

# Evaluating Center Pivot Drag-line Drip Irrigation Systems

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**Abstract.** *Center pivot irrigation is the most prevalent irrigation technology used in Texas, accounting for about 70% of the total acreage. Except in irrigation districts, farmers continue to switch from furrow to center pivot irrigation. In spite of the costs, pivots offer many advantages over furrow irrigation including higher efficiency and lower labor requirements. Drip irrigation is often used in production of vegetables, fruits and other high value specialty crops in Texas. However many farmers are discouraged from implementing permanent drip irrigation systems on larger fields due to its costs and high maintenance requirements. Although not a new concept, some manufacturers have started marketing center pivot drag-line drip irrigation systems. These systems combine the application efficiency of drip irrigation with the operational efficiency of center pivot systems. This paper will review the operation and performance of various center pivot operated drag line drip irrigation systems and summarize farmer perceptions of this technology.*

**Keywords.** Center pivot, drip irrigation, drag-line systems

## Background

The use of drip irrigation technology with center pivot irrigation machines is not a new concept. However, recently manufacturers and local irrigation dealers in Texas have started marketing drip irrigation packages for center pivots, often referred to as “drag-line drip irrigation systems” or “precision mobile drip irrigation”. These systems drag varying lengths of drip irrigation tubing behind the machine applying water slowly on the surface. The combination of these two technologies has potential to combine the higher application efficiency related to drip with the operational and maintenance benefits of center pivot machines. This paper reviews the design and performance of three recently installed drag line systems in Texas.

## System Design

Three drag-line drip irrigation systems were installed in Texas in 2015. One grower converted all 8 spans of his pivot to drip irrigation. The other two growers installed one and two spans on their existing center pivots, converting from LESA and LEPA water application technologies. Design of the three drag-line

systems varied. Factors such as crop type, planting layout (ie straight or circle rows), and designer/installer influenced the design. One type uses a secondary pvc manifold positioned below the pivot main which is held in place by guidewires attached to each pivot tower span. A series of pvc pipes or flexible pivot drop hose were used to connect drip lines to the manifolds. Systems either have a 30 or 60 inch drop/drip line spacing. Drip line length varies based upon the flow rate needed and is matched to the pivot printout. These three systems used Netafim DripNet PC Dripline. Drip line flow rates varied from 1 gallon per hour per foot to 2 gallons per hour per foot.



Figure 1. Example Design of Manifold Assembly.

Filtration and pressure regulation are typically standard practice when operating conventional drip irrigation systems. However, the use of filtration and pressure regulation varied across all the installed systems. Two of the systems evaluated had filters installed. Filter location varied from one at each drip line to only 1 from each pivot drop to the manifold. Pressure regulation also varied and 2 of the systems had pressure regulators on each drop/drop line. All three installations used pressure compensating drip tubing.

## System Operation & Maintenance

None of the growers reported any major maintenance problems with their systems. One grower reported that the plugs on the end of the drip lines would pop off during operation. The original

compression plugs were later switched out and replaced with “twist-locking” caps and no further problems were reported. Two growers reported some minor rodent damage to the drip tubing that required repair.

The growers expressed two operational concerns about the system. Adjusting the drip lines when changing pivot direction was required to avoid damaging the crop or having the dripline become entangled in the crop canopy. One grower noted that he had to move the move the drip lines by hand at the end of the field so he could perform tillage operations.



Figure 2. Drag-line system parked on end of field.

## Advantages and Disadvantages

The biggest advantage all three growers found with the use of the drag-line systems was the decreased depth of wheel tracks compared to sprinkler irrigation. One grower noted the ability to irrigate during colder weather and avoid freezing concerns. Growers also noted that use of drip irrigation reduced runoff from the field and evaporative and/or wind losses from sprinklers.



(a) Figures 3a & 3b. Pivot Wheel Tracks.

(b)



Figure 4. Drip line being dragged along crop row, Field Planted in Circle.



Figure 5. Drip line being dragged across crop rows, Field Planted Square.

The biggest problem observed by the grower who did not plant his crop in a circle was that the drip lines would pull across the top of the crop canopy (cotton plants) when traveling perpendicular to the rows. The grower did note some leaf damage but could not verify if it impacted crop yield.



Figure 6. Drip line being dragged over crop canopy.

## Conclusion

Many growers in Texas are interested in adopting the drag-line drip irrigation concept on their farms but have reservations regarding the performance, operation, management and costs. The information collected from the three growers is helpful in addressing potential grower concerns. Further evaluation and documented successful systems are needed before many growers will implement this system. As all three systems had a different design, further evaluation of each systems design using different types of manifolds and drops is needed to determine which design is the most practical and cost beneficial for converting existing systems.