Nebraska On-Farm Research Network

Irrigation Research Protocol: Traditional vs. 75%

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Objective: Demonstrate UNL irrigation recommendations by comparing traditional practices to 75% and rainfed and utilizing tools like ETgages, soil water sensors and drought resistant hybrids.

Rationale: UNL research at the South Central Agricultural Laboratory (SCAL) has confirmed that irrigating at 100% of ET results in optimum yield and that irrigating at 125% ET results in more yield loss and costs than irrigating at 75% of fully-irrigated corn.

Over-irrigation can result in deep percolation of water and nitrogen leaching, and runoff. Research has shown that excess water can increase weed pressure and create an environment favorable to diseases. Crop growth and yield can also be impeded with over-irrigation:

- Disturbs the oxygen balance of the root zone, drowns roots, reduces plant water uptake, and thus stresses plants.
- Reduces the exchange of air (oxygen) between the soil and atmosphere, and causes reductions in root growth (especially in the upper soil layers) and less transport of water and nutrients through the roots to the upper parts of the plant.
- Increases microbial growth which can cause the formation of sulfides and butyric acid that are toxic to plants.
- Increases the potential for root diseases.
- Causes a decrease in soil temperature, thus reducing root growth, which creates a shallow root structure.
- Leaches nutrients and pesticides from the root zone to groundwater.
- Negatively impacts yield.
- Wastes water and energy resources.

However, some producers feel that irrigation in excess of the recommendations is needed; this results in increased energy costs, increased potential for N loss and reduced profitability.

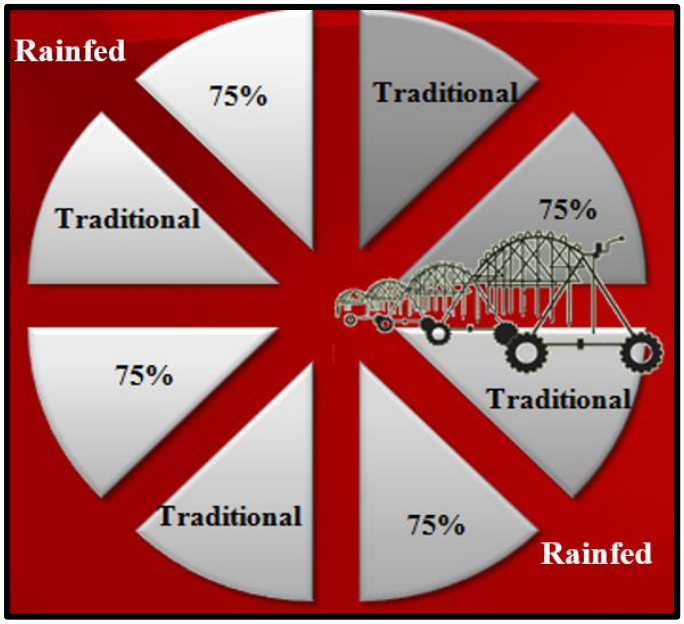
Procedures to conduct experiments with irrigation treatments are described below. For all studies listed here yield data will be gathered using precision ag. technology in the growers combine. i.e. GPS and yield monitor.

Procedure for 3 Irrigation Treatments:

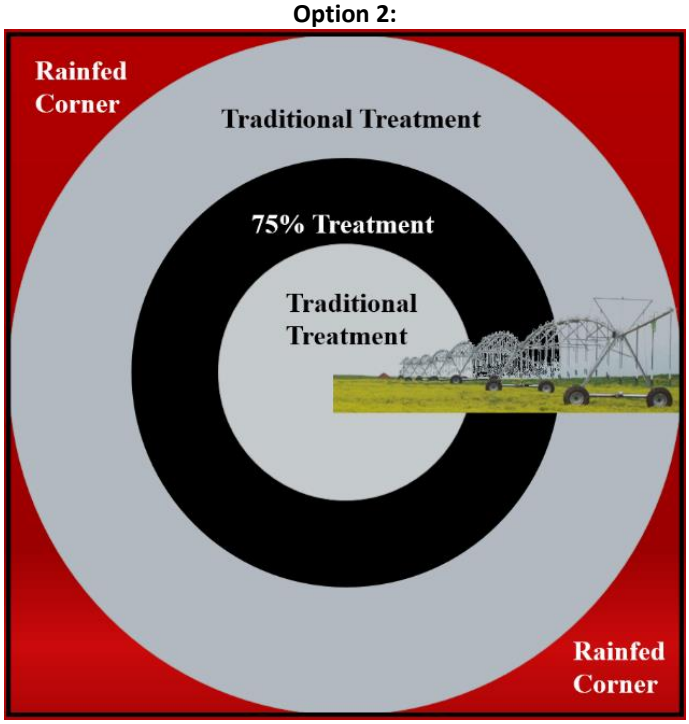
Treatment 1: Traditional
Treatment 2: 75%
Treatment 3: Rainfed

There are 2 options on how to set up this experiment. **Option 1** requires a pivot that can accurately vary the speed at a given location. Two or three wedge/pie shapes will be watered at 75% (each pie should be at least 30% for a total of 90% if 3 wedges) and the remaining area will be watered at the traditional rate. If possible, one or two corners of the pivot are left as rainfed. **Option 2** creates the 75% watering areas by re-nozzling one of the inner pivot spans to 75%. These two options are shown below.

