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New Jersey Agricultural Experiment Station

All I have learned about blueberry nutrition in 44 years: Fertilizing Highbush Blueberries Where we were and where we are now

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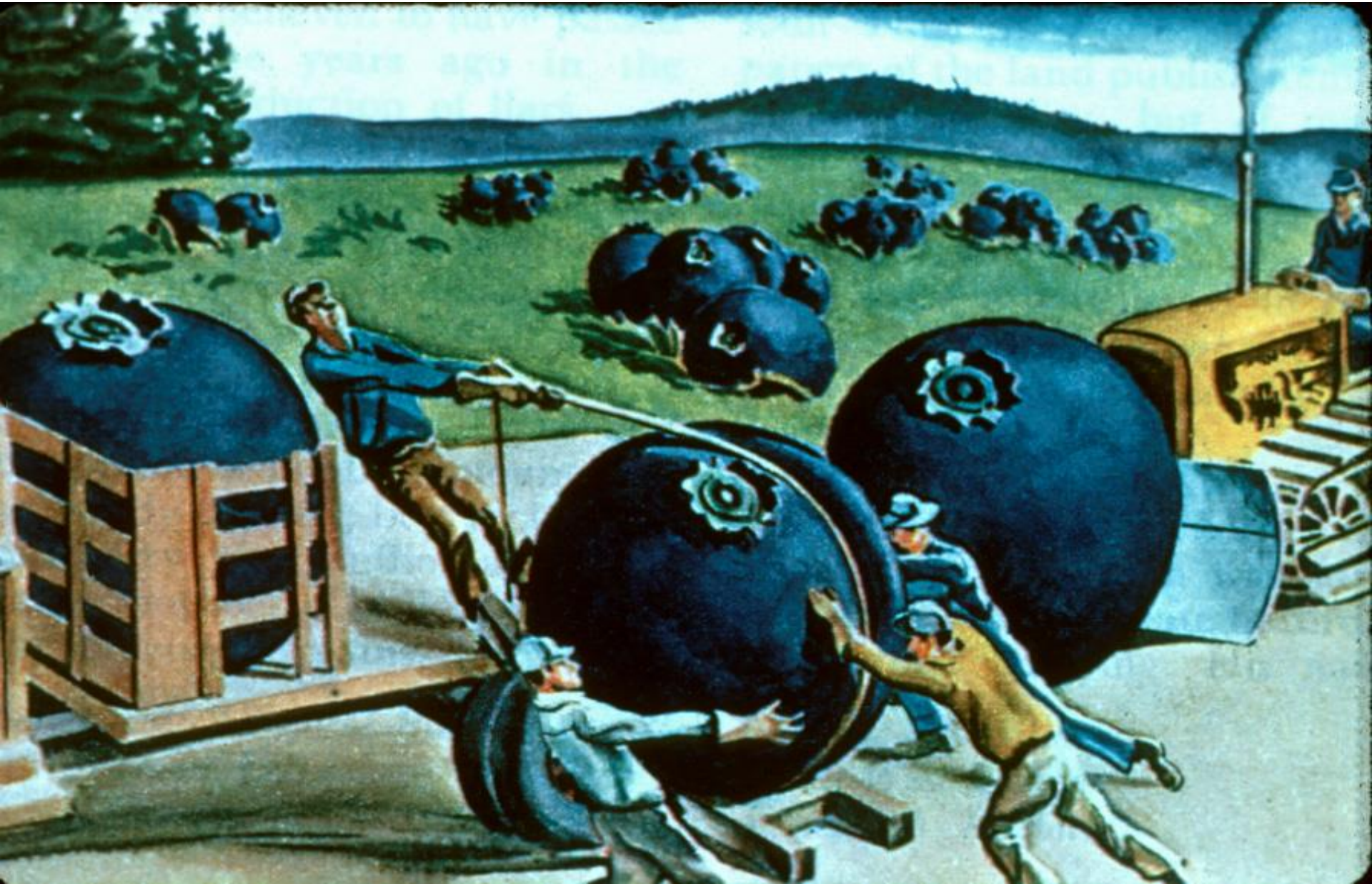

The New Jersey Blueberry Industry

1. **New Jersey's No. I crop in production value.**
2. **$84 million in 2017.**
3. **10,000 acres harvested.**
4. **9% of the total US blueberry crop.**
5. **NJ Ranked 5th in area harvested.**
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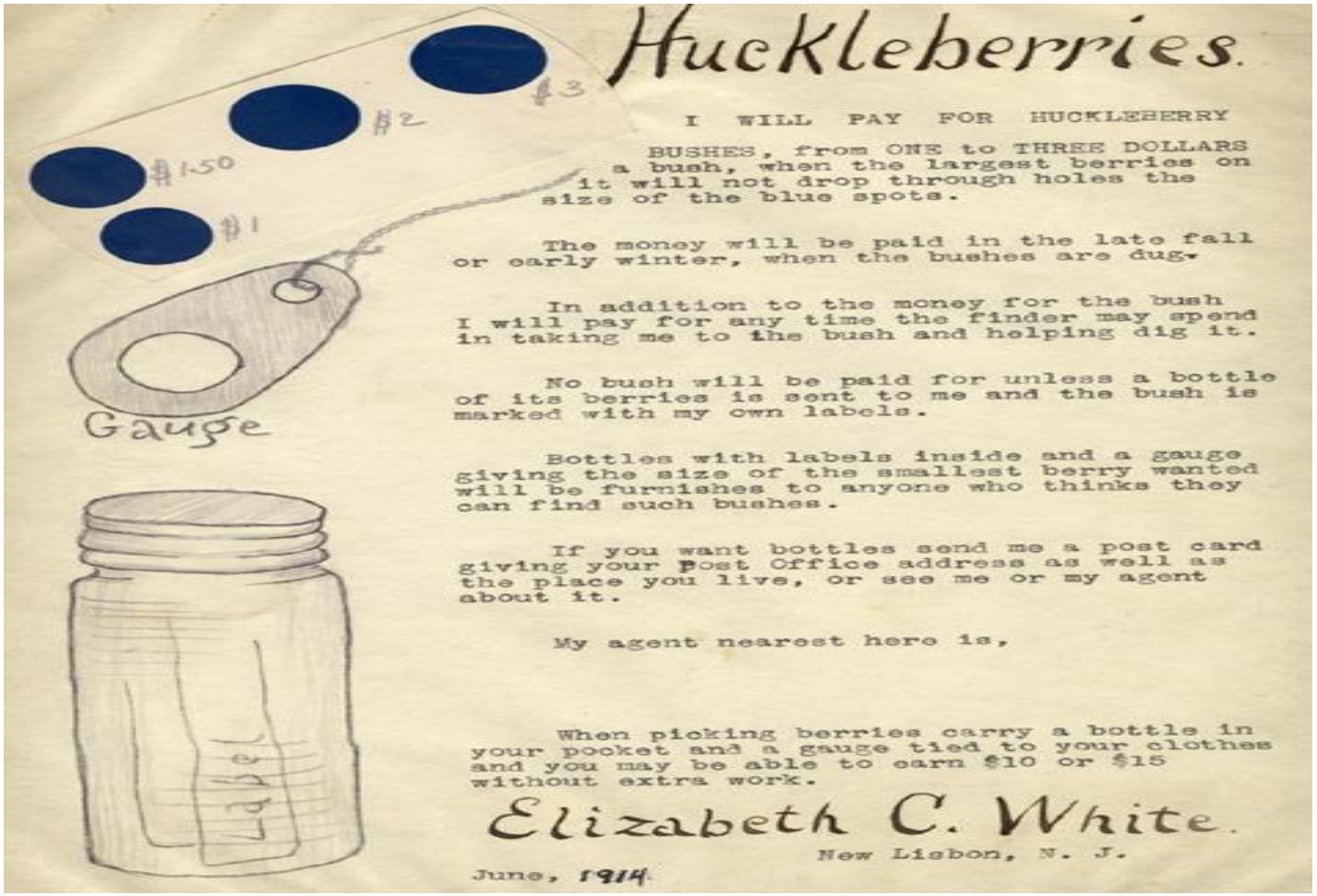
Pictorial of the early blueberry industry



