AGR 1402 Important Agriculture Concepts

Lesson Objectives

- By the end of the lesson you should be able to:
  - Understand physical dimensions of an acre
  - Calculate input needs based on area to treat
  - Think about agronomic decisions and field areas

Useful Agronomic Numbers

- Determine seed to order

- How much manure to apply

- How much chemical to mix

1 acre	is 1 rod wide and ½ mile long 1 rod 16.5 feet
1 mile	5280 feet, ½ mile 2640 feet
1 acre	43,560 sq feet 1 sq foot 144 sq inches
1 acre	6,272,640 sq inches
1 inch rain on 1 acre	6,272,640 cu inches water
1 gallon water	8.3453 pounds
1 cu foot water	7.48052 gallons
1 cu foot water	62.42718356 pounds
1 cu foot	1728 cu inches
1 cu inch water	0.036126842 pounds
1 cu inch water	0.004329005 gallons
1 acre inch of water	27,154.2876 gallons
1 acre inch of water	226,610.6763 pounds
1 ton	2000 pounds
1 acre inch of water	113.3053382 tons

https://www.ag.ndsu.edu/archive/dickinso/research/2004/PDF/range04c.pdf

Farmer Exercise

- Manure spreader applies 20' wide and carries 4,000 gallon
  - Soil and water allows to apply 6,000 gpa swine manure
  - Field is ¼ mile (1,320') long
  - Buffer width and ends 60' spread 1,260'
  - Discharge rate is 800 gallon per minute
  - How fast do you drive?

- 20' x 1,320' = 25,200/43,560 = .57 Acre
- 4,000 (g/l) / 6,000 (g/a) = .66 acre per load
- 4,000 g / 800 g/m = 5 m
- 1320 ft / 5m = 264 ft / minute
- 264 (ft/m) / 60 (sec/m) = 4.4 ft/sec
- 1 mph = 1.5 ft/sec
- 4.4 (ft/sec) /1.5 (ft/sec) = 3 mph

What is an Acre?

- 43,560 Square Feet

- 208.7' x 208.7'

- Acre Furrow Slice is 6.5" or .55'
  - Weighs approximately 2 million pounds

- What is the value of the acre furrow slice?
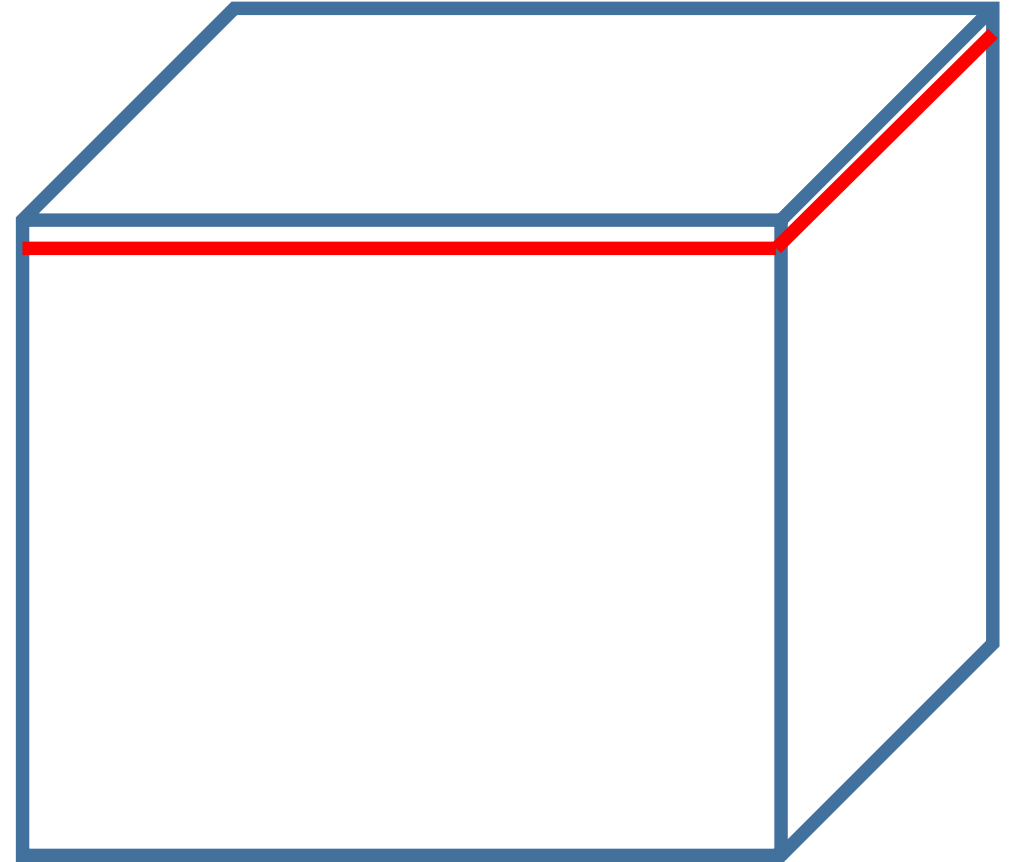
Mental Exercise

