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Biography

Dr. Hatfield received his Ph.D. from Iowa State University in 1975 in the area of Agricultural Climatology and Statistics a M.S. in Agronomy from the University of Kentucky in 1972, and B.S. from Kansas State University in Agronomy in 1971. He served on the faculty of the University of California-Davis as a biometeorologist from 1975 through 1983 and then joined USDA-Agricultural Research Service in Lubbock, Texas, as the Research Leader of the Plant Stress and Water Conservation Research Unit from 1983 through 1989. He was appointed Laboratory Director of the National Soil Tilth Laboratory in 1989 (renamed the Laboratory for Agriculture and the Environment in October 2009).

AGRICULTURAL NEEDS OF CLIMATE FORECASTS

Linkage to Decision Making

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Agricultural Decisions

- Crop establishment
  - Cultivation
  - Planting
- Crop Management
  - Pest management
  - Within season nutrient management
- Harvest
- Livestock management

Producer Needs

- Multiple scale forecasts
- Changes within a growing season
  - Shifts in precipitation
  - Extremes in temperature and timing
- Changes among growing seasons
  - Trends in precipitation and temperature
  - Trends in extremes of precipitation and temperature

How do Producers Use Information

- Short-term is for immediate decision-making, e.g., waiting on cultural operations, spraying, cutting hay
- Long-term, e.g., evaluation of the growing season to determine if there should be a shift in crop planting dates
- An example from 2012 into 2013. Producers want to know if the drought will persist and whether to plant a short-season corn or even not plant corn but a small grain which would mature before the hot, dry summer period.

Long-term Decisions

- How consistent are the trends in climate which would increase risk in production through direct or indirect stresses (insects, diseases, weeds)?
- What are the chances of increased variation in temperature and precipitation within and among seasons?

Example 1

- In Wisconsin, we have developed a guidance for producers not to apply manure if the soil water content is above 75% of field capacity and the forecast is for rain in the next 48 hours.
- Long-term are there changes in precipitation patterns which would affect this decision making and whether the risk profile changes
- The costs are lost nutrients from the field and runoff into nearby streams, rivers, or lakes

Example 2

- The trend toward increased precipitation in the spring has decreased the number of workable field days.
  - Is this trend expected to continue to allow for continued adaptation by producers to establish the crop.
- The shift to spring has reduced summer precipitation during the summer with expectations for continued drying.
  - Is this trend expected to continue because farming systems will have to adapt in terms in changing water management practices?

Example 3

- Livestock in feedlots are susceptible to hot temperatures over 90F and high humidity levels. One of the key parameters is the nighttime temperature for multiple nights.
- The costs on livestock production from these events is often in the $10-100 million in lost productivity or mortality
- Forecasts of extreme temperature events and relative humidity would provide a background for implementation of adaptation practices to reduce exposure to thermal stress

Areas which need enhanced climate information

- Evaluation of efficient cropping systems
- Impacts on insect and diseases lifecycles and range of adaptation
- Effect on invasive species (insects, diseases, and weeds)
- Evaluation of the effects on different management practices, e.g., nutrient management, water management

Questions for Climatologists

- Can we improve the accuracy of short-term climate forecasts (10-20 years) for decision-making?
- Can we improve the accuracy of long-term climate forecasts (50-100 years) to help guide improved agricultural management?
- Would climatologists be willing to work with producers to develop these intersection points to improve decision-making