Precision Agriculture Peanut Research Update

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EFFECTS OF CONVEYOR AND GROUND SPEED

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Objectives

Year	2016	2017
Type	Virginia	Runner + Virginia
Conveyor speeds	80%	70%
	90%	85%
	100%	100%
	110%	115%
	120%	130%
Ground speeds	2 mph	1.5 mph
	3 mph	2.5 mph
	4 mph	3.5 mph
	5 mph	4.5 mph

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Diggers used in study

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2017 *site description*

KMC Amadas

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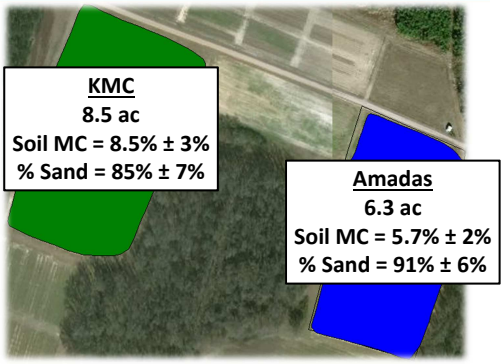
2017 *site description*



KMC Amadas

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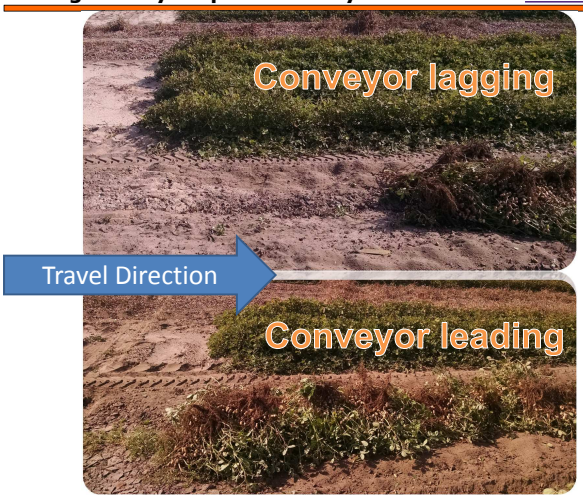
2017 planting map

CONVEYOR SPEED TESTS

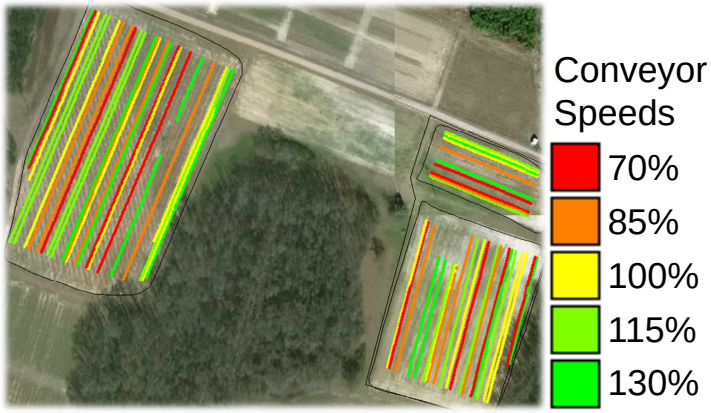
Conveyor speed: Literature

- Amadas
  - Set conveyor to match tractor speed (digital readout)
  - Excessive dirt in windrow = Conveyor too slow?
  - Conveyor stalls excessively = Conveyor too slow?
- KMC
  - Vine flow synchronized with ground speed and conveyor speed
- Bader, UGA
  - Chain speed slightly faster than forward speed to avoid pileup of vines ahead of pickup
- Roberson, NCSU
  - Synchronize to avoid dragging and snatching of plants
  - Optimum shaker speed is slightly faster than ground speed

