INCREASING CORN YIELDS
THROUGH EFFICIENT IRRIGATION SOLUTIONS

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

LINDSAY™

Why irrigate?

The correct amount of water on your corn 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. They also give you more flexibility when it comes to planting, because your timeline is not delayed by dry soils or lack of rain.

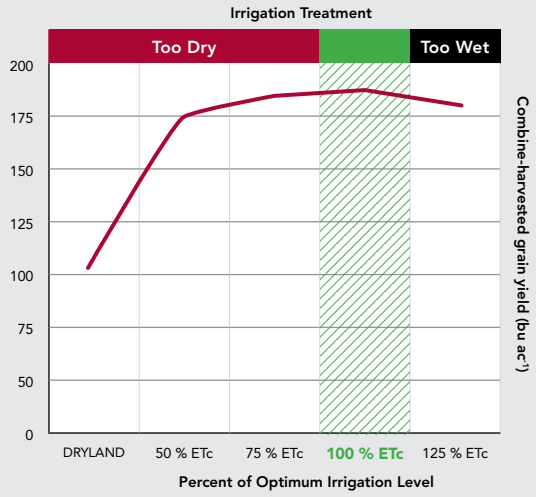
Proper irrigation management minimizes yield loss due to crop water stress, optimizes yield per unit of water applied and promotes good management practices. The result is a greater return on investment.

APPLYING THE CORRECT AMOUNT OF WATER AT THE CORRECT TIME IS CRITICAL FOR OPTIMAL CORN YIELDS[1]

For each additional 1 inch (25mm) of soil water used by the crop, 13 additional bu/a (818 kg/ha) will be produced.

Both overwatering and underwatering will result in lower yields. Overwatering will also result in higher operating costs.

Irrigation scheduling is the key to achieving optimal yields.

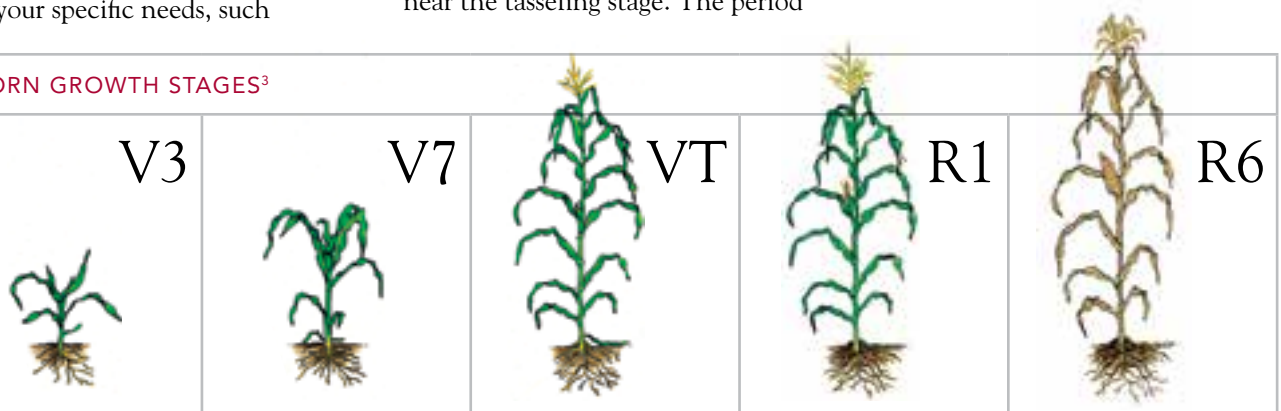


IRRIGATION IMPACTS EVERY STAGE OF GROWTH

From establishment to harvest, effective water management is important at each stage of corn 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.

As a corn plant grows, its demand for water rises with increasing leaf area, which reaches a maximum near the tasseling stage. The period of time shortly before pollination through early grainfill, when the kernels begin to dent, is the most critical period during which adequate moisture is important to corn yield.[2]

CORN GROWTH STAGES[3]



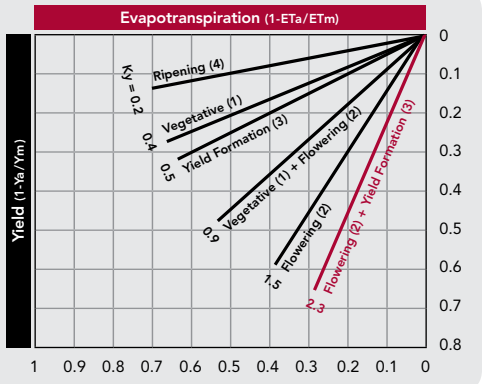
V3-Third Leaf Collar:	***V7-Seven Leaf Collar:***	***VT-Tasseling:***	***R1-Silking:***	***R6-Physiological Maturity:***
All leaves and ear shoots that the plant will produce are initiated. The growing point remains below the surface.	Rapid growth phase and kernel row determination begins. Plant's ability to take up nutrients and water is established.	Plant is almost at its full height and pollen shed begins. Plants at the VT/R1 stage are most vunerable to moisture stress.	Environmental stress at this time is detrimental to pollination and seed set, with moisture stress causing desiccation of silks and pollen grains.	Kernel moisture content ranges from 30-35% at this stage, with much variation among hybrids and enviromental conditions.

