AGVISE Demo Project Potpourri!

Soil Amendment Update

Tile Drainage and Salt update

Beet Lime Project Started

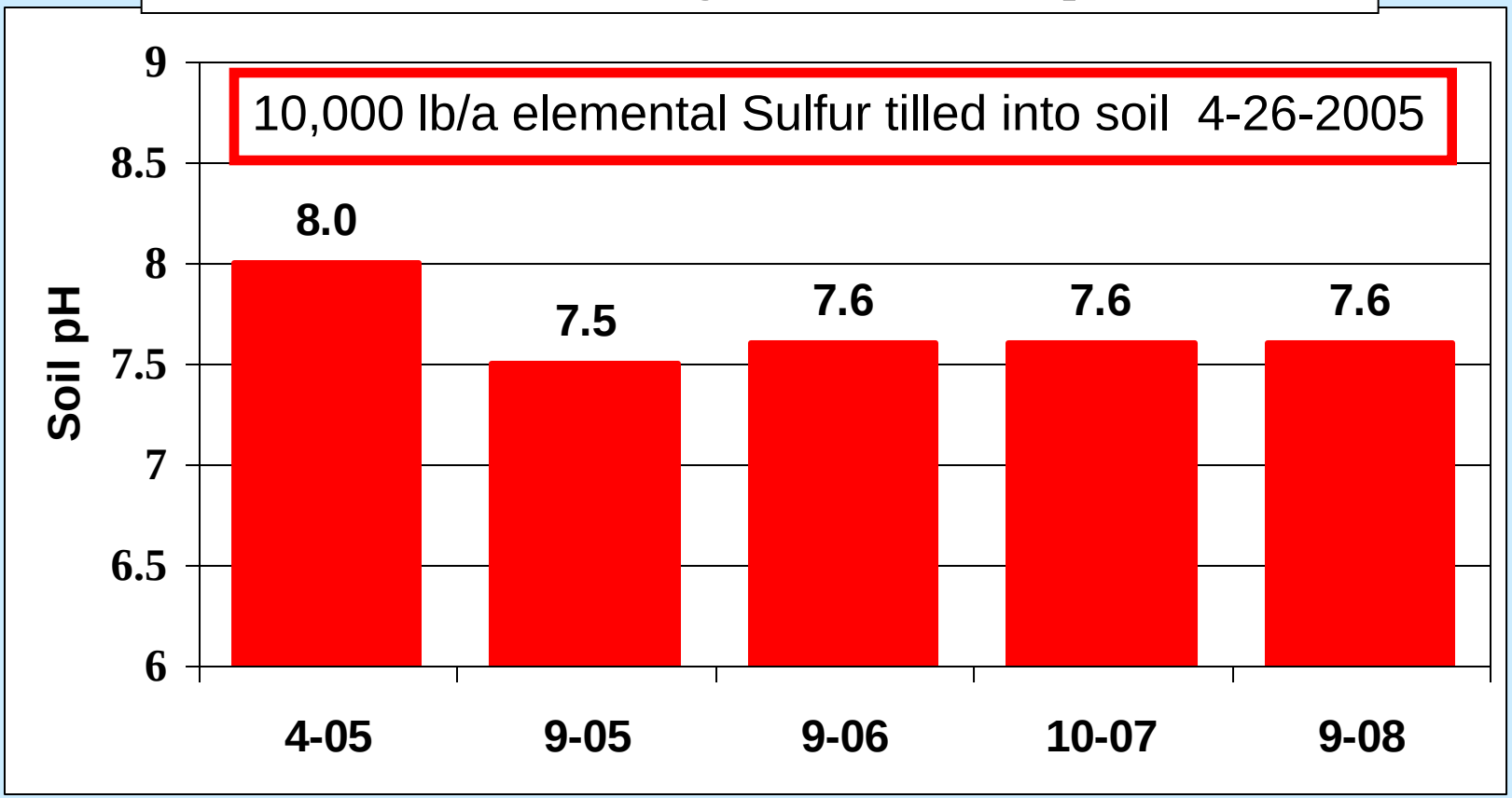
Starter Fertilizer Display

Soil Amendment Project Started in April 2005

- *Customer questions on how soil amendments will affect soils in our region*
  - *Most questions on*
    - *Gypsum*
    - *Elemental Sulfur*
    - *Lime*
  - *High rates applied and tilled in 6” deep*

Does Elemental Sulfur Decrease Soil pH?

YES! But no yield response!



1000 lb/a elemental sulfur had no affect on soil pH in three years

Soil (CCE) Carbonate level is 1.5%, loam soil texture

How Does Elemental S Lower Soil pH?

H^+ H^+

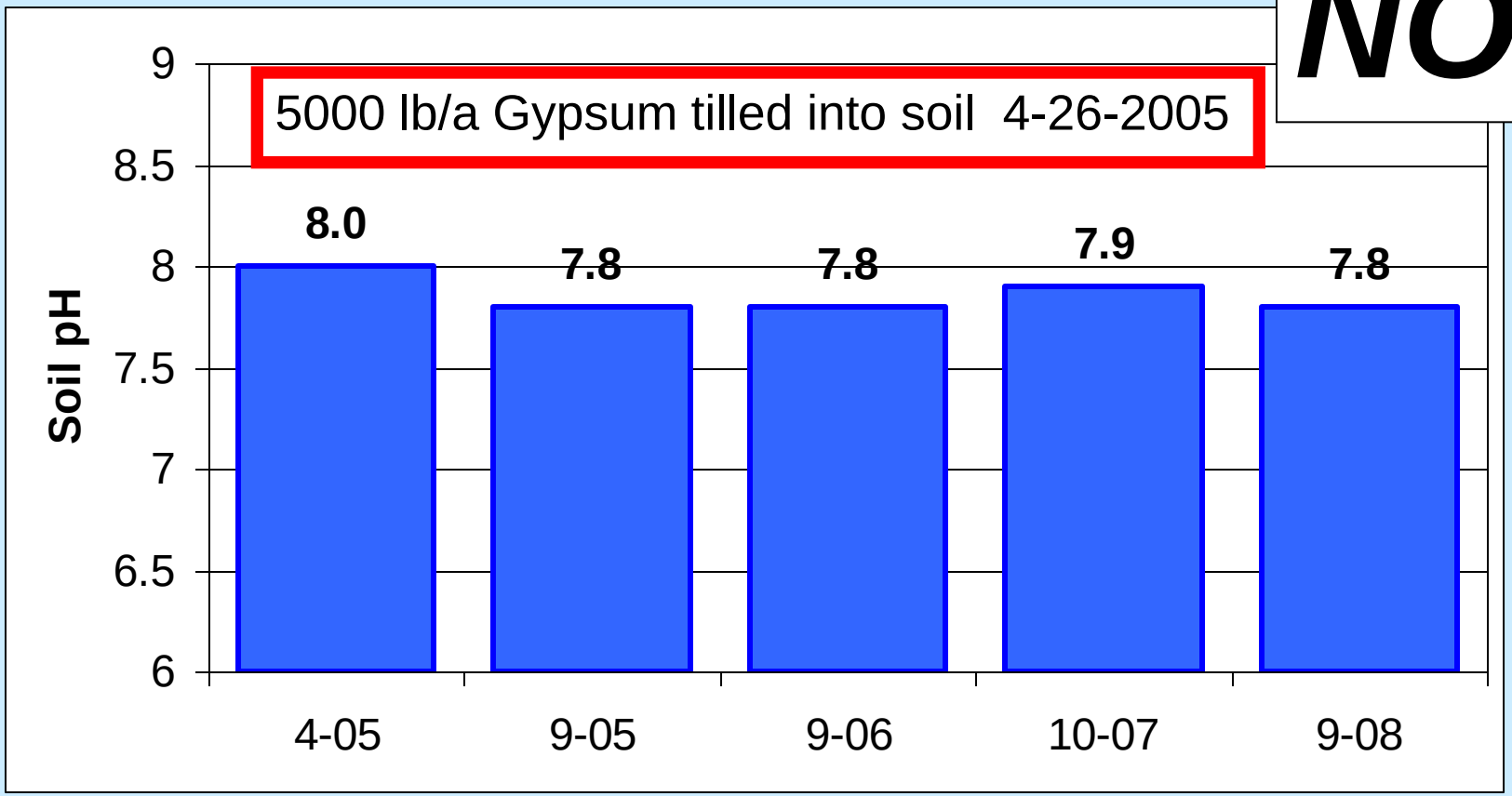
$$2S + 3O_2 + 2H_2O \longrightarrow 2H_2SO_4$$

Sulfur + Oxygen + Water ⟶ Sulfuric Acid

Elemental sulfur must be mixed with moist warm aerated soil with bacteria (Thiobacillus) for this reaction to happen. The hydrogen (H+) from the sulfuric acid interacts with the soil exchange sites resulting resulting in a lower pH. If the soil has a pH higher than 7.3 it does contain some level of carbonate.

Does Gypsum Decrease Soil pH?

NO!



200 lb/a gypsum had no effect on soil pH in three years

Why can't Gypsum lower the soil pH of productive soils

$$CaSO_4 + 2H_2O \rightarrow Ca^{+} + SO4^{-} + H_2O$$

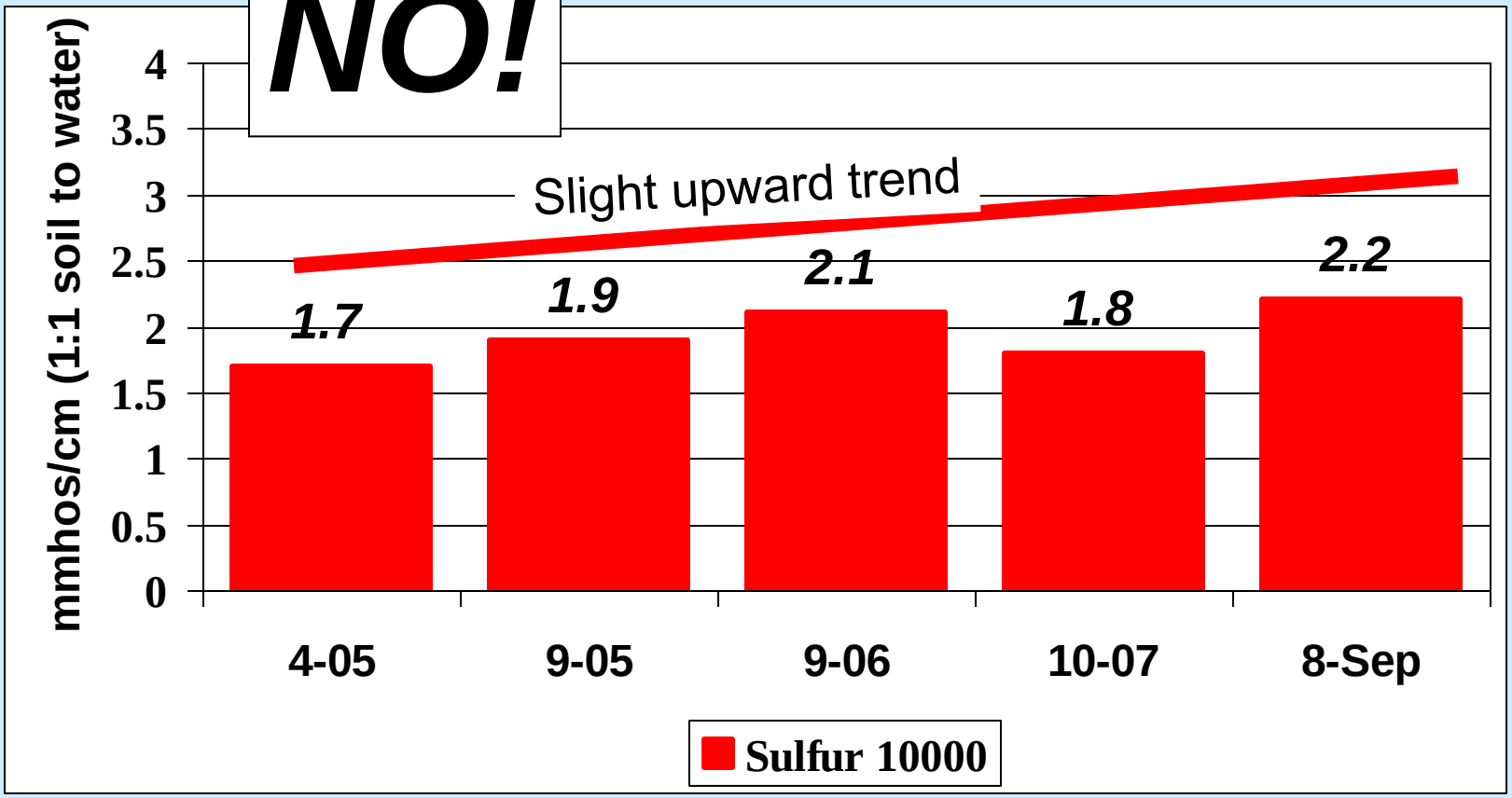
Gypsum + water → Calcium + sulfate + water

There is no H^{+} produced when gypsum slowly dissolves!

If no hydrogen is created in a chemical reaction the soil pH will not change!

Does Elemental Sulfur Reduce Soluble Salts?