Option 1:



Option 2:

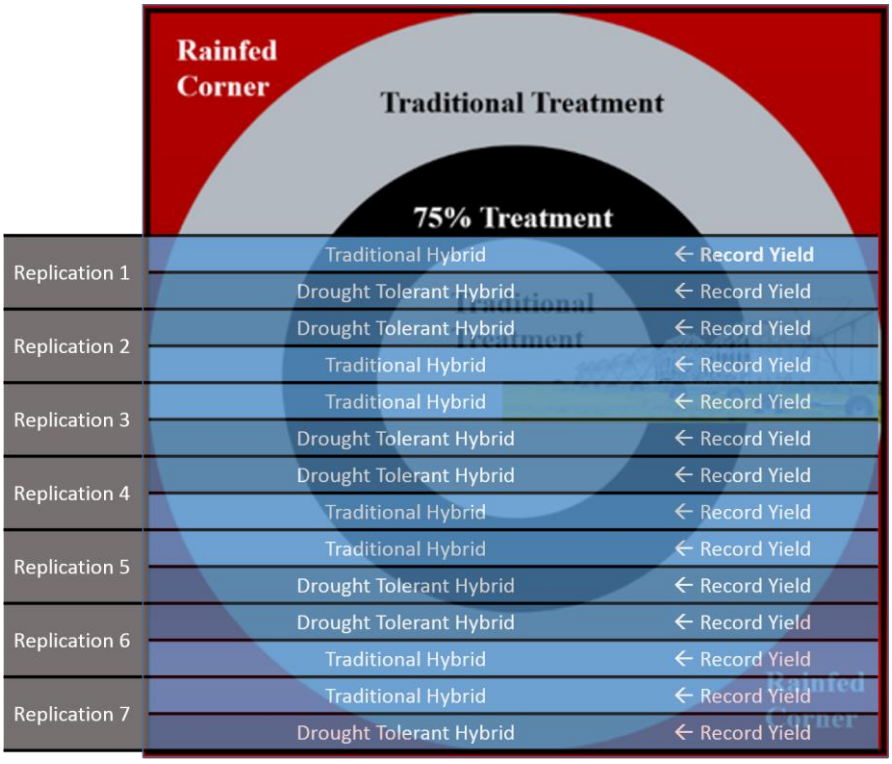


Procedure for Additional Hybrid Comparison

Additionally, producers could add a factor of hybrid to either option 1 or option 2 in this experiment. The hybrid option would look at a drought tolerant hybrid versus a traditional hybrid. The addition of a hybrid comparison to irrigation option 1 and 2 are shown below. The two hybrids would be planted so they cross the traditional irrigation, 75% irrigation, and rainfed irrigation areas. Seven replications of the two hybrid comparison are recommended as shown below.

