter. Essentially, probably similar to what is occurring in the "Oak" block. I'm assuming that Sam's recommendation of elemental sulfur has helped lower the pH in these blocks to some extent. My recommendation for soil amendments to increase magnesium, potassium and plant-available sulfur levels:

400 lbs/A of 0-0-50 potassium sulfate. This will provide approximately 200 lb K and assuming 18% sulfate, about 72 lb/A sulfur.

200 lb/A of epsom salt. Typically, epsom salt has about 10% magnesium and 14% sulfate. At this rate, you will be adding 20 lb/A magnesium and 28 lb/A sulfur.

You can blend the potash in 1-2 tons of humus compost; the epsom salts do NOT blend in the compost, from what I've been told. So that will have to be added separately. The sulfate ions will not lower pH, and will increase your sulfur levels above what the test result indicates is "optimal" (35 ppm, or 70 lbs). I see elevating the K and Mg base saturation levels as more important, though, and can recommend this despite the sulfur trade-off. The Microhume is also a good idea, to improve the micronutrient compliment. I don't know much about how the Dynamin and Carbonatite will affect the soil nutrients, but I don't see that they will have a negative effect. Your compost will also supply a small compliment of cations to the whole, which is also beneficial. The 1.5% organic nitrogen provided by your compost will increase what is available to the microbes to mineralize for plant use, but as the Ward Labs test indicates, there may be only 2.1 lbs/ton N available from the compost. My estimation is that you will need to add in more nitrogen for the rice production. Two split applications of 400 lbs/A each at planting, then at tillering, have been shown to have good effects (Fageria et al. 2010). Of course, these values represent rates of synthetic, conventional fertilizer. The only organic product Keystone has that comes close to fulfilling that need is the pulverized shrimp/crab shell mixture Sea POWER. The Explorer Nitrogen seems like a good fit, but the rates on the label for soil application appear to be prohibitively low. It could be something to apply in weekly foliar sprays, though, to supplement the plant nitrogen levels after transplanting. As I said in our phone conversation, I also recommend that we source potassium silicate in some form; the plants will benefit from both nutrients, even if you have to rely on foliar spraying. With the calcium levels being what they are, I don't think wollastonite is the best way to put some extra silicon into the system.

Those are my initial recommendations; you have my personal number and are welcome to use it to contact me anytime to discuss.

REFERENCES:

Fageria N K, O P de Morais and A B dos Santos. 2010. Nitrogen use efficiency in upland rice genotypes. Journal of Plant Nutrition 33: 1696-1711.

Fageria N K. 2014. Mineral Nutrtion of Rice. CRC Press. Boca Raton FL. Kindle Edition.

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