THE DOLLARS AND CENTS OF THE 1982 POTATO SEED SIZE AND SPACING SURVEY

by
R. Thomas Schotzko, Gary M. Hyde, Robert E. Thornton */

This past spring, under the guidance of Dr. Robert E. Thornton, Washington State University, Extension Horticulturist, the Washington potato industry collected information on potato seed piece size, and seed piece spacing from numerous cutters and several planting operations throughout the Columbia Basin. One purpose of this survey was to determine how well growers and cutters are actually doing in terms of achieving desirable seed piece size and spacing objectives.

This discussion will look first at seed size as represented in the samples taken this past spring, and secondly, look at the spacing distributions that were taken from the survey information. Finally, we will show what the combined seed size and spacing means in terms of returns to the grower.

The returns estimated here do not represent net returns to the grower nor do they represent gross returns. Returns are calculated on the basis of a sample contract that has a base price of $50 and incentive clauses for tuber size and percent U.S. #1s. In addition, seed costs and harvest costs have been deducted. Therefore, we call the returns adjusted returns.

This analysis is based on research that was discussed at the 1981, and 1982 Potato Conferences. Detailed discussions are provided in the Proceedings for the Conferences. Incentives for bruising and for specific gravity have not been included since information on bruising was not collected and specific gravity data, although collected, does not appear to be related to seed size and/or spacing.

Seed Size

Table 1 shows the lowest and highest reading in each range of seed piece sizes. In effect, these figures represent the ranges of observations for all samples. The percentages in each category are from different samples. The sample with the smallest amount of seed pieces in the less than 1 ounce category did not have the smallest amount of seed in the 1 to 1.5 ounce category.

The extremely wide range in all categories indicates the amount of variability in attention paid to seed cutting. It also indicates that it is possible to cut seed in a way that most pieces are in the most profitable categories.

Taking the average for all samples, 15.5 percent of all the seed pieces weighed less than 1 ounce, 30.4 percent of the seed pieces weighed between 1 and 1.5 ounces, 30.3 percent weighed between 1.5 and 2.0 ounces, while 23.8 percent of the seed pieces, weighed more than 2 ounces.

---

*/ Authors are Extension Economist; Associate Professor, Agricultural Engineering; and Extension Horticulturalist, respectively, located at Washington State University, Pullman, Washington.

This Presentation is part of the Proceedings of the 1983 Washington Potato Conference and Trade Fair.

Table 1. Seed Piece Size Survey Data

	Less than 1 oz	1.0 to 1.5 oz.	1.5 to 2.0 oz.	More than 2.0 oz.
		Percent of Sample		
Low	0.6	12.7	10.5	5.3
High	44.4	57.4	51.1	52.5
Average	15.5	30.4	30.3	23.8

Table 2 is another way to look at the seed piece samples. It shows the distribution of the samples based on adjusted returns. The range of returns goes from less than $1,306 to more than $1,355. We see that one sample had estimated adjusted returns of less than $1,306. Three samples generated estimated adjusted returns of more than $1,355. The peak adjusted return range was $1,326 to $1,335. Seven samples were just above and seven samples were just below the peak range. In total, there was 41 samples gathered by fieldmen and extension personnel.

If a grower was able to get exactly the right size and space them properly, we estimate his adjusted returns would be about $1,470. A large percentage of potato growers may be giving up as much as $120 or more per acre because of poor seed.

Table 2. Distribution of Seed Samples by Adjusted Returns.

Adjusted Returns $	No. of Samples
Less than 1,306	1
1,306 - 1,315	6
1,316 - 1,325	7
1,326 - 1,335	9
1,336 - 1,345	7
1,346 - 1,355	8
More than 1,355	3
Total	41

Maximum Adjusted Returns - $1,467

Figure 1 depicts the distribution of three different average seed size distributions. The line indicated as low returns represents the average seed piece size distribution for the six samples whose adjusted returns fell in the category of $1,306 to $1,315. The middle returns distribution is the average for the nine samples that were in the adjusted return range of $1,326 to $1,355. The high returns line represents the average of the three samples that generated adjusted returns of more than $1,355.

Note that the low returns curve is nearly horizontal, representing an almost uniform distribution of seed size. The middle returns curve, has much less seed in the less than 1 ounce category but it peaks in the 1 to 1.5 ounce category. The high returns distribution has nearly 46 percent of the seed pieces ranging in size from 1.5 to 2 ounces.

Looking at the averages, the low returns distribution averages 1.45 ounces per seed piece. The middle returns distribution had an average of 1.54 ounces per seed piece, while the high returns distribution had an average of 1.7 ounces per seed piece.