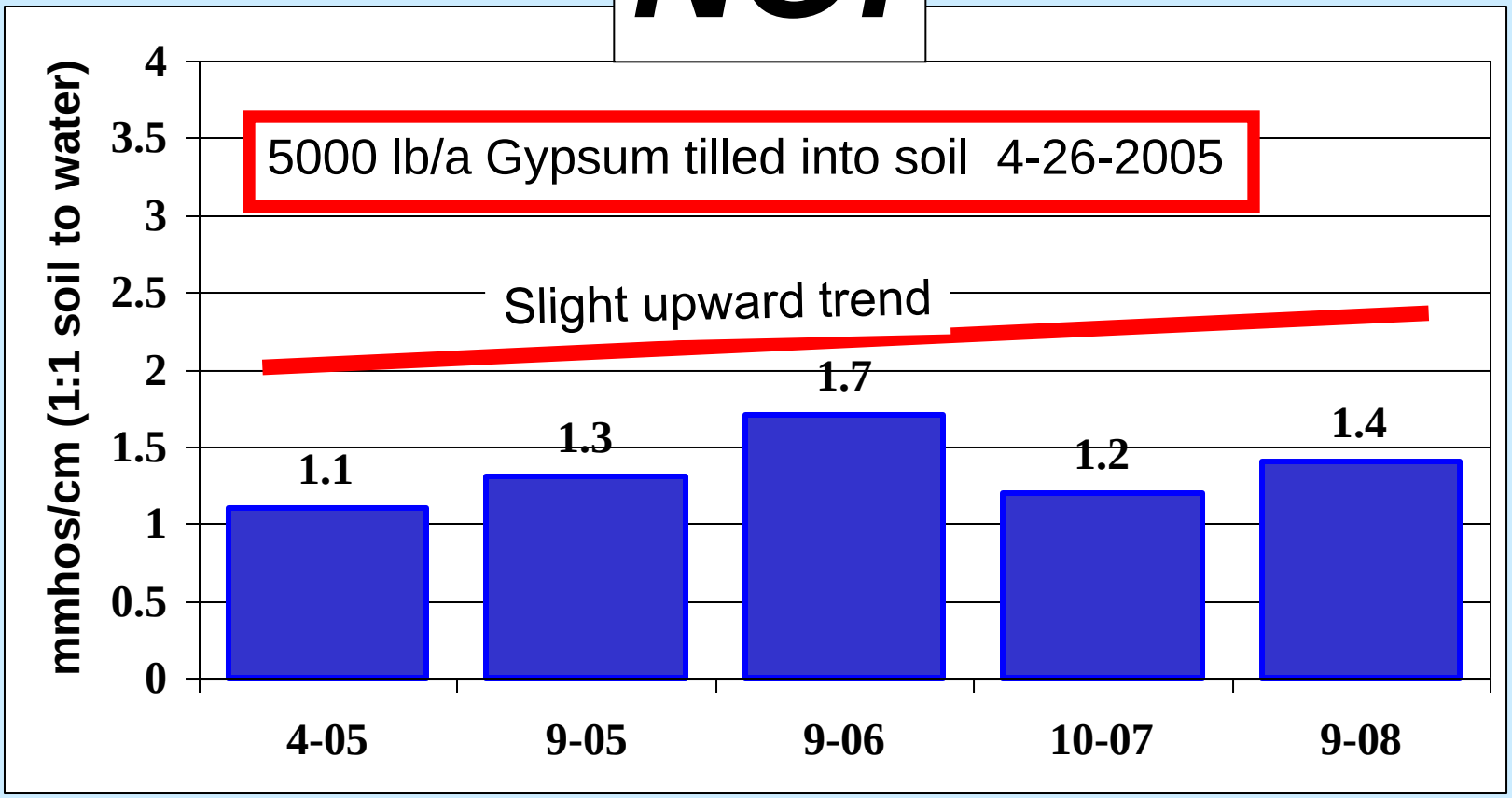
NO!



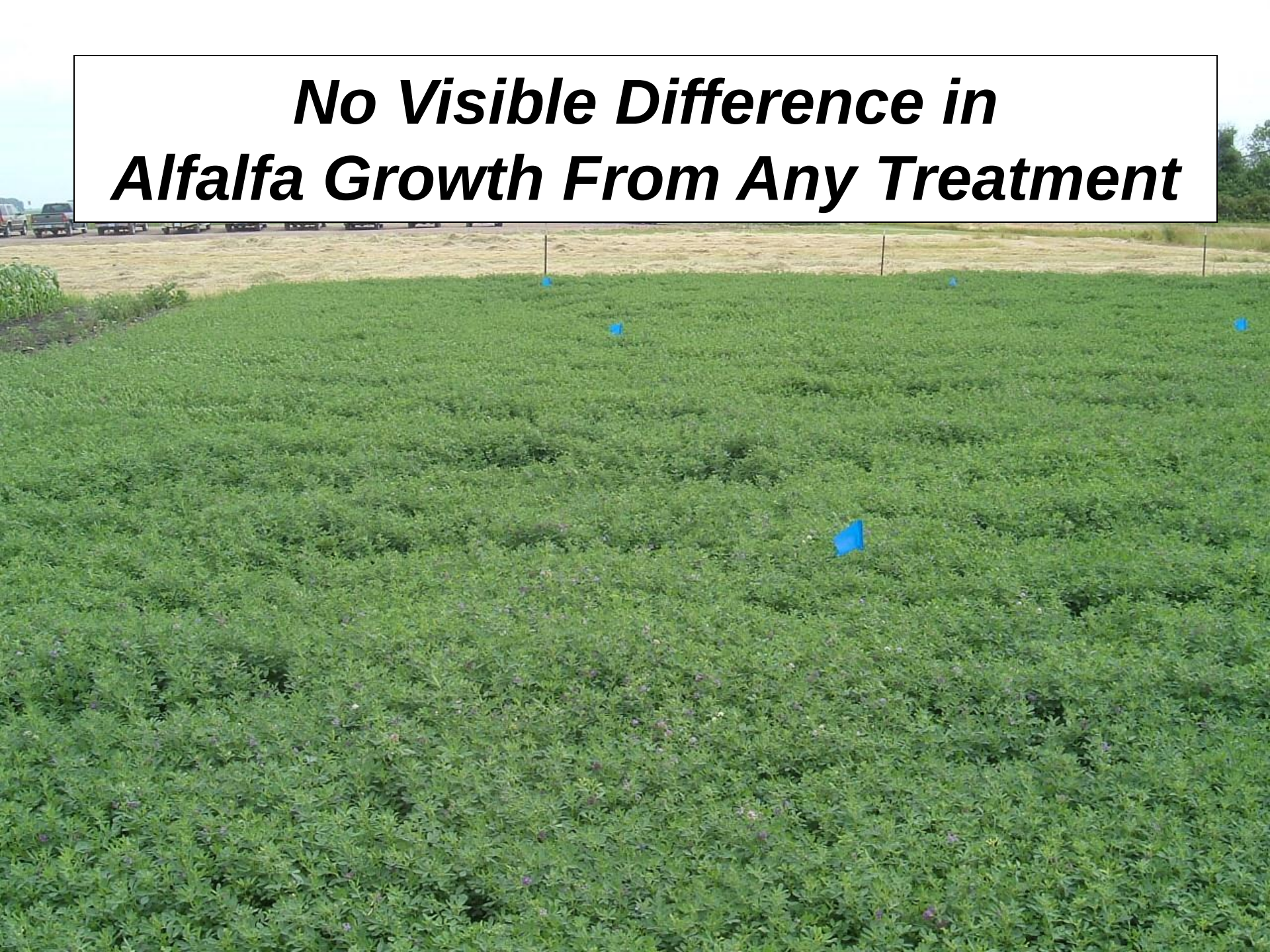
1000 lb/a elemental sulfur had no affect on soluble salts in three years

Does Gypsum Reduce Soluble Salts?

NO!

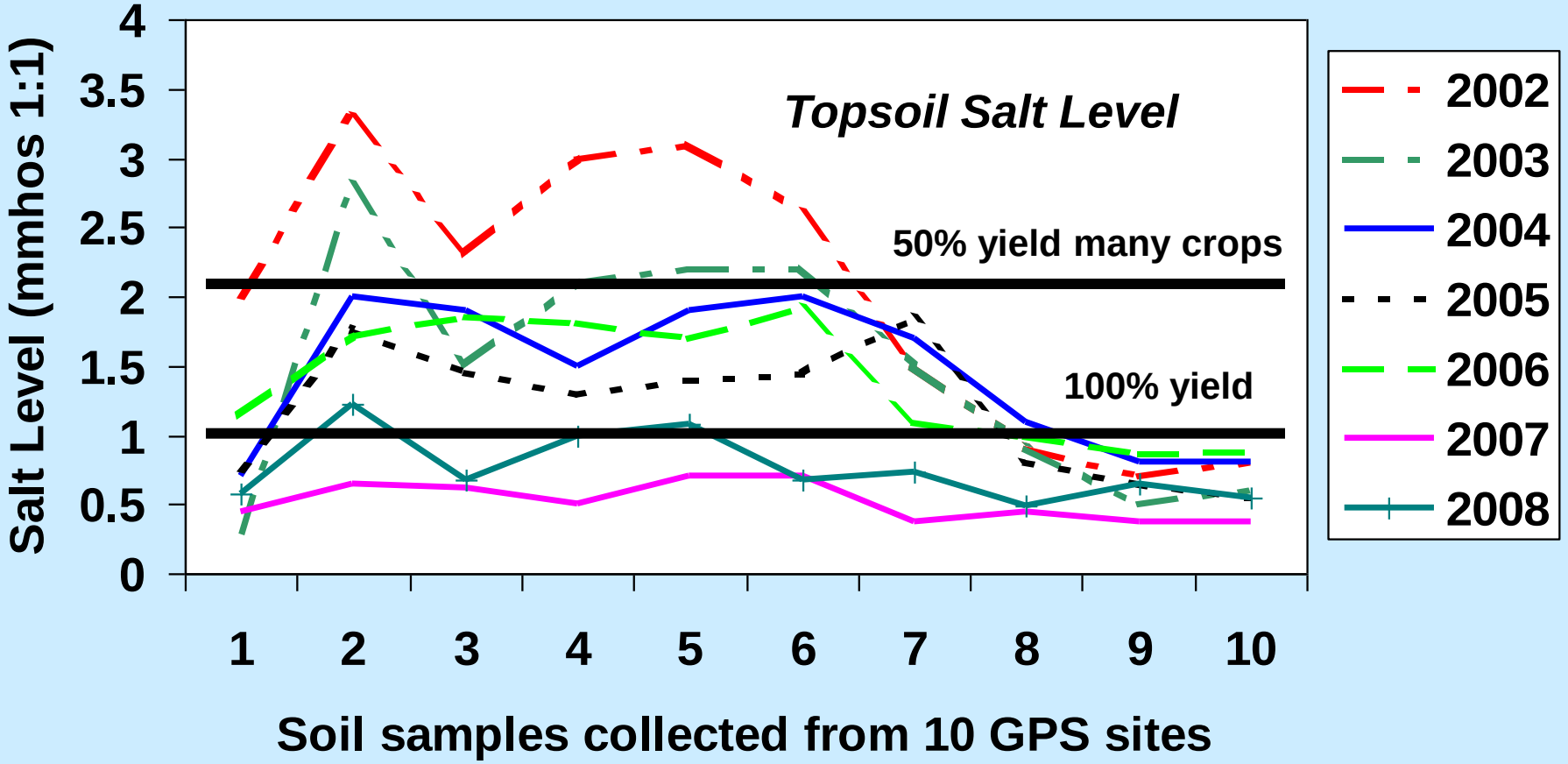


No Visible Difference in Alfalfa Growth From Any Treatment



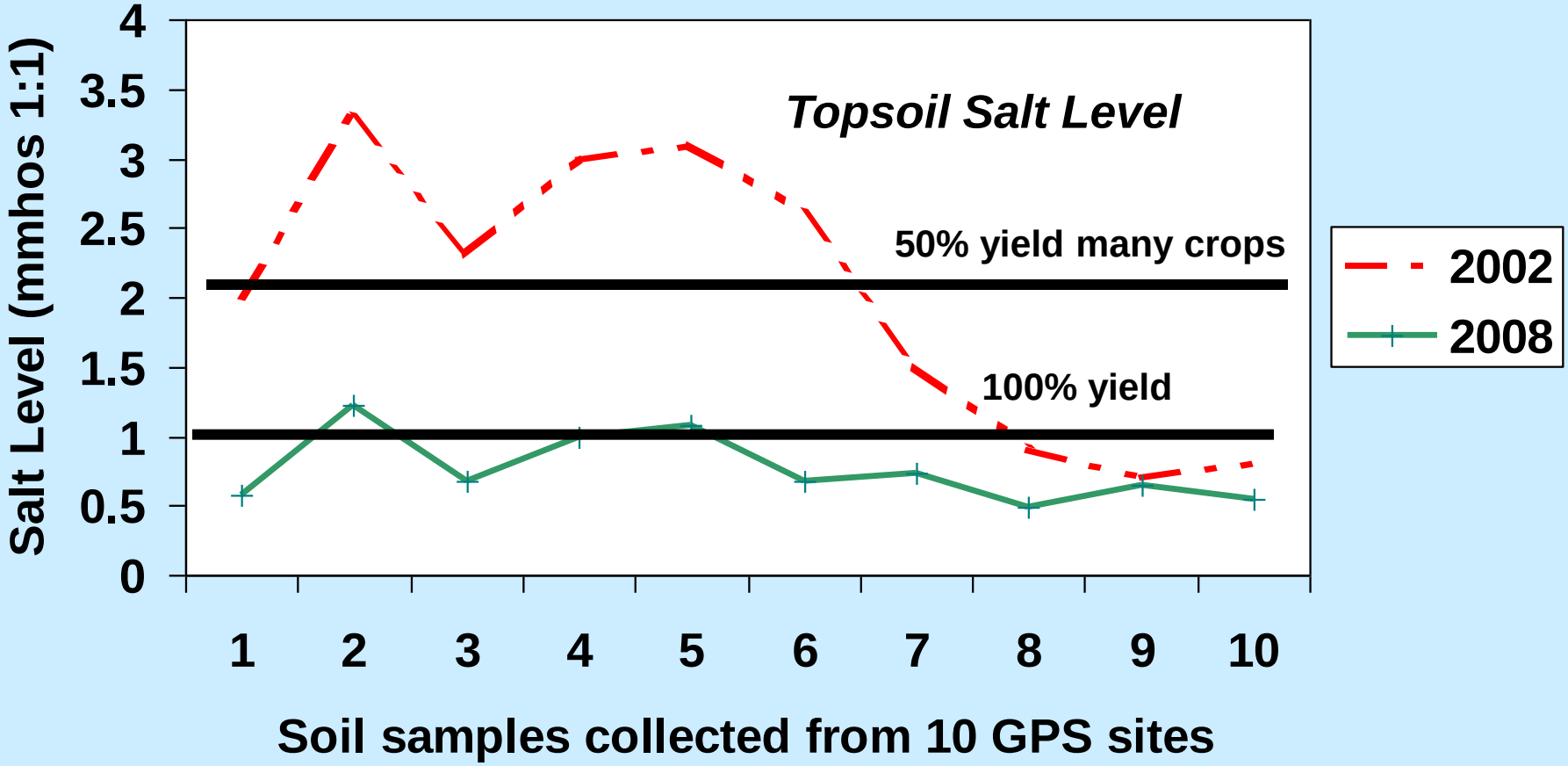
Tile Drainage - Soluble Salts Demonstration Project

