HOW VALUABLE IS THE RIGHT SIZE SEED [*]

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Once the optimum seed size can be identified, it is then possible to evaluate various seed size distributions in terms of their effect on returns.[1] That is the purpose of this paper. We will describe several distributions of seed piece size, look at the returns one could expect from those different size distributions, and then see what kinds of returns growers could expect if some of that seed were discarded and replaced by larger seed.

Figure 1 shows four different distributions of seed piece size. Distribution 1 is the rectangular box. It represents a uniform distribution of sizes from less than 1 ounce to over 3 ounces with 14.3 percent of the seed in each size classification. Distributions 2, 3, and 4 are actual seed size distributions obtained from sources within the industry. Distributions 2, 3, and 4 indicate the range of seed sizes that has been planted by growers in the past.

Distribution 2 has a fairly narrow range of seed sizes. Over 2/3 of the seed is 1.5 to 2.0 ounces in size. Approximately 9 percent of the seed weighed 1.0 to 1.5 ounces. Only 5 percent weighed less than 1.0 ounce. Twelve percent of the seed weighed between 2.0 and 3.0 ounces, and 6 percent weighed over 3 ounces.

Distribution 3 also peaks in the 1.5-2.0 ounce range. However, only 27 percent of the seed falls in this category. Twenty four percent and 21 percent of the seed falls in the 1.0-1.5 ounce and 2.0-2.5 ounce ranges, respectively. At the extremes, 11 percent is less than 1.0 ounces in weight and 16 percent is 2.5 ounces or larger.

Distribution 4 is similar to distribution 3, except that is has somewhat more smaller seed and less larger seed. The percent of seed in distribution 4 in each of the six size categories is 16, 33, 29, 15, 4, and 3 percent, respectively.

Using information from the other discussion, it is possible to estimate the expected returns from each lot of seed represented by those distributions. Table 1 contains those estimates. Harvest expenses and seed costs have been deducted from estimated returns. Distribution 1 with about 14 percent of the seed in each size category, will return the grower about $1,320. The distribution (2) that had the very high peak between 1-1/2 and 2 ounces will return about $1,425 to the grower. Distributions 3 and 4 return approximately $1,400 to the grower.

Distribution 5 is not shown in Figure 1. It shows the returns from having all of the seed the same size, the optimum size, given seed costs of $9 and 12-inch spacing. The difference between the adjusted returns for distribution 5 and any of the other distributions, represents the loss in returns caused by variable seed size. The $150 difference between distributions 1 and 5 is the amount a grower with a seed size distribution like number 1 could afford to pay for the optimum size seed and be no worse off than he was before.

The second column of numbers in Table 1, the 60 percent range, gives the range of returns within which the actual value will fall with a 60 percent probability. Since we are dealing with only a sample, we havn't been able to observe all possible conditions under which

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1/ This paper builds upon information described in, "Effect of Seed Size and Spacing on Economic Returns," by Tom Schotzko. Proceedings, 1982 Washington State Potato Conference.

potatoes may be grown here in Washington. It follows that we have to consider that our average estimate is nothing more than an estimate and the actual value will likely vary around that average. There is a 60 percent chance that the actual value one would experience given the same conditions would be between those two numbers. For distribution 1, there is a 60 percent chance that the actual value would fall between $1,229 and $1,411. As we will see in a later table, the more variation in seed size, regardless of the average, the wider the range of possible values that may occur.

Figure 1. Seed Size Distribution.