Figure 1. Average Seed Size Distributions

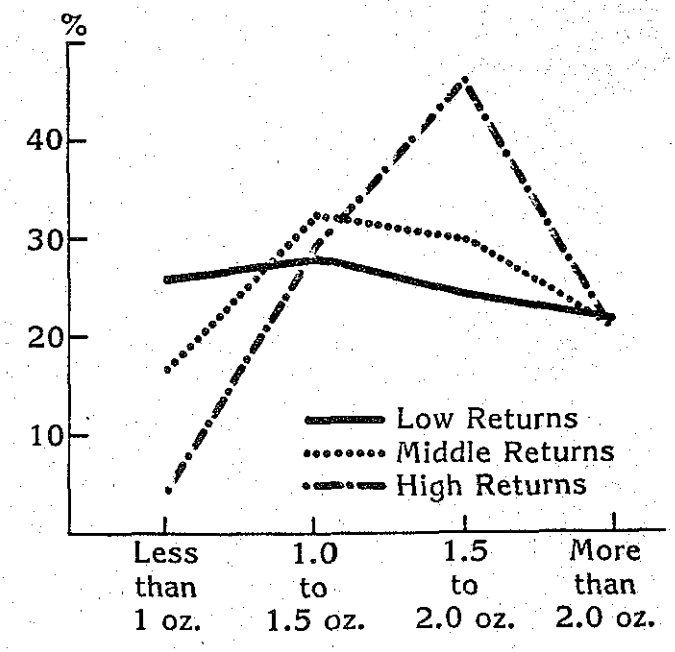


Table 3 shows the same information as Figure 1, but in a slightly different form. The low distribution shows the average percent of seed pieces in each of the size categories for that group of six samples generating adjusted returns in the range of $1,306 to $1,315. As you can see here, the adjusted returns are $1,310.

The middle distribution represents the average for the nine samples that fell between $1,326 and $1,355. The high distribution is composed of the average for the three samples that had adjusted returns of more than $1,355. Even the best distribution falls $100 short of maximizing adjusted returns.

It is interesting to note the relationship between the change in less than 1 ounce percentages and the change in adjusted returns. These data indicate that adjusted returns increased more rapidly when going from the middle to high group than when going from the low to middle group.

There is a very high correlation between the amount of seed that weighs less than 1 ounce and the adjusted returns. The more seed that falls in the less than 1 ounce category, the lower the growers' returns will be.

Regardless of which groups are being compared, each 1 percent reduction in the less than 1 ounce category increased adjusted returns per acre by more than $2. This is a particularly important point because the adjusted returns are net of seed costs.

The other major trend to be noticed in this group is in the 1.5 to 2 ounce category where the low seed distribution has less than 25 percent, the middle group has 30 percent, and the high group has nearly 46 percent of its seed. This is also crucial in terms of generating returns.

The 1.5 to 2 ounce range generates the best returns of the four categories. The less than 1 ounce seed generates the worst returns. In fact, there is a similar but opposite relationship between seed in the 1.5 to 2 ounce size category and adjusted returns when compared to small seed. The more seed that falls into the 1.5 to 2.0 oz. category the higher the grower returns will be. Note also that the best a grower could be expected to do would be roughly $1,470, which indicates growers may be giving up over $100 per acre due to the inadequacies of seed size.

Table 3. Grouped Seed Size Distributions.

	Less than 1 oz.	1.0 to 1.5 oz.	1.5 to 2.0 oz.	More than 2.0 oz.	Adjusted Returns
			Percent of Sample		$
Low	25.9	27.9	24.4	21.8	1,310
Middle	16.6	32.2	30.0	21.2	1,330
High	4.2	29.0	45.9	20.9	1,360

Maximum Adjusted Returns - $1,467

Seed Spacing Distribution

Figure 2 shows the averages of some of the distributions of seed spacing taken from behind potato planters last spring. The low distribution represents the average of two different observations with fairly close spacing and the high distribution represents the average of two spacings that were fairly wide. An important point to note is that both distributions are fairly wide-spread with skips ranging as far out as thirty or more inches.

Another interesting point that should be noted is that the closer the spacing the more doubles that occur. Wider spacings do not appear to generally have as many doubles. However, on the other hand, wider spacings appear to have a tendency to leave a larger number of skips.

