Corn
Benefits of Drip Irrigation

Improving Crop Development And Yields
Controlling Variability
Optimizing Input Costs
Improving The Application Of Water
### Why Is Drip Irrigation Important To Growing Corn?

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Greater water application uniformity and accuracy, resulting in improved water use efficiency (WUE) and crop uniformity.</td>
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<tr>
<td>2</td>
<td>Reduced soil surface wetting, resulting in lower evaporation losses and weed competition.</td>
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<td>3</td>
<td>Greatly reduced periods of anaerobic conditions in the root zone compared to other forms of irrigation.</td>
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<td>4</td>
<td>Greater ability to manipulate soil water content at peak demand to improve field access, minimize rutting, etc.</td>
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<td>5</td>
<td>Improved disease control due to improved root zone oxygenation or reduced foliar wetting.</td>
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<td>6</td>
<td>Ability to apply nutrients directly to the center of the active root zone resulting in very efficient and immediate uptake by crop.</td>
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<td>7</td>
<td>Minimize nitrate leaching loss potential to ground water, with good irrigation water management.</td>
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<td>8</td>
<td>Flexibility in application timing for nutrients and other crop care products.</td>
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<tr>
<td>9</td>
<td>Little or no application costs compared to any kind of nutrient application made to the soil or the crop canopy.</td>
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<td>10</td>
<td>The ability to fertigate eliminates the need for application vehicle traffic through the field, thereby eliminating soil compaction, root pruning or other forms of crop damage.</td>
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<tr>
<td>11</td>
<td>Can easily automate irrigation operations.</td>
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</tbody>
</table>

### Additional Benefits
- Easy field access
- Weed reduction
- Less evaporation losses
- Reduced damage from equipment and pests
- Reduced water temperature
- Reduce disease pressure
- Less lime scale
Water For Improving **Crop Development And Yields**

Water is a critical input which can dramatically enhance or hinder crop development. Drip irrigation has the ability to highly control the location, quantity, and timing of water. At each stage, the grower can accurately apply the proper volume of water to optimize the growth potential. In some critical stages, reduction in growth from water stress is not recoverable.

Drip irrigation benefits can be seen throughout the growing cycle, especially in germination, plant growth and cob development. Drip irrigation provides a better application of water to the soil profile for germination and spoon feeds nutrients in early vegetative stages. With drip irrigation, you can optimize the air and water balance in the soil thus optimizing the soil condition and nodal root development.

In the rapid vegetative growth, drip irrigation distributes nutrients directly to the root zone to allow for peak uptake of critical nutrients. In the silking and tasseling stage the available water to the plant is optimal for proper kernel development. And before harvest, drip irrigation allows you to methodically dry down the plant. Each step providing the farmer with the opportunity to utilize water to maximize yield.

Drip Irrigation provides precise application of water. With other methods of irrigation, you lose some water, as it must move through the crop canopy in order to get to the root zone, making it susceptible to evaporation. This means that 20-30% of the water may be lost with overhead application of water.

**A Delivery System For Nutrients**

Drip irrigation gives you flexibility to quickly and effectively apply nutrients directly to the root system. Providing the right amount of nutrients helps nodal and fibrous root development.

Drip irrigation creates a drier environment above ground, reducing leaf wetness and relative humidity where corn diseases will thrive.

**Drip Irrigation Benefits By Growth Stage**

<table>
<thead>
<tr>
<th>Vegetative Stages</th>
<th>Reproductive Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>VE</td>
<td>R1-R6</td>
</tr>
<tr>
<td>Germination and Emergence</td>
<td>Grain Fill and Harvest</td>
</tr>
<tr>
<td>V1-V5</td>
<td>VT</td>
</tr>
<tr>
<td>Early Vegetative Stages</td>
<td>Critical Flowering Stage •Tasseling</td>
</tr>
<tr>
<td>V6-V14</td>
<td></td>
</tr>
<tr>
<td>Rapid Vegetative Growth</td>
<td></td>
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<tr>
<td>Provide for peak N and K uptake while optimizing water supply.</td>
<td>Supply peak water needs during most yield-critical period to maximize kernel count and yield potential.</td>
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<tr>
<td>Spoon-feeding of nutrients promotes rapid establishment and nodal root development.</td>
<td>Maintain nutrient supply during period of decreasing water demand for high test weight and lengthened grain fill.</td>
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<tr>
<td>Drip Irrigation provides high distribution uniformity, resulting in rapid, uniform germination and emergence.</td>
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*Note: VE = Vegetative Emergence, V1-V5 = Early Vegetative Stages, V6-V14 = Rapid Vegetative Growth, VT = Critical Flowering Stage •Tasseling, R1-R6 = Grain Fill and Harvest*
Water For Improving Crop Development And Yields

