

INCREASING WHEAT YIELDS THROUGH EFFICIENT IRRIGATION SOLUTIONS

HIGHER YIELDS...OPTIMUM WATER USE...
LOWER COSTS...PRECISION APPLICATION



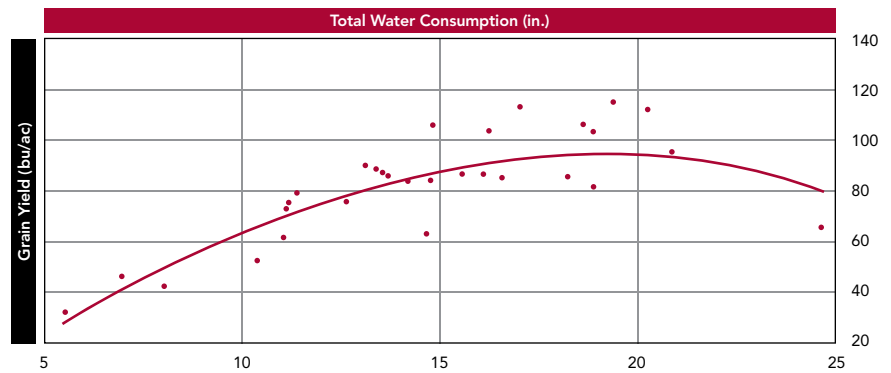
Why irrigate?

The correct amount of water on your wheat crop is essential for producing high yields. Zimmatic® by Lindsay irrigation systems bring a cost-effective solution, alleviating risk when the weather isn't cooperating. It also gives you more flexibility when it comes to planting, because your timeline is not as affected by nature.

Proper irrigation management minimizes yield loss due to crop water stress, optimizes yield per unit of water applied and promotes good management practices. The result is a greater return on investment.

Present global wheat production is about 582 million tons on 526 million acres (213 million ha).

Under irrigation, a good commercial grain yield is 90 to 130 bu/ac (6 to 9 tons/ha).



Source: Zhang et al. 2000. Management of supplemental irrigation of winter wheat for maximum profit. Food and Agricultural Organization of the United Nations.

IRRIGATION IMPACTS EVERY STAGE OF GROWTH

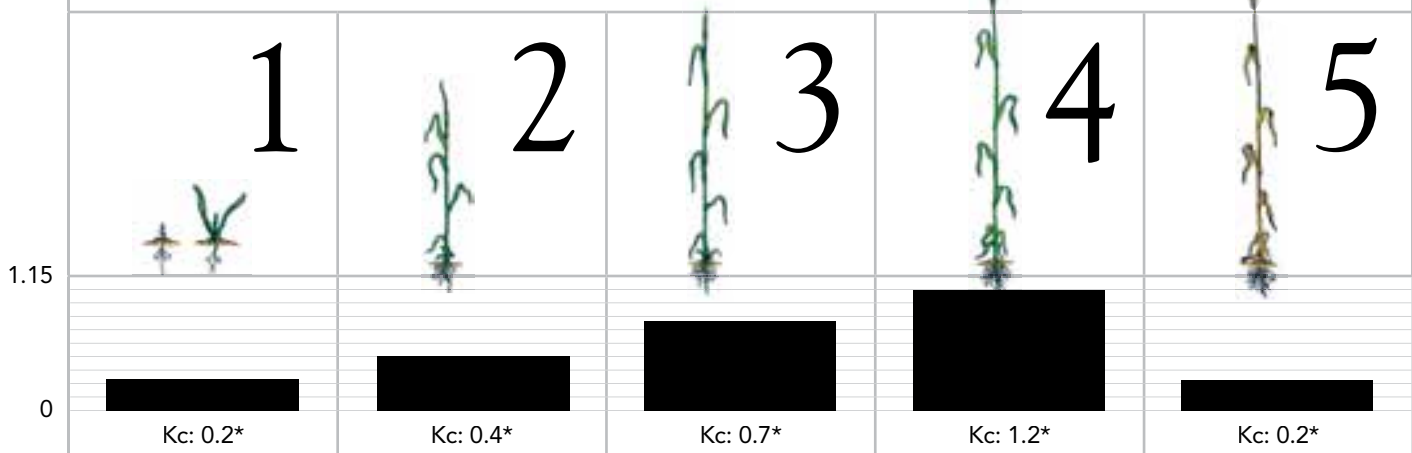
From establishment to harvest, effective water management is important at each stage of wheat growth. At Lindsay, we take into account many factors when designing irrigation systems to meet your specific needs, such as

local microclimate, soil type and elevation.

For winter wheat, irrigation is often needed to provide enough water to establish the crop and maintain it through the winter.

