Coffee and Nutrient Management Meeting Minutes – 3-16-21

Attendance: John Mischler, Greg Lake, Charles Enea, Stephen Pawlowski, Aimiee Wentworth, Ben Wicker, Brooke Rudicel, Courtney Taylor, Don Rekeweg, Janel Meyer, Jenna W, Kellie Adkins, Margo Nussbaum, Marissa Renz, Matt Kurtz, Micheal Werling, Paul Doctor, Raymie Porter, Robert Johnson, Scott Thompson, Tom Miller, Joelle Neff, Rich Barker

John – Setting the stage for today.

Ben – Going through the framework of the 4Rs and giving tools to apply the 4R strategies into their operation.

John Mischler’s topic was Nutrient Cycling. He is the director of the agroecology program at Goshen College. Merry Lea is an educational sustainable farmer focused on getting biology to work for you. The farm has a wetland that sequesters the runoff of nutrients. Their chicken houses spread chicken manure across pasture after the cows go through. They have goats, pigs, cows, and chickens.

* Agroecology and the Transformation of Food Systems.
	+ Level 1 – Increase input efficiency, reducing the use of costly, scarce, or environmentally damaging inputs. Pesticides and Herbicides are a tool, but we must be careful.
	+ Level 2 – Substitution of costly, scarce, or environmentally damaging inputs for locally produced, abundant, regenerative & renewable ones.
	+ Level 3 – Redesign the agroecosystem so that it functions on the basis of a new set of ecological processes that provide system resilience.
	+ Level 4 – Reconnecting the two most important parts of the food system – consumers and producers – through the development of alternative food networks.
* We can’t talk about nutrient management without talking about soil biology – endophytes, mycorrhizae, N-fixing bacteria
* Is there anyone on the call who has their own farm? – Farmers on the call raised their hands.
* How do farmers on the call nurture their soil?
	+ Mike Werling – his increase in organic matter is benefitting everything else. He does reduced tillage, cover crops, and plants green using a roller crimper to put a mat on the surface. Doing this keeps weeds down and protects the surface.
	+ Kellie Adkins – Uses compost for produce gardens
	+ Raymie Porter – No-till, slow-release nitrogen, crop rotation, moving toward cover crops, also adding biologicals (BioDyne)
	+ Rich Barker – manages 60 acres – He rotated all tillable acres from row crop to pasture land. Rotational grazing livestock.
	+ Marissa Renz – No till, some cover crops, compost, and crop rotation
* What works on one farm might not work down the road. We’re all focusing on different things. Merry Lea is working with nut, fruit, and veggie which is different from a row crop, but the principles can be applied to all. Merry Lea has perimeter fences for their grazing animals.
* Soil food web – Someone might use cover crops to keep weed pressure down, but the cover crop might do some nutrient cycling. We’re going to focus on the nutrient cycling part of these practices mentioned by the farmers.
* Common Knowledge: Nutrients must be in their inorganic form to be taken up by plants. How does this happen in my garden?
	+ Nitrogen cycle – Plants are interacting with soil life. There are nitrogen fixing plants and non-nitrogen fixing plants. Each has a unique interaction with the soil. Plants produce exudates which feed the microbes. Fungi can break down complex organic material; they are decomposers. Legumes are nitrogen fixing. They have nodules formed by bacteria on their roots. The nodules take nitrogen straight out of the air and fix it into a form that plants can use. Cover crops can be used for this in a backyard garden, small farm, or large farm. The living components are processing the organic material to make it available to plants
	+ Phosphorus cycle – Plants can’t fix phosphorus so we often get it from manures, compost, plant residues, or chemical fertilizers. They get absorbed in the clay particles. The bacteria and fungi in the soil break down the organic material into a form that the plant can use.
	+ We must make sure our soil is alive. Provide all the pieces that the community in your soil needs.
* Fertilizers – Some fertilizers that Merry Lea uses are fish emulsion, bone meal, feather meal, blood meal. Any material that comes from living material is considered an organic amendment. Try to manage systems so they build their own fertility. None of the fertilizers mentioned above are super-fast acting, but almost all are relying on the soil food web to process them. Fresh manure has a component that’s fast acting.
	+ Feather meal – basically all nitrogen – addresses a N deficiency
	+ Bone meal – high in phosphorus – addresses a phosphorus deficiency
* Two ways to address nutrients on the farm – organic fertilizers (complex carbon chained materials, designed to feed your soil biology) and synthetic fertilizers (taken up by plants immediately, but don’t over-apply so it doesn’t wash away. Doesn’t feed soil biology)
* Ways to deliver nutrients
	+ Compost – Merry Lea applies in the fall so their biology has time to get to it.
	+ Incorporation into the soil where crops are being grown
	+ Top dressing
	+ Foliar feeding via compost tea – make mixtures and apply on top of the plant

Remember – you are not just delivering nutrients, but you are also inoculating the soil!

Also, some soils retain nutrients better than others. SOM and Biochar can be VERY useful! Merry Lea’s farm has a lot of sandy soils and nitrogen can leach really easily. They’ve been adding lots of organic matter and Biochar which is basically cooking wood.

* Common knowledge: Nutrients have to be in their inorganic form to be taken up by plants. **NOPE** – Rhizophagy Cycle – we’re learning that plants do things differently than we thought they did.
	+ What we’re learning is that plant roots farm bacteria and microbes to feed themselves. They fish out the microbes they need. Microbes enter the plant and are then processed and stripped of nutrients. They then leave the plant and do it all over again.
	+ Plants are taking up whole amino acids!
* How to Keep Your Soil Living (and the nutrients flowing)
	+ Watch out when applying inorganic nutrients (N&P) as this can shut the whole show down.
	+ Avoid compaction, tillage, harsh pesticides and fungicides.
	+ Inoculates like compost/compost tea may be helpful.
	+ Diverse cover crop mixtures – keep living roots in the soil as much as possible.
	+ Not all nutrient sources are equal – amino acids, peptides, and urea are “less work” for the plant to take up – so nutrient efficiency will increase!
	+ Get soil tests relevant to your soil biology!