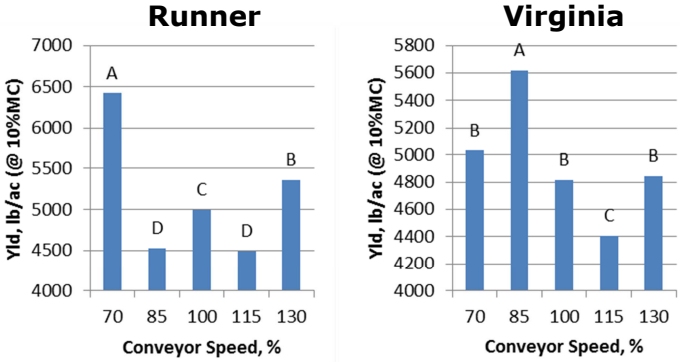
Setting conveyor speed visually



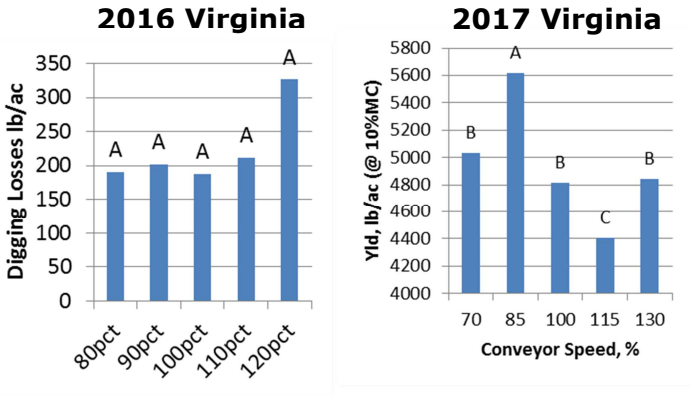
Conveyor speed tests: Ground speed was 2.5 mph



