CROPPING SYSTEM STRATEGIES THAT CAN REDUCE DROUGHT IMPACTS

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Presentation Outline

- Management strategies for corn and soybeans
- Adding winter annuals or other cool season crops to the rotation
- Alternative crops that tolerate drought or avoid drought
- Role of perennial biomass crops, including switchgrass and Miscanthus
- Adjusting cropping systems and land use to fit our soil and climate resources

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We need cropping systems that are resilient

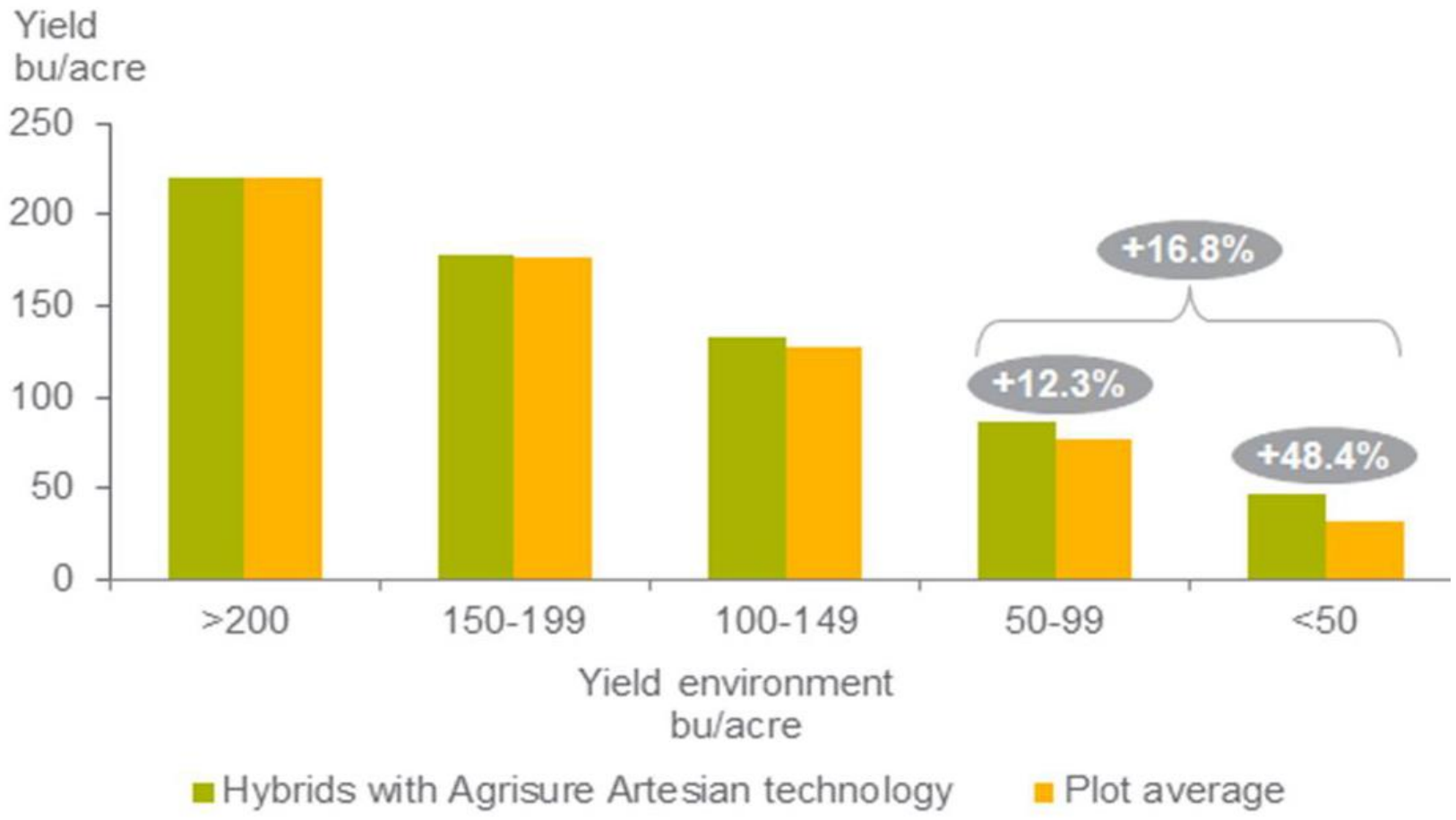
Drought Resistant Varieties

- Select based on yield stability and performance
- Consider varieties with GMO traits (but these traits may be targeted for regions to south and west)
- Early maturities is a positive but having a range of maturities can be a risk reducing strategy
- Resistance to insects and certain diseases important for stress conditions

