

Thresholds: Why do we have them?



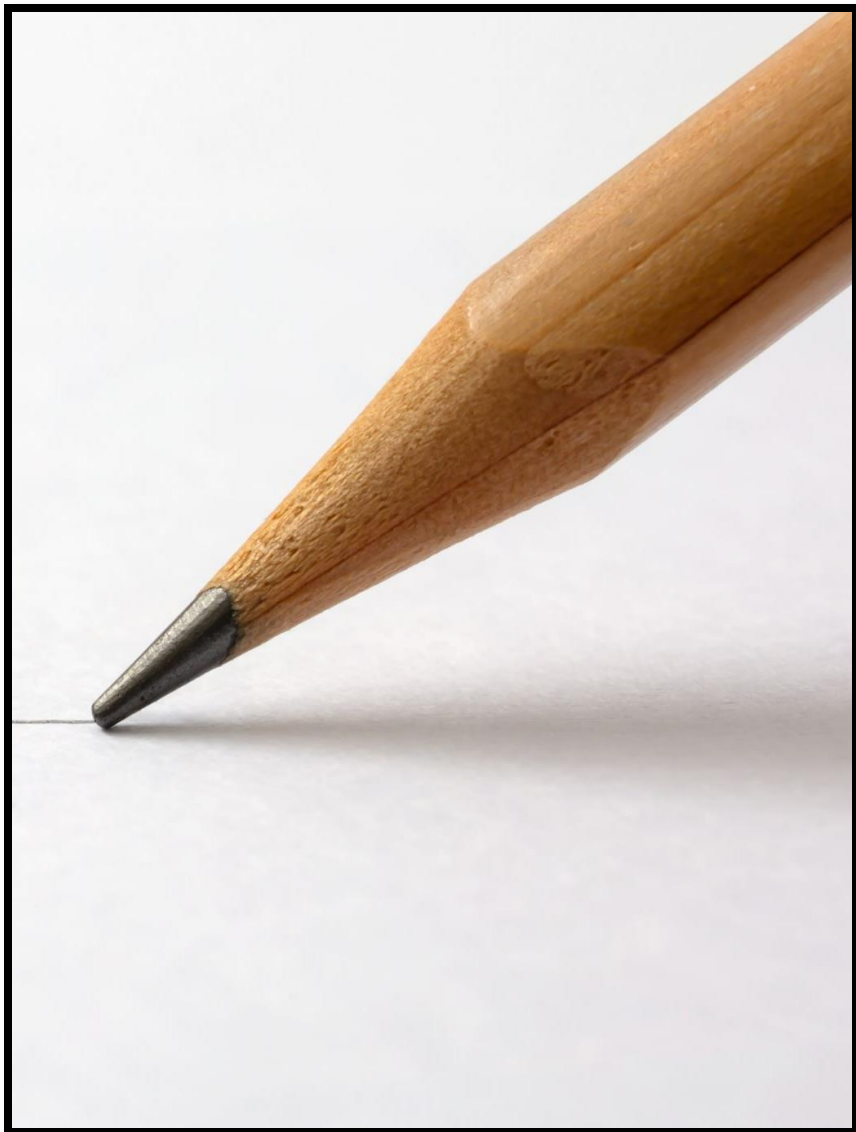
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Introduction

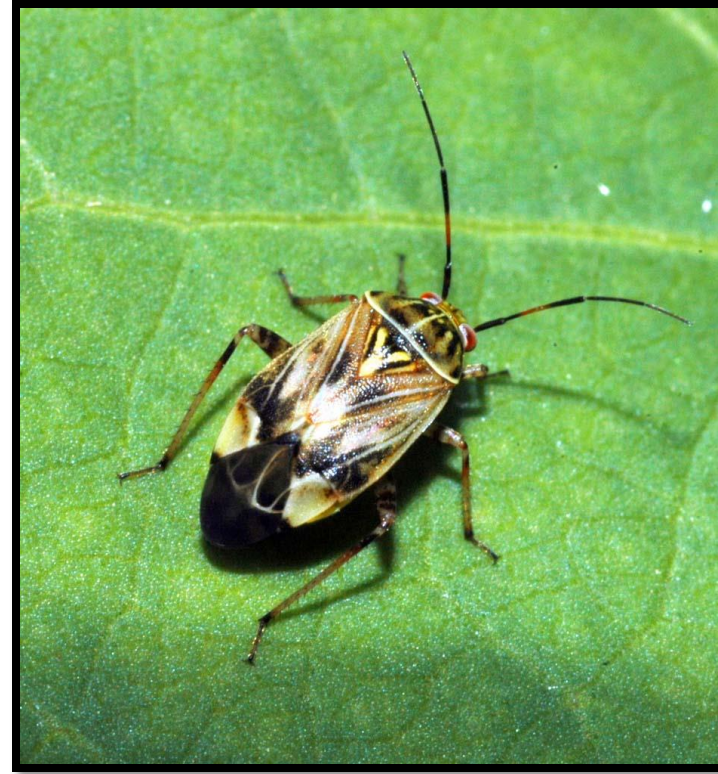
Number One Goal

- Best management practices
- Economically sound



“ The goal of an insect control measure should be to provide a **positive return on investment**, in this case by **preserving enough yield to justify its cost**. Using the **economic threshold** concept to guide these decisions helps to ensure that pest control actions will pencil out on the operations balance sheet”

- **Nick Seiter, University of Illinois**



Damage tolerance is situational



Economic Injury Level (EIL)

(EIL) = “The lowest population density of a pest that will cause economic damage; or the amount of pest injury which will justify the cost of control.”



