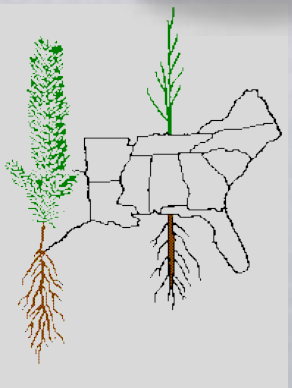
Testing for Soil Organic Matter

or

tell me what number you want



Tom Starkey

Southern Forest Nursery Cooperative

Auburn University

Why have this discussion?

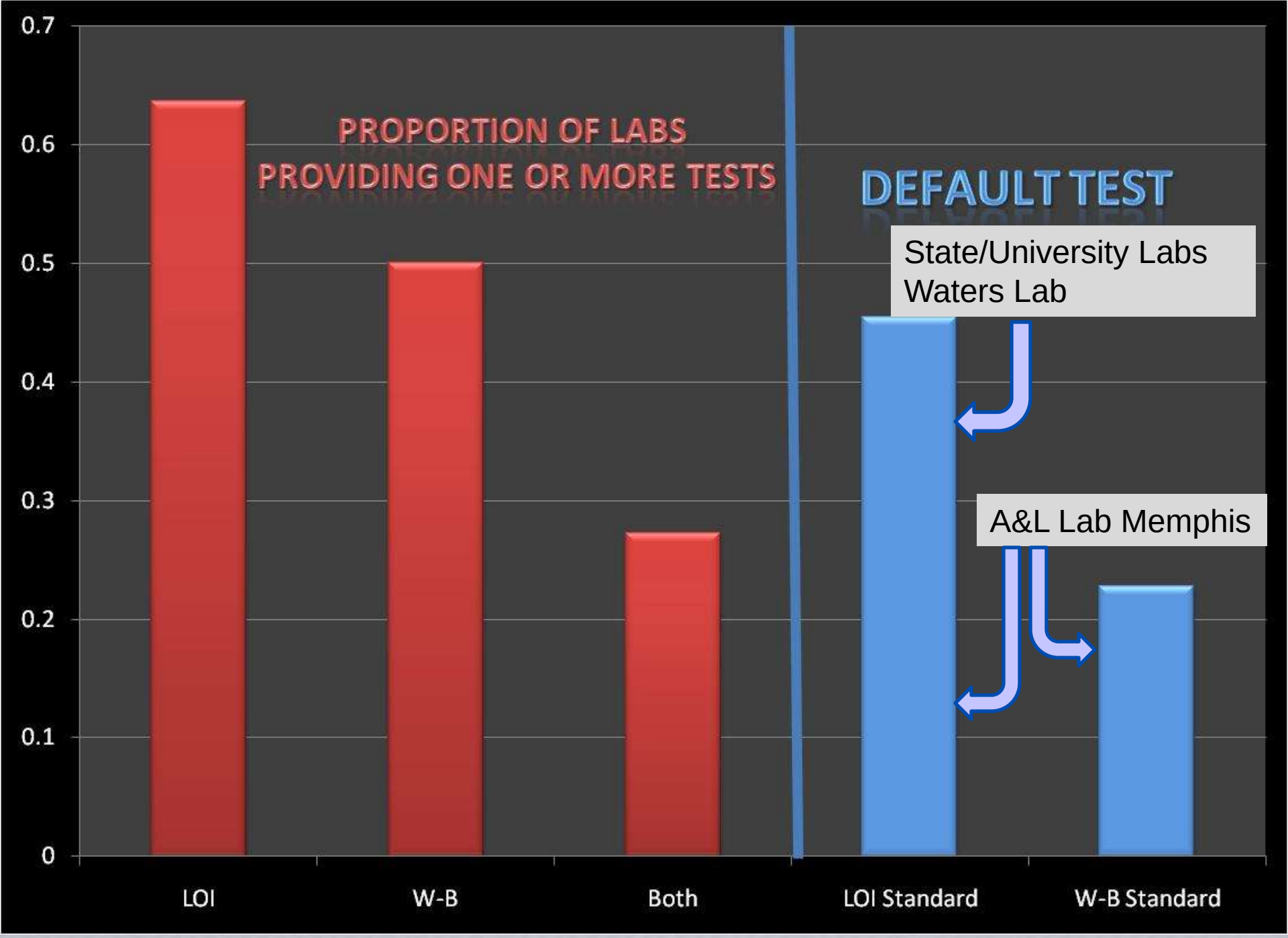
- EPA Buffer Zones
- Designed to reduce bystander risk not to increase fumigant efficacy!
- "Factors such as the application method, soil moisture, soil temperature, organic matter levels, water treatments, the use of tarps, biological activity in the soil, soil texture, weather conditions, soil compaction influence ……bystanders ….."
- Buffer Zone Credits will be provided for:
  - High barrier tarps,
  - Soil organic matter,
  - Soils with high clay content.