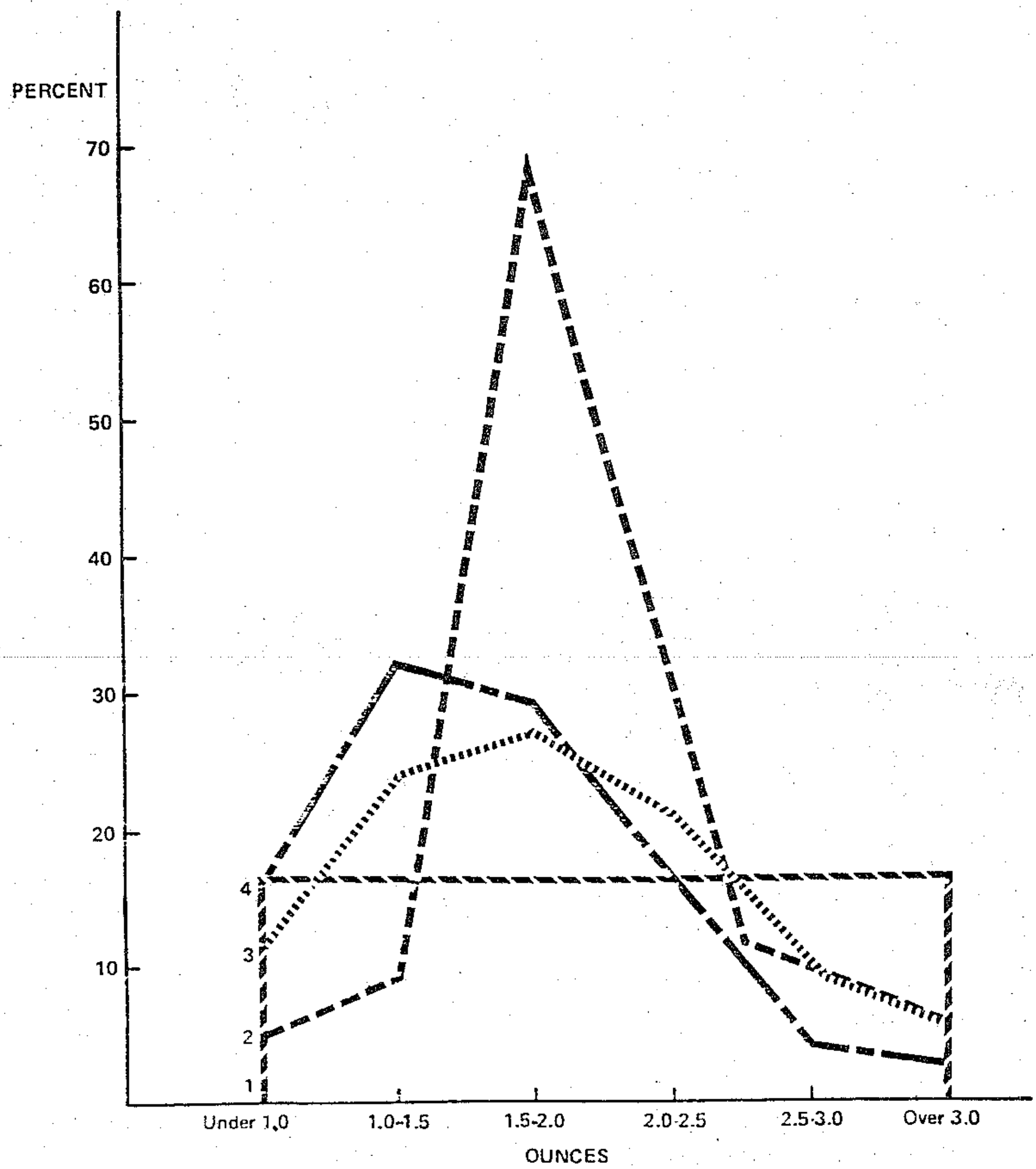

Table 1. Variable Seed Size and Estimated Returns. *

Distribution	Estimated Average Returns (\$)	60% Range (\$)
1	1320	1229-1411
2	1425	1369-1481
3	1396	1331-1461
4	1406	1354-1458
5	1470	1433-1507

*12" spacing

Table 2 presents the same data as Table 1 except that now the spacing is 9 inches instead of 12. Seed costs remain at \$9 and the optimal seed size changes according to the table in the earlier discussion (see footnote 1). The 60 percent ranges the averages are approximately the same between Tables 1 and 2. Of course, the critical question is what happens when we start eliminating the really small seed pieces and the really large seed pieces.

Table 2. Variable Seed Size and Estimated Returns. *

Distribution	Estimated Average Returns (\$)	60% Range (\$)
1	1303	1213-1391
2	1405	1352-1458
3	1377	1314-1440
4	1394	1345-1443
5	1452	1418-1486

*9" spacing

Table 3 shows the adjusted returns if all seed pieces below 1 ounce are eliminated and all seed pieces over 2-1/2 ounces are cut in half. Given these assumptions, returns are then calculated for the various distributions. Returns are higher in all cases. The increase in the returns depends upon the original distribution of seed piece size. The more scattered the distribution of seed piece sizes, the more one has to gain by limiting the range of sizes.