(Tiled summer of 2002)



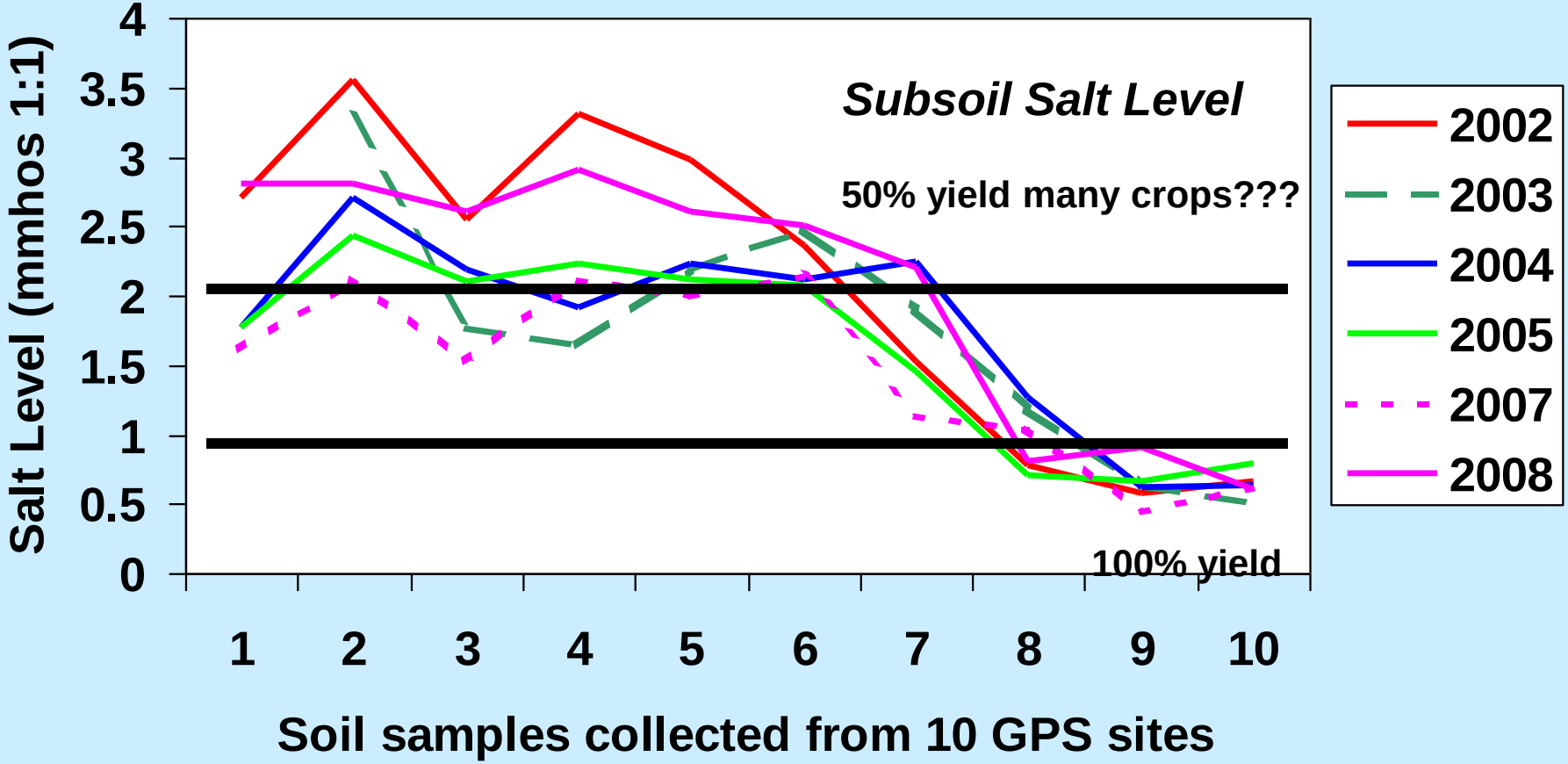
Tile Drainage Reduces Soluble Salts - Topsoil Changes

(2002 levels and 2008 levels only)



Tile Drainage - Soluble Salt Changes

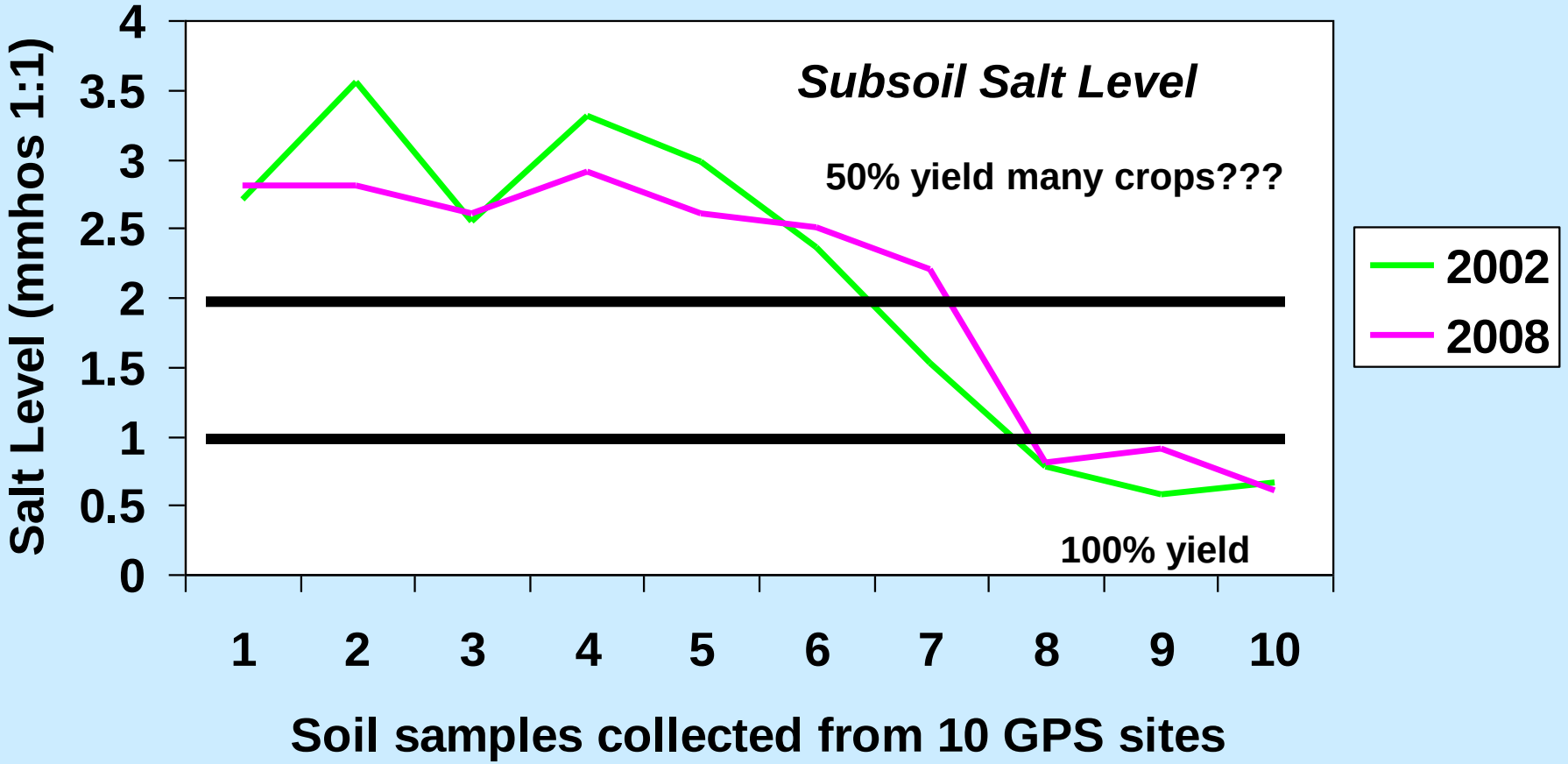
(2002,03,04,05,06,07,08)



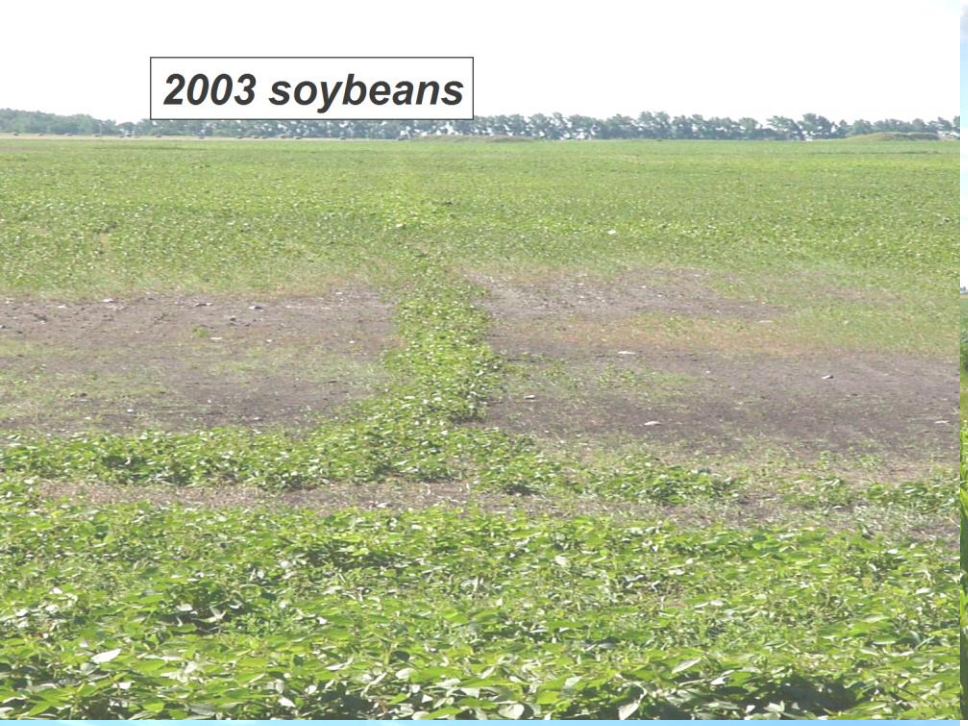
Subsoil Salt levels will remain high until the salt is leached from the topsoil

Tile Drainage - Soluble Salt Changes

(2002 levels and 2008 levels only)



Subsoil Salt levels will remain high until the salt is leached from the topsoil


2003 soybeans


2004 Corn


2005 Corn


2006 Sunflower


2007 Soybeans
2008 – Corn: I forgot to take a picture!!!!!!!
Very good yields – one of growers best fields!

Tile Drainage Results

- *Topsoil salt levels have decreased a lot!*
- *Several crops now produce good yields*
  - *Corn, soybeans, sunflowers*
- *Subsoil salt levels take longer to be decreased*
- *High subsoil salt levels do not affect yield as much as high subsoil salt levels*
  - *Seedling salt sensitivity vs. general salt sensitivity*

Sugarbeet Lime Demonstration Project 2008

- *Grower Interest in beet lime for "P" content*
- *Wanted to know the long term affect of lime on "P" soil test level and other soil properties*
- *Research shows benefits from Lime for disease reduction, increasing pH of acid soils and maybe from "P" and other nutrients*
- *Many areas use beet lime (Europe, U.S.)*
- *Demonstration project started fall 2008*

AGVISE Laboratories Sugarbeet Lime Project

- *Long term site for monitoring (10-20 years)*
- *Beet lime collected and blended to insure even application of “P”*
- *Uniform tillage of the material into the topsoil*


Site east of the Northwood lab in grassy area
Heavy poorly drained soil
10.19.2008