Original public notice used by Elizabeth White to enlist the help of locals, AKA "PINEY'S" in locating the choicest wild blueberry shrubs. Wild blueberries were also known at time as "huckleberries."

"To Grow blueberries successfully, you have to recreate New Jersey"

Pinelands Characteristics

1. pH of 4.5
2. O.M. of 5-8%
3. Well drained, sandy soil
4. Water table at 24-30 in.
5. Rainfall 47 in./yr.
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THREE MOST IMPORTANT FACTORS FOR SUCCESS

- pH
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What have we done to increase yield and quality?

- Monitor pH
- Annual leaf analysis
- Monitor and correct any nutrient deficiency
- Apply fertilizer at the most efficient time for uptake
- Prune correctly
- Control weeds
- Soil health?

SOIL NUTRIENT LEVELS

		Value	Unit	LOW / MEDIUM / HIGH / EXCESSIVE
Soil pH		4.3		XXXXXXXXXX
Phosphate	(P_2O_5)	781	lb/A	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Potash	(K_2O)	178	lb/A	XXXXX
Magnesium	(MgO)	103	lb/A	XX
Calcium	(CaO)	1400	lb/A	XXXXXXXXXXXXXXXXXXXX

RECOMMENDATIONS FOR BLUEBERRIES

See Back For Comments

Leaf Tissue Analysis

Sample #39

Nutrient	Deficiency	Excessive (#)
N	27	0
P	0	1
K	1	1
Mg	16	0
Mn	31	0
Fe	38	0
Cu	26	0
B	36	0
Zn	22	0

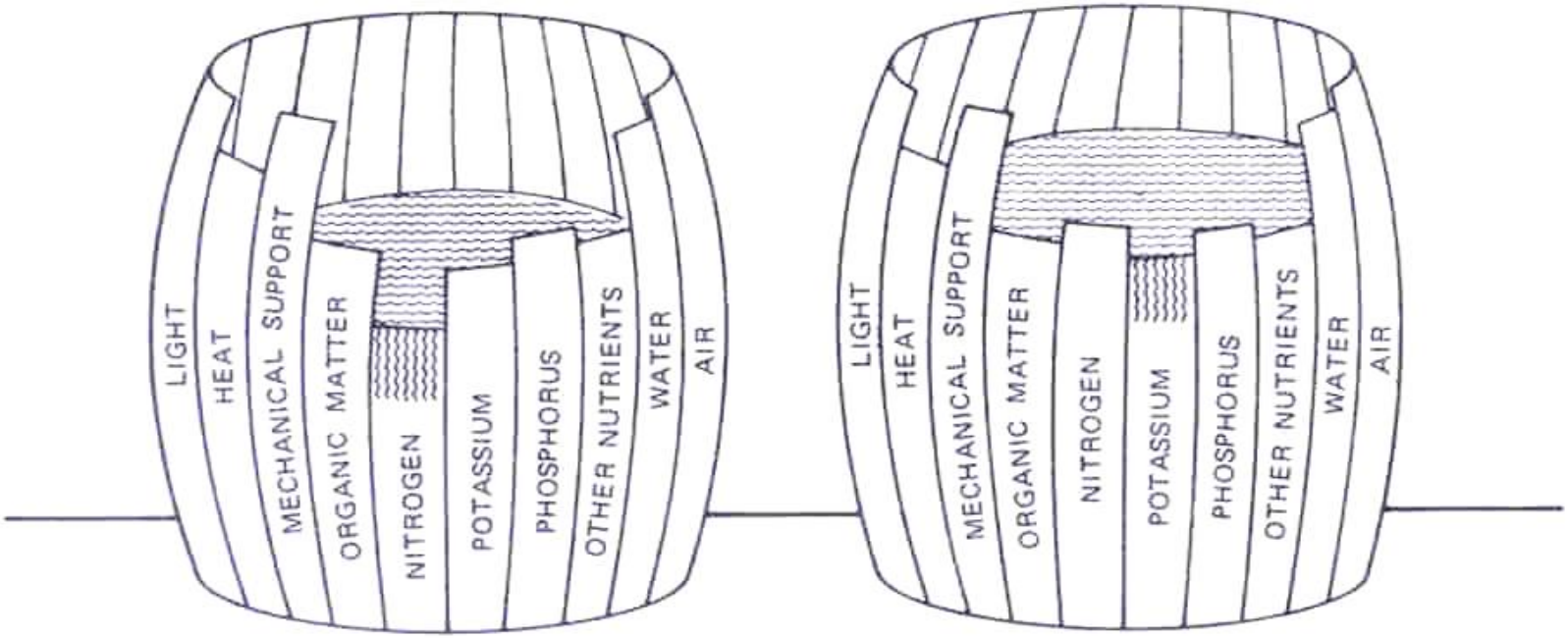
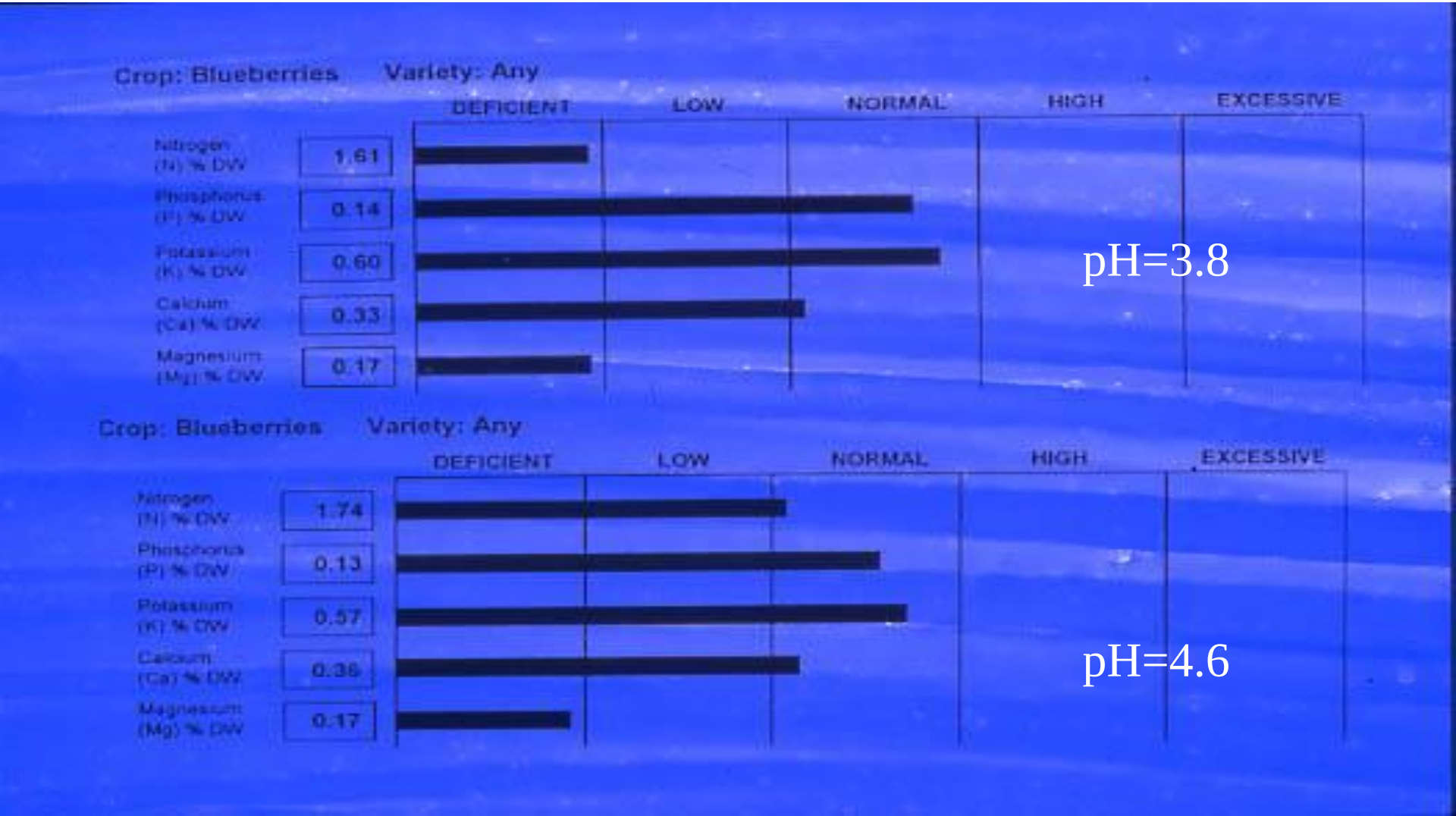