Economic Injury Level (EIL)

Corn Earworm in Soybeans, Sweep Net Sampling

$$P = C \div (V \times I \times D)$$

$$13.1 = \$20/\text{acre} \div (\$9/\text{bu} \times 1 \text{ larva per 25 sweeps} \times 0.17 \text{ bu lost})$$

No. Larvae / 25 Sweeps

Control Costs (\$/acre)

Crop Value (\$/bu)	10	15	20	25	30
6	9.8	14.7	19.6	24.5	29.4
7	8.4	12.6	16.8	21.0	25.2
8	7.4	11.0	14.7	18.4	22.1
9	6.5	9.8	13.1	16.3	19.6
10	5.9	8.8	11.8	14.7	17.6
12	4.9	7.4	9.8	12.3	14.7

P = Density or intensity of pest population
(for example insects/acre)

C = Pest Management Costs
(\$/acre)

V = Market Value of per unit of produce
(for example, \$/acre)

D = Damage per unit injury
(for example, bushels lost/acre/percent defoliation)

I = Injury units per production unit
(for example, % defoliation/insect/acre, expressed as a proportion)

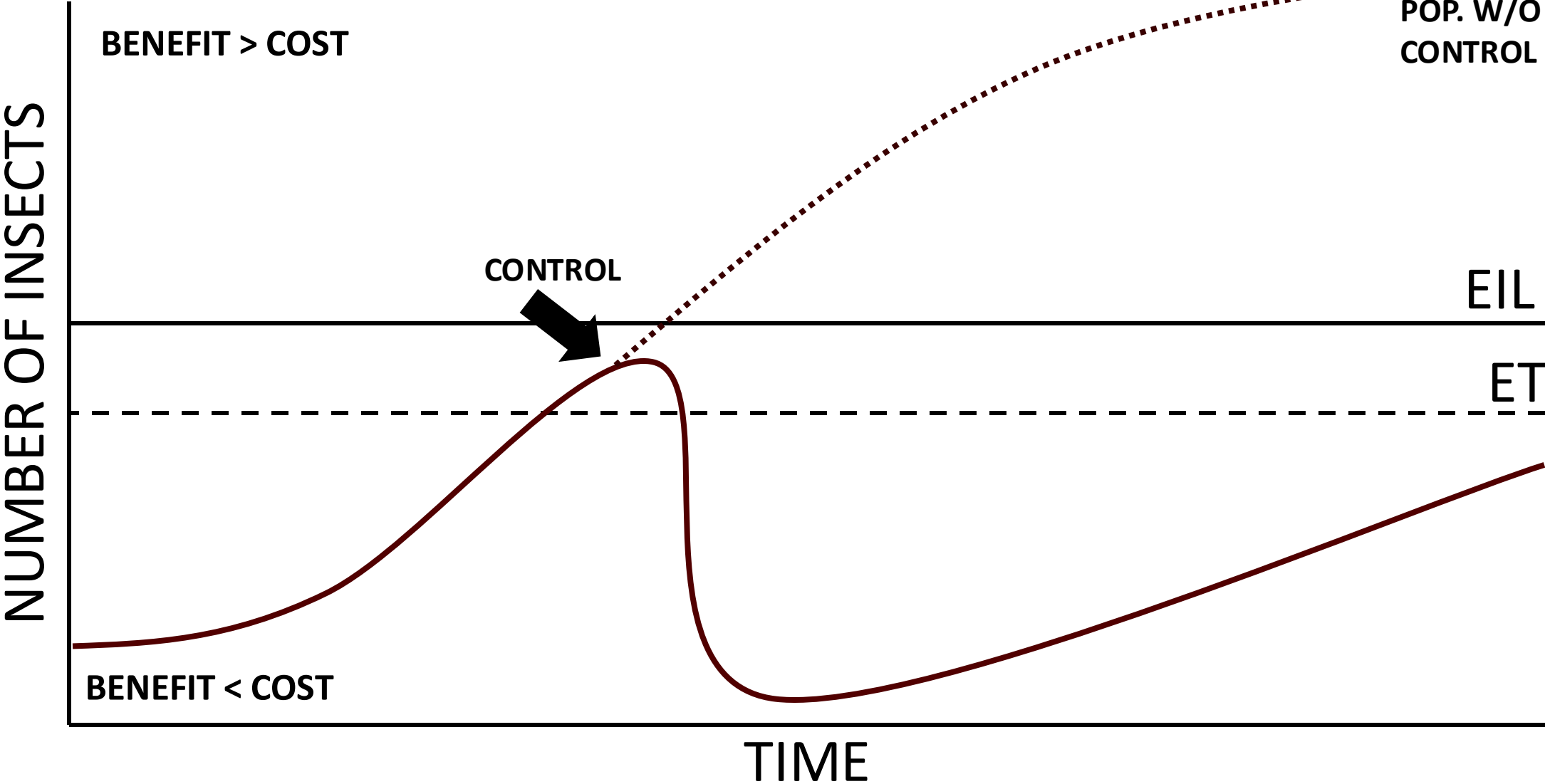


Economic Threshold (ET)