Early spring moisture is frequently sufficient for both spring and winter wheat. The late spring and summer irrigations should focus on providing adequate water for the plants from the boot through the dough growth stages.

CROP COEFFICIENTS (Kc) USED FOR WATER MANAGEMENT¹



Emergence: 10 to 15 Days. Adequate moisture at seeding encourages germination and root development for healthy, uniform stands.

Vegetative Growth: Varying Lengths. Slight water stress during vegetative growth may have little impact on yield but may accelerate plant maturation.

Flowering: 15 to 20 Days. Yield loss from water stress during flowering cannot be recovered by adequate water late in the growing season.

Yield Formation: 30 to 35 Days. Water stress during yield formation reduces both grain weight and quality.

Ripening: 10 to 15 Days. Excess water during ripening and dry down can induce lodging and yield loss.

Note: A better Uniformity Coefficient alone does not ensure more yield if the overall crop water requirement is not met and results in a water deficit.

¹Source: http://www.fao.org/nr/water/cropinfo_wheat.html. Stated Kc values are an average. Local Kc values will vary with local microclimate, terrain and wheat variety.

Irrigating Wheat

Both spring and winter wheat have their peak crop water use around the boot growth stage. Spring wheat matures later in the summer and thus uses more water at that time. However, winter wheat has water use in the fall and may require some irrigation to provide adequate water to establish the crop and maintain it through the winter.

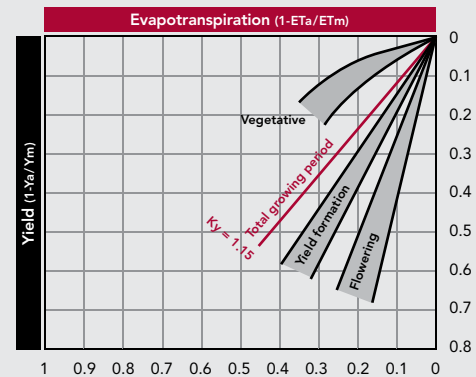
If soil conditions are extremely dry, irrigating before planting winter wheat should be considered to partially fill the soil profile. Planting into moist soil allows the seeding equipment to achieve good seed depth uniformity and excellent seed-to-soil contact. The goal of fall irrigation is to provide adequate water for germination and early growth, yet leave room for precipitation over the winter. In areas that may receive little or no wintertime precipitation and the climate gets too cold to irrigate during the winter, the soil profile should be filled to a depth of about 2.0 feet (60 cm) in the fall.

Precipitation during the winter and early spring is often sufficient for both spring and winter wheat. In fact, too much water in the early spring can cause problems. However, if precipitation has not built up the subsoil water, irrigation should start early enough to store some water in the root zone before the boot growth stage. The combination of the stored soil water and the water supplied by the irrigation system needs to be adequate to meet the peak water demand of the wheat. The higher the irrigation system capacity, the lower the need for storing water in the soil before boot.¹

Monitoring Evapotranspiration

To effectively plan irrigation, growers need to account for

EVAPOTRANSPIRATION DEFICIT IMPACT ON WHEAT YIELD¹



evapotranspiration (ET). Evapotranspiration is the total water use of a crop, including evaporation from the soil and transpiration by the plant. Temperature, humidity, solar radiation, wind, as well as crop health and growth stage affect evapotranspiration.

To determine when to irrigate, the following information is needed:

1. A local weather station report that estimates reference ET. The reference ET must then be multiplied by the crop coefficient to determine the water use of the crop each day.
2. A rain gauge placed in each field or group of adjacent fields.
3. An estimate of how much water can be used from the

soil before irrigation is needed. (This can be calculated by extension agents or crop consultants).

To maintain the starting soil water balance, just subtract the crop water use from each day, add in any rain, and apply enough irrigation to balance the equation to the starting point. Over the irrigation season, the balance can be allowed to become negative by the amount of the allowable water depletion for the soil.

References

¹Yonts, C. D., D.J. Lyon, D.D. Baltensperger, J.M.Blumenthal, R.M. Harveson, G.L. Hein, and J.A. Smith. 2002. Producing irrigated winter wheat. NebGuide G1455. University of Nebraska-Lincoln Extension.

Conditions vary by location. Talk to your local Lindsay dealer for more detailed information.



Zimmatic center pivot

FERTIGATION

Fertigation is an efficient method of supplying part of the nitrogen (N) needed for a wheat crop through the irrigation system, near the time of maximum nitrogen uptake.

