Direction of Planting: Does It Matter?

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No previous research on direction of planting exists for potatoes in the Columbia Basin. The purpose of this trial was to investigate if there is a difference in economic return to growers for planting in one direction or another.

Methods and Materials: In 2015-18, Umatilla Russet and Payette Russet (2018 only) were planted in four directions north to south (N to S), northeast to southwest (NE to SW), west to east (W to E), and northwest to southeast (NW to SE) and grown using standard practices (Figure 1). Each direction was replicated 4 times in a strip-plot design. These varieties were chosen because of their non-uniform emergence and dormancy issues (Payette R.). Soil temperature was measured for each treatment, 2 inches above the seed piece. Solar radiation was collected in 2018 only. Yield, size profile, US grade, tuber quality, and gross return were measured and calculated. Data were combined across years and cultivars for the summary in Table 1.

There were no differences in soil temperature based on row orientation. Rows planted N to S, NW to SE, and NE to SW collected more solar radiation during the day then those planted W to E (data not shown). Photosynthetic photon flux (PPF) measurements indicated that the north side of rows planted west/east failed to collect as much PPF during a typical summer day than other planting directions simply due to their orientation relative to the sun (data not shown). A significant shadow was always present on the northern side of the rows. Figure 2 demonstrates this relationship. Although the canopy eventually covers 100% of the ground after potato row-closure, the plants are less dense between rows compared to within-row plants and sunlight is still able to make its way into the canopy. Because of this, rows should be oriented to absorb as much solar radiation on all sides of the plants throughout the day (N toS, NW to SE, NE to SW). The row planting directions that absorbed the most solar radiation also produced the highest gross return and yield (Table 1). Based on four years of research, planting from or to N to S, NW to SE, or NE to SW (vice versa) is better for plant growth and economic return than planting W to E, vice versa. (Table 1).

When planted in a tight row (spaced about 10 inches apart in-row) and planted W to E, one side of the row tends to be shaded more than the other. Think about what side of the tree the moss typically grows in the northern hemisphere – north. In a row planted W to E or vice versa, the north side of the row is more shaded than the south. When planted N to S or close, the tightly spaced side of the row is on the W and E. As the sun moves from sunup to sundown (Figure 3), the W and E sides get close to equal exposure to the sun during the day – maximizing the capture of solar radiation. If plants were spaced in a perfectly square pattern, say 17 x 17 inches, as opposed to the typical row, say 10 x 34 inches, planting direction would not matter. Remember, results may vary if the field is sloped one direction or another. We hope to continue this research for one more year with more than one variety to proof the data before we make recommendations to growers. For many situations, growers must plant in the direction that is logical with the lay of the land.

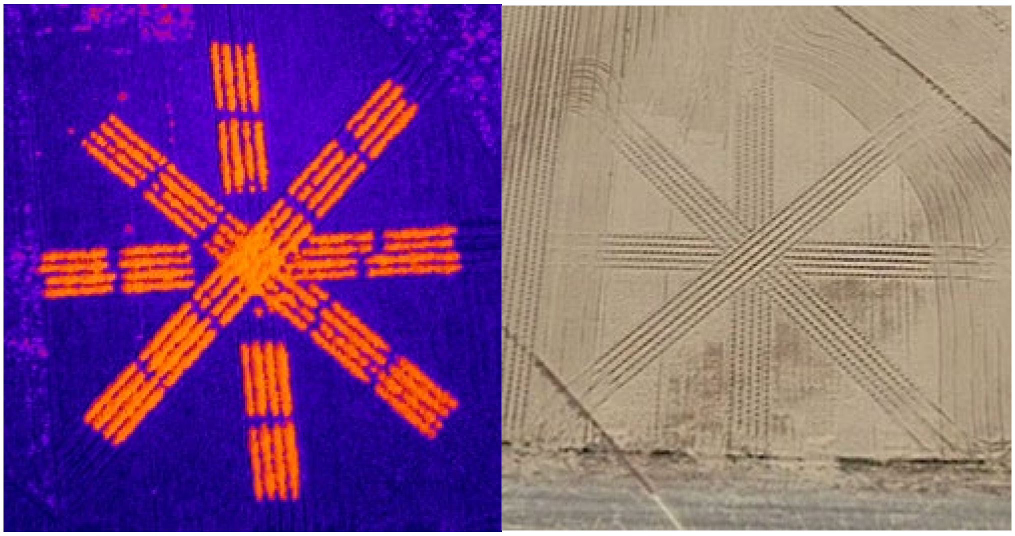

Figure 1. A near-infrared photo of the Direction of Planting trial taken by a drone (left) compared to a Google Earth snapshot (right). The photo on the left was taken near the end of June after potato plants had emerged. The photo on the right was taken after the trial had been planted and dammer-diked. The trial was located on the WSU Othello Research Farm.