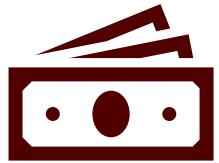
**The level of pest
infestation at which
management action is
justified**



EIL & ET: Pest Density



FACTORS THAT IMPACT ET



Management
cost



Crop value



Damage



Treatment
Effectiveness

Dynamics of Economic Pest Densities

	Higher Pest Populations (more pest tolerated)	Lower Pest Populations (fewer pest tolerated)
MANAGEMENT COST	↑	↓
CROP VALUE	↓	↑
DAMAGE	↓	↑
TREATMENT EFFECTIVENESS	↓	↑

University of California, Sacramento Valley Orchard Source





Recommendations are built on research

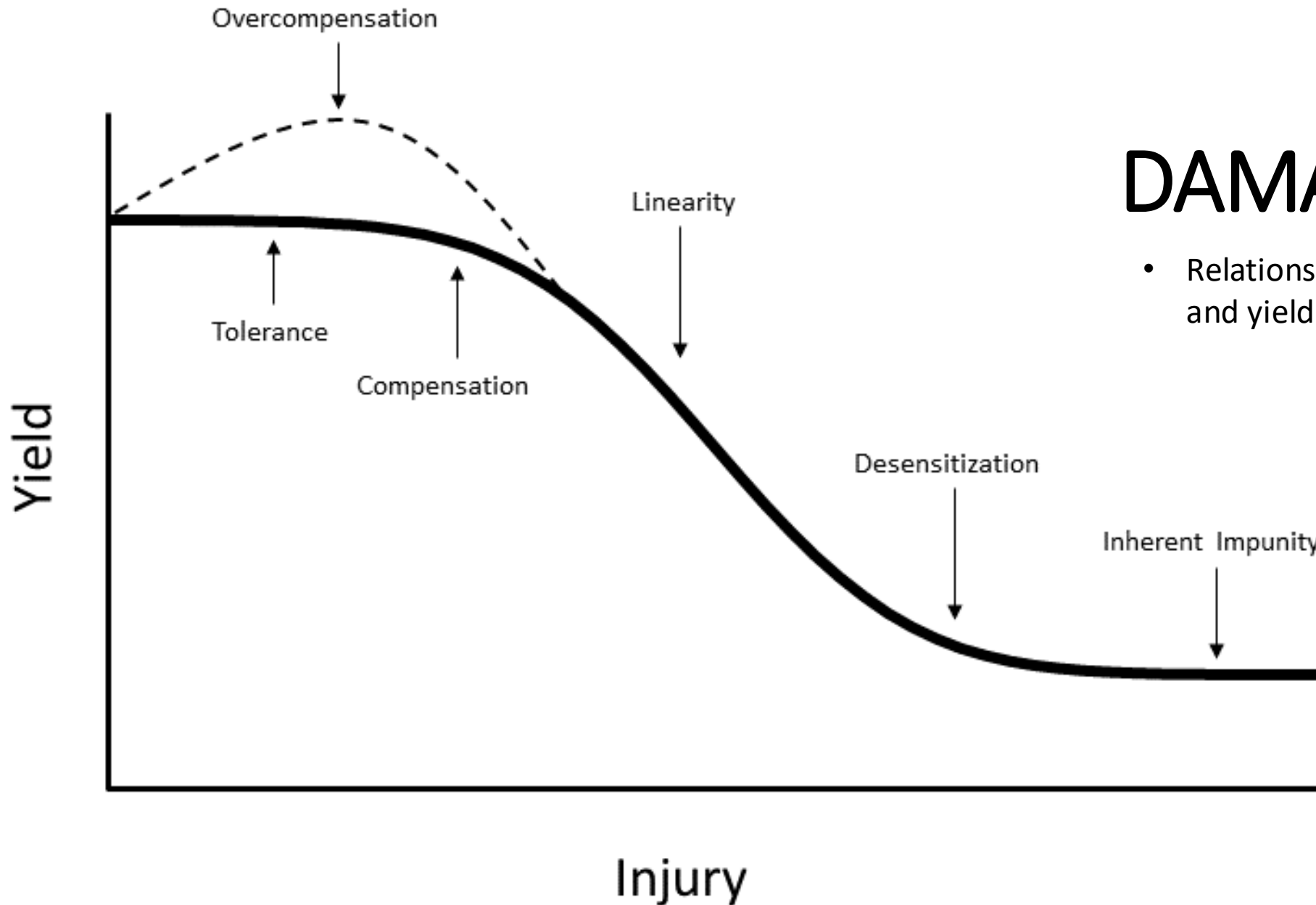


2022
INSECT CONTROL GUIDE
for
Agronomic Crops



Does one size fit all?