Wheat can be grown on a wide range of soils but medium textures are preferred. Peaty soils containing high sodium, magnesium or iron should be avoided. The optimum pH ranges from 6 to 8. For good yields, the fertilizer recommendations should be based on traditional soil test results and a realistic yield goal.

http://www.fao.org/nr/water/cropinfo_wheat.html

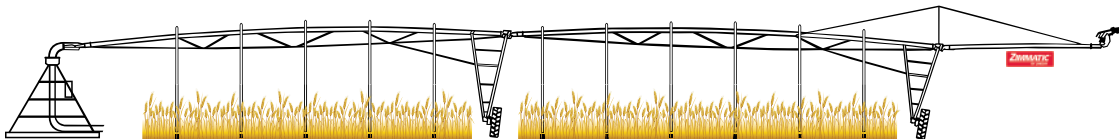
CHEMIGATION

Chemigation can provide a quick response to unexpected events like insect infestations, disease outbreaks, and weed escapes. Many crop protection chemicals including insecticides, fungicides, and herbicides, are labeled for application by chemigation. Advantages of chemigation include:

- Timing – chemicals can be applied at the first sign of trouble
- Uniformity of application – excellent water distribution provides uniform distribution of chemicals and more consistent control of pests
- Incorporation/activation – Chemicals are incorporated and activated by the water they are applied with
- Reduced compaction/crop damage – a center pivot covers a crop without additional areas of compaction or crop damage
- Reduced spray costs – applying chemicals through an existing center pivot is less expensive than using a spray service or dedicated spray equipment
- Reduced hazards – center pivots reduce worker exposure to chemicals

EFFICIENT APPLICATION FOR HIGHER YIELDS

Zimmatic Center Pivot Irrigation – Custom-fit your irrigation system to your fields for uniform application.



Zimmatic Lateral Irrigation – Irrigate 98% of square or rectangular fields, and tow your irrigation system between fields.



Why pivots/laterals?

Pivot/lateral irrigation systems – right amount of water at the right time, in the right place

Applying the correct amount of water at the right time is crucial to getting a good yield, but it's also important to apply it uniformly.

Pivots/laterals v. flood irrigation

Less waste

The most obvious benefit to irrigating with a pivot or lateral system is that it produces less waste. You get even, precise water application across the field (Figure A), rather than having too much water at the upper end, and not enough water at the lower end of the field (Figure B). You can also control the timing and amount of water that is applied while eliminating runoff, helping to prevent contamination of the water table and nearby streams.

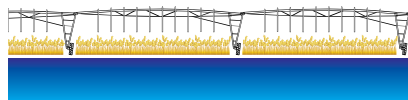


Figure A
Pivot/lateral irrigation

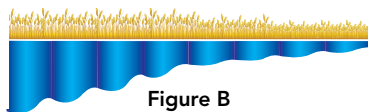


Figure B
Flood irrigation

Lower labor costs

The Zimmatic irrigation system is automated, so no one has to move pipes, or open and close floodgates. There are no ditches to maintain for pivots. One person can operate as many as 25 pivots, and with remote control and monitoring options, they can easily do it during the normal work day.



Low Elevation Spray Application (LESA) nozzles

Higher return on investment

The long life of a pivot or lateral system will save you money year after year. You'll use less water, reducing your energy costs. A Zimmatic pivot or lateral system also applies chemicals and fertilizers evenly, accurately and inexpensively. All this adds up to consistently higher yields.

Pivots/laterals v. drip

Fewer maintenance hassles and labor costs

Compared to an SDI system, maintenance is extremely simple for pivot and lateral systems. There is no emitter clogging, and no filter maintenance – it requires only a screened intake. Rodents, roots and cultivation equipment won't damage your system. There is no need to apply irrigation water to the field each year before the crop is planted and drive the entire field looking for leaks that need to be fixed. Even algae and chemicals aren't issues.

Greater return on investment

The cost of SDI may increase sharply if a field is irregularly shaped or elongated. Many factors influence the cost of SDI and growers should consult a dealer with design software to get an accurate estimate of cost.

SDI requires a higher level of management than pivot irrigation with LESA to achieve higher yields.

Better all-around value

- Lower investment cost per acre than SDI for a savings of 20-200% - 65% lower for 123.5 acres (50 ha)
- Longer system life – 20+ years for pivot irrigation compared to 10 years for SDI
- Mortgageable and recoverable asset with realizable resale value
- Easier to finance
- Removable
- 95% recyclable materials¹

Pivots/laterals v. dryland

Flexibility of planting time; high germination rates

Pivot/lateral irrigation provides insurance against yield loss from drought or inconsistent rainfall, along with the following benefits:

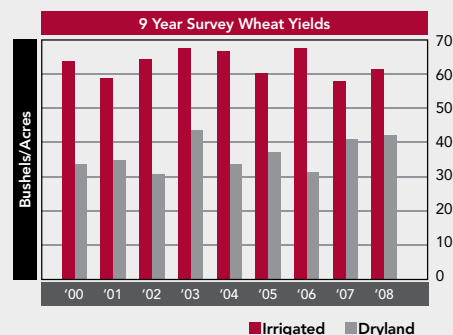
- Increased yield per acre (ha)
- Precise water distribution within the whole root zone
- Precise fertilizer application to prevent deep percolation and runoff

References

¹ Freddie Lamm, Daniel O'Brien, Danny Rodgers, Troy Dumler "Sensitivity of Center Pivot Sprinkler and SDI Economic Comparisons" American Society of Agricultural Engineers (ASAE).