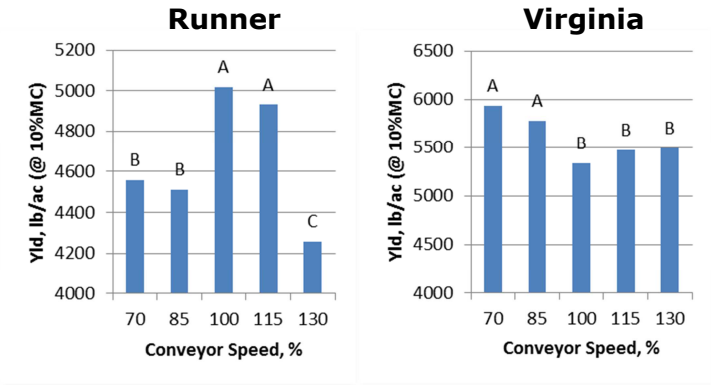
Amadas conveyor speed tests



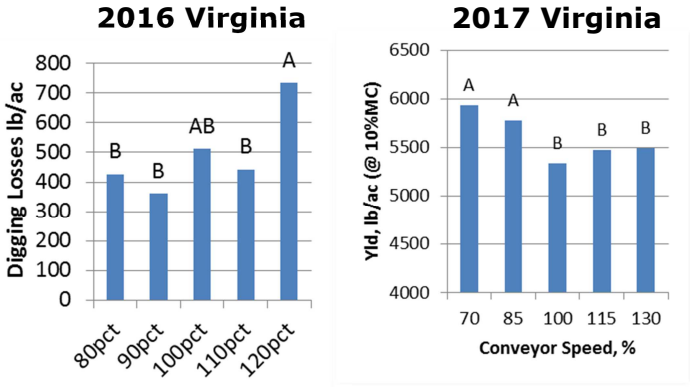
Amadas conveyor speed tests



KMC conveyor speed tests



KMC conveyor speed tests



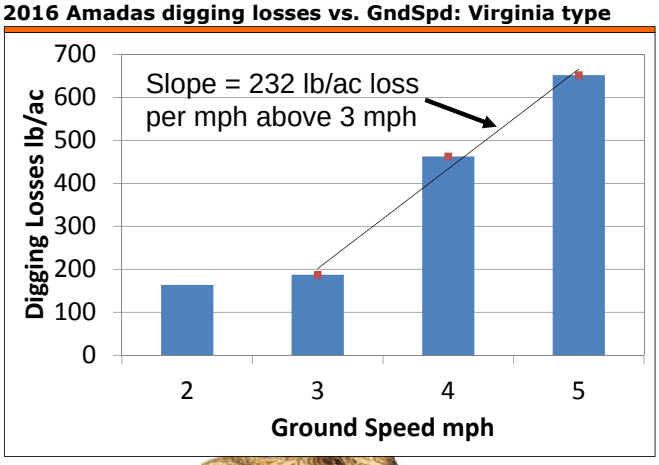
GROUND SPEED TESTS

Ground speed: Literature

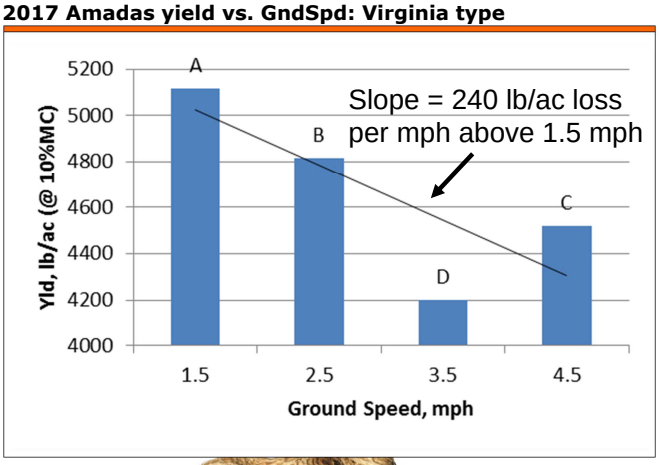
- Amadas: "Starting speed" 2.5 – 3 mph
- KMC: 3 – 3.5 mph
  - Too fast causes bunching
  - Too slow pulls vines apart, pulling off peanuts
- Bader, UGA: 3.5 – 5 mph
- Roberson, NCSU
  - Heavy pod losses at ground speeds in excess of 4 mph

Ground Speed Tests: Conveyor Speed = Ground Speed

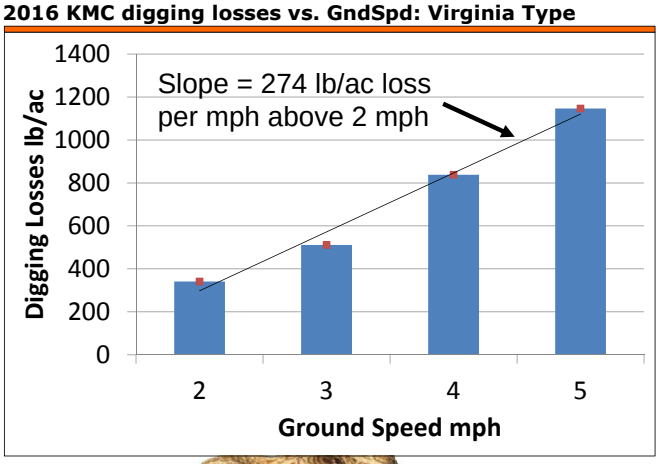
2016 Amadas digging losses vs. GndSpd: Virginia type



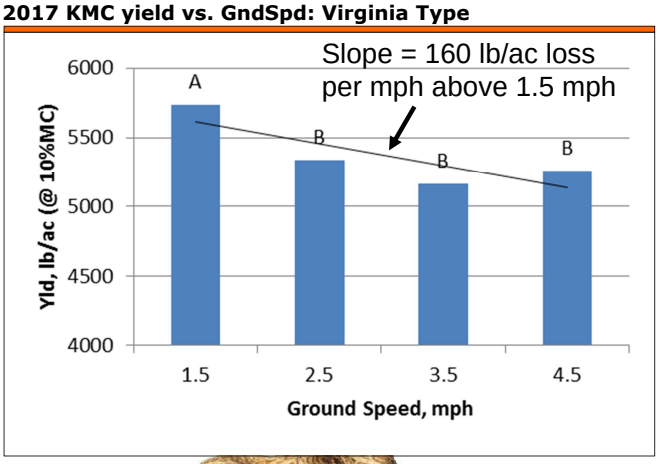
2017 Amadas yield vs. GndSpd: Virginia type