Why have this discussion?

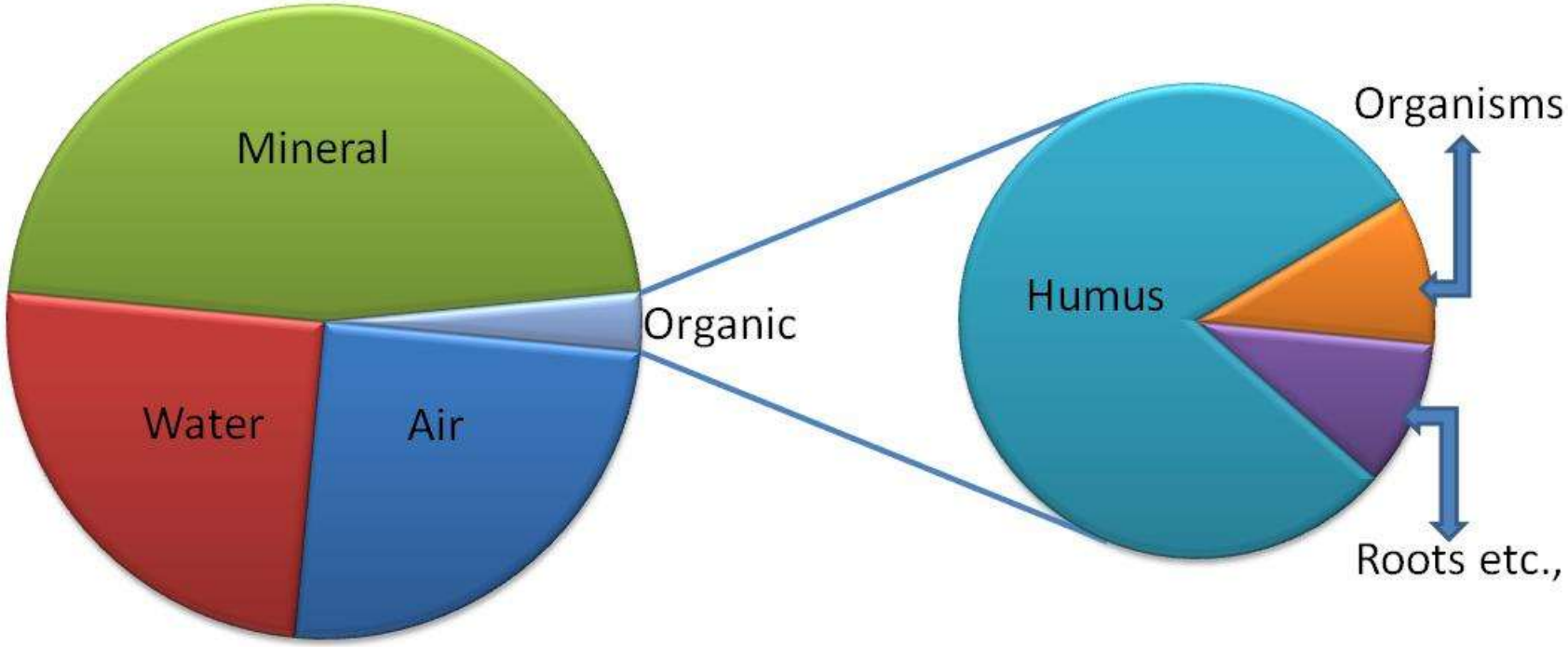
- Soil Organic Matter <1% = 0% Credit
- Soil Organic Matter 1% to 2% = 10% Credit
- Soil Organic Matter 2% to 3% = 20% Credit
- Soil Organic matter 3%> = 30% Credit
- Question?? Does the type of SOM test matter?
- Our sample
  - One lab, same soil, 2 methods,
    - Standard Method – Modified Walkley-Black **1.7%**
    - Loss on Ignition – **2.6%**