Beet Lime Site
Initial Soil Properties

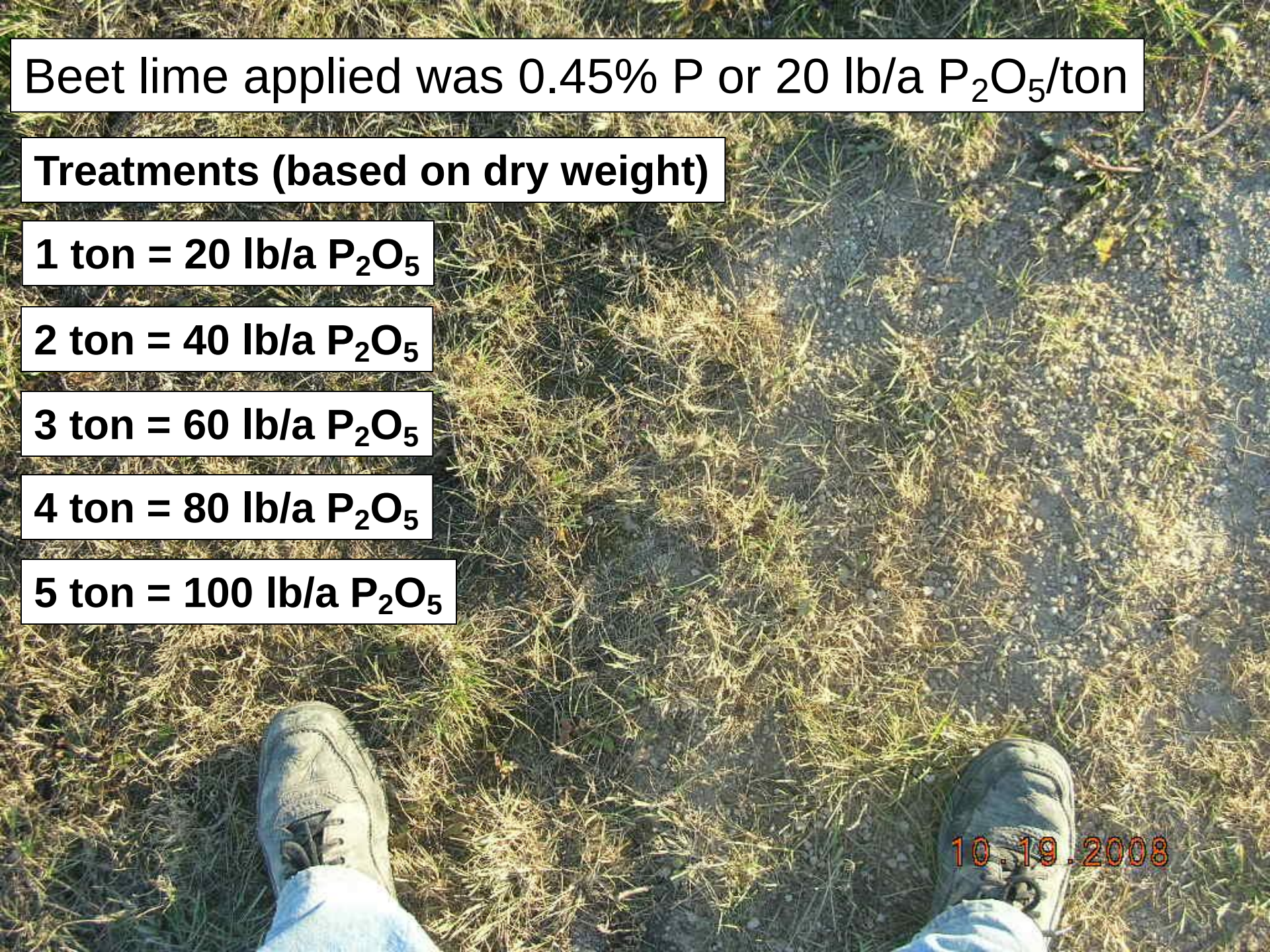
Site ID	Rate of Lime Applied	Soil pH	Olsen P soil test	Soluble Salt	CCE (Carbonate)
			ppm	mmhos/cm (1:1)	%
1	1 ton	7.8	4 ppm	1.5	3.0
2	2 ton	7.9	4 ppm	1.9	5.3
3	3 ton	7.9	4 ppm	1.9	4.0
4	4 ton	7.8	8 ppm	1.0	1.1
5	5 ton	7.8	5 ppm	1.7	1.8
6	6 ton	8.0	4 ppm	2.6	2.7

We expect changes in several soil test levels – P, pH, salts, Ca, Mg

Beet Lime is Plentiful

Beet Lime - Nasty to Handle!


Drop spreader used to “chew up” the lime for Uniform application
Beet lime applied 10-19-08
10.19.2008


Beet lime applied was 0.45% P or 20 lb/a P_2O_5/ton
Treatments (based on dry weight)
1 ton = 20 lb/a P_2O_5
2 ton = 40 lb/a P_2O_5
3 ton = 60 lb/a P_2O_5
4 ton = 80 lb/a P_2O_5
5 ton = 100 lb/a P_2O_5
10.19.2008

Beet lime tilled in 10-19-08

Grass will be established on each site
Soil properties and nutrients will be tested each year


Tried sampling again 12-18-08
1500
6
HANKOOK


Didn’t work to well (truck lifted off the ground)

U of M Research – Albert Sims
Change in P soil Test (0-3”)

Lime Rate	Olsen P	pH	Soluble Salts	Calcium	Magnesium
Wet Tons	ppm		mmhos/cm	ppm	ppm
0	19.5	7.42	0.67	3357	1038
5	24.1	7.66	0.71	4118	1097
10	31.5	7.74	0.69	4643	1185
20	41.7	7.75	0.73	5210	1280
30	56.6	7.78	0.76	5332	1402
linear	***	***	**	***	***

Hillsboro ND site – lime applied October 2003 –sampled May 2005

U of M Research – Albert Sims
Change in P soil Test (3-6”)

Lime Rate	Olsen P	pH	Soluble Salts	Calcium	Magnesium
Wet Tons	ppm		mmhos/cm	ppm	ppm
0	9.2	6.59	0.32	2474	1405
5	9.2	6.69	0.39	2474	1405
10	9.2	6.65	0.42	2474	1405
20	9.2	6.77	0.46	2474	1405
30	9.2	6.72	0.44	2474	1405
linear	ns	*	**	ns	***

Hillsboro ND site – lime applied October 2003 –sampled May 2005

AGVISE - Beet Lime Project

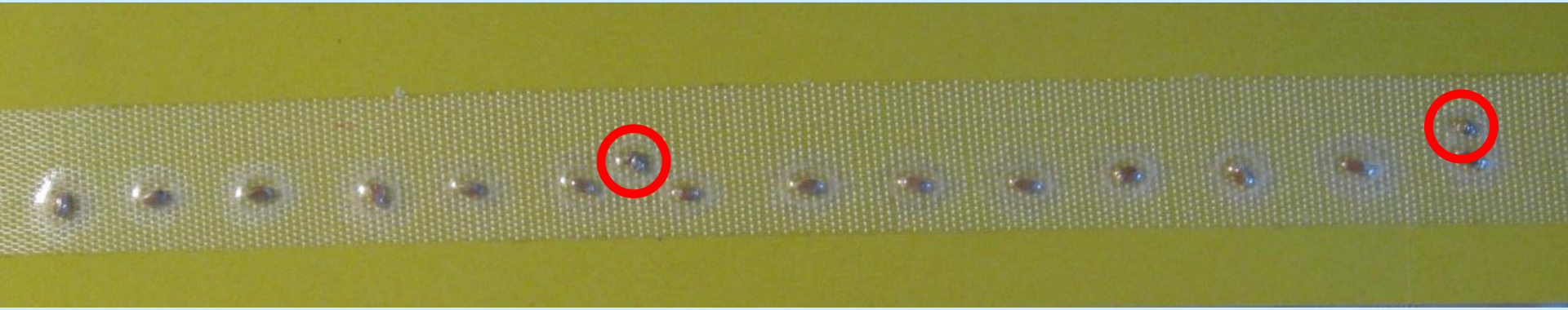
- *What have we learned so far?*
  - *Beet lime is used in many areas to reduce aphanomycese disease, raise soil pH and add nutrients to the soil*
  - *Beet lime varies in P concentration from factories*
  - *Beet lime is not easy to apply uniformly*
  - *Soil P test level will not change as much as research because routine sample depth is 0-6”*
  - *Time will tell how soil properties change over time*
  - *New U of M research will evaluate crop response to beet lime P*

Starter Fertilizer Distribution Display

- *How "Low" Can You Go?*
  - *Distribution of phosphorus fertilizer material (dry or liquid) at a range of rates applied with the seed*
- *Situation*
  - *1" spread (i.e. narrow shovel or disk opener)*
  - *Fertilizer placed directly with the seed*
  - *Medium soil texture -Good soil moisture*
- *Fertilizer must be within 1.5 - 2.0" of seed to get starter affect (how low can you go!)*
- *Caution with high rates*
  - *At high rates, starter fertilizer can reduce yield, depending on crop sensitivity, row spacing, fertilizer rate, fertilizer spread and soil moisture.*

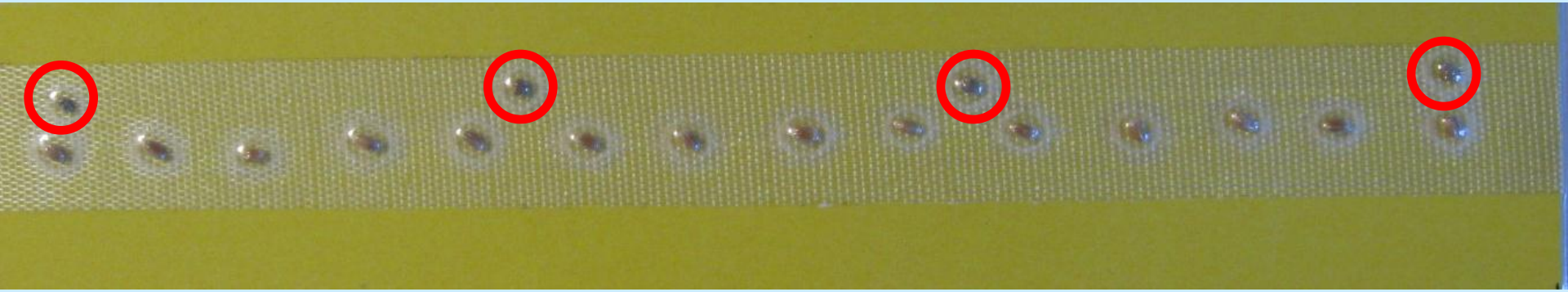
Dry Fertilizer Material

Wheat - 7” rows, 5 lb/a P_2O_5
10 lb/a MAP fertilizer
7.6” between MAP particles



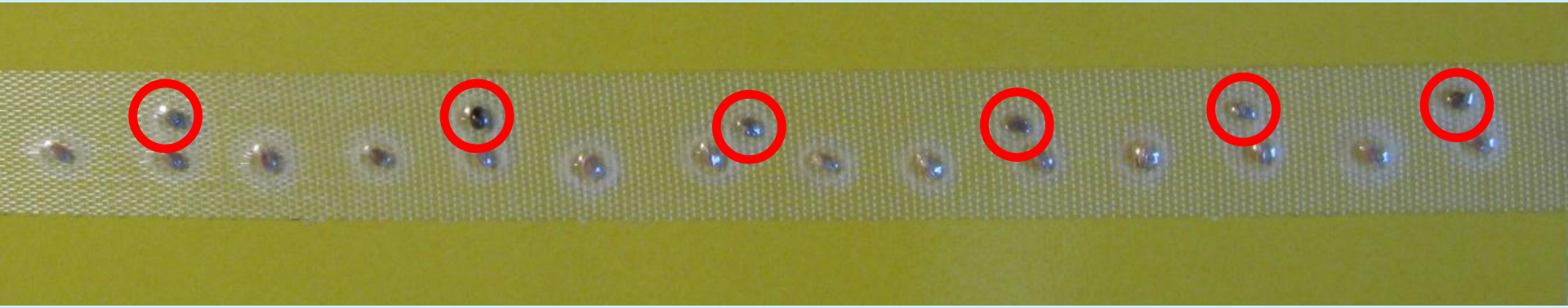
Wheat - 7” rows, 10 lb/a P_2O_5
19 lb/a MAP fertilizer
3.8” between MAP particles

AGVISE LABORATORIES



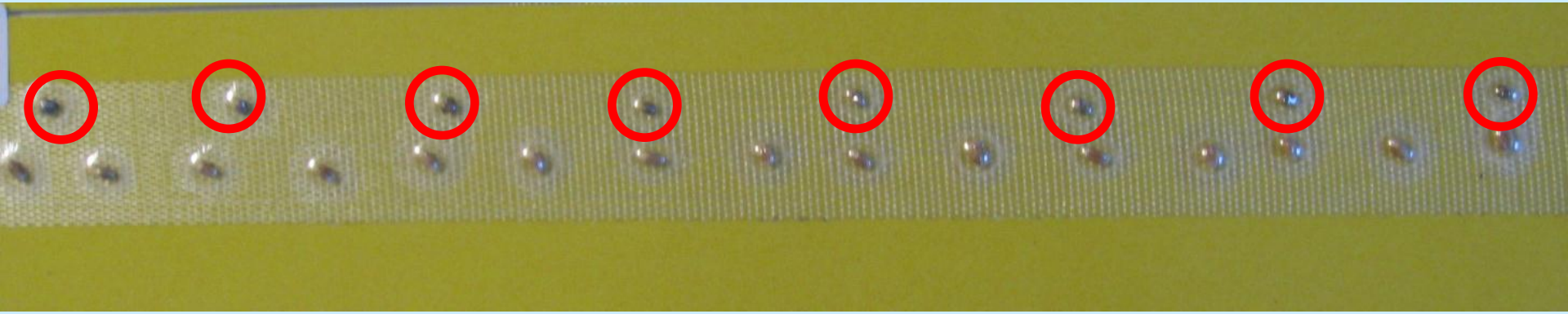
Dry Fertilizer Material

Wheat - 7” rows, 15 lb/a P_2O_5
29 lb/a MAP fertilizer
2.5” between MAP particles



