

The elusive math genie is nowhere in sight during a financial audit, mortgage refinancing, or tallying your friends' golf scores. Thankfully, the genie stopped by while writing this Organic Matter (OM) article.

OM is all non-mineral, carbon compounds within soil. Two soil OM types are recognized: stabilized (SOM) and active (AOM).

SOM is highly decomposed and thus stable. It improves soil structure by helping hold together soil particles, water infiltration and holding capacity by up to 6 times its weight, and nutrient retention and exchange by five times greater than clay and ten times better than sand.

AOM is comprised of partially and slowly decomposing matter which is not to be confused with fresh organic material. AOM releases macro and micro nutrients throughout the growing season. Certain farming practices can slowly increase AOM or rapidly decrease both AOM and SOM. The benefits of higher OM cannot be understated. However, of particular interest to producers is how much Nitrogen (N) will be released during the growing season termed the estimated nitrogen release (ENR).

OM is routinely tested for in laboratories and expressed on a soil test as a percentage. If you recall, there are about 2 million pounds of soil in an acre. Table 1 shows how many pounds of OM there is and the ENR one could expect under various soil moisture conditions

As the below table shows, the greater the soil organic matter, the greater the ENR and the less N fertilizer you may have to apply. Bear in mind that these numbers are estimated and are influenced not only by moisture content but, by soil temperature, soil pH, and anything else that influences soil microbe populations.

It is much simpler to lose OM than to increase soil OM content. Consider that it takes approximately 5-10 lbs of fresh organic material to make 1 lb of decomposed soil OM, as much of the material is converted to carbon dioxide. A one percent increase in OM equates to about 2000 lbs/ac

of decomposed matter. Thus, it will take 10-20,000 lbs/ac (10-20 ton) of straw material or 25-30 straw bales to increase the soil OM by one percent. If we apply 6-8 bales per year it might take 3-5 years to increase the OM just one percent. However, during this time, OM is breaking down and releasing nutrients back into the soil. Instead of 3-5 years it is more likely going to be 7-10 years to increase OM 1%.

Reducing tillage is a start to improving OM. Tillage both incorporates straw material and oxygenates the soil. Initially, N is immobilized for a period of time as the microbes require a lot of N to begin decomposition as the Carbon (C) to N ratio is high. If the soil N is low then, spring applied N will be used until the C:N ratio is less than 30:1. Higher oxygen levels allows faster decomposition rates, potentially tying up even more N. Fortunately, as C:N ratios decline, immobilized N becomes available. When it becomes available though, is the difference between seeing a yield bump or a protein increase.

Another OM boost would be to include forages, especially deep, tap rooted alfalfas into your crop rotation. They have large fibrous root systems that account for over 50% of the organic material generated each year.

Further, reducing the number of times a field is fallowed or the crop residue is removed will increase OM. Manure additions to crop land will also promote an increase in OM over time. Finally, soil test and ensure you are applying adequate nutrition of all nutrients to ensure high yielding crops, which will return higher levels of organic material to be decomposed into OM.

Losing OM is far easier than increasing OM levels. OM is an essential soil component that provides yield benefits when environmental conditions are challenging. Tillage reduction, manure additions, adequate nutrition, increased forage use and crop residue retention are methods that aid soil rejuvenation of OM content.

Do the math. Long term improvement of soil OM is profitable. The alternative is to hope a math genie exists to grant three wishes.

OM %	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5
OM lbs/ac	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000	14000	15000	16000	17000
ENR Dry	21	27	32	37	42	48	53	58	64	69	74	80	85	90
ENR Moist	27	34	40	47	54	60	67	74	80	87	94	101	107	114
ENR Wet	24	30	35	41	47	53	59	65	71	77	83	89	94	100

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