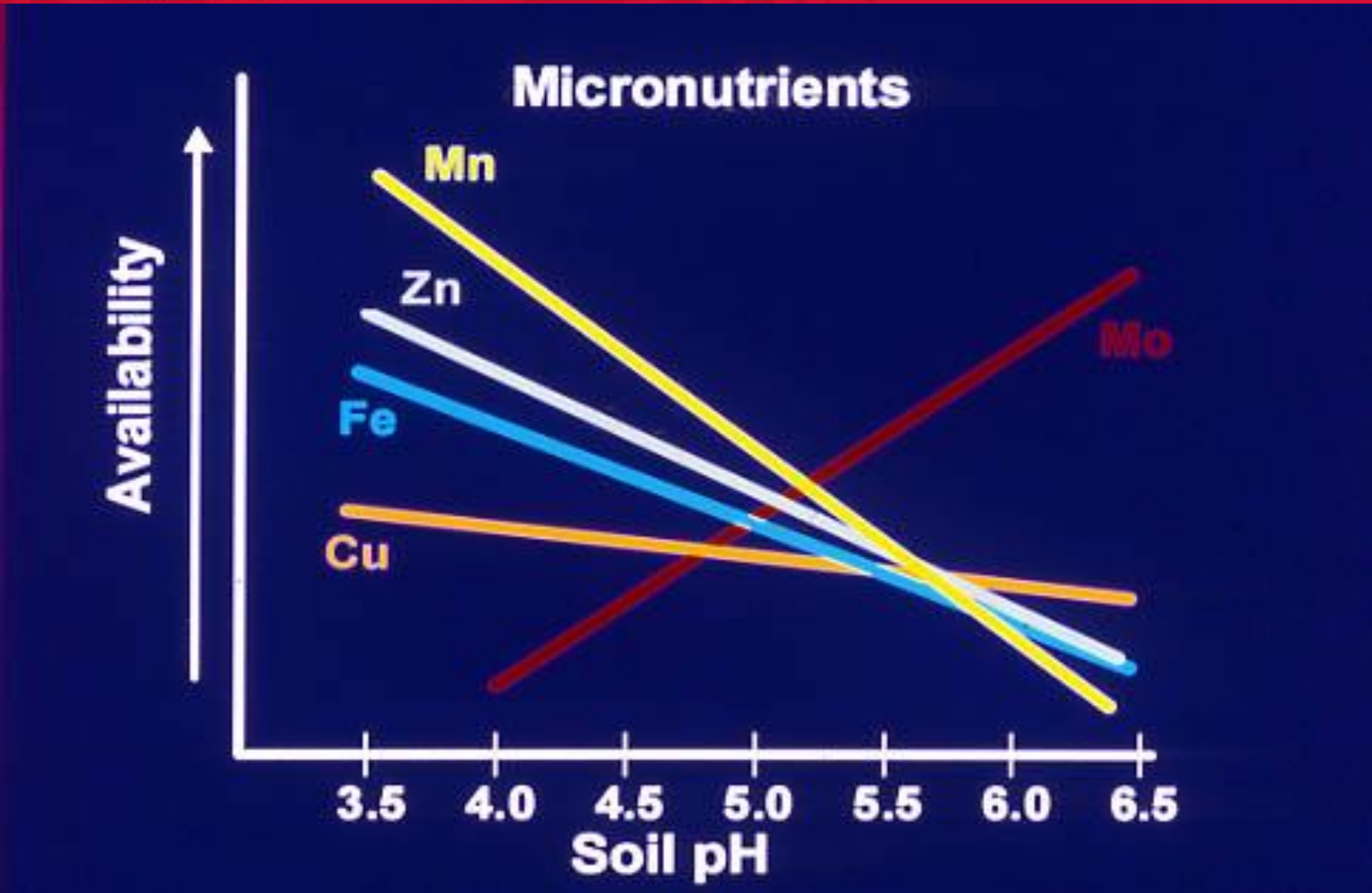
FIGURE 2:1. An illustration of the principle of limiting factors. The level of water in the barrels above represents the level of crop production. (*Left*) Nitrogen is represented as being the factor that is most limiting. Even though the other elements are present in more adequate amounts, crop production can be no higher than that allowed by the nitrogen. When nitrogen is added (*right*) the level of crop production is raised until it is controlled by the next most limiting factor, in this case, potassium.

pH effect on N uptake



Low Nitrogen Effects

1. Decreased cell division
2. Decreased cell expansion.
3. Prolonged dormancy.
4. Delayed bud swell.
5. Reduction in size of leaves, fruit, stems and roots.
6. Decrease in formation of laterals.
7. Chlorophyll production decreased.
8. Premature leaf abscission.