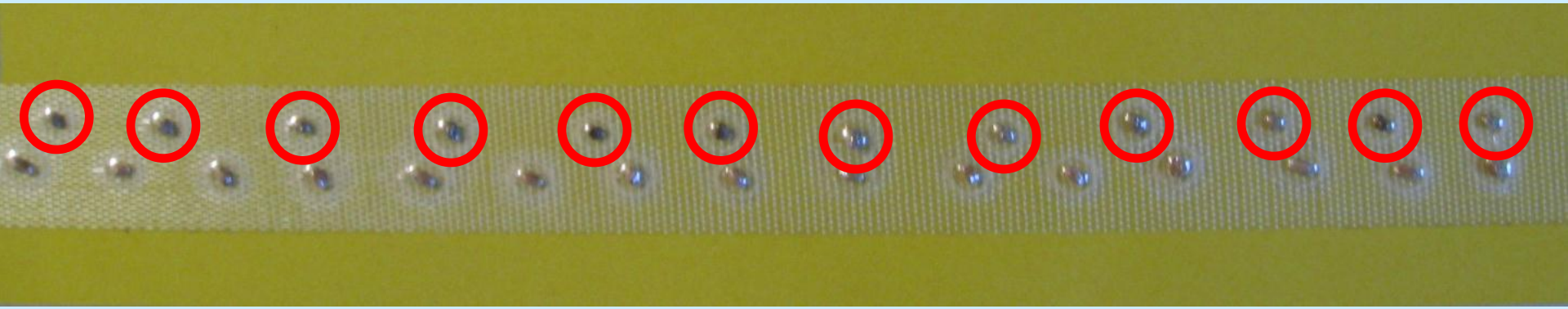
Wheat - 7” rows, 20 lb/a P_2O_5
38 lb/a MAP fertilizer
1.9” between MAP particles

AGVISE LABORATORIES



Dry Fertilizer Material

Wheat - 7” rows, 30 lb/a P_2O_5
57 lb/a MAP fertilizer
1.3” between MAP particles



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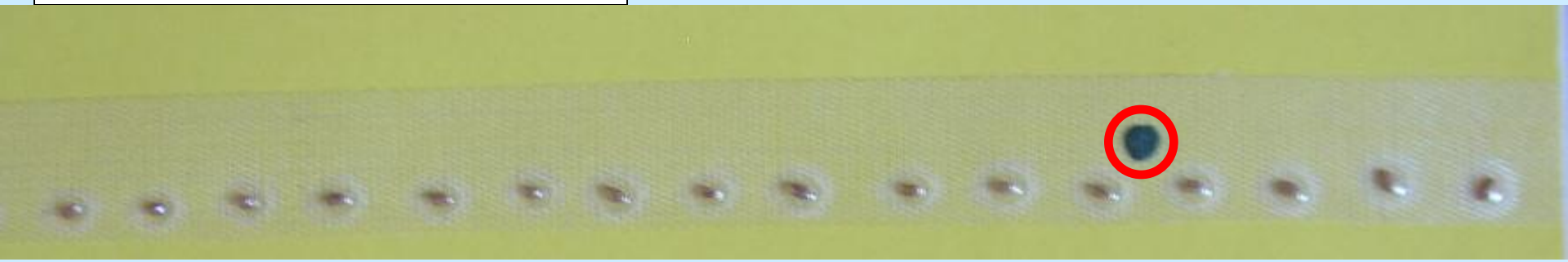
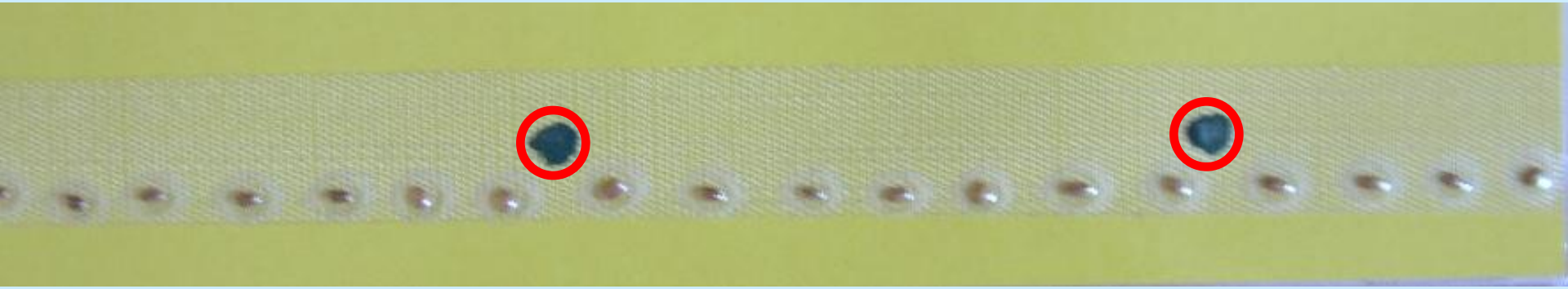
Liquid Fertilizer Material

Wheat – 7” rows, 5 lb/a P_2O_5
1.25 gallons/acre 10-34-0
11.2” between drops of fertilizer



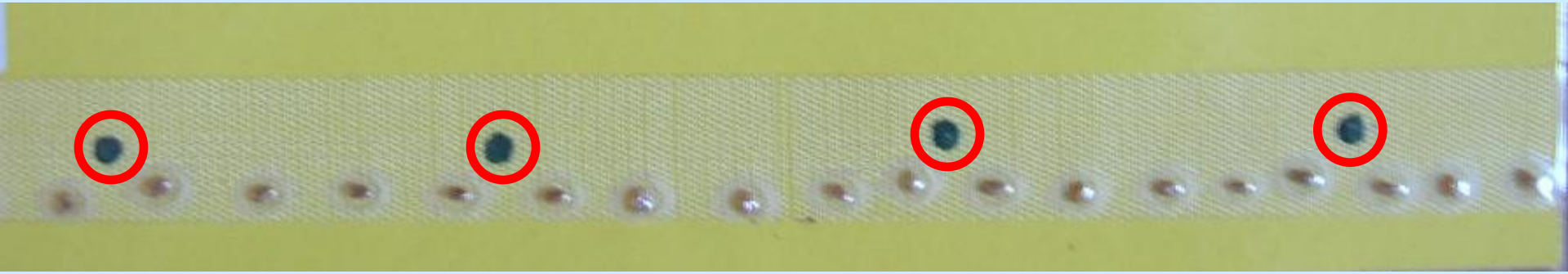
Wheat – 7” rows, 10 lb/a P_2O_5
2.5 gallons/acre 10-34-0
5.9” between drops of fertilizer

AGVISE LABORATORIES

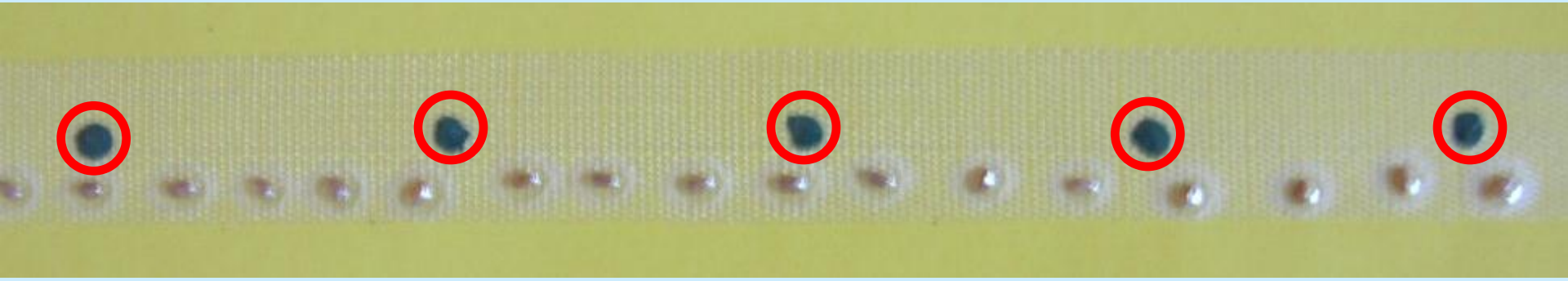


Liquid Fertilizer Material

Wheat – 7” rows, 15 lb/a P_2O_5
3.75 gallons/acre 10-34-0
3.7” between drops of fertilizer

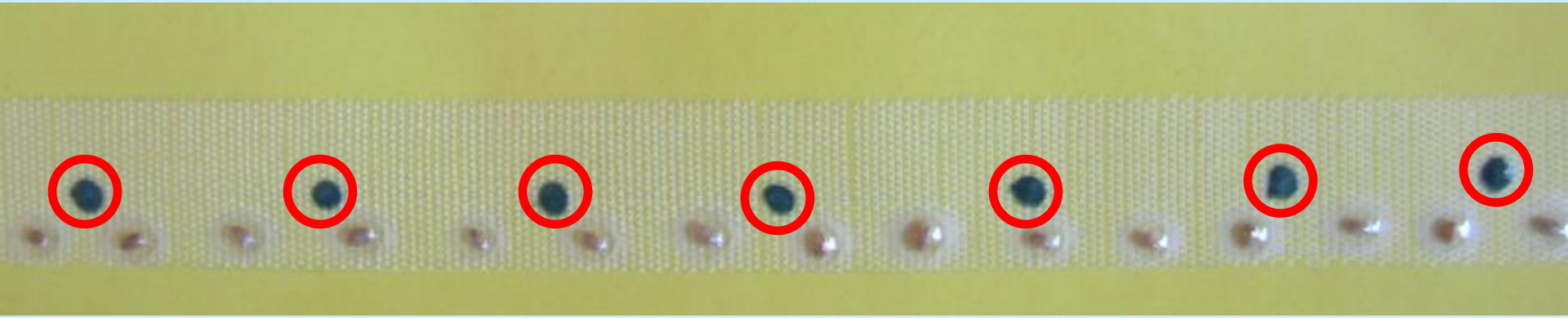


Wheat – 7” rows, 20 lb/a P_2O_5
5.0 gallons/acre 10-34-0
2.8” between drops of fertilizer



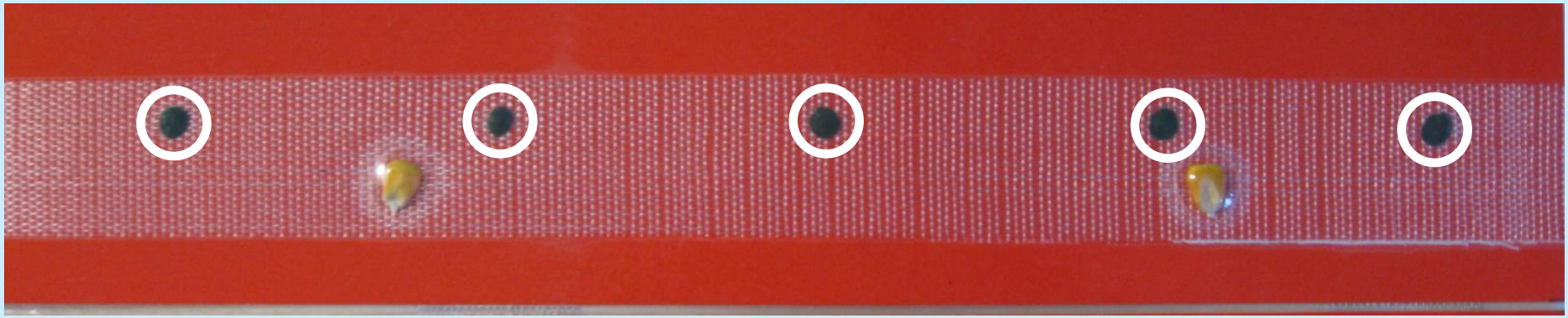
Liquid Fertilizer Material

Wheat – 7” rows, 30 lb/a P_2O_5
7.5 gallons/acre 10-34-0
1.9” between drops of fertilizer



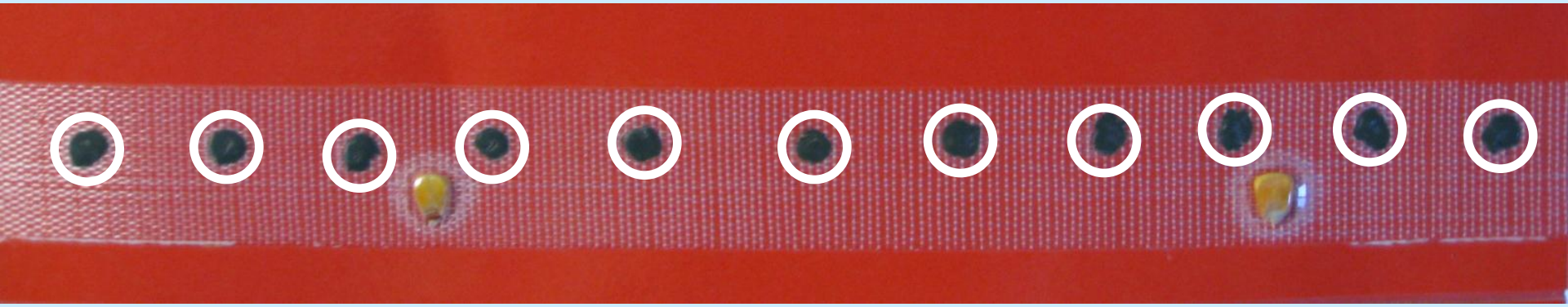
AGVISE LABORATORIES

Corn – 30” rows, 5 lb/a P_2O_5
1.25 gallons/acre 10-34-0
2.6” between drops of fertilizer