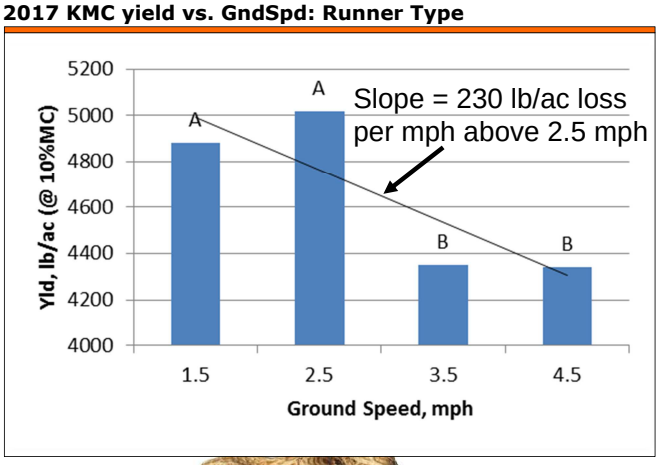
2016 KMC digging losses vs. GndSpd: Virginia Type



2017 KMC yield vs. GndSpd: Virginia Type



2017 KMC yield vs. GndSpd: Runner Type



Field Capacity for Various Digging Speeds

4-Row Diggers

Speed (mph)	Capacity (ac/hr)	Time (hr/10 ac)
2	2.6	3.8
2.5	3.3	3.1
3	3.9	2.6
3.5	4.6	2.2
4	5.2	1.9
4.5	5.9	1.7
5	6.5	1.5

6-Row Diggers

Speed (mph)	Capacity (ac/hr)	Time (hr/10 ac)
2	3.9	2.6
2.5	4.9	2.0
3	5.9	1.7
3.5	6.9	1.5
4	7.8	1.3
4.5	8.8	1.1
5	9.8	1.0

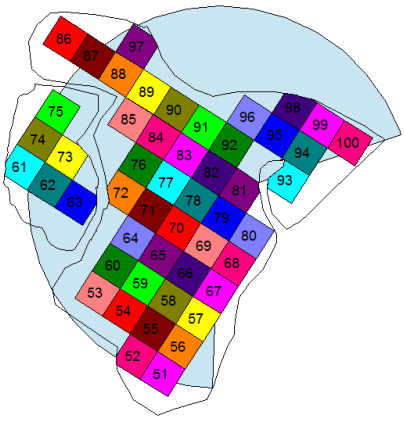
DIGGER OPERATION CONCLUSIONS

Digger Operation Conclusions

- Best to lag conveyor speed in heavier vines (virginia type)
- Perhaps match conveyor speed in lighter vines (runner type)
- Yield losses increase with ground speed: 150-250 lb/ac per mph above optimum speed
- Optimum speed = 1.5 to 3 mph
  Across diggers, years, peanut types