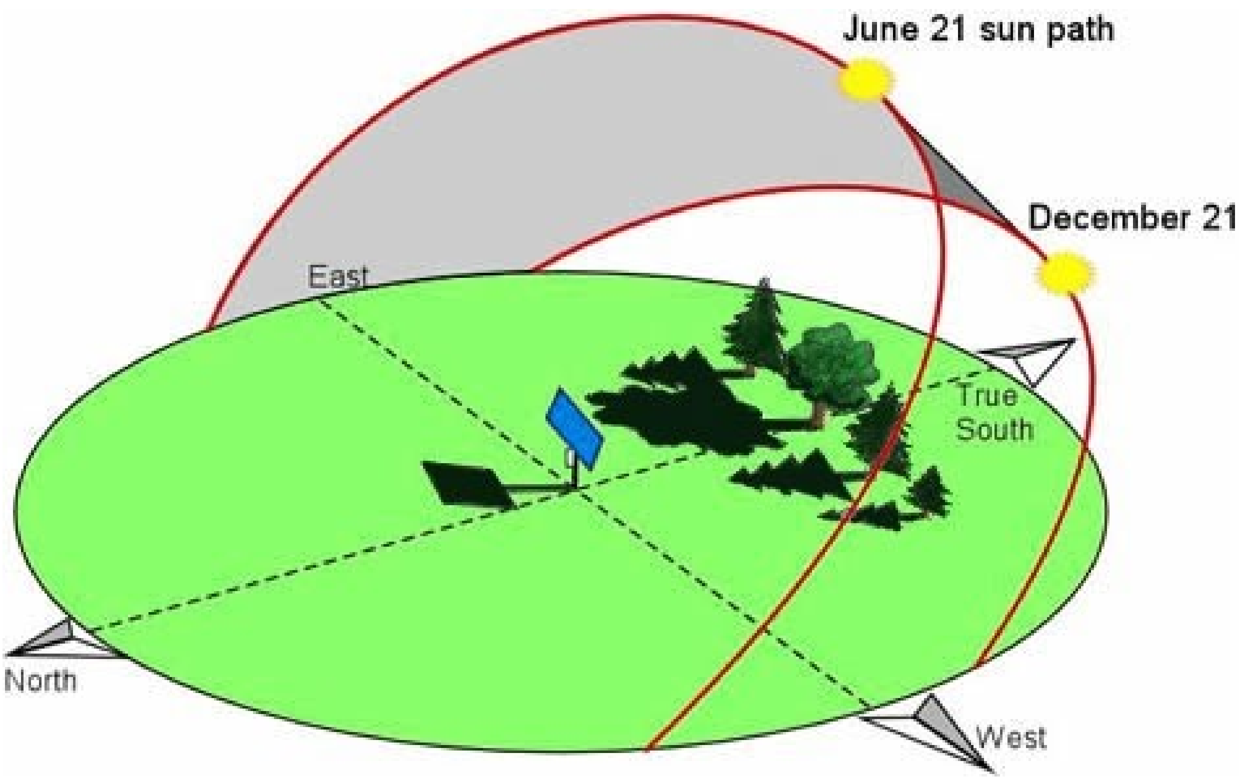

Figure 2. The sun's movement during summer and winter soltice. Note the shadow on the north side of a tree line planted due west/east. The shadow is similar on potato hills and plants when planted west/east.

