# Christmas Tree Farm – Irrigation

Normally Iowa gets plenty of rain throughout the year to grow crops like corn, soybeans, and Christmas trees. However, the rain can come sporadically and some of the peak growing months like July and August may see little to no rain. Consider that you are an owner of a Christmas tree farm, and you want to install an irrigation system to your fields. This will better supply water to the growing trees when they need it the most. Adequate water will ensure the trees stay healthy, grow well, and resist diseases.

1. Give a brief overview of the issue that Christmas tree farmers face.
* Trees can grow healthier with adequate water supplied when they need it. Healthy trees can resist pests and diseases better than unhealthy trees. Pumping water onto fields can be expensive. There are a lot of options and variables to consider.
1. What limitations or constraints does the farmer face? Describe and explain each.
* Farm size – different irrigation systems are better suited to different farm sizes.
* Terrain you are working with (hilly vs. flat). Terrain determines how much runoff and erosion might occur. Long, solid pipes won’t bend over curved hills whereas soft plastic tubing can fit to the contour of a hill.
* The available water source(s). Municipal water sources could be very expensive and billed. An on-farm retention pond, creek, or stream could be drawn from for relatively little cost.
* Efficiency of system. An inefficient system wastes money by pumping and distributing more water than needed. Water can be lost to evaporation or runoff in an inefficient system.
* Labor availability. Center pivots and traveling guns can move without a lot of labor after setting up. Other raised sprinkler systems might require a large labor force to move pipe at regular intervals. Drip irrigation requires a lot of labor to install and regular maintenance throughout each growing season but doesn’t require labor to be moved regularly.
* Energy requirements. The more PSI or pressure required for the system; the more energy will be consumed. The more energy consumed, the more costly the system is to run.
* Cost/budget. This can be the biggest limiting factor. However, if the addition of the irrigation system is profitable, then the costs are justified.
1. What are the potential solutions that address this issue?
* Sprinkler systems – simulate rainfall with pressurized water discharged through sprinklers (raised sprinklers: center pivots, traveler guns).
	+ Center pivots suitable for large farms – more than 130 acres. Require 60 psi of pressure. Cost over $1,000 per acre to install and run. 70-85% efficient with water loss to evaporation.
	+ Traveler guns suitable to smaller farms 50-80 acres. Require more pressure, 60-100 psi of pressure. Cost $800-1000 per acre to install and run. 60-65% efficient with water loss to evaporation.
* Micro irrigation – drip irrigation. Can work on farms of any size. Low pressure required, less than 50 psi. Cost $600-800 per acre to install and run. 80-95% efficient with water loss to evaporation.
1. What impacts might each solution have on people?
* Moving pipes through raised systems can be very labor intensive. This could result in muscle strains or other accidental injury.
* The cost of raised sprinkler systems makes them risky if the enterprise doesn’t make a profit.
* Micro irrigation systems can be labor intensive to install.
1. What impacts might each solution have on the natural environment?
* Raised sprinkler systems have lower efficiency which means more water is used. In dry years, this reliance on and use of water can put strains on the natural environment especially if it comes from a natural source (underground aquifer or flowing river/stream).
* Excess water can be detrimental to the natural environment as well as it could cause erosion or nutrient runoff.
* Irrigation systems take energy to pump the water. If the energy is not from a renewable source, then that energy consumption can contribute toward climate change.

Suggested resources:

* <https://youtu.be/xjhlRqsOnUs>
* <https://www.canr.msu.edu/news/optimizing_your_christmas_trees_irrigation_with_soil_tensiometers>
* <https://youtu.be/EvL1NwaF8Oo>
* <https://youtu.be/btAEVHtGdXM>