Survey of State & Private Testing Labs

- 22 labs
  - 10 University Labs
  - 12 Private Labs
- Testing Methods Used:
  - Walkley-Black or Modified Walkley- Black
  - Loss on Ignition (either by weight or measure CO_2)
  - Colorimetric


0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
PROPORTION OF LABS PROVIDING ONE OR MORE TESTS
DEFAULT TEST
State/University Labs Waters Lab
A&L Lab Memphis
LOI
W-B
Both
LOI Standard
W-B Standard

Soil Components



All organic matter in soil is not equal

Scientists describe 3 pools of soil organic matter

Organic Material

CO_2

Active SOM
Weeks – 2 yrs
C/N ratio 15 – 30

- Recently deposited organic material
- Rapid decomposition
- 10 – 20% of SOM

Slow SOM
15 – 100 yrs
C/N ratio 10 – 25

- Intermediate age organic material
- Slow decomposition
- 10 – 20% of SOM

Passive SOM
500 – 5000 yrs
C/N ratio 7 – 10

- Very stable organic material
- Extremely slow decomposition
- 60 – 80% of SOM

Modified from: Richard Stehouwer
Department of Crop & Soil Sciences
Penn State University

Soil Organic Matter Test

	Loss on Ignition	Walkley Black	Modified Walkley Black
Active SOM	▪ YES	▪ YES	▪ YES**
Slow SOM	▪ YES	▪ YES	▪ YES
Passive SOM	▪ YES	▪ NO***	▪ NO***