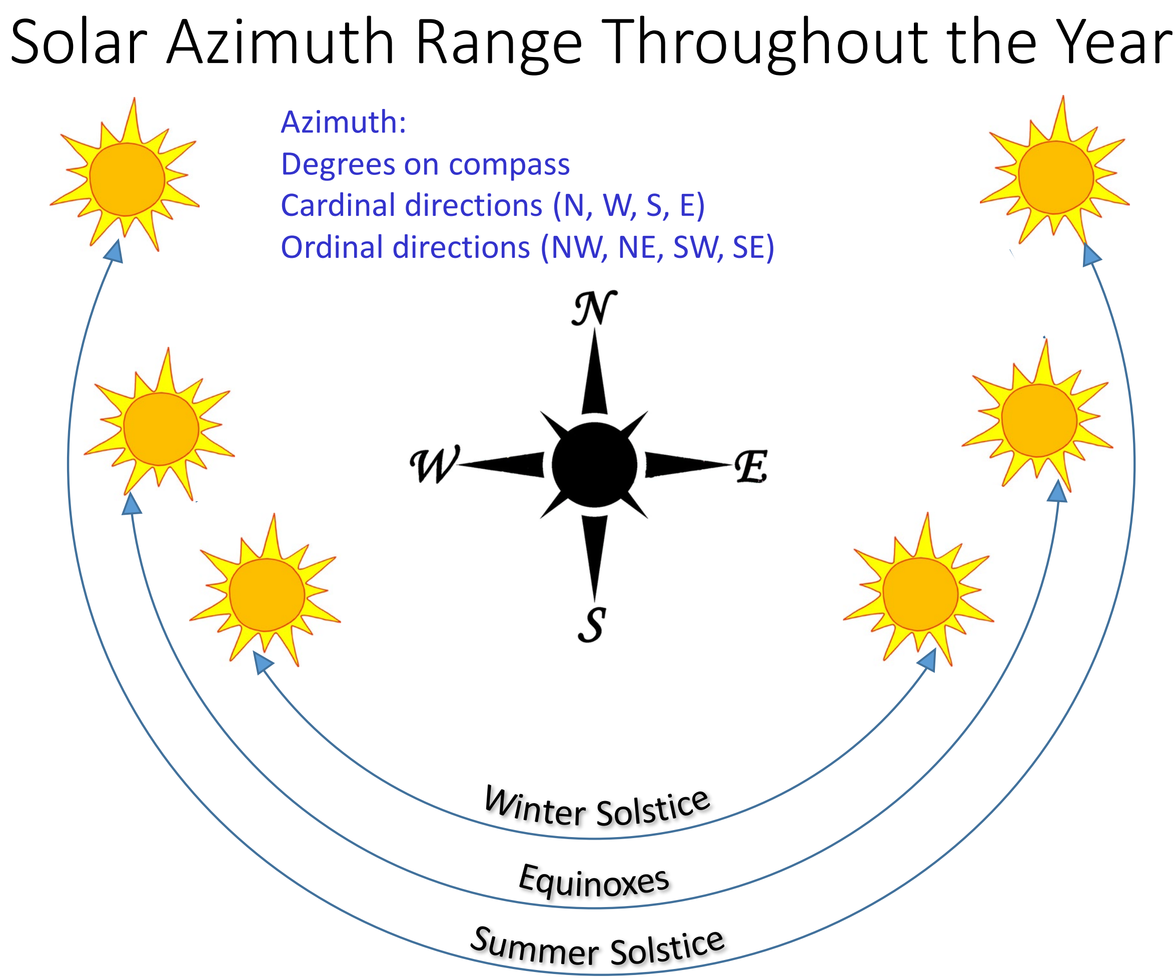

Figure 3. Solar azimuth range throughout the year for the Northern Hemisphere

Table 1. Yield, economics and tuber information from the 2015-18 Direction of Planting trial.

2015-18 WSU DIRECTION OF PLANTING TRIAL SUMMARY

Treatment	Process Adjusted Gross $/A	Total Yield CWT/A	Total Market Yield	US 1s > 4 oz %	US 2s > 4 oz %	Culls & < 4 oz %	Process Yield US 1 & 2s > 6 oz %
N to S	4690	776	737	78	2	21	58
NW to SE	4900	768	721	78	3	19	64
NE to SW	4590	751	718	76	2	22	57
W to E	4280	722	674	75	2	24	57
LSD	480	54					4.9
Pvalue	0.0484	0.0578	ns	ns	ns	ns	0.0067

Treatment	Tuber Weight oz	Average Tuber Number Per Plant	Specific Gravity	Market Yield (Percent of Market Yield) CWT/A 0-4	4 to 8	8 to 12	12 to 16	> 16
N to S	7.1	10.7	1.089	129	300	168	70	69
NW to SE	8.1	9.3	1.089	104	254	169	103	91
NE to SW	7.1	10.3	1.089	128	290	156	75	69
W to E	7.3	9.8	1.089	121	266	155	78	54
LSD		0.8		19	37		21	21
Pvalue	ns	0.0051	ns	0.0057	0.0343	ns	0.0037	0.0279

ns = values within the same column are not signficantly different based on Fisher's Least Signficant Difference Test

LSD values not shown when treatment values are not significantly different