The crop coefficients are intended for a general reference and are for use with a grass-based reference crop. Some areas provide an alfalfa-based reference crop. It is suggested you get local coefficients for your area and for your reference crop.

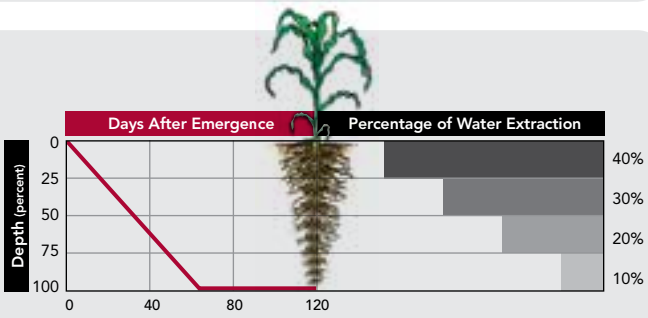
CORN CROP COEFFICIENTS[4]

GROWTH STAGE	K_C
Seed	0.25
Emerg	0.35
4-leaf	0.45
5-leaf	0.70
6-leaf	0.85
8-leaf	1.00
10-leaf	1.15
12-leaf	1.20
14-leaf	1.25
Tassel	1.25
Silk	1.30
Blister	1.30
Milk	1.30
Dough	1.20
Dent	1.00
½ mat	0.90
Blk lyr	0.70
Harvest	0.00

EVAPOTRANSPIRATION DEFICIT IMPACT ON CORN YIELD[5]



ROOT ZONE SOIL WATER EXTRACTION AND PLANT ROOT DEVELOPMENT PATTERNS[6]



Monitoring Evapotranspiration

To effectively plan irrigation, growers need to account for 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 multipled 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.

Soil Water Extraction Patterns

Corn plants extract the easiest-to-get water first. Assuming the soil is uniformly wet, this is the water in the top 25% of the root zone. As the top layer gets dryer, the plants go deeper for water. Since rain and irrigation are both applied to the surface, the plants get most of the water from the shallower depths. If water is applied to the soil surface, the typical extraction pattern follows the 4-3-2-1 rule: 40% of the water comes from the top ¼ of the root zone, 30% comes from the second ¼, and so on. The 4-3-2-1 rule is illustrated above.

In addition, though corn roots can reach depths of 5-6 feet (1.5-1.8 m), conservative irrigation management assumes a 3-foot (.9 m) effective root zone. Later, when predicting the timing and amount of the last few irrigations, the effective root zone is expanded to 4 feet (1.2 m).[6]

References

[1] http://www.ianrpubs.unl.edu/epublic/pages/publicationD.jsp?publicationId=1131

[2] http://www.ces.purdue.edu/extmedia/NCH/NCH-40.html

[3] http://weedsoft.unl.edu/document/growthstagesmodule/cor/corn.htm

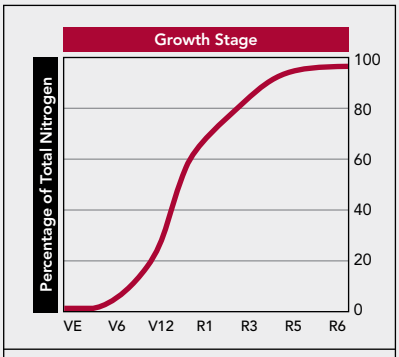
[4] http://texaset.tamu.edu/growers.php

[5] Crop Water Management, AGLW Water Management Group, FAO

[6] http://www.ianrpubs.unl.edu/epublic/pages/publicationD.jsp?publicationId=1004

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

Zimmatic 9500L lateral system



NITROGEN NEEDS

Corn plants on average will take up as much as 50% of its total N by the V14 or R1 growth stages. All N should be applied by the R1 to R2 growth stages.