Managing Corn and Beans for Possible Drought Conditions

- Adopting drought resistant varieties
  - Dupont/Pioneer: Aquamax
  - Syngenta: Artesian
  - Monsanto: Droughtguard

Syngenta Artesian corn hybrids

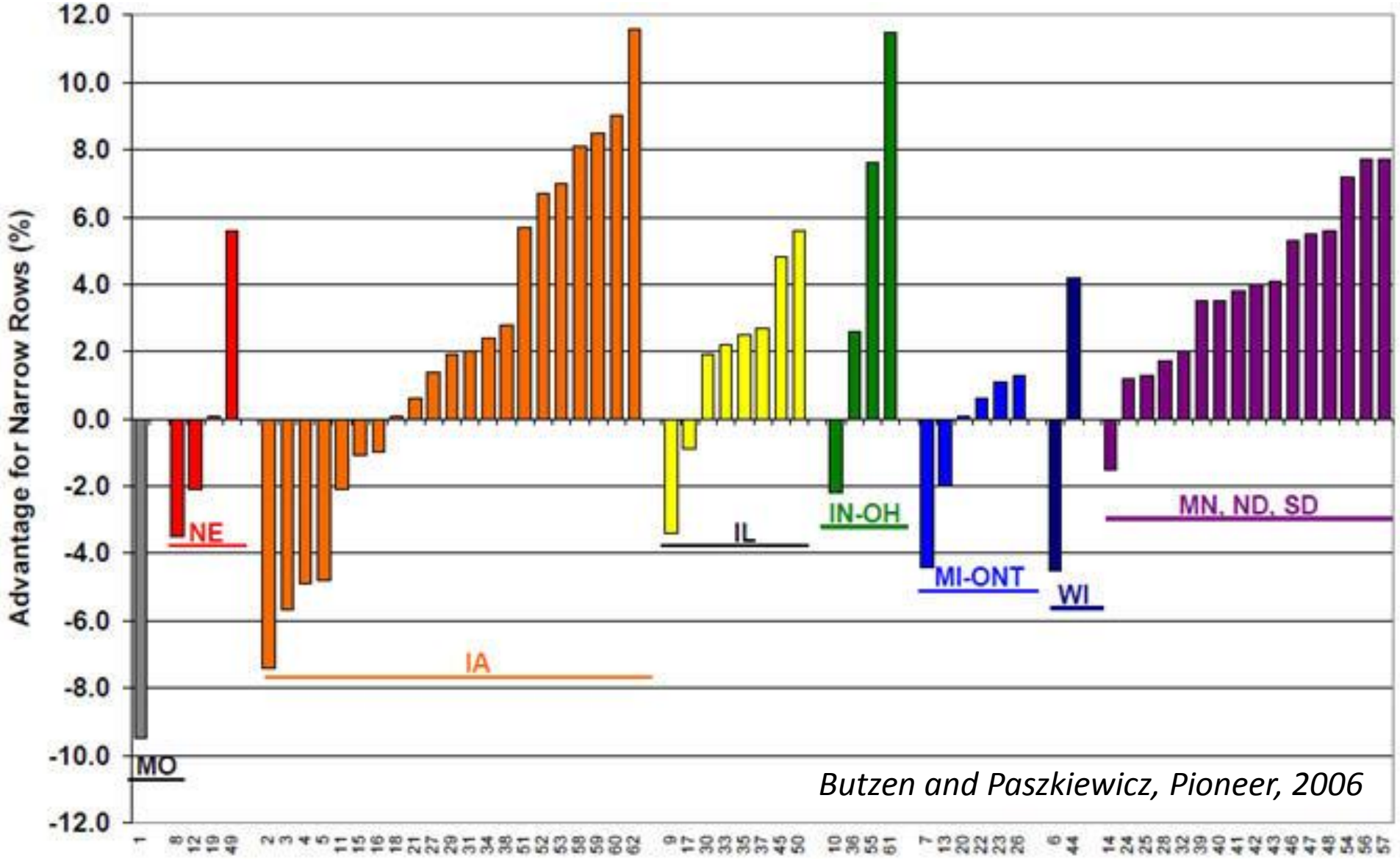


From Syngenta press release: based on 1100 Corn Belt trials

Planting Date, Plant Population and Fertilization

- Early is generally better but a mix of planting dates and maturity groups can be beneficial
  - Especially important for corn pollination
- In the past, reduced population was helpful in a drought, but new corn varieties are designed to hold yield under high populations
- Fertility is complex – you want good root growth but less fertilizer may be needed in a drought
  - Split N treatments for corn
  - Placement and distribution of nutrients in soil profile is important

Response of corn yield to narrow rows



Butzen and Paszkiewicz, Pioneer, 2006

Tillage and Residue

- "Each time you till you lose on average the equivalent of ½ inch of rainfall"
  - *Dr. Jerry Hatfield, ARS National Lab for Ag & Env.*
- Farmers may be concerned that 100% no-till can leave soils too wet in spring
- Can we remove crop residue for feed or energy?

Using Cover Crops and Building Organic Matter

- Do cover crops help or hurt spring moisture?
  - When and how does the cover crop die
- Impact of cover crops on soil tilth, porosity, and rainfall infiltration
- Distribution of nutrients in the soil profile
- Other ways to build organic matter?


Sweet Yellow Clover


Crimson clover

Austrian Winter Peas

Tillage Radishes

Photo credit – Skip Peterson


Hairy vetch and oats

Rodale Research Center

Double Crop Options

- winter canola - double crop (dc) soybean
- northern Missouri
  - winter wheat - dc sunflower
  - winter wheat - dc buckwheat
- sandy soils
  - winter wheat - dc cowpeas
  - winter wheat - dc sunflowers
  - winter wheat - dc pearl millet (southern MO)
- spring flax - dc buckwheat


Canola

Canola

- Good alternative to winter wheat, often more profitable (depending on distance to market)
- Price tracks soybean prices
- Winter canola grown in Missouri is non-GMO
- Over a million acres grown in U.S. but still import a large amount to meet demand