Figure 2. Seed Spacing Distribution

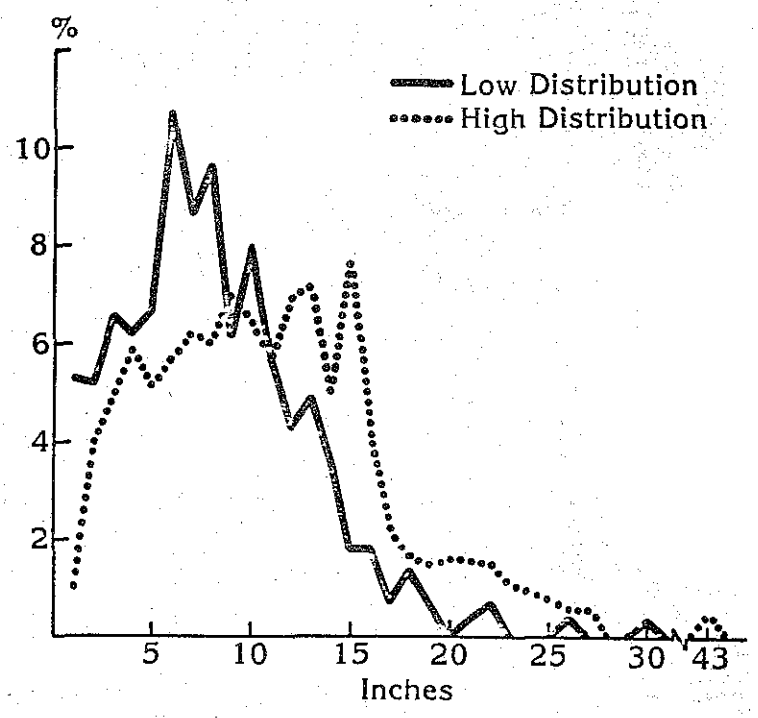


Figure 3 is somewhat complicated. It shows the average spacing distance between seed pieces for each of the five operations that were measured. In each case, the two end points represent that spacing range within which 2/3 of the seed piece spacings are likely to fall. If we take the bottom line, 2/3 of the seed piece spacings will fall within the range of five and approximately 16.5 inches, which means that on the average, 1/6 or about 16 percent will be less than five inches apart and 16 percent will be over 16.5 inches apart.

The numbers of the right-hand side are called the coefficient of variation. It represents the ratio of the standard deviation and the mean. It is another way of describing the line graph. The higher the coefficient of variation (C. V.), the wider the range of spacings will be. For example, an average spacing of 12 inches and a C. V. equal to 0.5 indicates that about 2/3 of the spacings will be between 6 inches and 18 inches. If the C. V. equals 0.25, then 2/3 of the spacings will be between 9 inches and 15 inches.

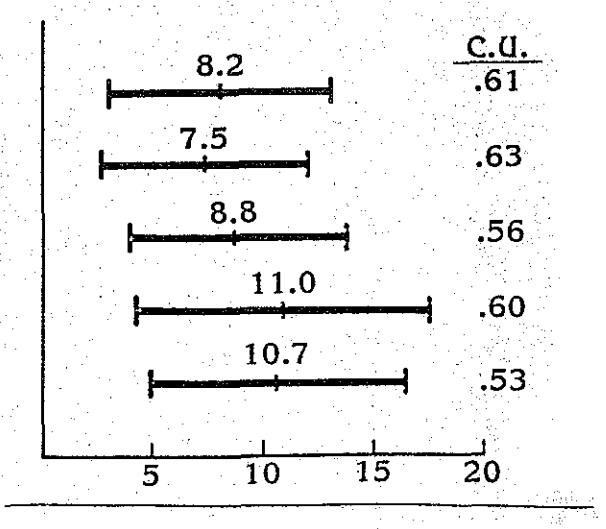
Using the C.V. for the top lines, it says that the distance from either end point to the mean is 61 percent of the mean. If we multiplied .61 x 8.2 and subtracted that product from 8.2, we would get the lower left-hand end point of the line.

In the past, we have argued that the 68 percent range should probably be no more than 25 or 30 percent of the mean. In other words, the coefficient of variation should be no greater than .3 to .33. However, in the fields we visited, the range in the distribution of spacings was much wider than that.

The range in the spacing distributions becomes crucial, especially for those growers who are aiming for a closer spacing. A wide range in spacing distances with a narrow average reflects an increasing number of doubles.

For the wider spacings the problem of doubles is less of a problem. However, on the other hand, growers aiming for an average wider spacing do have the problem of in increased number of skips.

Figure 3. 68% Spacing Range



Combined Effects of Seed Size, and Seed Spacing

The final table shows the combined effects of seed size and spacing on estimated adjusted returns. The close spacing is based on the low distribution shown in Figure 2. The wide spacing, accordingly, is based on the high distribution in Figure 2. The low distribution has an average spacing of approximately eight inches and the wide distribution has an average of approximately eleven inches. The small, medium, and large seed represent the three averages we discussed earlier.

By combining the different spacing categories with the three seed piece size distributions, we can generate the third column of adjusted returns. We see that if a grower is after large potatoes as well as a high percentage of U.S. #1s and ends up with small seed at a closer spacing, his adjusted returns will be as much as $100 less than a grower who goes with a wide spacing and large seed. In all cases, it appears that the wider spacing generates the better returns. Further, it shows that the range between small and large seed, in terms of returns, is better for the wide spacing than it is for the close spacing. The wide spacing ranges from $1,304 for small seed to $1,340 for large seed, a difference of $36. Whereas for small seed with close spacing versus the large seed with close spacing, the difference is only $19.

When looking at the differences between the optimum adjusted returns and the various combinations in Table 4, it is obvious that growers can afford to put more effort into the planting operation.

Table 4. Combined Effect of Size and Spacing and Returns.

Spacing	Distribution Seed	Estimated Adj. Returns $
Close	Small	1,235
Wide	Small	1,304
Close	Medium	1,244
Wide	Medium	1,319
Close	Large	1,254
Wide	Large	1,340

Estimated Optimum Adjusted Returns: $1,467