INTENSE SPATIAL DATA COLLECTION

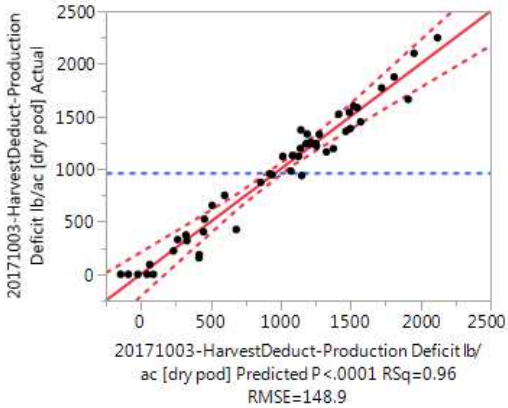
General test description



Data collected at grid centers: > 350 data entries each

- One-time or periodic measurements:
  Soil texture, organic matter, penetrometer readings, shallow soil fertility, deep soil fertility, stand count, phytotoxicity, thrips, TSWV, weed ratings, hopper burn, late leaf spot, necrotic plants, maturity, weather data, irrigation distribution uniformity, white mold, digging losses, FM/LSK, grade, yield, harvest speed, nematode counts
- Every 2-4 weeks:
  Soil moisture content, soil temperature, canopy temperature, NDVI, canopy height, canopy closure, aerial imagery data

Actual vs. Predicted Production Deficit, lb/ac

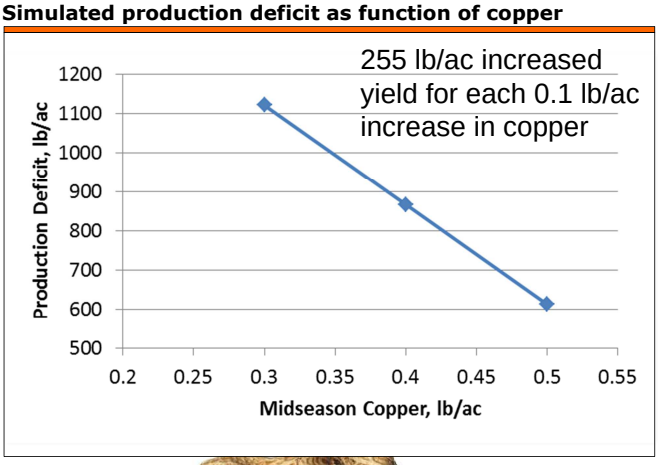


Model for predicting production deficit

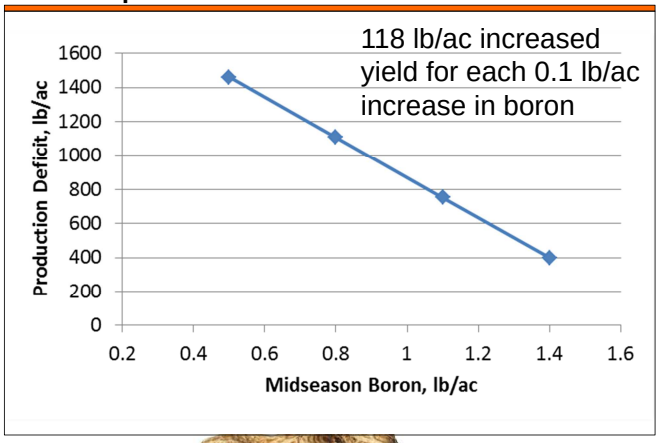
Parameter Estimates

Term	Estimate
201707??-SoilSample-B	-1180.511
20170330-ShallowSoilTest-BufferpH	3848.3376
Intercept	-26673.2
(20170330-ShallowSoilTest-P-75.7708)*(20170828-Ratings-TSWV-12.2083)	-0.681978
(201707??-SoilSample-Cu-0.39184)*(201711??-SoilNematode-Spiral-17.9167)	-114.2149
(20170330-ShallowSoilTest-BufferpH-7.78125)*(20170827-Maturity-PaleYellPix%-3.7958)	1242.39
(201707??-SoilSample-Na-13.643)*(201711??-SoilNematode-Spiral-17.9167)	2.4910937
20170828-Ratings-TSWV	36.606451
20170827-Maturity-PaleYellPix%	-39.25742
201707??-SoilSample-Cu	-2588.216
20170816-UAV-Weeds-TotalWeed %	-163.9971
201707??-SoilSample-Na	-33.82786
201711??-SoilNematode-Stubby	14.415976
20170622-Penetrometer-Depth to 300 psi BtwRow, in	-12.88145
(20170622-Penetrometer-Depth to 300 psi BtwRow, in-13.9604)*(20170622-Ratings-TSWV Incidence-15.2708)	2.2697648
20170330-ShallowSoilTest-P	1.0755339
20170622-Ratings-TSWV Incidence	6.7539918
201711??-SoilNematode-Spiral	-0.744105