FERTIGATION

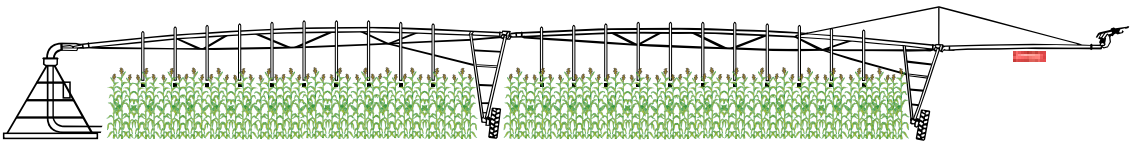
Fertigation is an efficient method of supplying part of the nitrogen (N) needed for a corn crop through the irrigation system, near the time of maximum nitrogen uptake. The chart at left illustrates the typical pattern of N uptake by a corn crop. While this pattern and amounts of uptake will vary slightly with hybrid, the most rapid period of N uptake is between V8 and VT growth stages. During this time, a steady supply of N is critical to ensure optimum yield.

Timing fertigation

Nitrogen fertigation for corn generally should begin with the first irrigation and be complete by the R1 to R2 growth stages. Application rates of 20-30 lb. N/acre (22-34 kg/ha) per irrigation event are recommended. However, higher rates of up to 50 lb. N/acre (56 kg/ha) per irrigation event is unlikely to cause crop damage because the fertilizer is diluted in water. Growers should ensure that water is applied uniformly, without runoff, for even distribution of N. Urea-ammonium nitrate (UAN) solution is the most common N source for fertigation, though ammonium thiosulfate (ATS) can also be used, particularly in sandy soils likely to benefit from sulfur (S) fertigation.[1]

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.

References

[1] http://cropwatch.unl.edu/archives/2009/crop18/fertigation.htm

[2] An Economic Comparison of Subsurface Drip and Center Pivot Irrigation Systems, D.M. O'Brien, D.H. Rogers, F.R. Lamm, G.A. Clark, Kansas Agricultural Experiment Station, Paper No. 98-123-J. ASAE Paper No. 97-2072.

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

[4] Economic Importance of Irrigated Agriculture, 2005. Nebraska Policy Institute.

[5] http://agebb.missouri.edu/irrigate/survey/nbh04.htm

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.

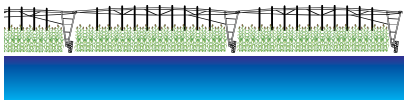


Figure A
Pivot/lateral irrigation

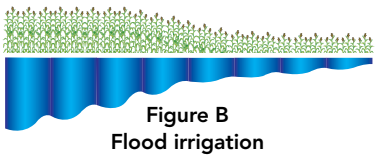


Figure B
Flood irrigation

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.

Higher return on investment

The long lifespan of your Zimmatic pivot or lateral system saves you money year after year: You will use less water, and reduce waste by applying chemicals and fertilizers more accurately and evenly. It all adds up to consistently higher yields and lower input costs.

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

A study comparing pivot irrigation with SDI indicated that for 160 acre (65 ha) fields, SDI had a distinct disadvantage in net returns of $21.85 per acre ($54/ha).

- SDI net returns were approximately equal to center pivot systems for 64 acre (26 ha) fields, and greater for 32 acre (13 ha) fields.
- Results were dependent on SDI life – unprofitable for a lifespan of <10 years.
- Corn yield, price changes and drip line costs affected SDI profitability.[2]

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 materials[3]

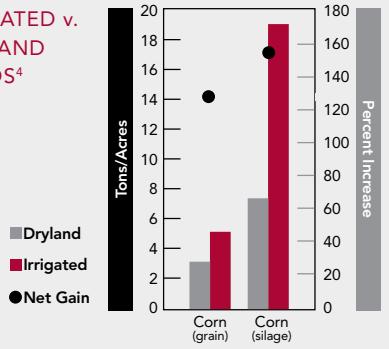
Pivots/laterals v. dryland

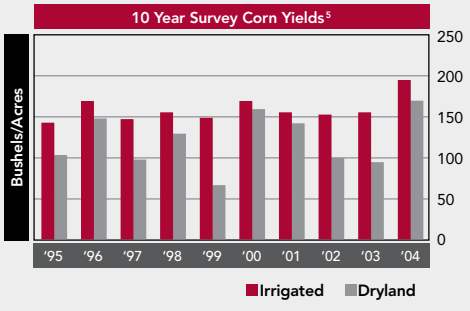
Flexibility of planting time; high germination rates

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

IRRIGATED v. DRYLAND YIELDS[4]





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.