Micronutrients
Mn
Zn
Fe
Cu
Mo
Availability
3.5
4.0
4.5
5.0
5.5
6.0
6.5
Soil pH

Iron and Boron Effects

Iron:

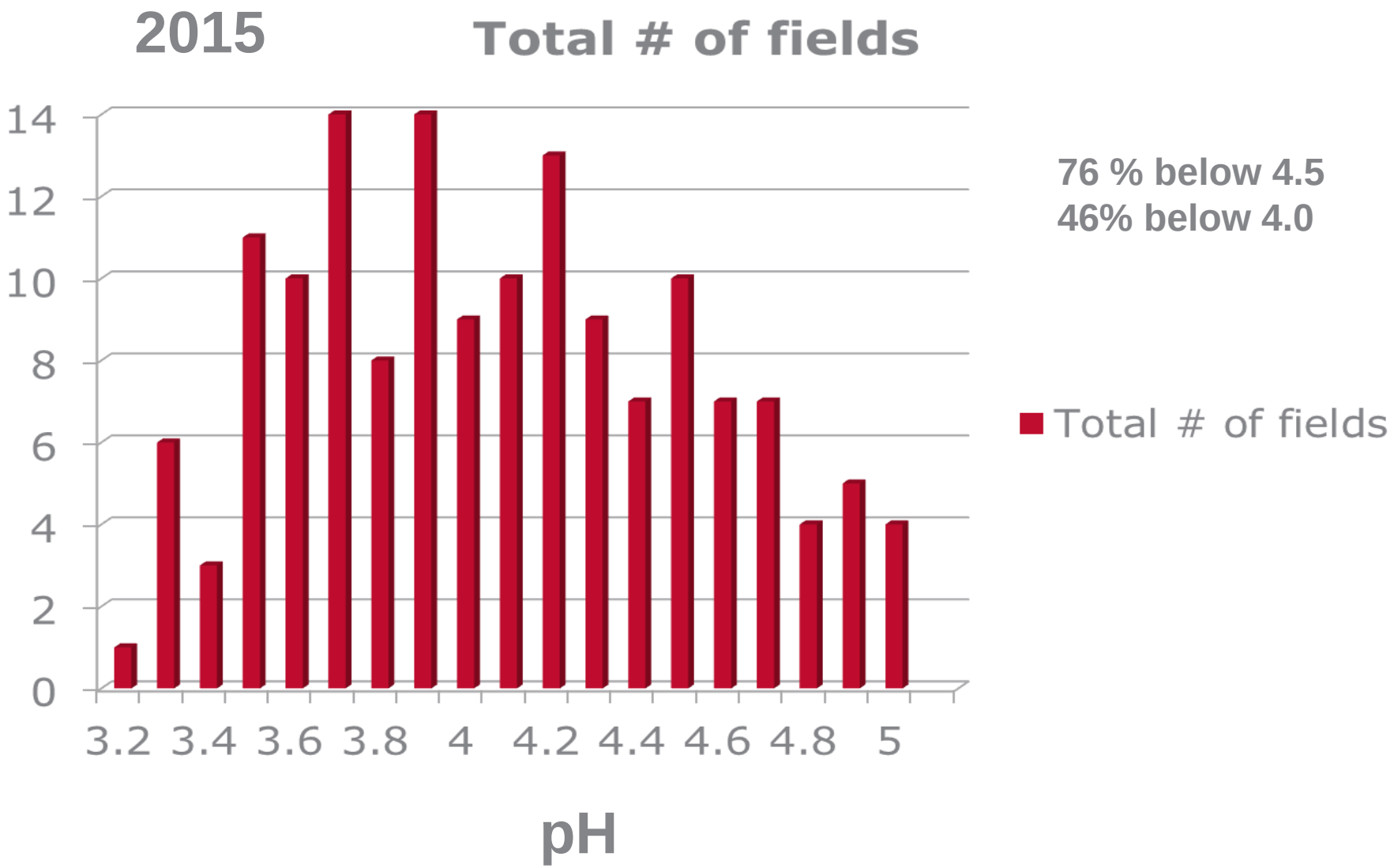
1. Decreased photosynthesis.
2. Decreased protein synthesis.
3. Decreased chlorophyll synthesis.

Boron:

1. Decreased pollen tube growth.
2. Decreased fruit set.
3. Decreased cell division.
4. Decreased sugar movement in the plant.