** Does not handle fresh nonhumified OM

*** It all depends – remember this is a gradient

Lab Tour – Loss on Ignition

Samples arrive and are logged into the system

Lab Tour – Loss on Ignition

All samples are
dried over night
in their original container

Lab Tour – Loss on Ignition

All sampled are ground and must pass through a 2 mm screen mesh

Lab Tour – Loss on Ignition

The LOI analysizer

Lab Tour – Loss on Ignition

Foil packet prepared

160 mg sample
Placed in foil
and weighed

About the size
of a green pea

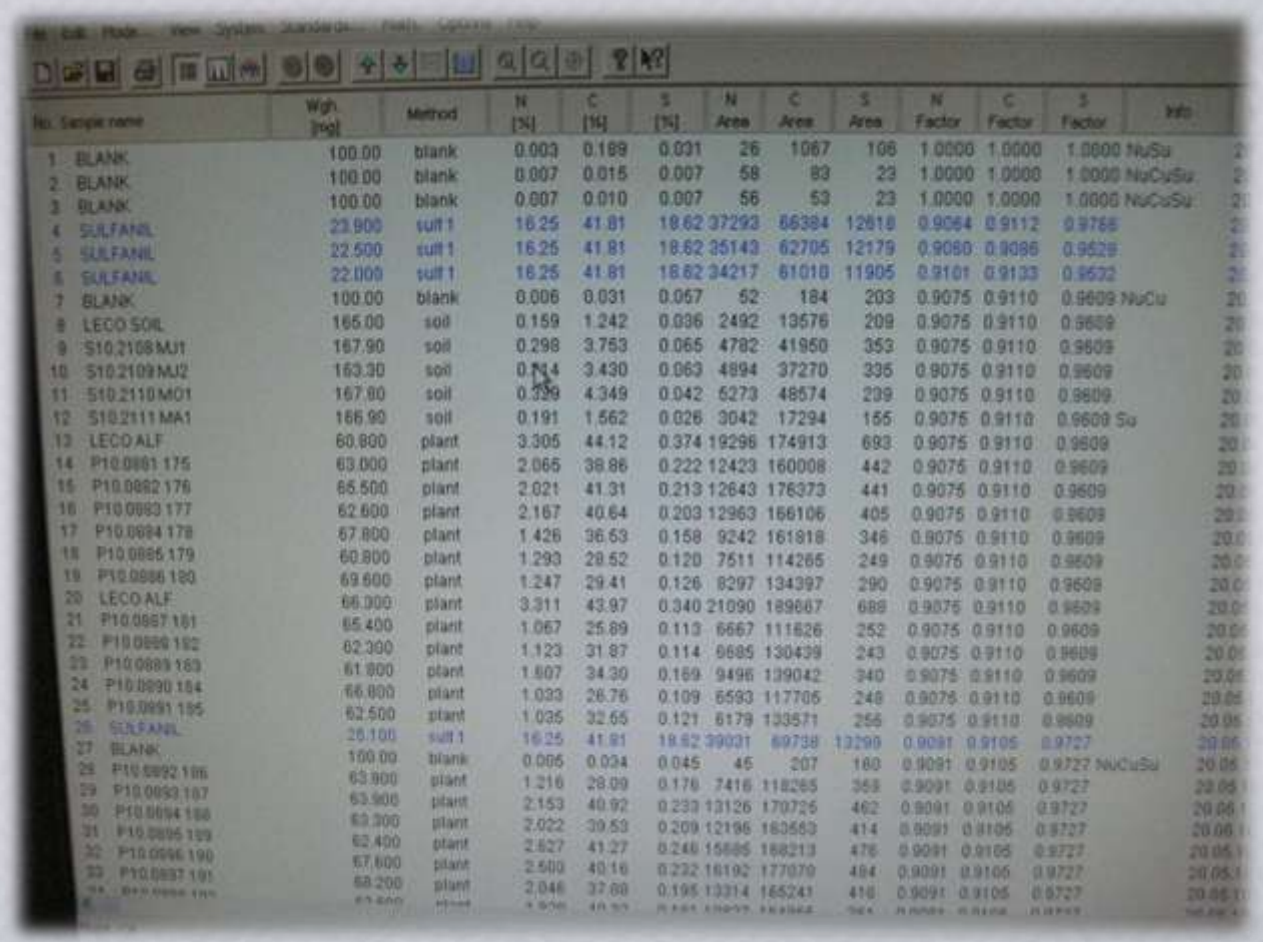
Lab Tour – Loss on Ignition

Foil ball dropped into disc =
waits it's turn to enter the burner

Burner = 1,150ºC
(2,100ºF)
for 6 minutes

Lab Tour – Loss on Ignition

Results sent to lab personnel for interpretation



No.	Sample name	Wgh [mg]	Method	N [%]	C [%]	S [%]	N Area	C Area	S Area	N Factor	C Factor	S Factor	Info
1	BLANK	100.00	blank	0.003	0.189	0.031	26	1067	106	1.0000	1.0000	1.0000	NuSu
2	BLANK	100.00	blank	0.007	0.015	0.007	58	83	23	1.0000	1.0000	1.0000	NuCuSu
3	BLANK	100.00	blank	0.007	0.010	0.007	56	53	23	1.0000	1.0000	1.0000	NuCuSu
4	SULFANIL	23.900	sulf 1	16.25	41.81	18.62	37293	66384	12618	0.9064	0.9112	0.9768	
5	SULFANIL	22.500	sulf 1	16.25	41.81	18.62	35143	62705	12179	0.9060	0.9086	0.9629	
6	SULFANIL	22.000	sulf 1	16.25	41.81	18.62	34217	61010	11905	0.9101	0.9133	0.9632	
7	BLANK	100.00	blank	0.006	0.031	0.057	52	184	203	0.9075	0.9110	0.9609	NuCu
8	LECO SOIL	165.00	soil	0.159	1.242	0.036	2492	13576	209	0.9075	0.9110	0.9609	
9	S10.2108 MJ1	167.90	soil	0.298	3.753	0.065	4782	41950	353	0.9075	0.9110	0.9609	
10	S10.2109 MJ2	163.30	soil	0.314	3.430	0.063	4894	37270	335	0.9075	0.9110	0.9609	
11	S10.2110 MO1	167.80	soil	0.199	4.349	0.042	5273	48574	239	0.9075	0.9110	0.9609	
12	S10.2111 MA1	166.90	soil	0.191	1.562	0.026	3042	17294	155	0.9075	0.9110	0.9609	Su
13	LECO ALF	60.800	plant	3.305	44.12	0.374	19296	174913	693	0.9075	0.9110	0.9609	
14	P10.0881 175	63.000	plant	2.065	38.86	0.222	12423	160008	442	0.9075	0.9110	0.9609	
15	P10.0882 176	65.500	plant	2.021	41.31	0.213	12643	176373	441	0.9075	0.9110	0.9609	
16	P10.0883 177	62.600	plant	2.167	40.64	0.203	12963	166106	405	0.9075	0.9110	0.9609	
17	P10.0884 178	67.800	plant	1.426	36.53	0.158	9242	161818	346	0.9075	0.9110	0.9609	
18	P10.0885 179	60.800	plant	1.293	28.52	0.120	7511	114265	249	0.9075	0.9110	0.9609	
19	P10.0886 180	69.600	plant	1.247	29.41	0.126	8297	134397	290	0.9075	0.9110	0.9609	
20	LECO ALF	66.000	plant	3.311	43.97	0.340	21090	189667	688	0.9075	0.9110	0.9609	
21	P10.0887 181	65.400	plant	1.067	25.89	0.113	6667	111626	252	0.9075	0.9110	0.9609	
22	P10.0888 182	62.300	plant	1.123	31.87	0.114	6685	130439	243	0.9075	0.9110	0.9609	
23	P10.0889 183	61.800	plant	1.607	34.30	0.169	9496	139042	340	0.9075	0.9110	0.9609	
24	P10.0890 184	66.800	plant	1.033	26.76	0.109	6593	117705	248	0.9075	0.9110	0.9609	
25	P10.0891 185	62.500	plant	1.035	32.65	0.121	6179	133571	256	0.9075	0.9110	0.9609	
26	SULFANIL	26.100	sulf 1	16.25	41.81	18.62	39031	69738	13290	0.9091	0.9105	0.9727	
27	BLANK	100.00	blank	0.006	0.034	0.045	45	207	160	0.9091	0.9105	0.9727	NuCuSu
28	P10.0892 186	63.900	plant	1.216	28.09	0.176	7416	118265	359	0.9091	0.9105	0.9727	
29	P10.0893 187	63.900	plant	2.153	40.92	0.233	13126	170725	462	0.9091	0.9105	0.9727	
30	P10.0894 188	63.300	plant	2.022	39.53	0.209	12196	163563	414	0.9091	0.9105	0.9727	
31	P10.0895 189	62.400	plant	2.627	41.27	0.248	15685	168213	476	0.9091	0.9105	0.9727	
32	P10.0896 190	67.600	plant	2.500	40.16	0.232	16192	177070	494	0.9091	0.9105	0.9727	
33	P10.0897 191	68.200	plant	2.046	37.69	0.195	13314	165241	416	0.9091	0.9105	0.9727	