- If an acre of land sold for $10,000 an acre, what is the value of 1/32"?

- If we accept that we farm the top 6.5" which is more or less our top soil, then we have 6.5 (total inches) x 32 (1/32 per inch) = 208

- $10,000 / 208 = $48.07 per 1/32" of Soil

- Remember 2,000,000 / 208 = 9,615 Pounds of Soil in 1/32"

- Is this important?

Let's Keep Thinking

- 2007 USDA NRS Estimated Losses in Tons per Acre
  - Water Erosion 2.7
  - Wind Erosion 2.1
  - Total Erosion Ton per Acre 4.8
- 4.8 x 2,000 = 9,600 pounds of soil lost by erosion
- 9,600 Pounds of soil = 1/32" = $48.07 per acre lost

Table 18. Water (Sheet & Rill) Erosion on Cropland, by Year, with Margins of Error

Year	Million Tons per Year	Tons per Acre per Year	
1982	1,676.50 ±13.3	4 ±0.0	
2007	959.9 ±14.9	2.7 ±0.0	

Notes:
- Cropland includes cultivated and non-cultivated
- Estimated margins of error <.05 are shown as 0.0.

Table 19. Wind Erosion on Cropland, by Year, with Margins of Error

Year	Million Tons per Year	Tons per Acre per Year	
1982	1,384.50 ±28.9	3.3 ±0.1	
2007	765.1 ±37.8	2.1 ±0.1	

Notes:
- Cropland includes cultivated and non-cultivated
- Estimated margins of error <.05 are shown as 0.0.

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/nri/results/?cid=stelprdb1041678

Acre Inch of Water

- Does water cause soil compaction?

- 1 Gallon of water across an acre is 27,154 Gallons

- 1 Gallon of water weighs 8.34 pounds
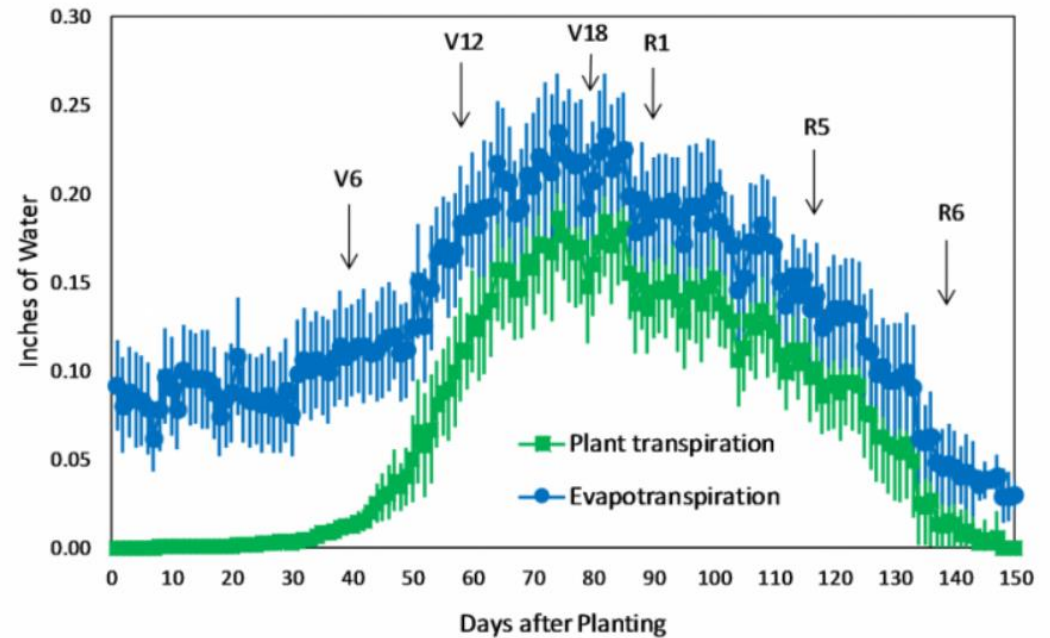
- 27,154 x 8.34 = 113 tons of water