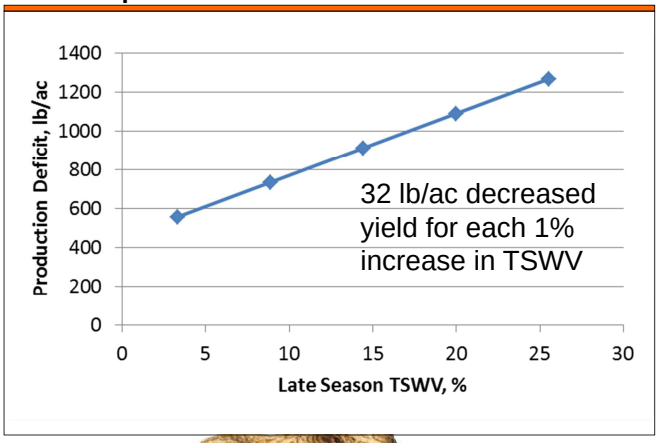
Simulated production deficit as function of copper



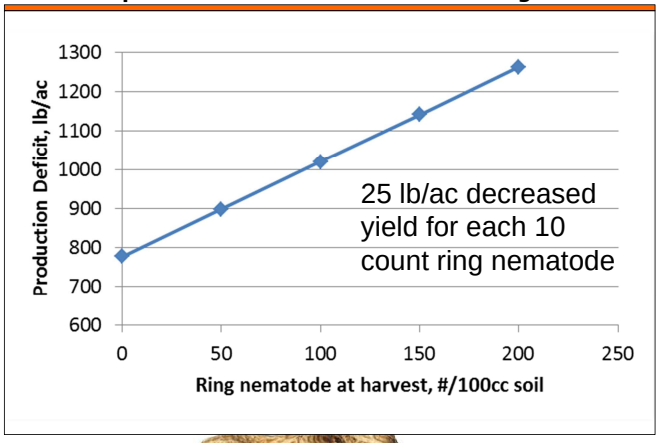
Simulated production deficit as function of boron



Simulated production deficit as function of TSWV



Simulated production deficit as function of ring nematode

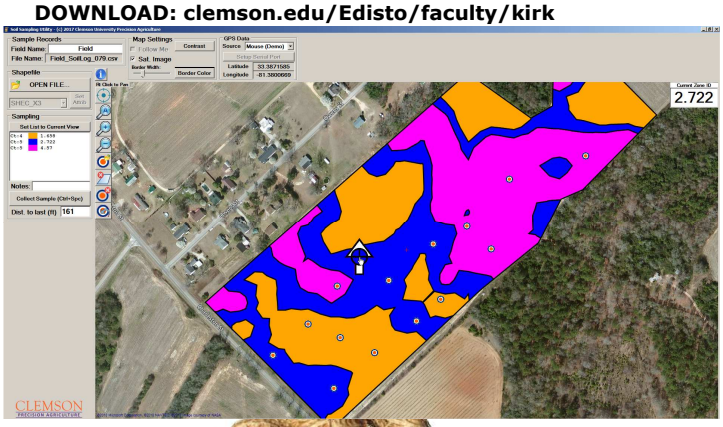


Primary drivers of other spatial variability

- Maturity
  - pH and micronutrients
- TSWV
  - pH, micronutrients, ring nematode
- LLS
  - Depth to hardpan, P, maturity, Zn
- Thrips damage
  - Lesion nematode, Zn, OM, depth to hardpan

Clemson Soil Sampling Utility

DOWNLOAD: clemson.edu/Edisto/faculty/kirk



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Acknowledgments

South Carolina peanut board

National Peanut Board™

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- Clemson Ag Mech & Business Undergraduate Program
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