Potato Production Under Drip Irrigation in the Columbia Basin

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Background:
In 2002, two adjacent fields comprising 56 acres were planted to Umatilla and Ranger Russet potatoes under drip irrigation. The selection of these varieties was based on previous work conducted by Clint Shock at Oregon State University, Malheur Experiment Station, which showed several varieties responding well under drip irrigation, including both Umatilla and Ranger (Shock, et al., 2001). However, early experiences with adapting drip tape to conventional 34 inch spacing and hilling practices did not provide many encouraging results. After these early attempts, it was realized that a different approach was necessary. Building on previous experience in 2001 with a "bed" production system, an 88 inch bed width was selected for 2002. This bed configuration allows for a pair of potato rows to be serviced by one drip tape, with the drip tape placement intended to produce a favorable balance of air and soil moisture in the root zone.

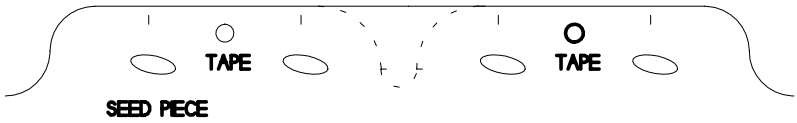

Figure 1. Schematic of the potato bed design using one drip tape per pair of rows. The entire bed is 88 inches across.

Results:
The field average results as received and reported by the processor are shown in Table 1. The Ranger crop was sent directly to the processor whereas the Umatilla crop went into storage.

Table 1. Yield and quality information for the two fields of drip irrigated potatoes.

	Umatilla	*Ranger*
Payable yield (tons/ac)	39.2	36.7
Percent US No. 1	93.0	87.8
Percent bruise free	76.0	No bruise data
Specific gravity	1.0921	1.0874
Percent 6 oz and above	76.5	75.5

In addition to the yield data given by the processor, two sub-sample plots were hand-harvested per field and variety to investigate possible differences between the rows within the bed. These plots were 11.5 feet of bed comprising approximately 10 plants per row. Figures 2-4 present these data.

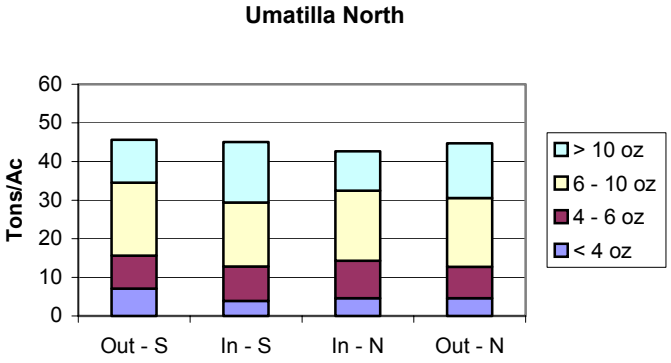

Figure 2. Yield and size distribution of tubers for each row within the bed for the north field (east-west rows) of Umatilla Russets.

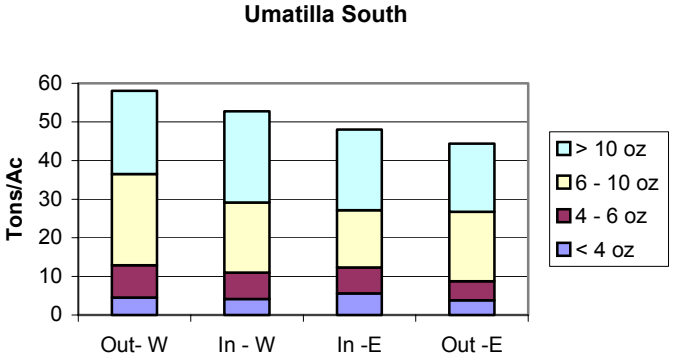

Figure 3. Yield and size distribution of tubers for each row within the bed for the south field (north-south rows) of Umatilla Russets.