Figure 1. Evapotranspiration and plant transpiration values from planting through crop maturity for a 110-day corn hybrid growing in central Iowa. Data are average values across 35 simulations that includes different weather years using the well-calibrated APSIM model for this environment. The average simulated yield across 35-years was 200 bushels per acre.

https://crops.extension.iastate.edu/cropnews/2017/06/corn-water-use-and-evapotranspiration

Corn Yield and Water Use

- As Yields Increase, so does demand for water

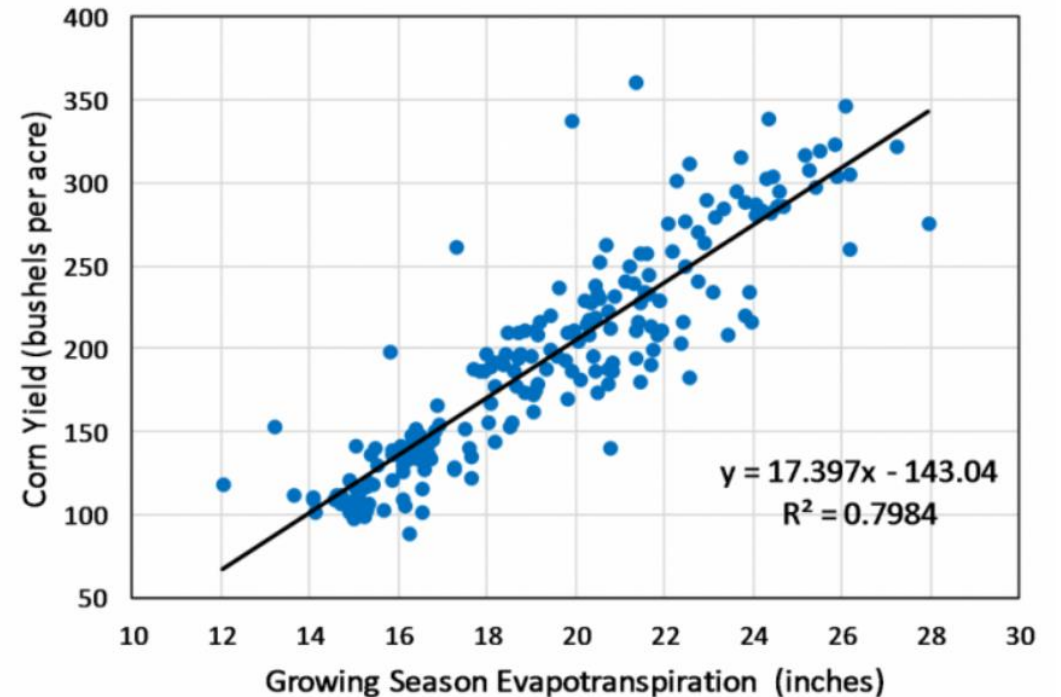- How does this information influence hybrid selection and planting date?

Figure 3. Relationship between corn yields and evapotranspiration.

The chart plots Corn Yield (bushels per acre) on the y-axis from 50 to 400 against Growing Season Evapotranspiration (inches) on the x-axis from 10 to 30, with the regression equation:

$$y = 17.397x - 143.04$$
$$R^2 = 0.7984$$

https://crops.extension.iastate.edu/cropnews/2017/06/corn-water-use-and-evapotranspiration

Lesson Summary

- An acre is 43,560 square feet
- Acre furrow slice of 6.5" weighs about 2 million pounds
- Acre inch of water is 27,000 gallons