² USDA National Agricultural Statistics Service.

IRRIGATED vs. DRYLAND YIELDS (NEBRASKA)²



Why Lindsay?

Tough, dependable Lindsay irrigation systems have been the choice of the world's irrigators for more than 55 years. Lindsay irrigation systems pay for themselves many times over during their lifespan, and alleviate risk when weather conditions are not ideal for planting and growing conditions.

Yields: maximized

A Lindsay irrigation system can provide proper application to every part of a field throughout the growing season, even in those areas that are currently underutilized.

Energy, water, labor and time: saved

When compared to other irrigation methods, a Lindsay system will help maximize crop yields while using less energy, water, labor and time. Flexible, intuitive Lindsay irrigation control products make scheduling and operation simple, while Web-based remote control options offer comprehensive monitoring and management.

Application: precision

Zimmatic by Lindsay dealers analyze each grower's operation to customize a sprinkler package based on crop and climate conditions.

Downtime: minimized

Lindsay irrigation systems are designed and engineered for life on the farm. They're constructed using only the highest quality components for superior performance season after season.

Support: certified

Our network of certified dealers is trained to customize, install and service our entire range of irrigation systems.

Watertronics – Customized pump stations for maximum efficiency

Watertronics™, a Lindsay company, offers a complete, integrated pump station that helps maintain consistent water delivery from river stations, irrigation reservoirs, canals and lagoons.



Factory tested, each pump station is engineered based on your needs and field conditions to ensure peak performance.

- All components are integrated and housed in one complete unit
- Precision energy efficiency
Variable Frequency Drive provides immediate energy savings
- Simple monitoring and control
- Continuous surge-free pressure regulation for enhanced efficiencies
- Horizontal and vertical pump stations available

Also available as an economical pump control upgrade for existing pumps.



Machines to fit your field

Zimmatic offers irrigation options like center pivots, lateral moves or 9500CC Custom Corner systems that can handle anything from irregular fields to rugged terrain to multiple crops.



Durability

Heavy-duty spans, trusses and advanced drivelines (Center Drive and AT Gearbox) assure long life, durable operation and deliver even water distribution. There are varying heights to provide the proper irrigation for different types of crops – proven to withstand the elements in nearly any environment.



Control panels

Depending on your needs, each user-friendly Zimmatic control panel offers a different level of control, convenience and maintenance options.

Zimmatic
pivot point with
VISION control panel



The right pivot option for any field or terrain

Lindsay has the pivot options to increase water efficiency and maximize yield. Lindsay offers durable parts, quality components and a range of tower heights for crop clearance and stable operation on varying terrain.



Poly-lined pipe

Top-of-the-line alternative pipeline offers excellent wastewater management solutions. Heavy-duty High Density Polyethylene (H.D.P.E.) Liner handles corrosive elements, saline and acidic water.



Customized sprinkler packages

Lindsay custom designs every system and can provide a full range of sprinkler packages to fit your specific field/crop conditions and needs.



SmartDesign

This program allows the dealer to design and review with you an irrigation system that fits your specific field to optimize acreage utilized for increased ROI. Determine field boundaries, obstacles, system length, and total irrigated acres to increase application accuracy and efficiency.



FieldNET™

Remotely monitor and control entire irrigation systems – from pivots and laterals to pumps and sensors – from a laptop, tablet or smartphone. Next-generation technology provides integrated water, fertilizer and chemigation management.



Zimmatic center pivot

The Lindsay Advantage

Zimmatic® by Lindsay offers proven systems and products that are built to be strong, long-lasting, durable and easy to use for growers who need highly efficient irrigation solutions. These systems can be enhanced with a family of integrated plug-and-play add-ons.

Growers around the world rely on Zimmatic’s innovative technology support by a network of knowledgeable dealers to add value, reduce risk and take full advantage of every growing season.

For more information, visit lindsay.com or talk to your local Zimmatic by Lindsay dealer.



To learn more about crop specific applications, scan this QR Code.



THE LINDSAY ADVANTAGE

DURABLE • RUGGED • EASY TO USE • INTEGRATED TECHNOLOGIES • BROADEST LINE OF SOLUTIONS



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Lean, Clean and Green. Lindsay Corporation is committed to developing environmental awareness and implementing sustainable practices to reduce the use of and protect energy, water, and all other resources.



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