IRRIGATION SOLUTIONS

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

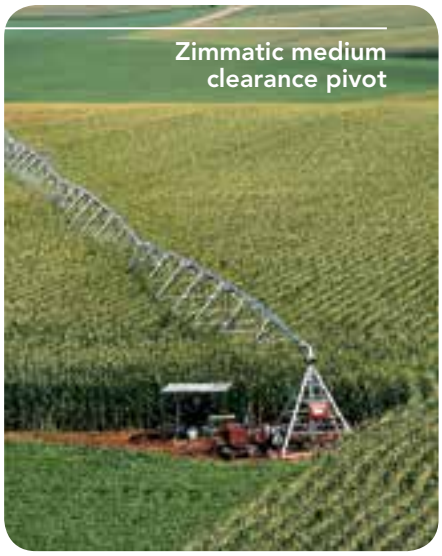
Heavy-duty spans, trusses and advanced drivelines (Center Drive and AT Gearbox) assure long life, durable operation and deliver even water distribution. There are varying heights to provide the proper irrigation for different types of crops – proven to withstand the elements in nearly any environment.

Control panels

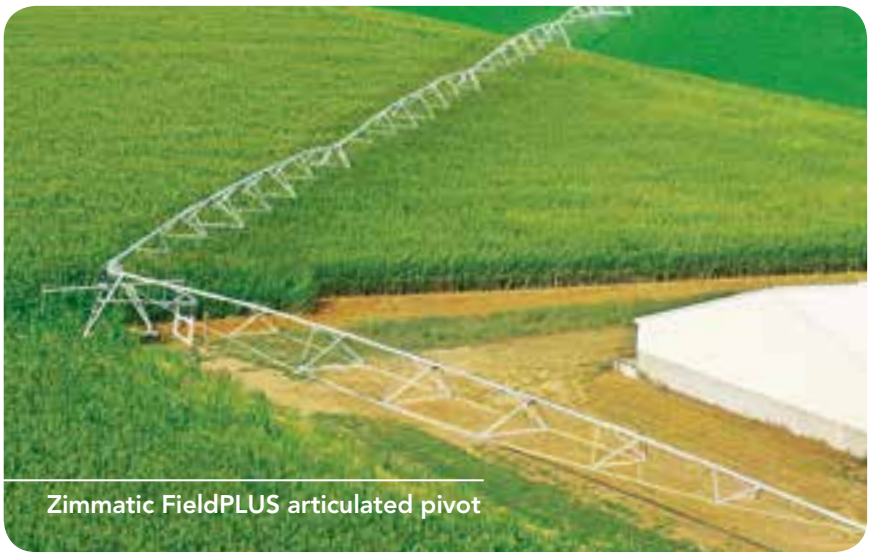
Depending on your needs, each user-friendly Zimmatic control panel offers a different level of control, convenience and maintenance options.

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.

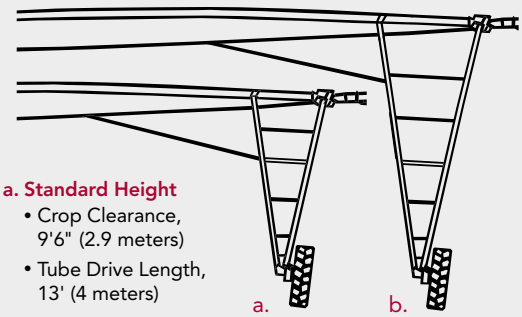


Zimmatic medium clearance pivot



Zimmatic FieldPLUS articulated pivot

Higher clearance for healthier corn



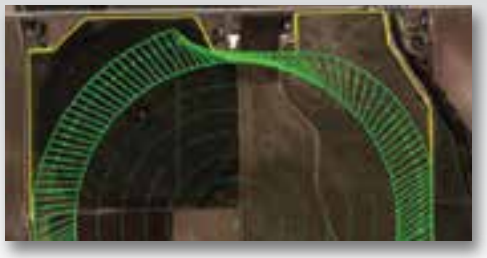
a. Standard Height
- Crop Clearance, 9'6" (2.9 meters)
- Tube Drive Length, 13' (4 meters)

b. Medium Clearance
- Crop Clearance, 11'2" (3.4 meters)
- Tube Drive Length, 15' (4.6 meters)

DURABLE HEIGHT OPTIONS PROVIDE NEEDED CROP CLEARANCE AND STABLE OPERATION FOR VARYING TERRAINS AND STRONG HYBRIDS

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 hectares 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 9500P center pivot

The Lindsay Advantage

Lindsay is the only single-source irrigation manufacturer that can develop a customized pivot, lateral or drip system for your individual needs. From planning and design to wireless management, filtration and custom pump stations, Lindsay will help you optimize yields and reduce risk while efficiently utilizing resources.

Growers around the world rely on Lindsay's innovative technology and long-lasting products supported by a network of knowledgeable dealers.

To find out how to save water and energy while achieving higher yields, visit www.zimmatic.com or talk to your local Zimmatic® by Lindsay dealer.

LINDSAY™

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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