- Demand is partially for biofuel but mainly for healthy food oil use

Sunflowers


Sunflowers

Sunflowers

- Seeds are 40-45% oil
- Drought tolerant crop
- Native American crop
- Wide planting window
- Large number of oilseed and confectionery varieties; all commercial varieties are hybrids but not GMO
  - Confectionary type are used for snacks, baking
  - Oilseed types are higher oil and higher yield
  - Most oilseed varieties now available are NuSun, which means mid-levels of oleic acid (45-70% oleic)
  - Also many new ornamental varieties for cut flowers


Cowpeas

Cowpeas

- Traditional Missouri market is in the Bootheel
- Find out the market class the buyer wants
- Typical “good” yield is 1200-1500 pounds/acre
- Price varies widely
- Best niche is on sandier soils
- Can be double cropped


Grain Sorghum


Grain Amaranth

- Amaranth was first promoted by Robert Rodale and others in the 1970’s
- Rodale Research Institute (Pennsylvania) develops several improved cultivars for release in 1980’s
- Most amaranth now imported but can be easily grown in the U.S.
- Has received substantial interest due to nutritional value


Oats


Flax


Flax

Flax

Flax

- Grown as an early spring crop like spring oats
- Historically grown all over eastern/Midwestern U.S.
- Traditionally used primarily in non-food markets, such as linseed oil for paints and varnishes
- Resurgence of interest as a food ingredient due to high levels of omega-3 fatty acids


Buckwheat


Buckwheat

What About Bioenergy Crops?


Biomass
Sorghum


BLADE


Giant Miscanthus

Giant Miscanthus

Perennial Grasses


Designing our
cropping system
landscape

Possible Funding Sources

- Conservation programs can possibly provide cost share or incentive payments, such as EQIP or CSP through state NRCS

- USDA SARE Farmer/Rancher Grants

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Summary

- For commodity crops, choose varieties with high yields over multiple years/locations; GMO drought traits may not be big advantage for MO yet
- Managing to reduce stress, especially during pollination and seed set is critically important
- For overall cropping system, need to:
  - Diversify crops and varieties used
  - Build soil organic matter and overall soil health
  - Preserve soil cover to maintain moisture