SEED SPACING - A CLOSER LOOK

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During the past several Potato Conferences, we have discussed the effect of appropriately sized seed on grower returns. This year the focus will be on seed spacing.

Most of our past references to spacing have only alluded to the impact on returns. In one case, the relationship was described graphically. In 1983, graphs of actual distributions were used to show how variable actual spacings really were. This year the discussion relies on data collected by the Washington Crop and Livestock Reporting Service regarding hills per acre as well as making use of previously discussed material.

Each year the Washington Crop and Livestock Reporting Service samples a large number of fields to determine yields. These samples include information on the estimated hills per acre.

Figure 1 shows hills per acre as well as several other pieces of information. Also shown are the number of samples collected, the average yields per acre, and yield per hill. Yield per hill is calculated by dividing yield per acre by the number of hills per acre.

Figure 1.

Hills per Acre

Year	No. of samples	No. of Hills per acre	Average yield per acre	Yield per hill
1981	153	13,924	490	3.52
1982	190	14,194	480	3.38
1983	171	14,428	520	3.60

Note the large number of samples. This is the number of times the Crop and Livestock Reporting Service counted plant stands. It is the approximate center of all the stand counts taken. Since there are contracts which specify a 9 inch spacing, there must be quite a number of fields with low stand counts. Further improvement in the planting operation may be warranted.

The number of hills per acre has increased significantly over the past three years. At an average yield per hill of 3.5 lbs. average yield per acre has increased 17.5 cwt. between 1981 and 1983. At $3.75 per cwt. the increased number of hills per acre is equivalent to increased grower receipts of $62.62 per acre.

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Yield per hill has ranged from 3.38 lbs. in 1982 to 3.6 lbs. in 1983. These variations from year to year are significant, but likely result as much from seasonal growing conditions as anything.

Figure 2 shows the hills per acre again and the average spacing associated with each figure. Some improvement can be noted, however, many growers indicate a desired spacing of 10.5". This means there is still substantial room for improvement in many fields.

Figure 2.

Average Spacing per Acre

Year	No. of hills per acre	Spacing in inches
1981	13,924	13.2
1982	13,194	13.0
1983	14,428	12.8

By using the information collected by the Washington Crop and Livestock Reporting Service and data generated by our previous work, it is possible to determine the magnitude of income foregone by not monitoring closely the planting operation. 3/

Evaluating Income Effects

Figure 3 shows the yield per acre and yield per hill at different spacings. As seed piece spacing increases, total yield declines, but yield per hill increases. Keep in mind, however, that increased total yield by itself is not necessarily good. The reduced yield per hill also reflects a somewhat smaller tuber which can reduce returns in some contracts.

Figure 3.

Estimated Total Yield and Pounds per Hill

Spacing in inches	Total yield cwt	Yield per hill in pounds
8	595	2.58
9	588	2.87
10	581	3.15
11	573	3.42
12	566	3.68
13	559	3.94
14	551	4.18

In terms of the actual average spacing, a 12.8" spacing is associated with a potential yield of 560 cwt. per acre. Based on the generally preferred spacing of 10.5" potential yield is estimated at 577 cwt. per acre. These figures will be used to calculate potential losses caused by improper seed placement.

Figure 4 shows the net loss from poor seed placement without changing the average distance between seed pieces. Actual average yields for the 1983 crop were 520 cwt. The potential yield is 560 cwt. The net loss in total yield from poor seed placement is 40 cwt. At an average value of $3.75 per cwt., the loss in receipts is $150 per acre. Allowing for harvest cost at 20¢ per cwt. results in a net loss of $142 per acre.

Figure 4.