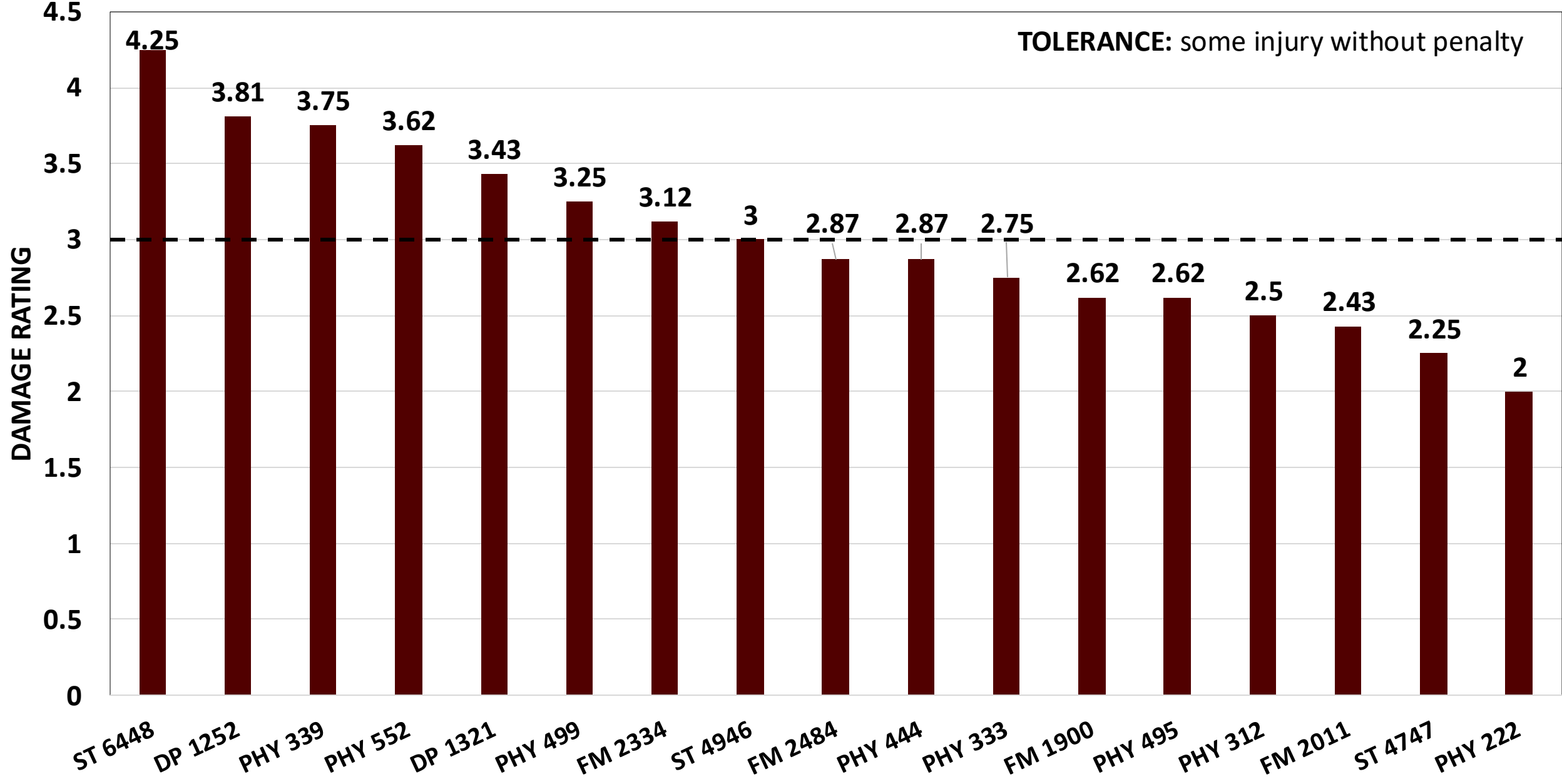
- No
- Guideline for management
- Every situation is different
- The end goal doesn't change



DAMAGE CURVE

- Relationship between level of injury and yield response.

Bueno et al. 2013



OTHER FACTORS:

