# GROWERS USE LESS NITROGEN FERTILIZER ON DRIP-IRRIGATED ONION THAN FURROW-IRRIGATED ONION

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## Summary

Over previous years, research at the Malheur Experiment Station has shown that nitrogen (N) needs of drip-irrigated onion can be modest (Shock et al. 2004). In 2002, surveys of two growers' furrow-irrigated and drip-irrigated onion fields showed that N fertilizer use efficiency was substantially better in drip-irrigated fields than in furrow-irrigated fields (Shock and Klauzer 2003). In 2004 we repeated this survey with various growers' fields.

## Introduction

Drip irrigation is generally used on fields with imperfect topography, lower soil fertility, and histories of lower productivity compared to the fields used for furrow irrigation. From 1992 to 1994 we demonstrated that drip irrigation is an effective irrigation practice compared to furrow and sprinkler irrigation for onion production on Treasure Valley soils that were difficult to irrigate (Feibert et al. 1995). While 320 lb N/acre is commonly used in furrow-irrigated onion production, drip-irrigated onion is not very responsive to N fertilizer (Shock et al. 2004). The lower response of drip-irrigated onion could be because less irrigation water is applied using drip. With less irrigation, water is less apt to leach away residual soil nitrate and N from mineralization, allowing these N sources to supply the crop much of its N needs. Here we report growers' 2004 nitrogen fertilization practices using drip- and furrow-irrigation systems and the corresponding crop yields.

## Materials and Methods

Growers were asked to keep records of all fertilizer and water supplied to their onion fields. Yield was recorded for each field. The soil water potential was monitored in selected fields. The bulb yield was recorded. This report covers the yield, N applied, and yield per unit of applied N fertilizer for onions grown using drip and furrow irrigation. Some of the drip-irrigated fields were of poorer soil quality than the corresponding furrow-irrigated fields.

Although root tissue testing for nitrate is a proven method to assure adequate supplies of N for onion, to improve yields, and save on N fertilizer costs, none of the growers surveyed conducted root tissue testing.

## Results and Discussion

For the growers and fields surveyed in 2004, growers applied on average 279 lb N/acre when growing onions with furrow irrigation, while only 173 lb N/acre was applied with drip irrigation (Table 1). These N rates include all N applied during the fall prior to the crop year, spring preplant fertilizer, sidedressed N, and N applied by fertigation in the irrigation water.

Drip irrigation out-yielded furrow irrigation by an average of 68 cwt/acre for 4 growers and furrow irrigation out-yielded drip by 300 cwt/acre for 1 grower (Table 1). The low yielding drip-irrigated onion was from a very unfavorable field. The 2004 Treasure Valley growing season was favorable for high onion yields and excellent onion quality. During previous years, with more heat and water stress potential, larger yield differences were observed in favor of drip irrigation.

As a consequence of lower N fertilizer rates used for drip-irrigated onions than for furrow-irrigated onion, more onions were produced for each pound of applied N using drip (Table 1). The surveyed growers might have economized further on N fertilizer costs through root tissue testing for nitrate. Thorough nutrient management for onion has been described by Sullivan et al. (2001) and the methods they discuss are underutilized.

Growers used less N fertilizer under drip irrigation and yields were on average similar to furrow irrigation even though the soils in a few cases had less favorable physical and chemical properties. Under furrow irrigation, much more water is applied at each irrigation. The potential for deep leaching of nitrate and groundwater contamination is substantial with furrow irrigation. With drip irrigation it is easier to maintain uniform soil moisture, even on difficult sites. Since each water application with a drip system can be carefully managed to just replace water used by the crop, nitrate leaching can be greatly reduced with drip irrigation, and this results in better N fertilizer use at a commercial scale.

Drip irrigation may provide an important option for growers who wish to rotate onion onto soils not usually used for the crop. These fields may not be as highly infested with pathogens from short rotations of cash crops.

## References

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Table 1. Comparison of nitrogen (N) fertilizer rates, onion yield, and bulb yield per pound of applied N in furrow-irrigated and drip-irrigated onion, Treasure Valley of Oregon and Idaho, 2004.

| | Grower | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Furrow irrigation | | | | | | |
| N rate, lb/acre | 250 | 320 | 275 | 250 | 300 | 279 |
| Yield, cwt/acre | 810 | 800 | 855 | 750 | 850 | 813* |
| Ratio, cwt/lb N | 3.24 | 2.5 | 3.11 | 3 | 2.83 | 2.94 |
| Drip irrigation | | | | | | |
| N rate, lb/acre | 140 | 175 | 150 | 230 | 172 | 173 |
| Yield, cwt/acre | 860 | 850 | 930 | 850 | 550† | 808* |
| Ratio, cwt/lb N | 6.14 | 4.86 | 6.2 | 3.7 | 3.2 | 4.82 |

*Often drip-irrigated onion is grown on soil that is less favorable than furrow-irrigated onion.
†Extremely unfavorable soil.