Improved Spacing Distribution

Potential yield (cwt)	560
Actual yield (cwt)	520
Difference (in cwt)	40
Value per cwt ($)	3.75
Loss	$150.00
Less allowance for harvest cost	8.00
Net loss	$142.00

If we allow for achieving the desired spacing of 10.5" as well as better seed placement, potential returns are even greater. Figure 5 shows the impact of improving average spacing as well as the distribution around the mean (i.e., changing the spacing and then placing all of the seed at that spacing). At 10.5" the potential yield is 577 cwt. This is 57 cwt. more than was achieved in the 1983 crop. Again, using $3.75 per cwt., the gross loss was $213.75 per acre. Deducting the cost of the additional seed required by the closer spacing and allowing for the extra harvest expense shows a net loss of $161.11 per acre associated with poor distribution of seed spacings and not achieving the generally preferred spacing of 10.5".

Figure 5.

Improved Spacing Average and Distribution

Potential yield (in cwt @ 10.5 in.)	577
Actual yield	520
Difference (in cwt)	57
Value per cwt ($)	3.75
Loss	$213.75
Less allowance for seed @ $12 per cwt	41.24
	172.51
Less allowance for harvest	11.40
Net loss	$161.11

So far, the discussion has centered on exact placement of the seed piece. Further, the average yield represents all potato production in Washington. Given the current state of the art in potato planting equipment precise placement of each seed piece is not possible. Also, the average yields are biased downward somewhat by Norgold Russet. We can adjust for these problems and still estimate the value of spending more time ensuring good seed size and the best spacing distribution possible.

The rest of the calculations are based on the following conditions.

1: The grower is able to achieve 50 percent of the potential yield as shown in Figure 5 (577 cwt).
2: The grower is planting 130 acres to Russet Burbank.
3: Planting labor costs $110 per day.
4: The grower spends 2 days adjusting planter and 2 days watching the seed being cut.

Figure 6 shows the potential returns based on the stated conditions. Note that the expected returns are from the situation where seed placement is improved but the average spacing is not changed (spacing is 12.8"). Improved seed placement means that more seed pieces are spaced properly.

Figure 6.

Calculating Net Value

(based on increased returns of $142 per acre)

Projected returns per circle	$18,460
Achievement level	0.5
Actual increase	9,230
Less planting labor (2 days @ $110)	220
Net	9,010

Value per Hour of Your Effort

9,010 ÷ 40 hrs = 225.25 per hour

From 130 acres the potential increase in grower returns is $18,460. Allowing for the bias in the reported average yield caused by combining Russet Burbank and Norgold Russet as well as the difficulty in getting all pieces spaced properly, the actual potential increase in returns is $9,230. Deducting the planting labor cost yields a net to the grower of $9,010.

Recall that four days were spent by the grower to ensure appropriately sized seed and a correctly adjusted planter. That is equivalent to 40 hours. Dividing the $9,010 by 40 hours yields a per hour return to the grower of $225.25.

Summary

It should be obvious that substantial increases in returns can be generated by improved planting performance. The increased returns are likely to be $70 to $80 per acre, depending on current yields.

There may be situations where these figures are not appropriate. In those cases, growers can make their own estimates by collecting information on actual seed piece spacing in their own fields, calculating hills per acre and determining yield per acre. By assuming yield per hill does not change, it is possible to calculate the difference in yield per acre by multiplying average yield per hill and the difference between actual and desired hills per acre. Value per cwt., seed costs, and harvest costs can be based on the growers own experience. The difference is potential and actual returns represents the maximum amount of money a grower can afford to spend to improve seed size and spacing and be no worse off than before the improvement.

FOOTNOTES

1/ Schotzko, Tom. "How Valuable is the Right Sized Seed." Proceedings, 21st Annual Washington State Potato Conference and Trade Show, February 1-3, 1982, pp. 113-117.

2/ Schotzko, R. Thomas, Gary M. Hyde, and Robert E. Thornton. "The Dollars and Cents of the 1982 Potato Seed Size and Spacing Survey." Proceedings, 22nd Annual Washington State Potato Conference and Trade Show, February 1-3, 1983, pp. 23-29.

3/ Schotzko, R. Thomas, W. M. Iritani, and R. E. Thornton. "The Economics of Russet Burbank Seed Size and Spacing." Potato Journal. Forthcoming.