Iron chlorosis due to high pH

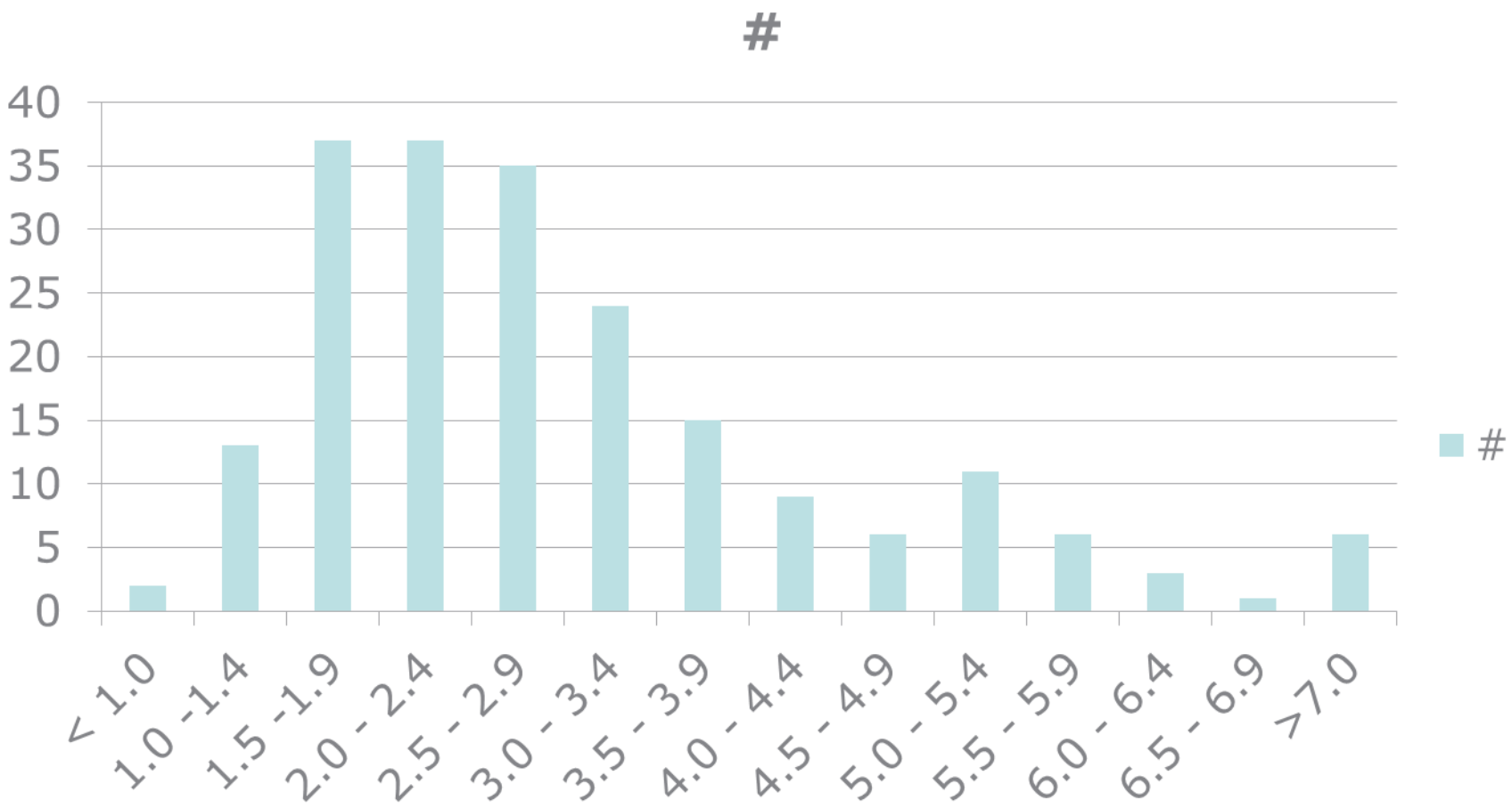
High pH effect on root growth



76 % below 4.5
46% below 4.0

Soil Health?

Field Organic Matter %



How has the pH gotten so low?

- 1. 10-10-10 contains ammonium sulfate(NH4)2SO4. In the soil the ammonium ion is released and forms a small amount of acid, lowering the pH balance of the soil.
- When ammonium is absorbed by the blueberry plant, is acidifies their root zones, unlocking P, Z, B, Fe, Cu and MN from fertilizers and soil.
- Note that the sulfate has a negligible effect on pH.
- However, elemental sulfur WILL lower pH.

Other factors to consider

- The pH of your irrigation water.
- The breakdown of the soil organic matter.
- The pH of your mulch
- The lower the CEC, the faster the soil pH will decrease with time.

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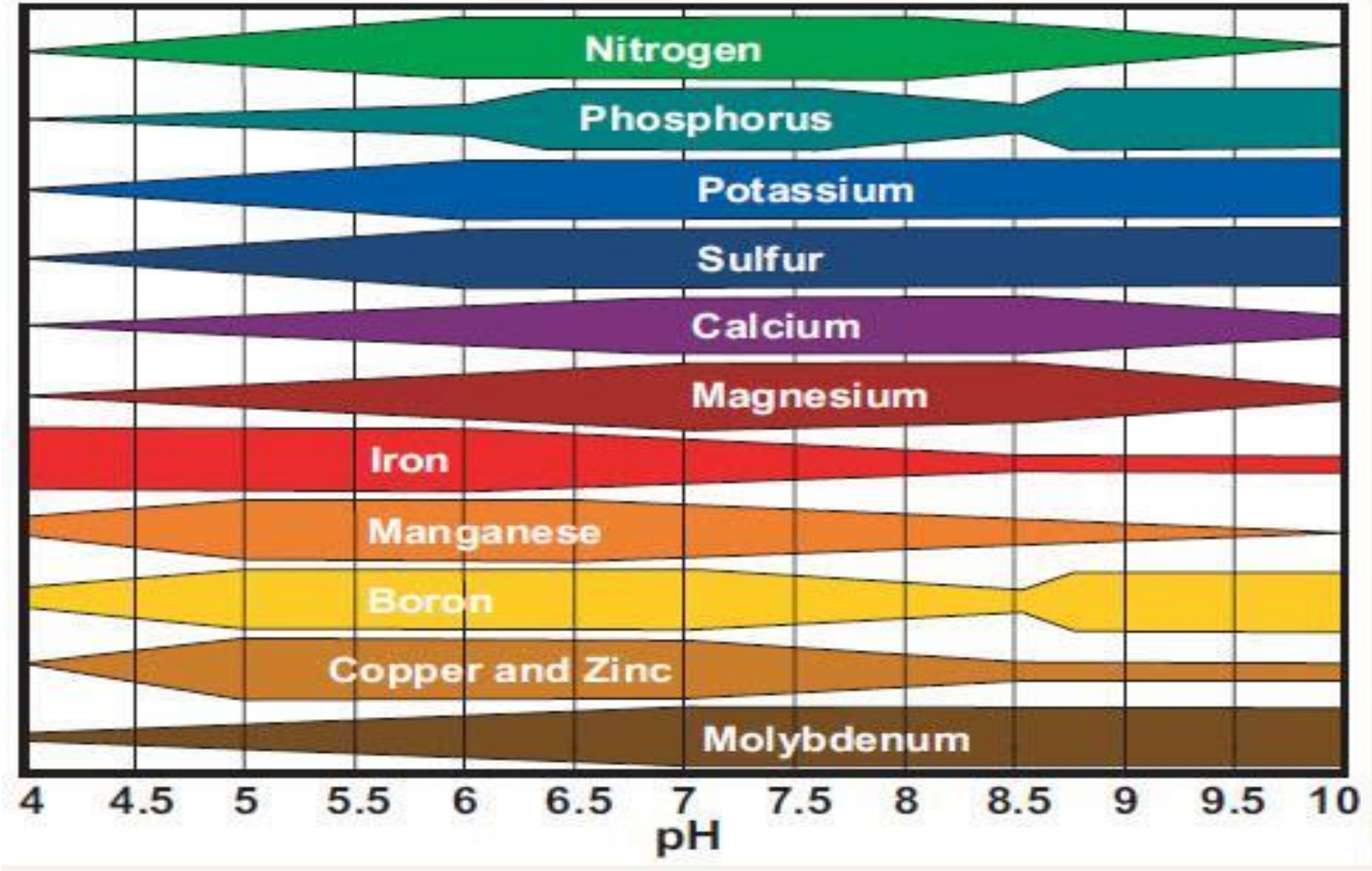
How soil pH affects availability of plant nutrients



What should be done?

Lime is the answer. How much?

100 lbs. of lime for every .1 of increase needed in the pH.

Example: To increase the pH from 3.5 to 4.5, 1000lbs. of lime needed.