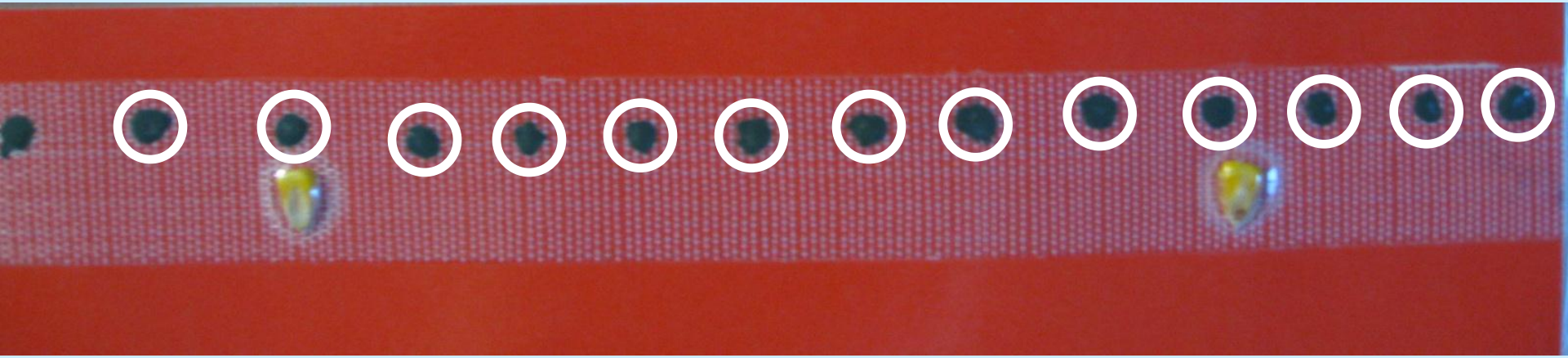


Corn – 30” rows, 10 lb/a P_2O_5
2.5 gallons/acre 10-34-0
1.3” between drops of fertilizer

AGVISE LABORATORIES

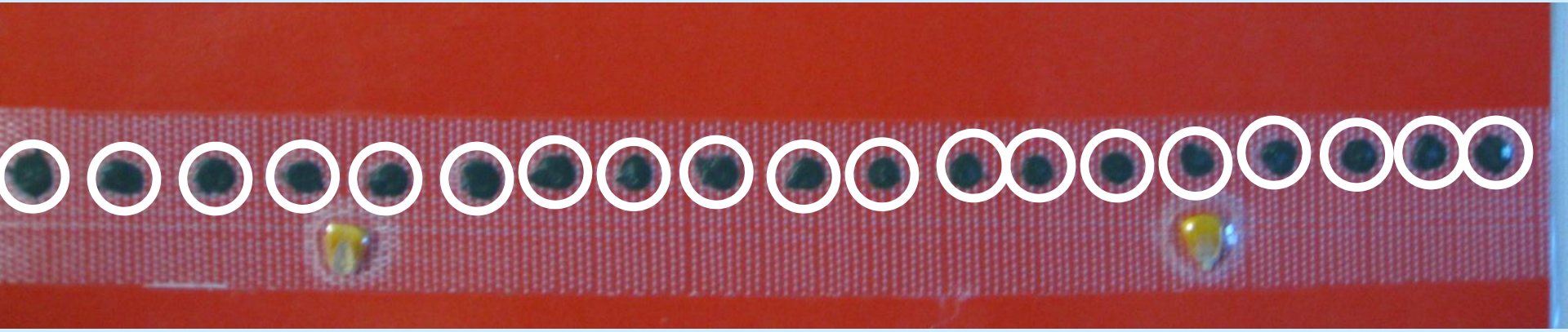


Corn – 30” rows, 15 lb/a P_2O_5
3.75 gallons/acre 10-34-0
0.87” between drops of fertilizer

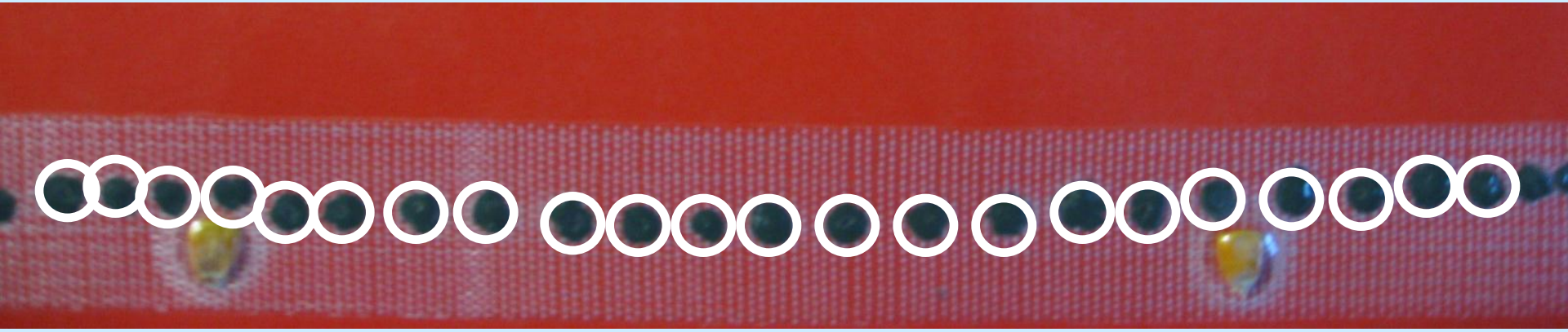


Corn – 30” rows, 20 lb/a P_2O_5
5.0 gallons/acre 10-34-0
0.65” between drops of fertilizer

AGVISE LABORATORIES



Corn – 30” rows, 30 lb/a P_2O_5
7.5 gallons/acre 10-34-0
0.43” between drops of fertilizer



Caution – stand reduction may occur
With dry sandy soils

AGVISE LABORATORIES

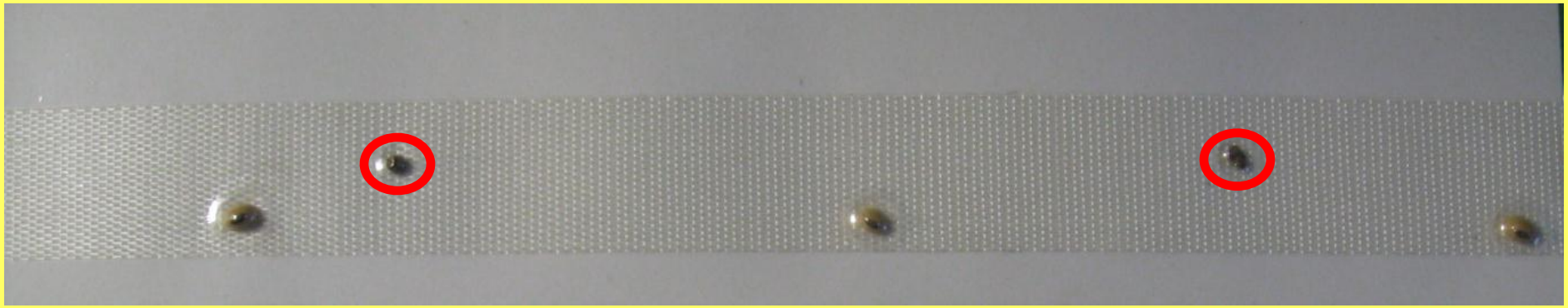
Starter Fertilizer Distribution Display

- *How to use these displays?*
  - *Show your growers how far apart the fertilizer particles or drops are at low rates.*
  - *Remind growers that "Magic Products" applied at low rates will have even more distance between particles!*
  - *Remind growers that low rates of "P" fertilizer is a short term plan. Applying less than crop removal will result in yield loss for many fields in the long term.*

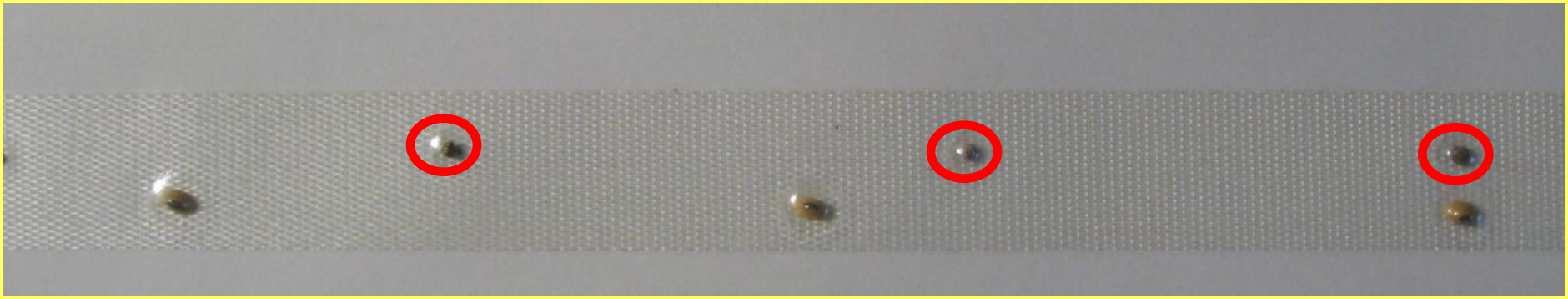
Thank You!

- *Please fill out reviews and suggest topics and speakers*
- *Make sure you have signed in and out on the CCA – CEU sheets*
- *Please have a safe ride home!*

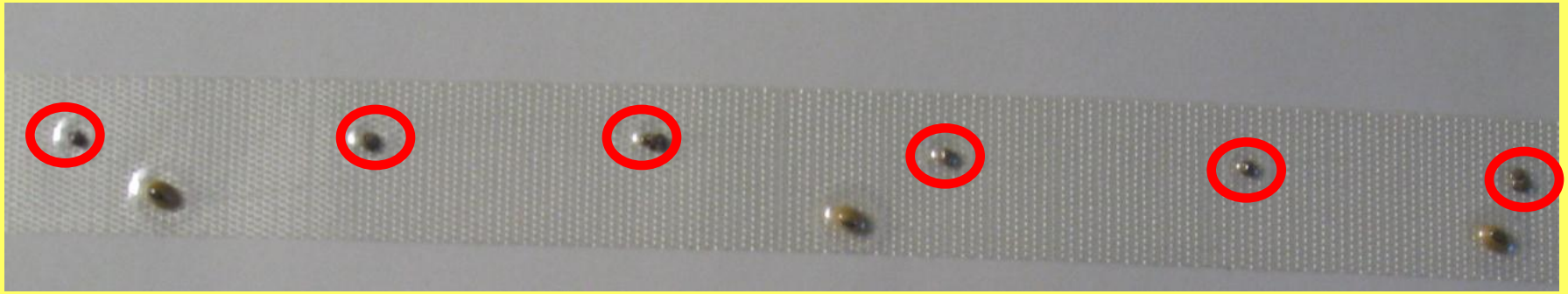
Soybeans - 7” rows, 5 lb/a P_2O_5
7.6” between MAP particles