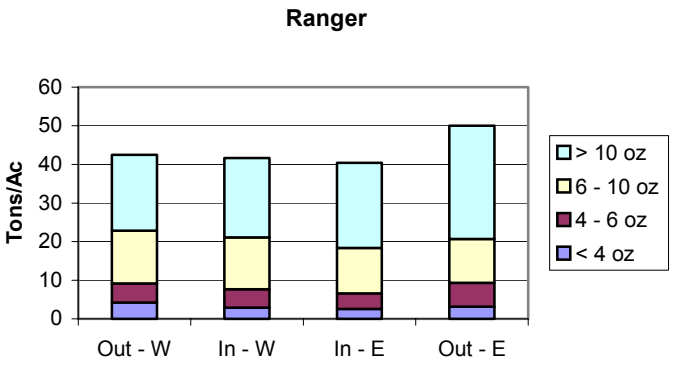

Figure 4. Yield and size distribution of tubers for each row within the bed for the south field (north-south rows) of Ranger Russets.

With the higher population and the close proximity of the plants within the bed, there was some concern as to inter-row competition for sunlight having a negative effect on size and yield on the inside rows. However, the results from the hand-harvest of the plots did not conclusively show inter-row competition to be an important factor. Factors such as plant stand, stem count and individual plant health appeared to be more important.

Figure 5 shows the average daily water application rate of our potato crop compared to an onion crop. Of particular interest is the very aggressive increase in water use early in the season as the plants advanced. (An EnviroScan and Watermark data-logging system were used to gauge soil moisture status). For the season, the total irrigation water applied to the crop was 26.3 inches, which results in a water use efficiency of about 1.5 and 1.4 tons payable per inch of water applied for the Umatillas and Rangers respectively.

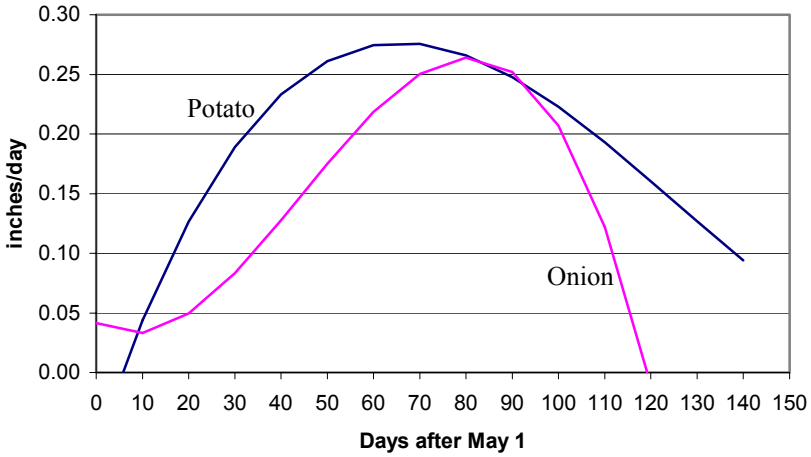

Figure 5. Daily water application rate for the 2002 potato crop compared to an onion crop.

Lastly, some observations can be made concerning the growing environment under this production system. With the tighter plant spacing, the plants grew relatively tall and created a fairly dense canopy structure, which acted as an insulating layer between the ambient conditions and the soil surface for a good part of the season. This was observable in single observation data-logged temperature and relative humidity readings obtained within the plant canopy. In general, the maximum daily air temperatures within the canopy were lower in comparison to a field of center-pivot irrigated Umatillas and did not exceed 80 degrees Fahrenheit as long as the canopy was maintained. However, for the same period the relative humidity levels within the plant canopy were higher in comparison to the center-pivot.

Special Thanks To:

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Literature Cited:

Shock, C. C., Eldredge, E. P., Saunders, L. D. 2001. Early and Late Harvest Drip-Irrigated Red and Russet Varieties. Malheur Experiment Station Annual Report 2000, SR 1029. Oregon State University.