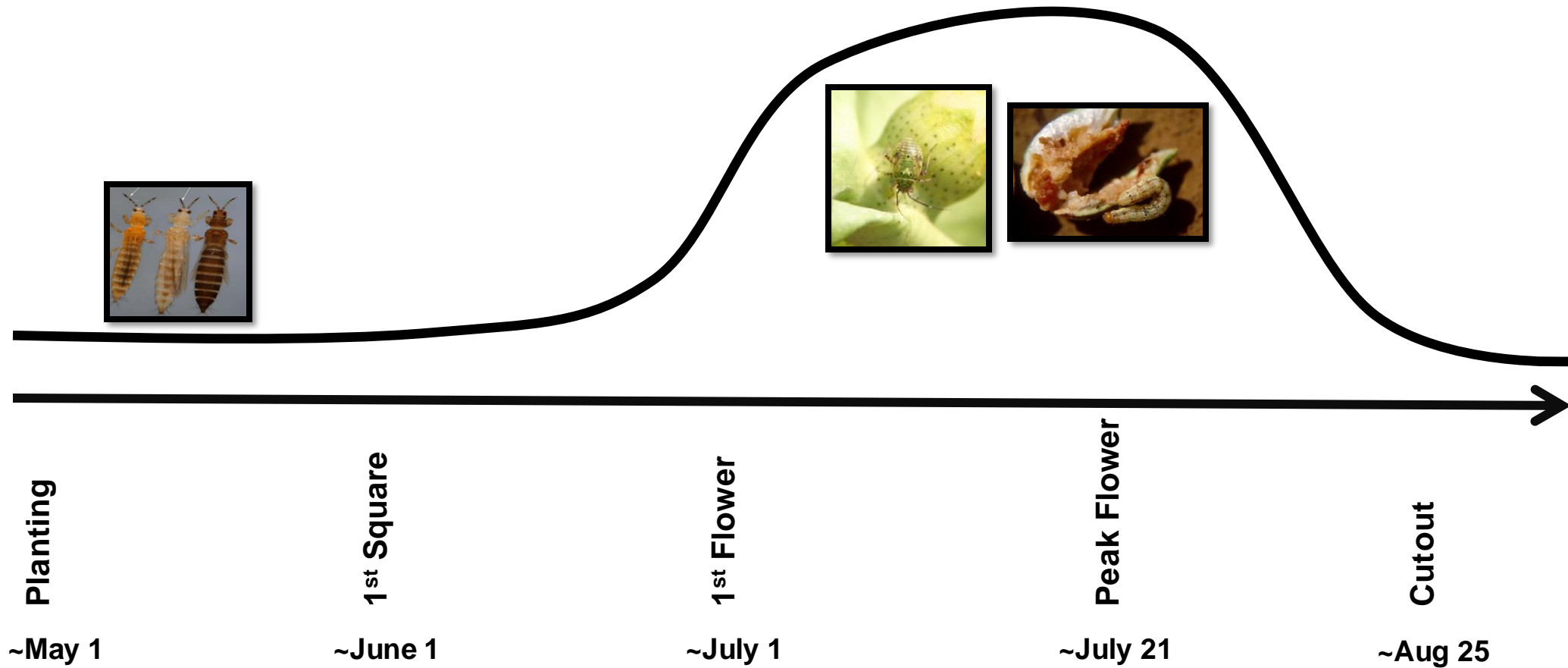
Injury

- Type
- Timing
- Intensity
- Location

Environmental Factors

- Stresses
 - Drought
 - Nutrient Deficiencies

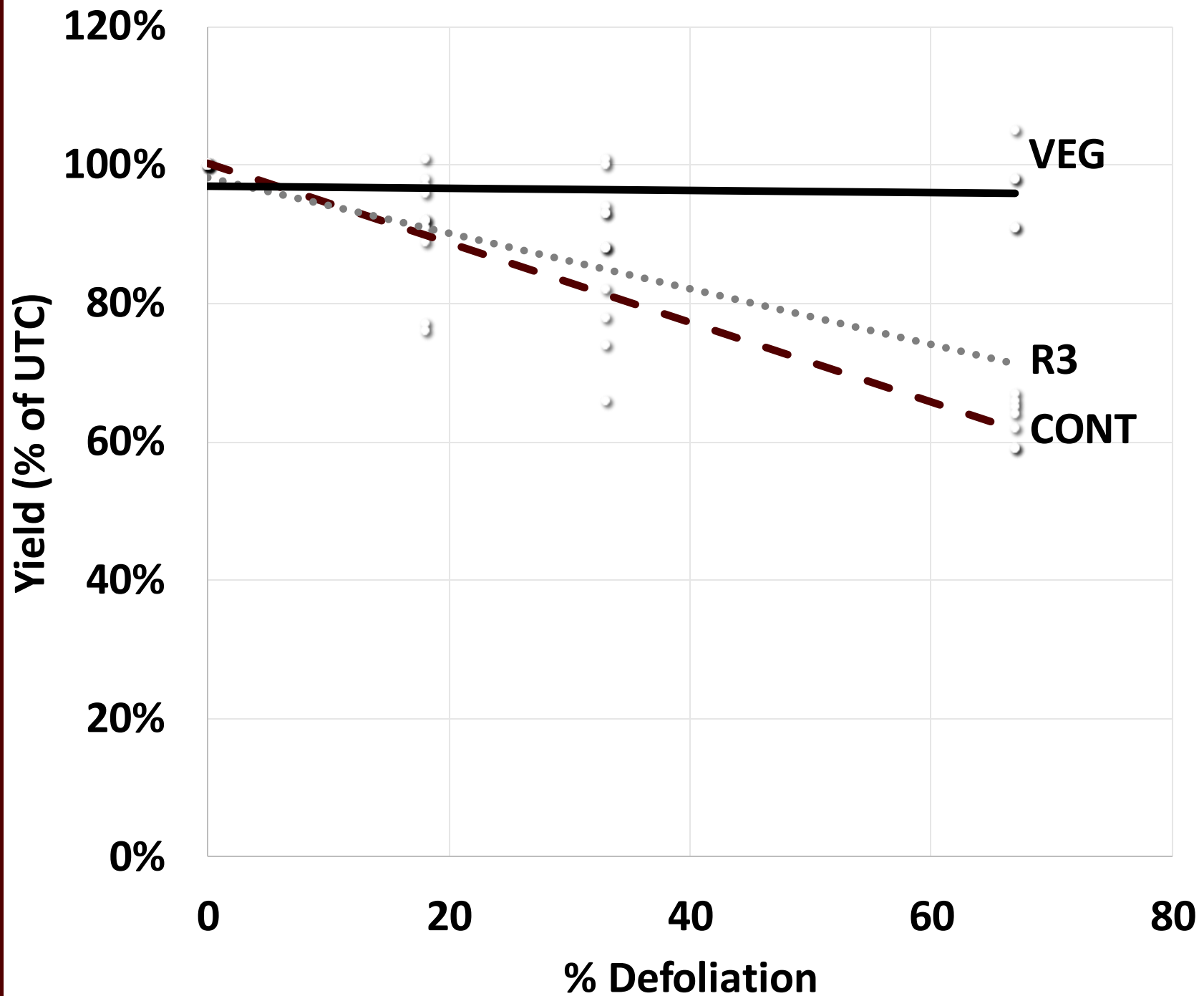
COMPENSATION: increasing yield loss per unit injury