Dormant Fertilization was norm 10 years ago

Old Method:
Dormant & petal fall

New Method:
Bud Break & 6 weeks later

Newer Method:
Spread out the application over 6 weeks starting at bud break
Fertigation

Oakcrest Farms - Hammonton

- Total NPK=60lbs./A
- Fertigate for 6 weeks
- Fertigate every morning
- Soil Moisture Sensors in drip line signal satellite
- Satellite turns on and off pumps
- Micro-nutrients also supplied
- Decreased NPK from 80#/A to 60#/A
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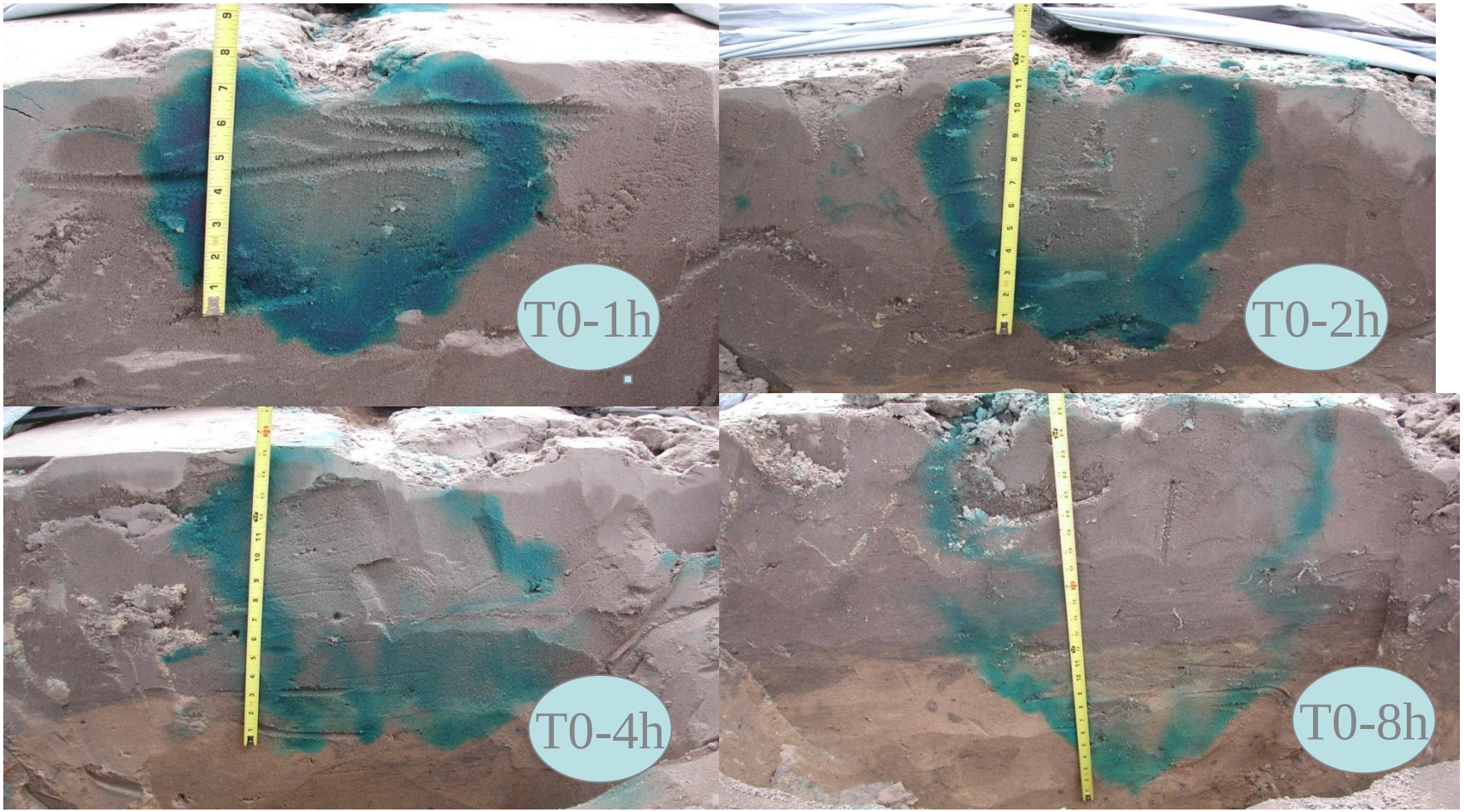
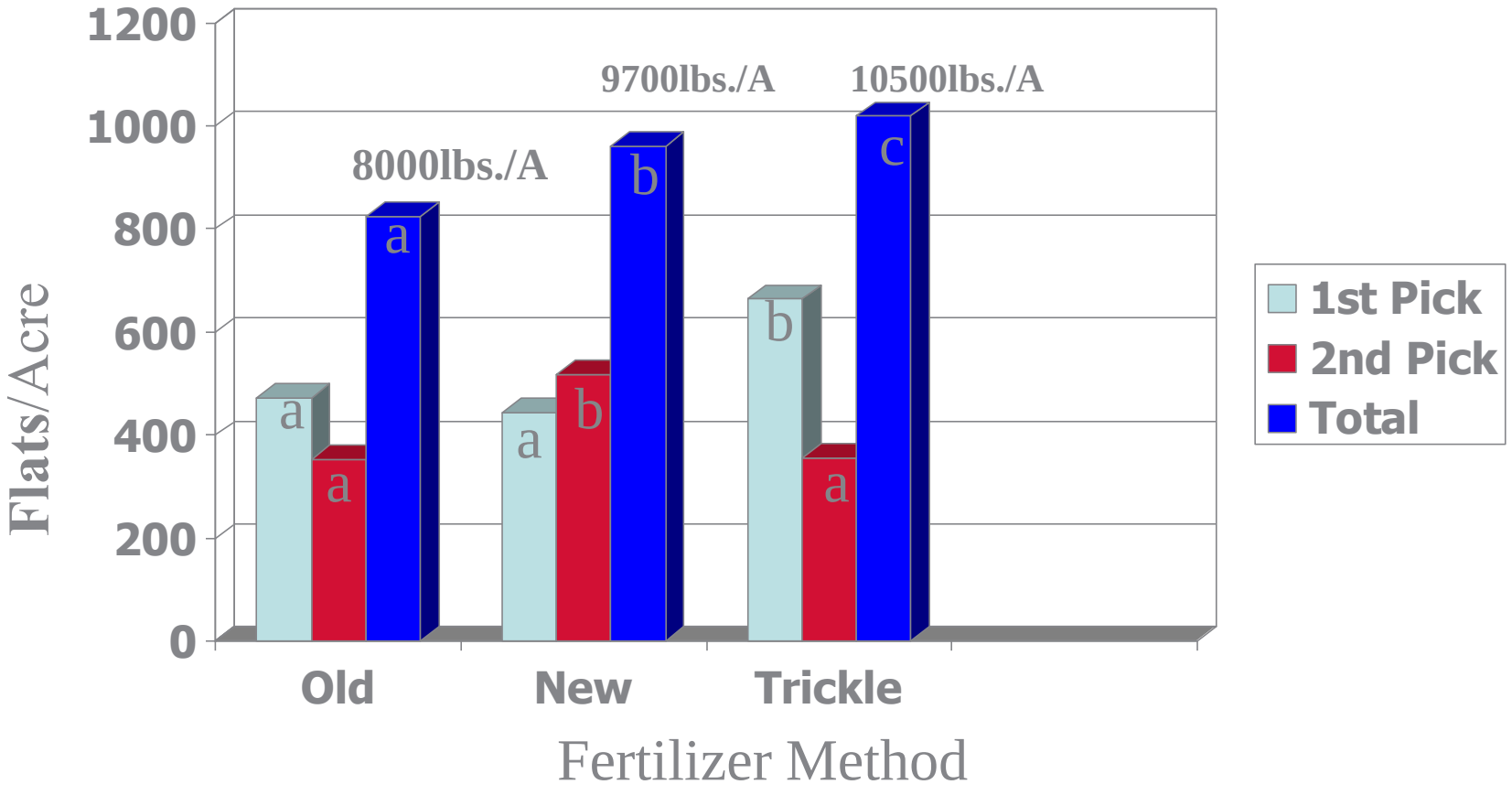
Fertigation distribution with time