Soybeans - 7” rows, 10 lb/a P_2O_5
3.8” between MAP particles

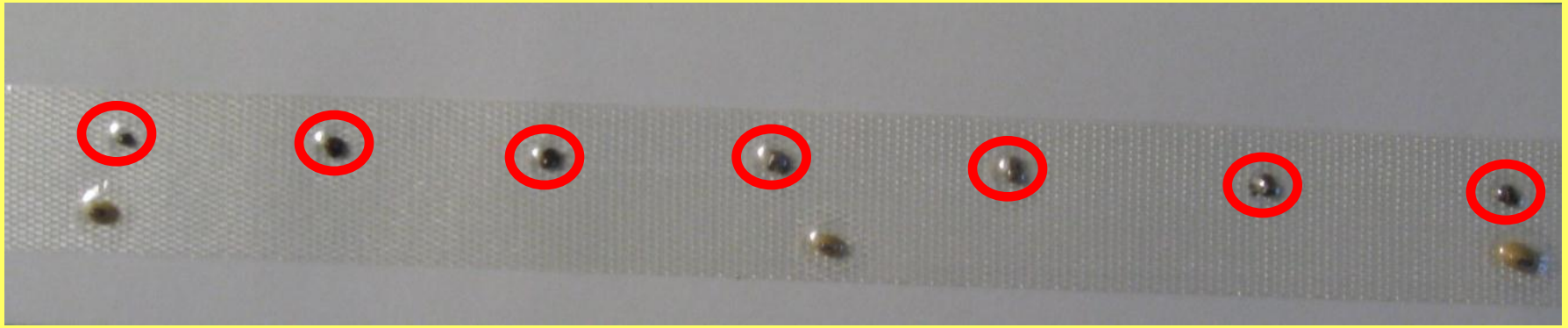


Soybeans - 7” rows, 15 lb/a P_2O_5
2.5” between MAP particles

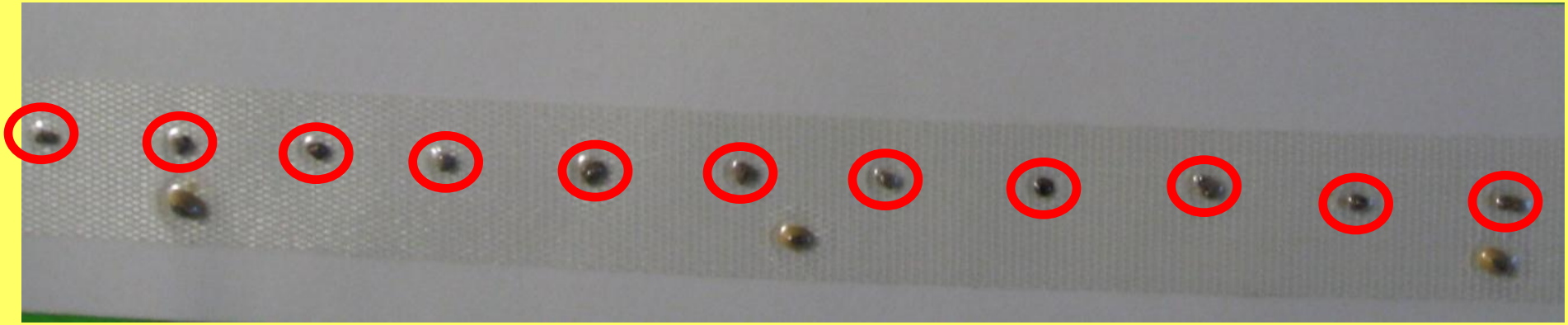


Soybeans - 7” rows, 20 lb/a P_2O_5
1.9” between MAP particles

AGVISE LABORATORIES



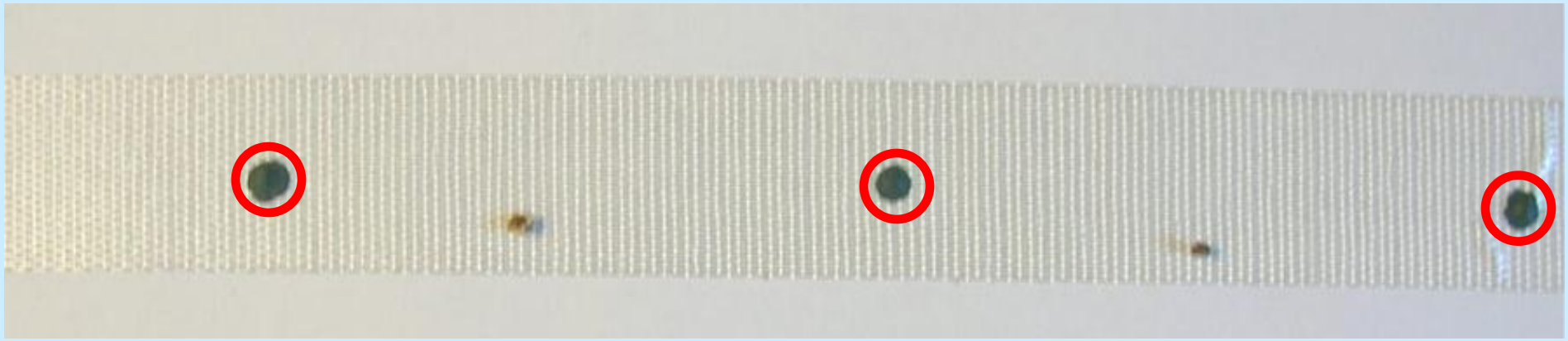
Soybeans - 7” rows, 30 lb/a P_2O_5
1.3” between MAP particles



Caution – stand reduction may occur

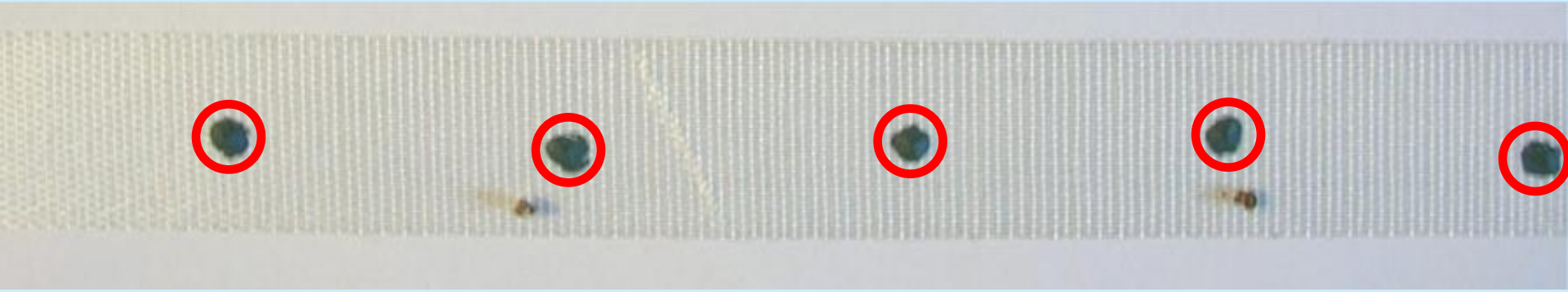
AGVISE LABORATORIES

Sugarbeets (5” spacing) – 22” rows, 4 lb/a P_2O_5
1.0 gallons/acre 10-34-0
4.5” between drops of fertilizer

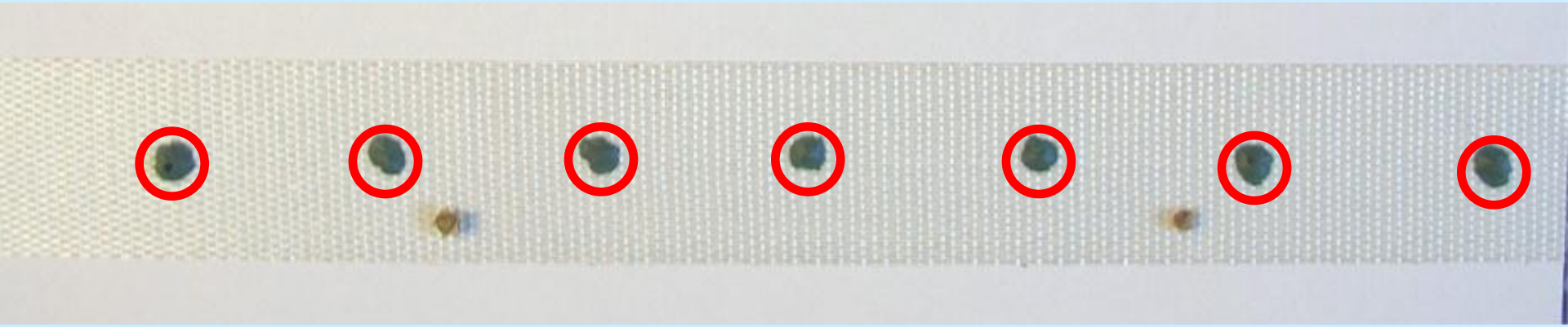


Sugarbeets (5” spacing) – 22” rows, 8 lb/a P_2O_5
2.0 gallons/acre 10-34-0
2.25” between drops of fertilizer

AGVISE LABORATORIES

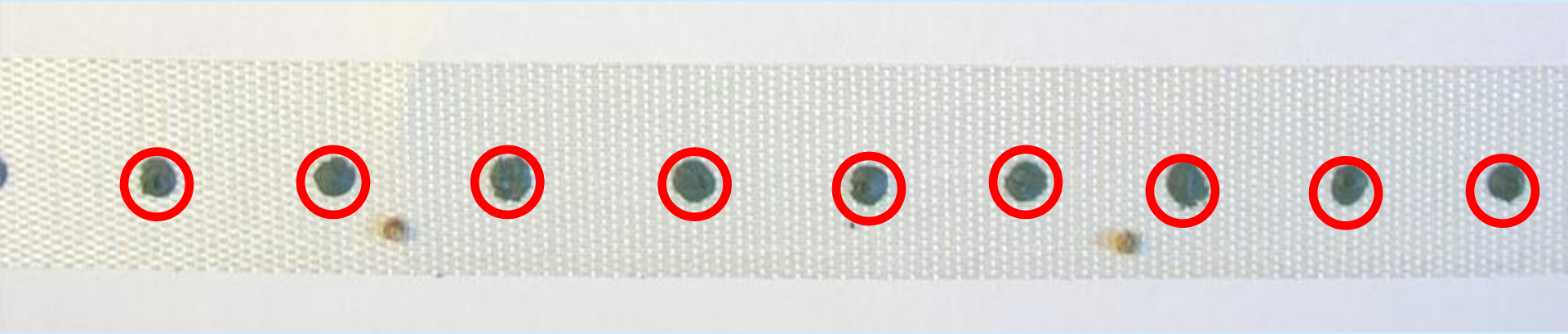


Sugarbeets (5” spacing) – 22” rows, 12 lb/a P_2O_5
3.0 gallons/acre 10-34-0
1.5” between drops of fertilizer

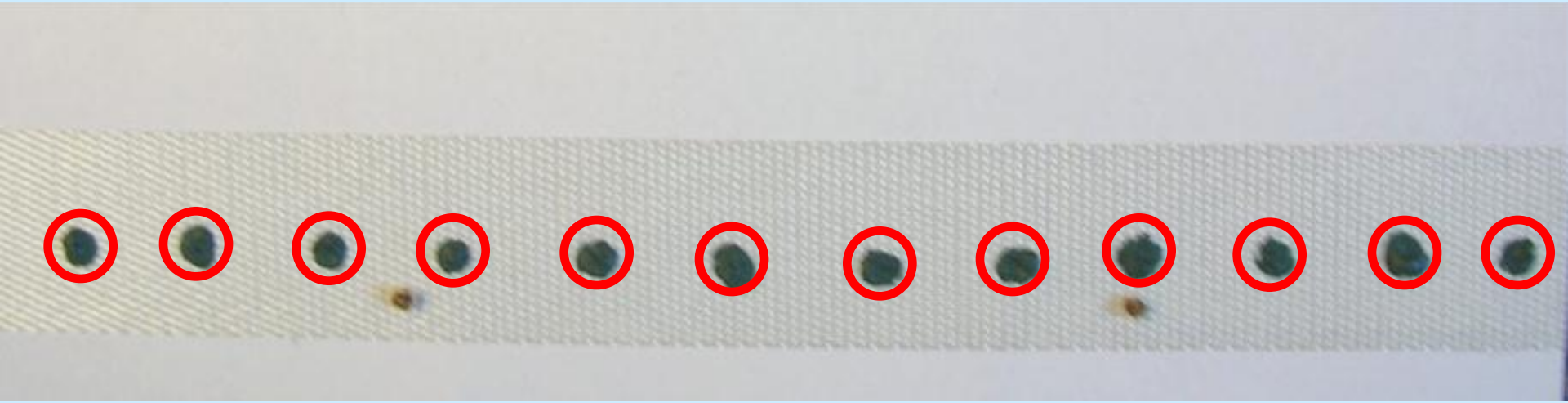


Sugarbeets (5” spacing) – 22” rows, 16 lb/a P_2O_5
4.0 gallons/acre 10-34-0
1.12” between drops of fertilizer

AGVISE LABORATORIES



Sugarbeets (5” spacing) – 22” rows, 20 lb/a P_2O_5
5.0 gallons/acre 10-34-0
0.9” between drops of fertilizer

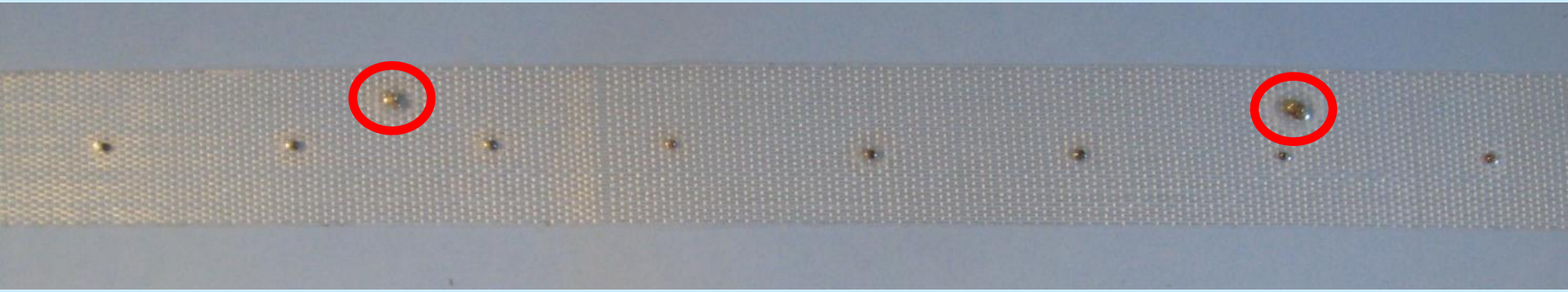


Caution – stand reduction may occur

AGVISE LABORATORIES

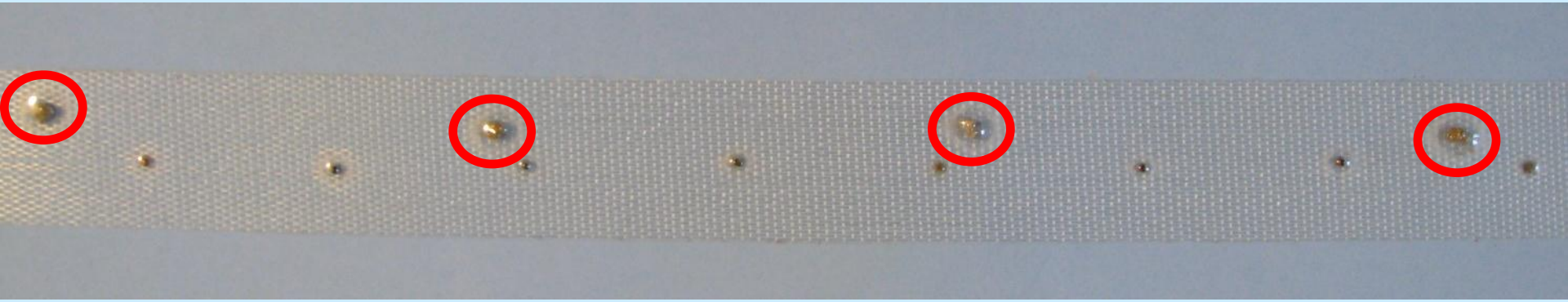
Dry Fertilizer Material

Canola - 7” rows, 5 lb/a P_2O_5
10 lb/a MAP fertilizer
7.6” between MAP particles