Yields are impacted by the management of water at each stage of growth. According to major research study results, significant differences in yields were achieved with drip irrigation. Even with changes in other inputs, drip irrigation still played a much greater role in changes to the yields. In the separate studies below, you can see the difference in total yield based on water availability and phosphate rates.

Increased yields are dependent on the ability to deliver the optimal amount of water, based on the plants needs and changing weather conditions. Drip Irrigation has the ability to meet these needs.

Risk of Yield Loss Due to Drought Stress in Corn

Days since emergence

Yield susceptibility * %

0.0 0.1 0.2 0.3 0.4 0.5

*% potential yield loss when drought occurs during this period.

Source: Limited Irrigation Management: Principles and Practices by J. Schneekloth, T. Bauder, N. Hansen (1/09)

Crop Yields in Alabama Study

Crop Yields in Illinois Study

Yields doubled using SDI over dryland
- Dryland Yield (Bu/Ac)
- Irrigated Yield (Bu/Ac)

Yields using Drip Irrigation over dryland
- Dryland Yield (Bu/Ac)
- Irrigated Yield (Bu/Ac)

Source: 2009-2010 SDI Report – Alabama Cooperative Extension System

Source: University of Illinois
Controlling Variability

Reduce The Variability Of Water Throughout The Season.

Drip Irrigation provides growers with the opportunity to reduce the variability that comes with growing corn. It is about supplying enough water throughout the season without missing critical growing periods due to stress. Studies show that there is a high correlation between risk of yield loss and daily water requirements.

No season is the same, so growers never know if your corn crop is going to get the rain it needs, at the right time and amount. Too little rain or to much rain can impact your yields. Drip irrigation can reduce the impact that weather has on your crop, optimizing your crop’s potential.

Control Points (Drip Irrigation)

1. Reduce uncertainties associated with variable rainfall patterns
2. Improve crop uniformity
3. Increase field access
4. Control plant stress
5. Maintain consistent soil moisture
6. Apply macro and micro nutrients in all stages of the crop (spoon feed the plant)
7. Reduce weed pressure

Source: USDA NASS
A Solution To **Optimizing Input Costs**

Drip irrigation systems play an important role in reducing other input costs associated with growing corn. Utilizing a drip irrigation system can reduce:

- **Pumping costs** (due to lower pressure and volume requirements)
- **Losses of chemicals and fertilizers** (fertigation) due to inefficiencies
- **Reduce cost** associated with weeds and plant disease
- **In-season cultivation** - furrow making, weeding (weed pressure) and other labor intensive farm practices

The chart to the right shows prices of the selected fertilizers rising. With the help of drip irrigation, there is an opportunity to increase the efficiency of fertilizer applications.

**Benefits Of Drip Fertigation:**

1. **Minimize nitrogen volatilization.** When urea is converted into a gas and lost to the atmosphere, volatilization takes place. Using a drip fertigation system allows nitrogen to be applied directly into the soil solution close to the plants roots. This significantly increases the chance of nutrient uptake, minimizing volatilization.

2. **Minimize nitrogen loss.** Drip fertigation is a very efficient process where a greater percentage of the applied nutrients are utilized.

3. **Reduce number of tractor passes.** With the option to apply nutrients through the drip line not only do you reduce labor and fuel requirements, you also help reduce total soil compaction.

4. **Increased uniformity of fertilizer delivery.** Fertilizers can now be distributed to your total wetted area across the entire field with high uniformity.