Option 1 + Hybrid Comparison

Option 2 + Hybrid Comparison

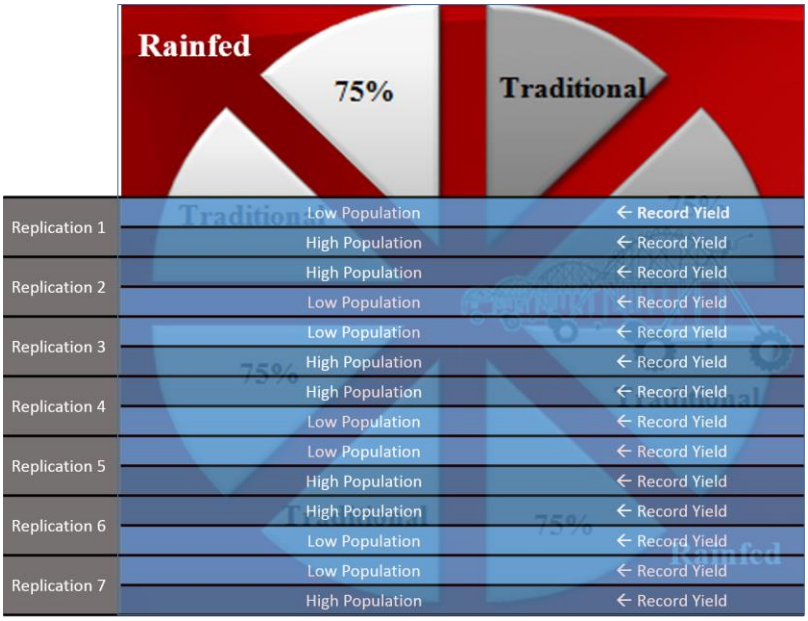


Procedure for Additional Population Comparison

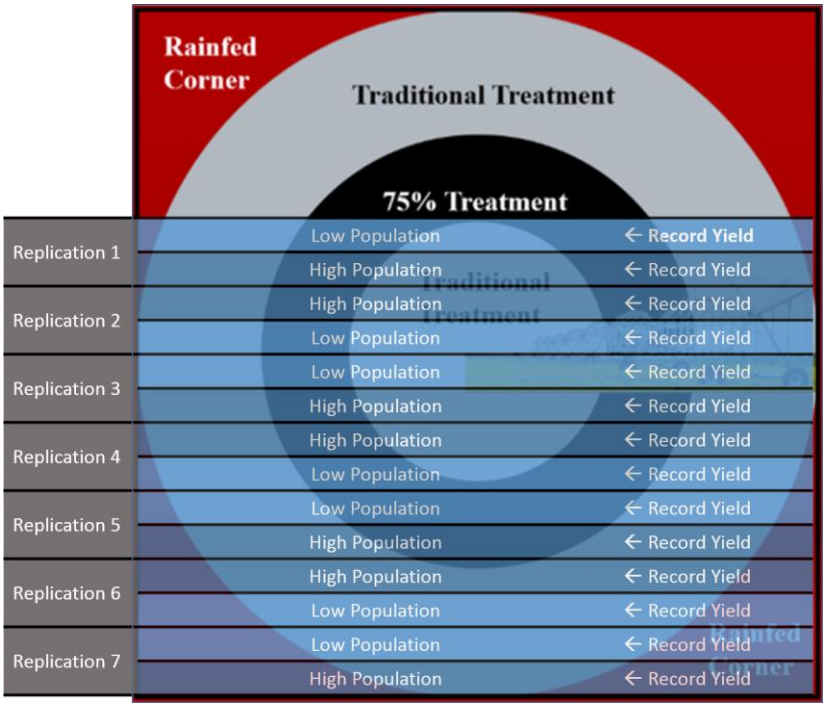
An alternative to looking at different hybrids would be to look at different planting populations. Again, this factor of planting population could be added to either option 1 or option 2 in this experiment. The planting population comparison could look at from 2 to 4 planting population levels. Population levels should vary by at least 4,000 seeds/acre.

An example with 2 planting populations is shown below for both irrigation option 1 and 2. Seven replications of the two population comparison are recommended as shown below. If more than 2 planting populations are desired, see research protocol "Corn Planting Population: 4 Populations" at www.cropwatch.unl.edu/farmresearch/protocols. The population levels should be planted so they cross the traditional irrigation, 75% irrigation, and rainfed irrigation areas.

Option 1 + Population Comparison



Option 2 + Population Comparison



Grower Requirements:

1. Flag or **mark** GPS location of each treatment.
2. Provide all necessary **inputs** for crop production.
3. Complete a **background** agronomic form about site and practices.
4. Collect **rainfall** information, **weekly ETgage data**, and **crop growth stage** information.
5. Collect **yield data** and **grain moisture** with weigh wagon or yield monitor. If using yield monitor, please designate a separate "load" for each treatment and set up separate "products" names for each treatment harvested. Yield monitor must be **well calibrated**. Contact UNL Extension if assistance with this process is needed.
6. Collect **stand counts** at harvest. Each treatment in all replications should have a stand count recorded. It is recommended that at least 3 counts be averaged together for each reported stand count.
7. Submit harvest data to UNL Extension within 30 days of harvest or by Dec. 15 of the harvest year.
8. Allow UNL Extension to use submitted and collected data for research, educational, and informational purposes.

Nebraska On-Farm Research Network will:

1. Provide technical assistance in setting up replicated and randomized experimental design.
2. Provide assistance upon request with treatment implementation, flagging, stand counts, stalk rot tests, soil water data collection, ETgage data collection, and recording yield.
3. Analyze raw data using statistical analysis and provide this information to the grower.

For assistance with studies, please contact the Nebraska On-Farm Research Network Coordinators:
Keith Glewen: kglewen1@unl.edu or 402-624-8005
Laura Thompson: laura.thompson@unl.edu or 402-624-8033
Or your local educator