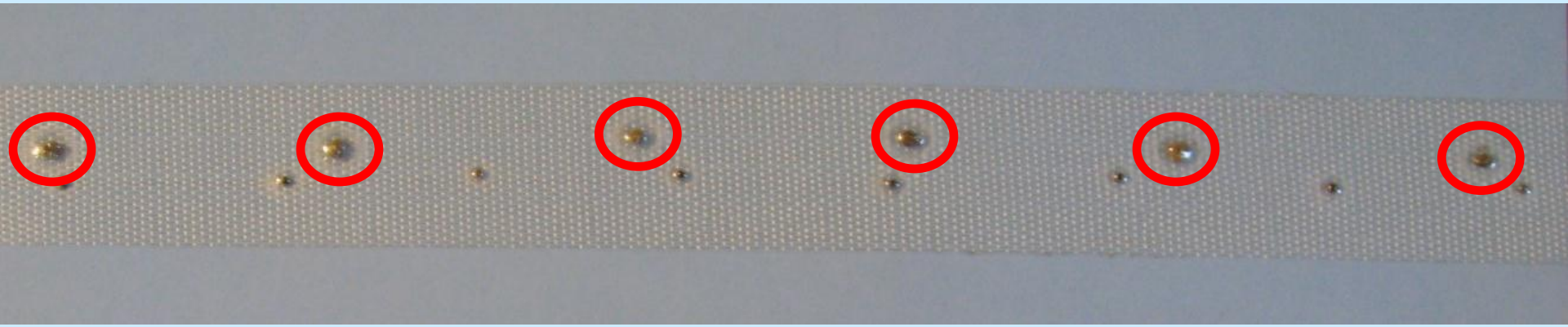
Canola - 7” rows, 10 lb/a P_2O_5
19 lb/a MAP fertilizer
3.8” between MAP particles

AGVISE LABORATORIES



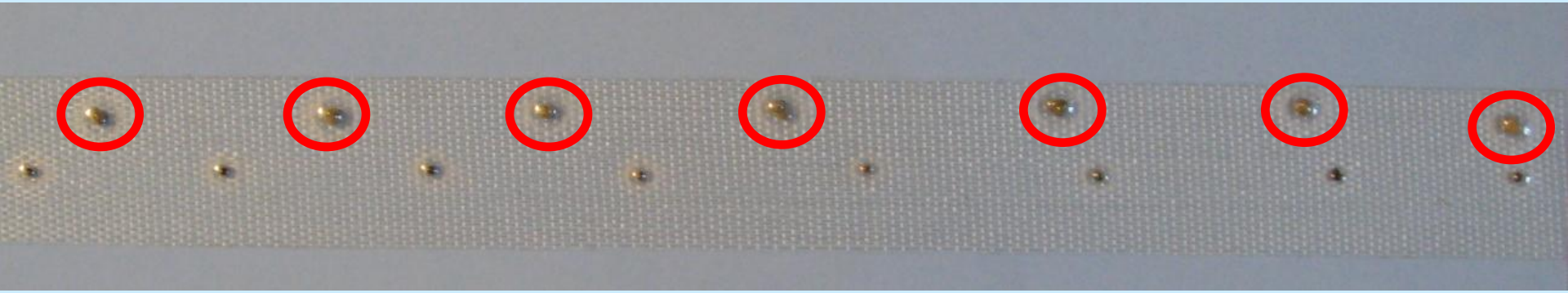
Dry Fertilizer Material

Canola - 7” rows, 15 lb/a P_2O_5
29 lb/a MAP fertilizer
2.5” between MAP particles



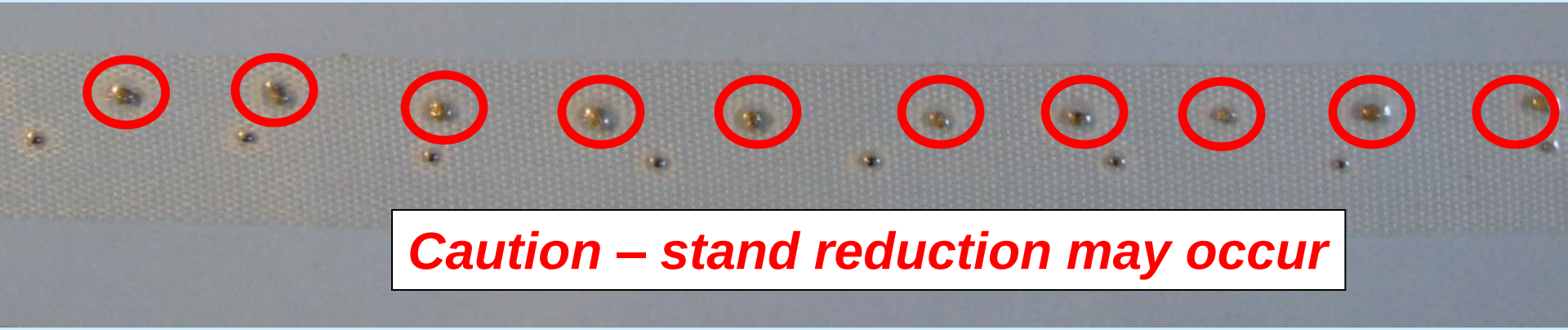
Canola - 7” rows, 20 lb/a P_2O_5
38 lb/a MAP fertilizer
1.9” between MAP particles

AGVISE LABORATORIES



Dry Fertilizer Material

Canola - 7” rows, 30 lb/a P_2O_5
57 lb/a MAP fertilizer
1.3” between MAP particles

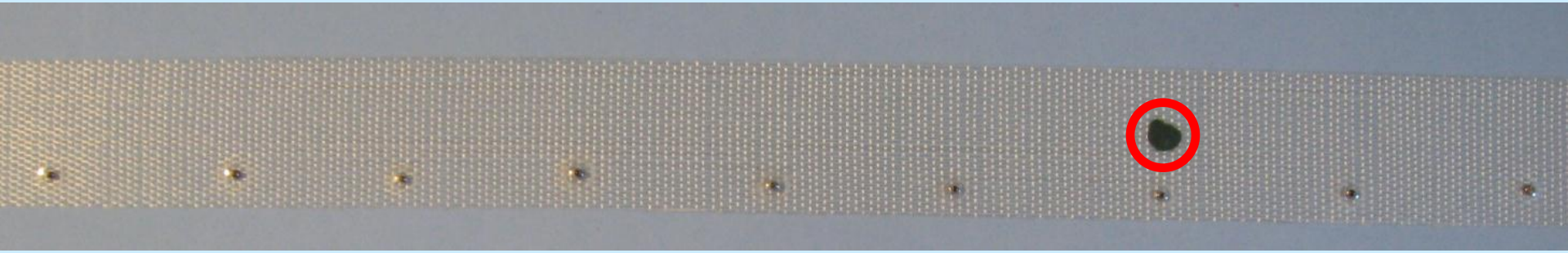


Caution – stand reduction may occur

AGVISE LABORATORIES

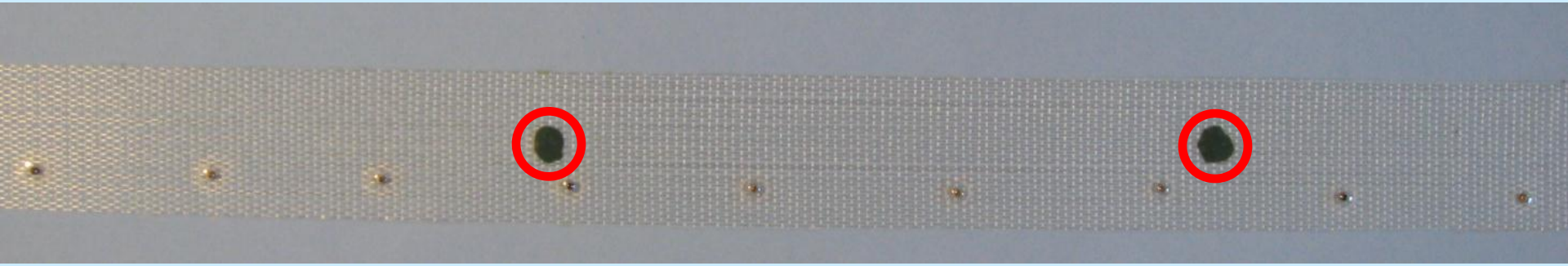
Liquid Fertilizer Material

Canola – 7” rows, 5 lb/a P_2O_5
1.25 gallons/acre 10-34-0
11.2” between drops of fertilizer



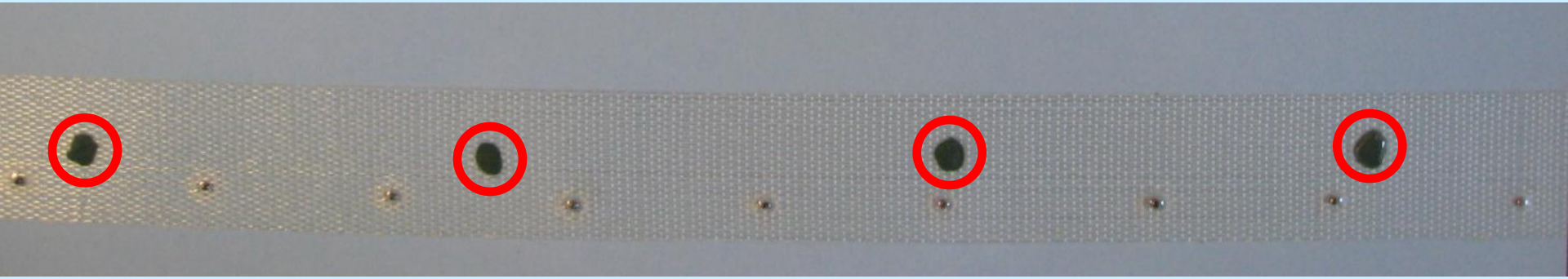
Canola – 7” rows, 10 lb/a P_2O_5
2.5 gallons/acre 10-34-0
5.9” between drops of fertilizer

AGVISE LABORATORIES



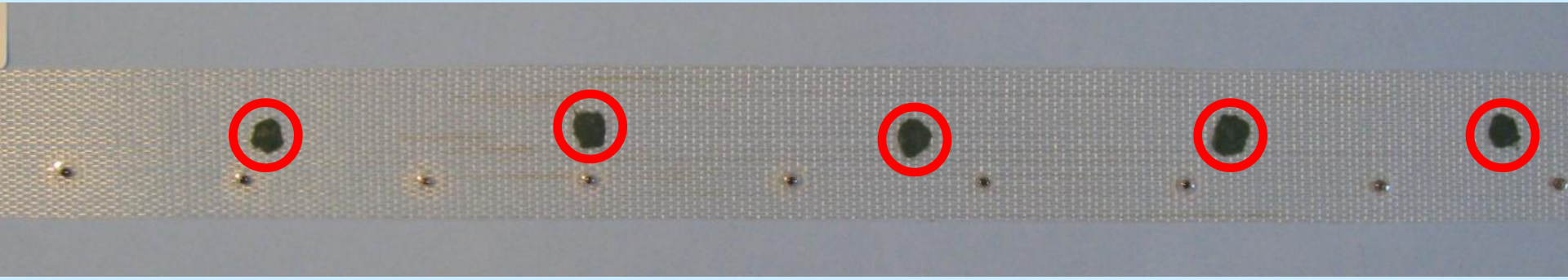
Liquid Fertilizer Material

Canola – 7” rows, 15 lb/a P_2O_5
3.75 gallons/acre 10-34-0
3.7” between drops of fertilizer



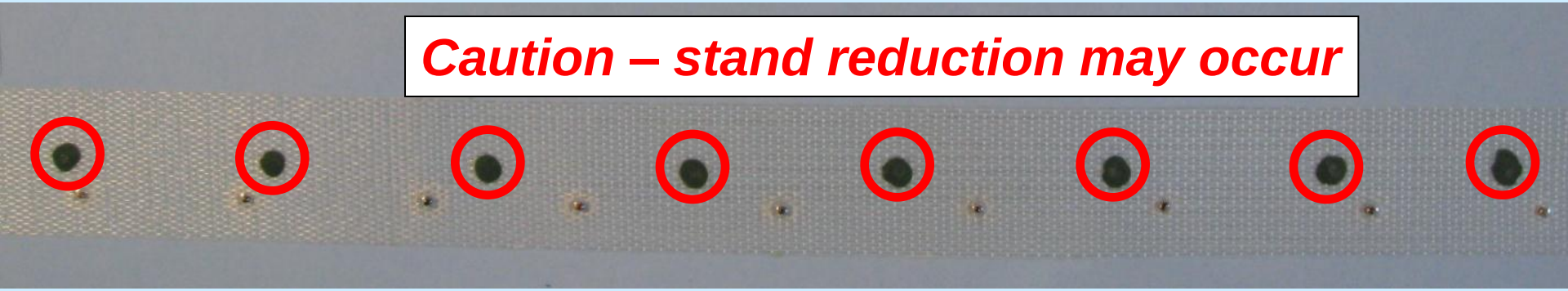
Canola – 7” rows, 20 lb/a P_2O_5
5.0 gallons/acre 10-34-0
2.8” between drops of fertilizer

AGVISE LABORATORIES



Liquid Fertilizer Material

Canola – 7” rows, 30 lb/a P_2O_5
7.5 gallons/acre 10-34-0
1.9” between drops of fertilizer



Caution – stand reduction may occur

AGVISE LABORATORIES