Continuous Defoliation on Soybean Yields



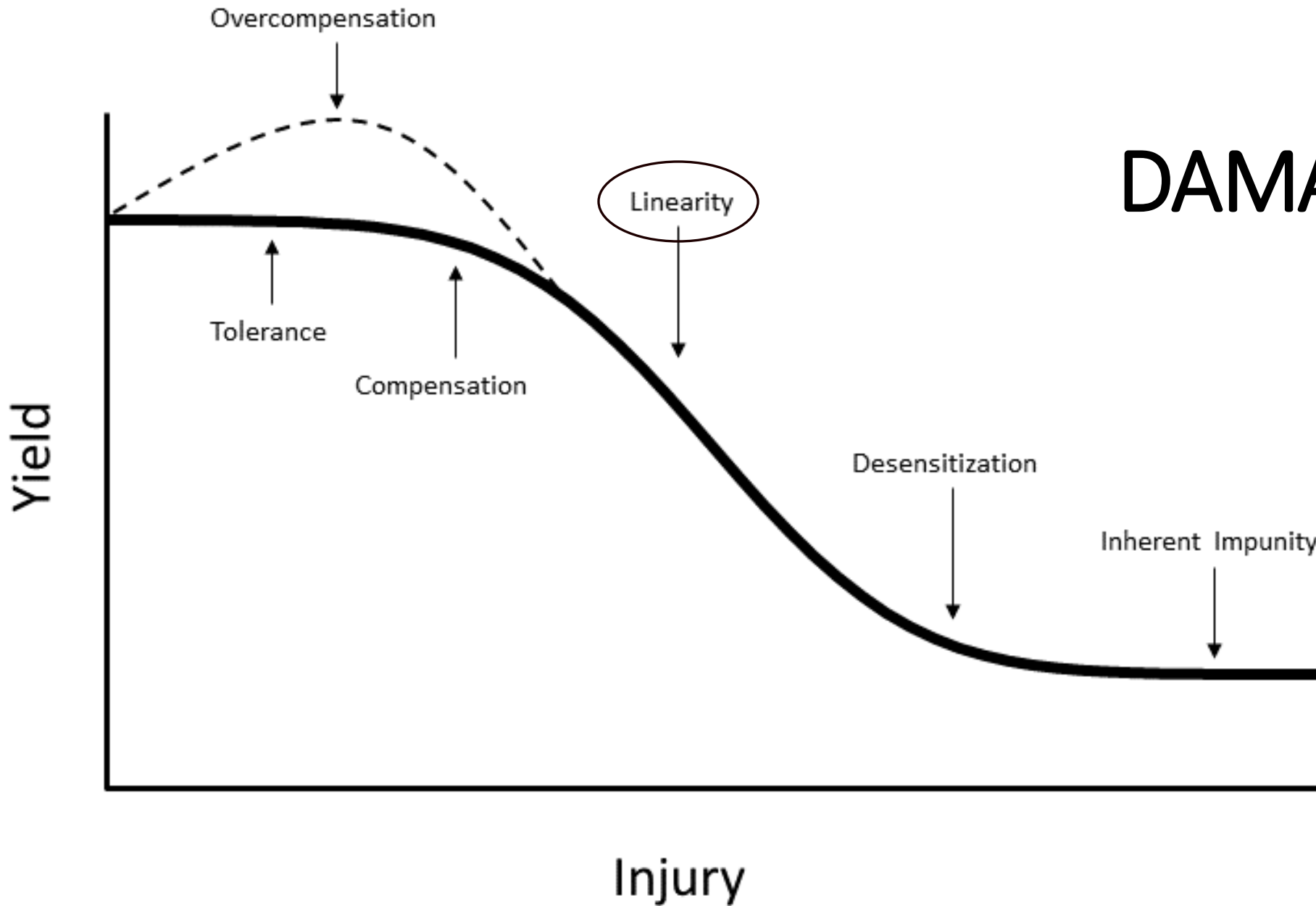


Darrin Dodds



Trent Irby

DAMAGE CURVE



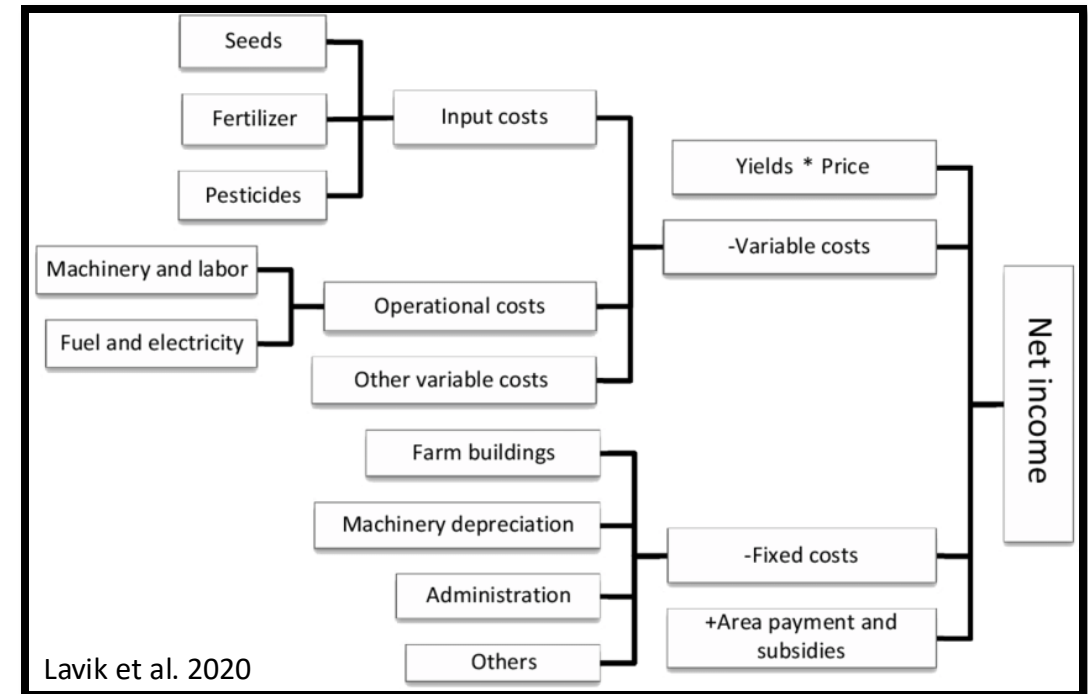
Bueno et al. 2013



Yield Potential and Budgets

- Example:
 - Yield Goal: 100 bushels
 - Market: \$5
 - Budgeted Expenses: \$300

	100 Bushels	50 Bushels
Value	500	250
Expenses	300	300
Profit	200	-50



Adjusting Insect Management

- Rice Stink Bug in Sorghum (<https://extensionentomology.tamu.edu/sorghum-rice-stink-bug-calculator/>)
 - Cost, Value, and Heads/A

High	Grain Value, \$/100 LB			
	6	7	8	10
Control Cost \$/A	Rice Stink Bug Per Head			
6	0.63	0.56	0.48	0.39
8	0.84	0.72	0.63	0.51
10	1.06	0.9	0.79	0.63
12	1.29	1.09	0.95	0.76

Low	Grain Value, \$/100 LB			
	6	7	8	10
Control Cost \$/A	Rice Stink Bug Per Head			
6	1.7	1.12	0.96	0.78
8	1.68	1.44	1.26	1.02
10	2.12	1.8	1.58	1.26
12	2.58	2.18	1.9	1.52

THRESHOLD: Treat when fields average four to five stink bugs per head.



Table 1. Economic thresholds for corn earworm larvae based on sweep net sampling.

Crop value (\$/bu)	Larvae/25 sweeps				
	Control Costs (\$/acre) ¹				
	10	15	20	25	30
6	7.4	11.0	14.7	18.4	22.1
7	6.3	9.5	12.6	15.8	18.9
8	5.5	8.3	11.0	13.8	16.5
9	4.9	7.4	9.8	12.3	14.7
10	4.4	6.6	8.8	11.0	13.2
12	3.7	5.5	7.4	9.2	11.0
13	3.4	5.1	6.8	8.5	10.2

Based on early-planted Maturity Group IV soybean varieties with >50 bu/acre yield potential.

¹Including application costs.

Table 2. Economic thresholds for corn earworm larvae based on drop cloth sampling.