5. **Allows in season application** of P & K fertilizers. Application via fertigation has an increased efficiency, since these elements are precisely placed in the plant root zone. Drip irrigation optimizes uptake.

Lower potential for P fixation by the soil due to point application to the zone of maximum root concentration. This should result in improved P use efficiency.

Subsurface P application should reduce the risk of surface P losses due to erosion or overland flow.
With drip irrigation, you can manage the timing, duration, and uniformity of the water that can be delivered at any point in the season. Additionally, drip irrigation can reduce losses in water due to seepage, transmission, evaporation, and leaks common in other methods of irrigation. In the charts below you see how yield and water needs are affected by the ability to accurately deliver water throughout the season. No other irrigation technique can provide the same level of distribution uniformity (DU) that drip. Drip irrigation systems can provide a distribution uniformity of 93% and higher.

**Daily Water Use by Corn**

- Emergence
- Knee High
- Tasseling
- Silking
- Early Dent
- Black Layer

**Yield Results at ≈75% of Full Irrigation**

Source: Robert Evans, Extension Agricultural Engineering Specialist
D. K. Cassel, Professor of Soil Science. R. E. Sneed, Extension Agricultural Engineering Specialist
Published by: North Carolina Cooperative Extension Service. Publication Number: AG 452-1

Source: KSU Research For Corn Production Using SDI
F.R. Lamm, W.E. Spurgeon, D. H. Rogers and H.L Manges1
Drip Line Solutions for Corn

T-Tape Drip Tape
John Deere T-Tape drip tape features a long filtration area designed to prevent large particles from infiltrating and clogging the tape. The turbulent flow channel and labyrinth with its sharp angle teeth creates a high degree of turbulence, which keeps the dirt in suspension and prevents it from accumulating. The slit outlet prevents dirt intrusion and makes the T-Tape suitable for subsurface applications.

Hydrodrip Drip Tape
Hydrodrip Drip Tape is the ideal drip tape solution for crops requiring the combination of wide dripper spacing, low flow rates, and excellent uniformity in long run lengths. The dripper is engineered with a highly effective filter inlet system and a turbulent flow path, reducing the chance of plugging and helping to maintain peak performance. And with its flap outlet, Hydrodrip Drip tape reduces the ingestion of soil on system shut-down when used in a subsurface application.

D5000 Flow Regulated Drip Line
The John Deere D5000 Flow Regulated Drip Line features a highly effective filtration, a large cross sectional labyrinth resisting clogging and a regulating chamber and membrane forming a differential regulation, which maintains constant flow rate in a wide range of pressures. An additional feature is the self flushing mechanism ensuring small particles entering the emitter will be flushed out. The slit outlet in thin wall drip lines (15 mil) prevents soil particles from being drawn back into the dripper when the system shuts down.

Common T-Tape Drip Tape options used for Corn (Surface & Subsurface)

<table>
<thead>
<tr>
<th>Diameters</th>
<th>⅜&quot; and ⅞&quot;</th>
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</thead>
<tbody>
<tr>
<td>Wall thickness</td>
<td>8 - 15 mil</td>
</tr>
<tr>
<td>Spacings</td>
<td>12&quot; - 16&quot;</td>
</tr>
<tr>
<td>Flow rates</td>
<td>0.22 - 0.34 gpm/100'</td>
</tr>
</tbody>
</table>

Common Hydrodrip Drip Line options used for Corn (Surface & Subsurface)

<table>
<thead>
<tr>
<th>Diameters</th>
<th>⅜&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall thickness</td>
<td>10 - 15 mil</td>
</tr>
<tr>
<td>Spacings</td>
<td>12&quot; - 18&quot;</td>
</tr>
<tr>
<td>Flow rates</td>
<td>0.17 - 0.25 gpm/100'</td>
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</tbody>
</table>

Common D5000 Drip Line options used for Corn (Surface & Subsurface)

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<tr>
<td>Wall thickness</td>
<td>15 mil</td>
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<tr>
<td>Spacings</td>
<td>12&quot; - 18&quot;</td>
</tr>
<tr>
<td>Flow rates</td>
<td>0.29 - 0.43 gpm/100'</td>
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