Table 3. Dollar Returns from Restricting Seed Size to the Range 1 Oz. to 2.5 Oz.

Distribution	*Returns*			
	12" spacing		9" spacing	
	Average	Range	Average	Range
1	1445	1411-1479	1427	1383-1471
2	1471	1430-1512	1453	1415-1491
3	1442	1396-1488	1424	1381-1467
4	1464	1423-1505	1448	1411-1485

Table 4 shows the amount of increase in returns and what happens to that 60 percent range for 12 inch spacing. The increase in returns on the average, ranges from approximately $45 to $125. Remember that distribution 1 was the hypothetical distribution with 14 percent of the seed pieces in each size category and obviously has the most to gain by eliminating the very small pieces and cutting the very large pieces into two seed pieces. The other three distributions gain somewhat less, but they also reduce the amount of variability that we would expect. For all practical purposes, there is no difference in the increase of returns if one is comparing 9 inch spacing to 12 inch spacing given the same seed costs and the appropriate spacing.

Table 4. Amount of Increase in Returns and Change in 60% Range.

	Returns			
	12" Spacing		9" Spacing	
Distribution	Difference In Average *($)*	Difference In Range *($)*	Difference In Average *($)*	Difference In Range *($)*
1	125	114	124	90
2	46	30	48	30
3	46	38	47	40
4	58	22	54	24

The next step is to reduce these increases in returns by the value of the discarded seed. Calculating through, we find that for distribution 1 we have eliminated roughly 175 pounds of seed; distribution 2, about 25 pounds of seed; distribution 3, about 75 pounds of seed; and for distribution 4, we have eliminated about 125 pounds of seed. Remember now that these are the small seed pieces, those that weigh less than 1 ounce. Seed costs were $9 per cwt. of seed and by multiplying the number of cwt. by $9, we get the value of the discarded seed which is subtracted from the information in Table 4 to give us the right-hand column, the adjusted difference, in Table 5.

Table 5. Value of Discarded Seed and Adjusted Differences - 12" spacing.

Distribution	Quantity of Discarded Seed *cwt*	Value *($)*	Adjusted Difference *($)*
1	1.75	15.75	109.25
2	.25	2.25	43.75
3	.75	6.75	39.25
4	1.25	11.25	46.75

In effect then, concentrating on distributions 2, 3, and 4, we see that one has a potential gain of $39 to $47 per acre. At 12-inch spacing, we are talking about approximately 18 sacks per acre. So the increased value in terms of seed then is $2 to $2.50 per cwt. That is the additional amount a grower could afford to pay for seed with good size and be no worse off than he was with a wide range of seed sizes.

Remember now that these figures are based on the assumption that all seed pieces range in size from 1 to 2-1/2 ounces. Further gains would be achieved if that range of sizes was reduced, for example, from 1-1/2 to 2-1/2, as opposed to the 1 to 2-1/2 ounce seed piece size range. Additional returns could be expected where the seed piece size range was reduced from 1-1/4 to 2-1/4 ounces, or even further if the variability was kept within 1/2 ounce. However, under most circumstances, more seed would be discarded and the cost of the discarded seed would be increasing.

While we have concentrated entirely on seed piece size and not looked at all at spacing, it is important that you keep in mind that spacing is also important. While the interaction of size and spacing are not known in terms of planter performance, it is possible that more uniform seed size provides a better spacing. One can concentrate on reducing the range of seed piece sizes, but it is also important to keep track of spacing. Figure 2 shows us why. A grower whose seed spacing ranged from 7 or 8 inches to 13 or 14 inches will not have much effect on his returns. But once spacing becomes more erratic, returns suffer dramatically. In fact, in the case of doubles, a grower is generating negative returns. So, concentrating all of the effort on minimizing the range of sizes in your seed and then going out and planting without regard to spacing will likely waste the effort that was spent on getting good, appropriately sized seed.

Figure 2. Effect of Spacing on Returns.