What I learned from this….

- Depth of sampling is important – keep sampling depth at 4” – 6”. Beyond this OM is diluted.
- OM results will vary in relation to time of year and cultural activities (especially when using LOI). To have a more accurate idea of what is happening to your OM from year to year keep note of cultural activities.
- Your SOM is determined from a 160 mg sample. This means a 10% Buffer Zone Credit is determined by the weight of a toothpick!

  Sample multiple places in a field and thoroughly mix the composite sample.

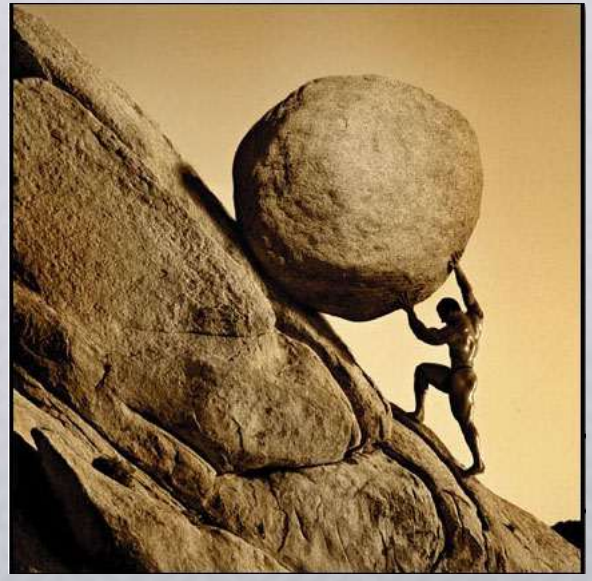
What I learned from this….

- Even though the sample is ground, only particles < 2mm enter into the final sample.
- If your lab provides alternative OM tests – specify what test you want.
- For EPA Buffer Zone credits – I would always specify LOI .
- SOM is not normally provided on many soil tests.
- In the future, labs will probably switch over to LOI test due to (1) speed and (2) reproducibility.

Wisdom from the Masters

- **Chuck Davy**'s recommendation to build up OM over time has been the same thing for the last __??__ years – apply ¼" sawdust/bark after last crop.

- It takes time and effort,
  but it pays off in the long run.



Wisdom from the masters

- **David South** says “You can grow seedlings without organic matter, **but**, it’s like walking a tightrope, the more organic matter you have, the wider the rope becomes and the easier life is.