Yield as affected by fertilizer timing and method - 2002



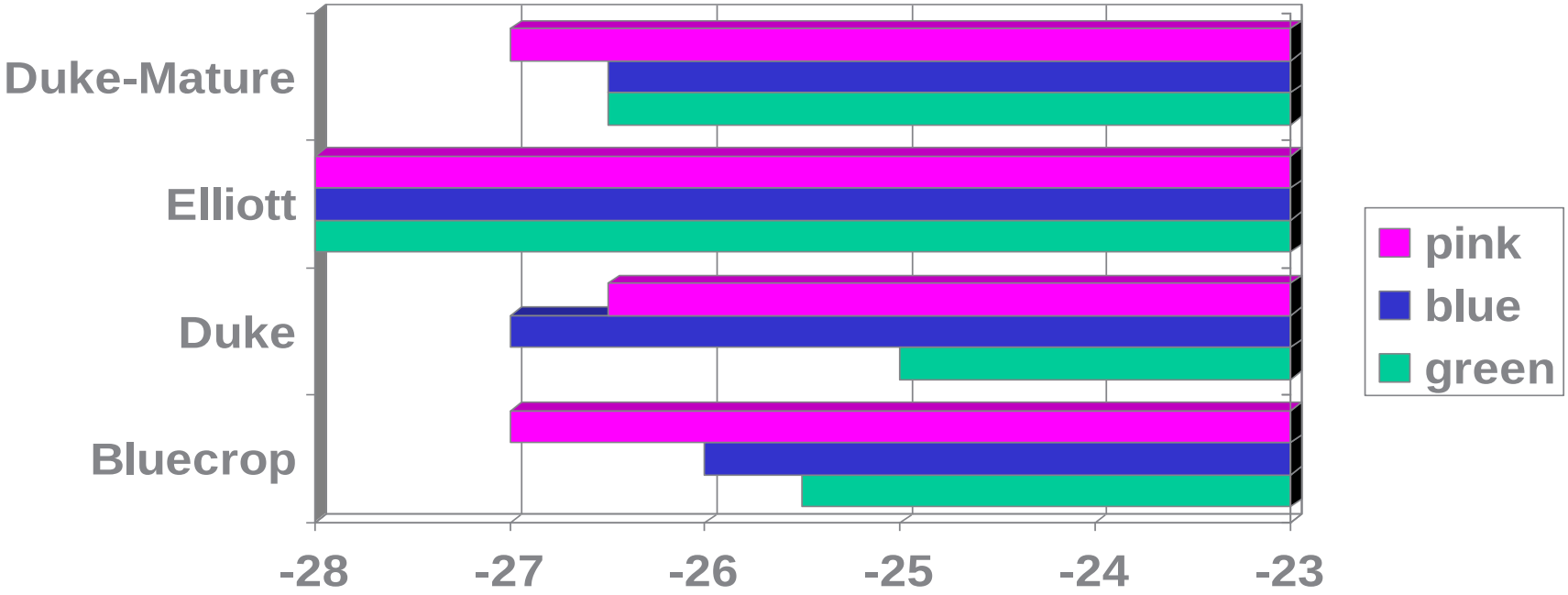
Fertilizer keys

- **Timing makes fertilizer more efficient.**
- **pH pH pH**
- **Leaf analysis is the only way to go.**
- **High soil P does not mean you don't apply P.**
- **Iron deficiency sometimes is not a function of high pH, especially with 'Duke'.**
- **Boron is different from the other micros.**
- **Micro teas are a No NO.**
- **Using Ammonium Sulfate decreases pH.**
- **OM in Atlantic County Fields is dropping like a rock.**
- **Spreading fertilizer applications out results in more yield.**

Conclusions:

- Fertilizer recommendations are based on leaf analysis.
- pH is monitored annually, optimum is 4.5-4.8.
- Fertilizer application is later= more efficient, higher yield(22,000lbs./A), firmer fruit.
- Fertigation results in even higher yields.