Ben Wicker – Developing a 4R plan - Ben is the Director of IANA, a CCA, and a farmer of a row crop, forage, and cattle operation

* IANA is collaboration of major conservation organizations, keeping Indiana at forefront of conservation.
* Practice adoption goals – plan, apply, and protect
* Key components of your plan
	+ Understand soil needs – soil type and test
	+ Understand crop needs – different crops have different nutrient needs
	+ Apply nutrients using 4R principles
	+ Document what you’ve done – for on farm perspective to make improvements
* What is a 4R nutrient management plan
	+ Right source, right rate, right time, right place
	+ Framework for making nutrient applications that maximize plant uptake and minimize risk of environmental loss
	+ Cropping system specific
	+ Adaptable to all farms
* Right Source – Matches fertilizer type to crop needs
	+ What’s the nutrient analysis? – TEST! – Macronutrient and micronutrient levels
	+ What’s the nutrient from? – Organic vs inorganic – Synthetic fertilizers are designed to be quickly taken up – organic nutrients are going to have to go through a cycle before they’re taken up
* Right Rate – Matches amount of fertilizer to crop needs
	+ Crop needs – soil contribution = fertilizer rate
	+ Applying too little will keep us from producing efficiently, but applying too much can have downstream impacts
* Right Place – Keeps nutrients where crops can use them
	+ Large scale or small
	+ Plot A vs Plot B
	+ In furrow vs beside
	+ Surface vs incorporated – soluble forms on the surface (for the most part) are really risky application in relation to loss
* Right Time – Makes nutrients available when crops need them
	+ Dependent on soil/crop/weather
	+ Consider plant uptake AND loss risk
* 4R Plans Applied
	+ Corn Nitrogen Management Examples
		- Source: 28% UAN
		- Rate: 212 lbs N/ acre (Purdue)
		- Time: Split application at planting and in-season
		- Place: injected beneath the soil surface
	+ Garden Example: Growing Tomatoes -P & K Low based on soil test
		- Source: 10-10-10 (N-P-K)
		- Rate: 0.5#/100 sq ft recommended, 5#/100 sq ft actual product applied
		- Time: Applied at transplant time – in case there’s rain and runoff
		- Place: Incorporated in bed
	+ Resources for developing 4R Plans
		- Technical Assistance
			* Certified Crop Advisors, SWCD, Purdue Extension
		- Online Resources
			* 4R Resources
			* Row Crop: Tri-State Fertilizer Recommendations
			* Vegetables: Purdue Guides

Questions:

* Biochar – Are there specific woods that are better to use? What about black walnut?
	+ John Mischler – Any type of hardwood is going to be fine. Stay away from pines and trees with high resin content. John hasn’t looked specifically at black walnut. It can cause some issues with other plants. His guess is that using the wood for Biochar probably wouldn’t be a problem. The allelopathic effects of walnuts is usually through the roots.
* Mike Werling – What are the speakers’ thoughts on incorporating would chips into the soil?
	+ John Mischler - Be aware of your carbon to nitrogen ratio. When you incorporate wood chips into the soil, you end up pulling nitrogen out of the soil to break wood down. If your goal is to cultivate a fungal network, then you might be ok as long as you have enough nitrogen in the soil. Mother nature builds OM on the top of soil, she does not incorporate it.
	+ Ben Wicker– Be aware of the C/N ratio. The soil is going to eat first. So, if you have grassy cover crops, you may have short term nitrogen deficiencies, but you can overcome that by applying some nitrogen. Ben plants quite a bit of cereal rye. He uses early starter nitrogen at planting, then the nitrogen from the cereal rye will be released.
* Mike Werling – It’s always good to find a mentor.
* Scott Thompson – Scott has sampled over 5,000 acres in the last year. Phosphorus is usually pretty low in the majority of the fields because manure is usually applied close to the barn. If you have access to cheap or free manure, you have a tendency to apply, but repeated applications like this can increase the nutrient runoff. Sometimes the phosphorus levels on our gardens are 15 times greater than they should be. If you’re already sampling with a consultant, keep working with that consultant.
* How do gardens that are high in phosphorus lower their levels?
	+ Don’t apply more – it’ll save you money
	+ There are also low-cost ways to apply nitrogen through fixation
	+ Having high phosphorus levels around the barn happens in a lot of places. Sample the manure to give a value to it. If you don’t need it on your farm, you may be able to get someone else to pay for it.
* Compost when flipping beds – Do you put compost in between crops?
	+ John Mischler – His standard protocol is to cut lettuce flush to the ground (it keeps feeding soil), and they might add compost on top of that. They might add an inch to 3 inches depending on compost history
* Building organic matter is the goal – where is the organic matter coming from?
	+ John Mischler - Building it both from the roots and from the above material. You have to encourage fungal growth to encourage the soil organic matter.
* Any tips for building more acidic soil for growing things like blueberries?
	+ John Mischler - Indiana has so many different types of soils. It depends on the soil you have. You can find sandy patches which are really good for blueberries, or if you have muck soils, there are some blueberries that can do really well. If you don’t have a patch then use an acidifying fertilizer – pine needle mulch or another. If you’re going to try to change the pH of your soil, then you must really want blueberries because you’re going to have to continually be amending the soil.

Keep reaching out and testing things on your farm!