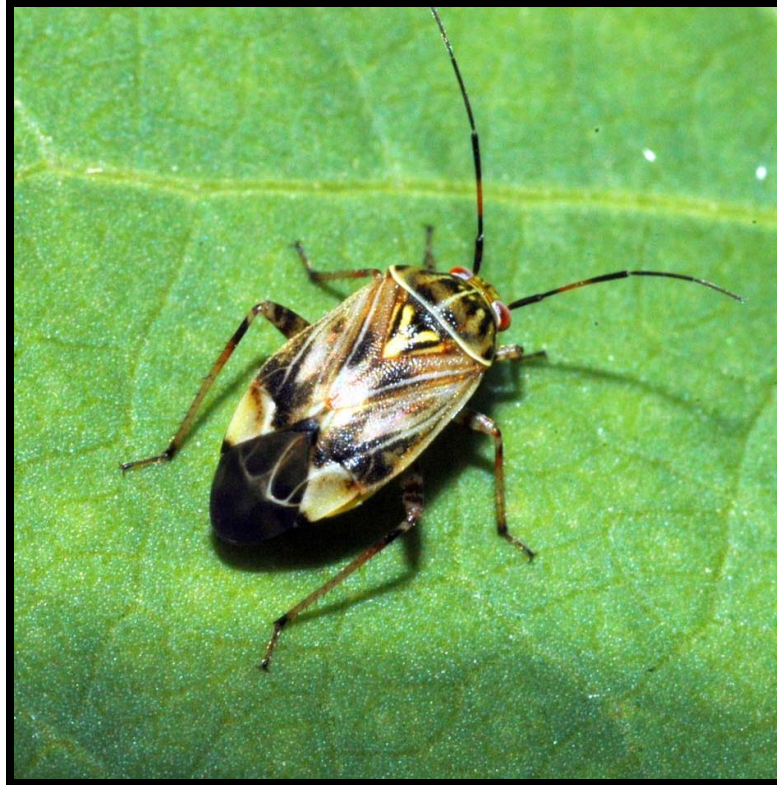
Crop value (\$/bu)	Larvae/row foot				
	Control Costs (\$/acre) ¹				
	10	15	20	25	30
6	1.0	1.5	2.0	2.4	2.9
7	0.8	1.3	1.7	2.1	2.5
8	0.7	1.1	1.5	1.8	2.2
9	0.7	1.0	1.3	1.6	2.0
10	0.6	0.9	1.2	1.5	1.8
12	0.5	0.7	1.0	1.2	1.5
13	0.5	0.7	0.9	1.1	1.4

Based on early-planted Maturity Group IV soybean varieties with >50 bu/acre yield potential.

¹Including application costs.

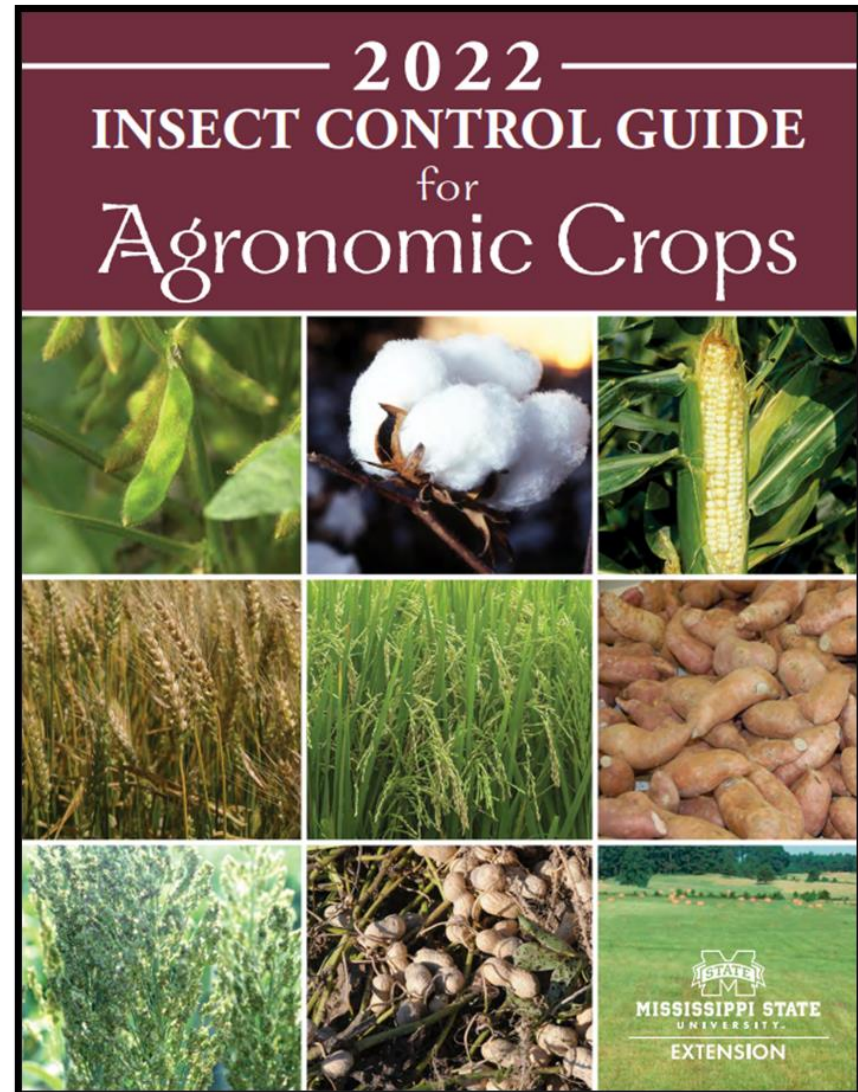
Dynamic Thresholds

IPM PRACTICES



At the end of day:

- Remember ETs
 - Guideline
 - Starting Point
 - Positive Returns
- Other IPM Practices





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