Bud hardiness- Estimated LT50s Freeze Date 1/14/2009



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BC –Yellow

10-10-10 600lbs. total

Grower standard

BC - Orange

10-10-10 + post- bloom 21-0-0

High rate 1,000lbs. total

10-10-10 + post- harvest 21-0-0

Late 1 – 600lbs. + 150

BC - Green

10-10-10 + 21-0-0 + 21-0-0

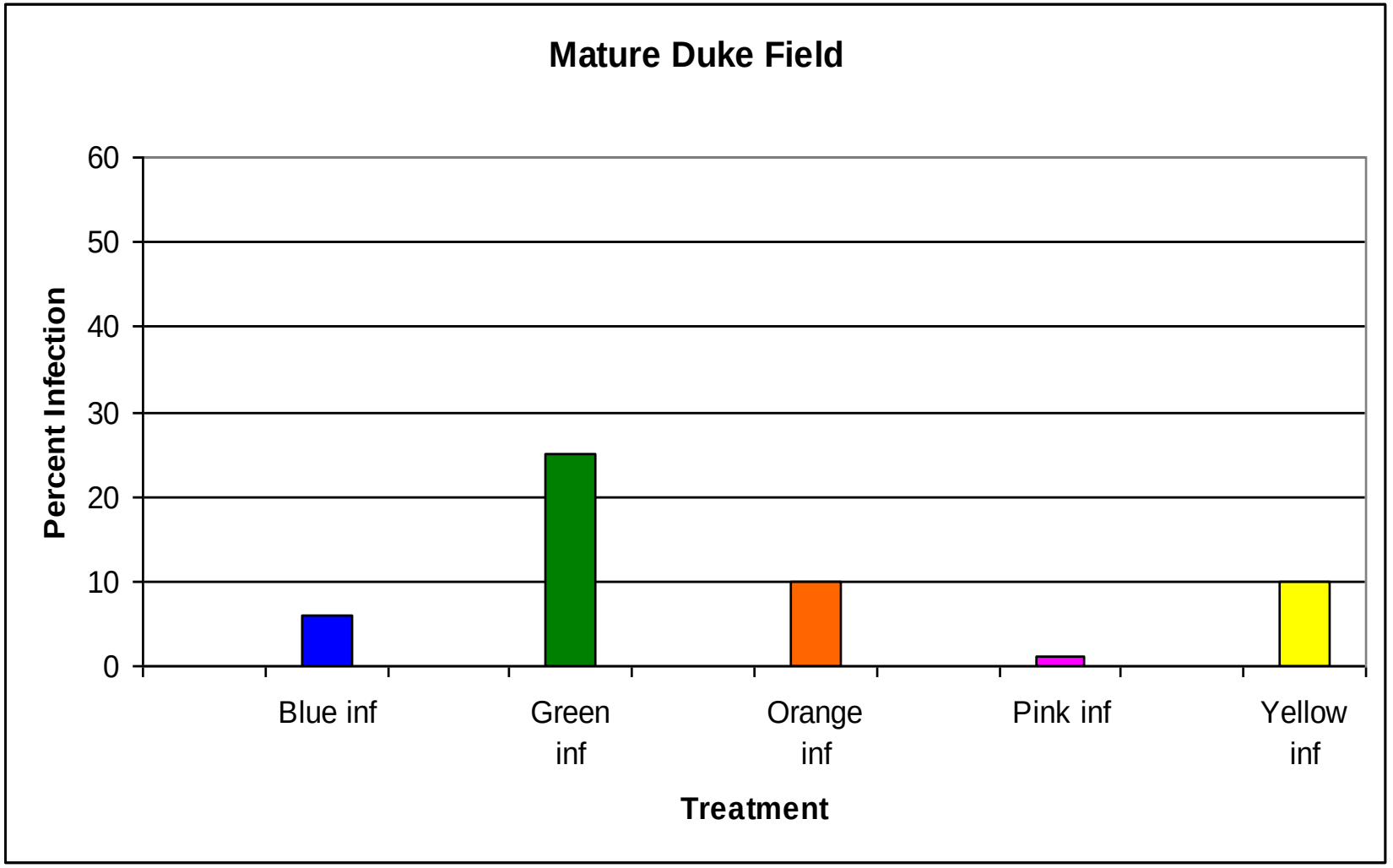
Late 2 – High rate 1,000lbs. + 150

BC - Blue

Control 0 lbs. total

Bluecrop -November 13, 2008

Stem blight infection as affected by nitrogen level



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1 weed = $1 lost

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Nitrogen deficiency

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Phosphorus deficiency

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Potassium deficiency

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Magnesium deficiency

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Boron deficiency

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Iron deficiency

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Micro-nutrients sources and rates

Nutrient	Product	Method	Rate
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Boron	Solubor20	Ground	5lb./A
Boron	Borax11	Ground	10lb./A
Copper	Cu chelate	Foliar	Label Rate
Iron	Fe chelate	Foliar	Label Rate
Mn	Mn chelate	Foliar	Label Rate
Mn	Mn sulfate	Foliar	2 lb./A
Zn	Zn chelate	Foliar	Label Rate

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Blueberry Diagnostic Resources

1. Rutgers - The Blueberry Bulletin – www.rcre.rutgers.edu/pubs/blueberrybulletin

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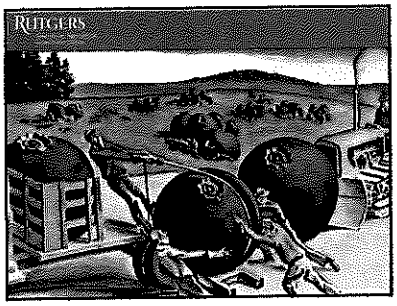

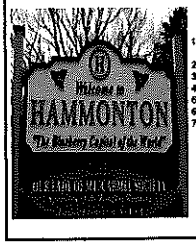

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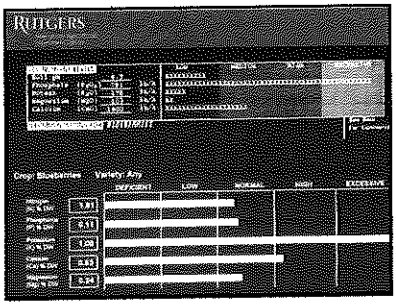

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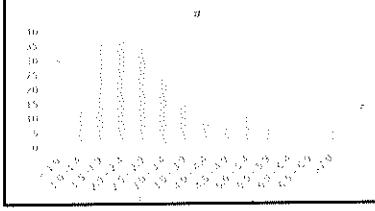

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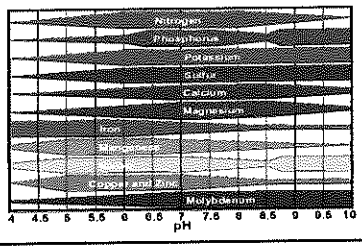

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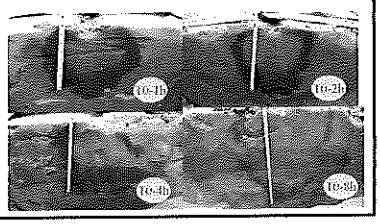

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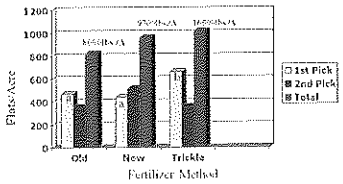

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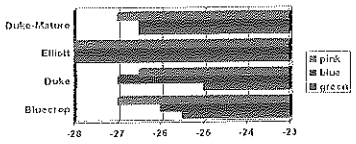

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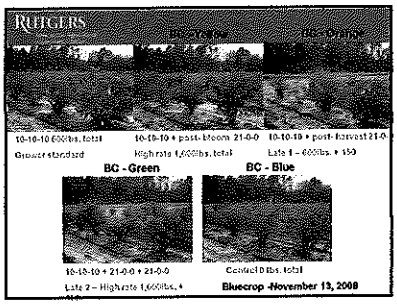

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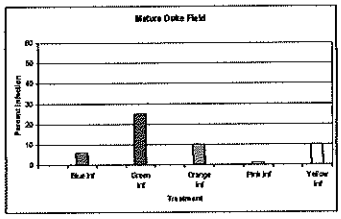
Stem blight infection as affected by nitrogen level



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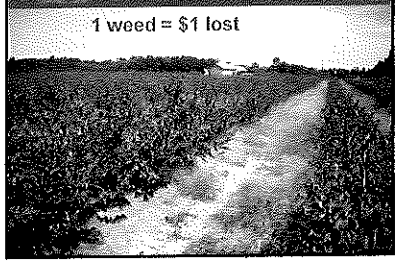

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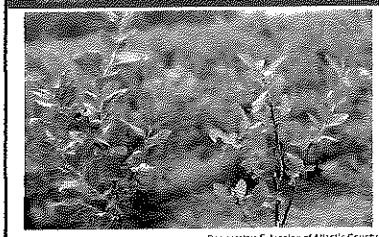
Nitrogen deficiency



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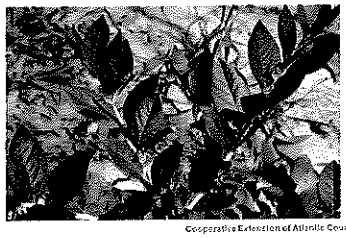
Phosphorus deficiency



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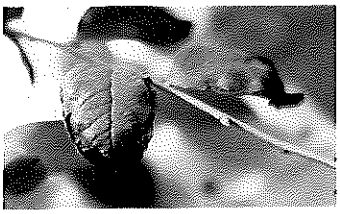
Potassium deficiency



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Magnesium deficiency

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Boron deficiency

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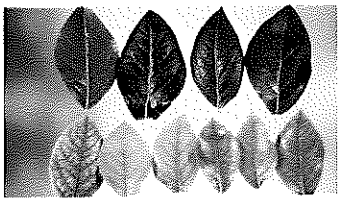
Iron deficiency



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