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Cost Savings From Improved Seed Germination Rates

Bennett B. Foster and Earl W. Belcher, Jr.

Forest Economist, USDA Forest Service, Southern Region, State and Private Forestry, Atlanta, Ga., and Director, USDA Forest Service, National Tree Seed Laboratory, Macon, Ga.

A procedure for establishing the economic value of increased seed quality is described and illustrated. Methods and equipment for improving seed quality can be evaluated with these procedures.

A new piece of equipment or handling technique often results in a better product. How is this improvement evaluated? If greater *quantity* is the result, the benefit can be expressed in a new average production cost figure: new total cost divided by new quantity of output. However, if the result is improved product quality, choosing an appropriate evaluation criteria is more difficult. This is the case when new equipment or handling techniques result in improved seed germination rates. For example, how can an economic value be attached to a germination rate that is improved from 50 to 60 percent?

One approach is to view the quality improvement as a *quantity* improvement. At a germination rate of 50 percent, 2.0 pounds of field-run seed will produce a pound of 100-percent viable seed. If the price plus processing costs of field-run seed is $40 per pound, a pound of viable seed would cost $80. After improving the germination rate to 60 percent, only 1.67 pounds of field-run seed will produce a pound of viable seed. The cost would then be $66.67 for a cost savings of $13.33.

Table 1 contains cost savings figures per 100 pounds of viable seed for selected seed price plus processing costs and germination rates. For example, if the market price plus processing cost of seed is $34 per pound and the current mean germination rate is 65 percent, improving the germination rate to 66 percent will decrease the cost of processing 100 pounds of viable seed by $79.30.

We can easily expand this simple example into a more realistic situation. Suppose a State forestry agency purchases a new seed dewinger to reduce the impact damage caused by the old one. The new dewinger increases the seed germination from 65 percent to 88 percent for species "A" seed and from 61 percent to 78 percent for species "B" seed. The market price of field-run seed is $31.50 per pound for species "A" and $25.75 per pound for species "B." The processing cost of each species and for each dewinger is the same: $2.60 per pound.

To determine the approximate economic benefit of this new dewinger, calculate the average cost savings per 100 pounds of viable seed for each species by averaging the tabulated cost savings for the nearest before-improvement price/cost/germination rate and the nearest after-improvement price/cost/germination rate and then multiply this figure by the number of percentage points between the initial and improved germination rates.

For species "A" the calculation would be as follows:

Price plus processing cost: $34.10 per pound.
Initial germination rate: 65 percent.
Nearest table value: $79.30 ($34 row, 65-percent column).
Improved germination rate: 88 percent.
Nearest table value: $41.50 ($34 row, 90-percent column).

$$\frac{\$79.30 + \$41.50}{2} = \$60.40$$

$60.40 X 23 (percentage point difference between 65 and 88 percent) = $1,389.20 (the approximate cost savings from processing 100 pounds of viable species "A" seed).

Following the same procedure, the approximate cost savings from processing 100 pounds of viable species "B" seed would be $1,017.45.

Note that these are only approximate cost savings. The calculations treat the table values as if they were linearly related, which is not the case; and the closest price/cost/germination rate values were used, not the exact ones. More precise cost savings figures can be calculated using the following formula:

$$\text{Cost savings per 100 pounds of viable seed} = \left[\frac{P+C}{G} - \frac{P+C^*}{G^*}\right] 100$$

where:

P = Market price (or cost) per pound of field-run seed.
C = Initial processing cost per pound of field-run seed.
C* = New processing cost per pound of field-run seed.
G = Initial germination rate (as a decimal).
G* = Improved germination rate (as a decimal).

Using this formula, the previous example of cost savings would be calculated as follows for species "A":

P = \$31.50 per pound.
C = \$2.60 per pound.
C* = \$2.60 per pound.
G = 65 percent.
G* = 88 percent.

$$\left[\frac{\$31.50 + \$2.60}{.65} - \frac{\$31.50 + \$2.60}{.88}\right] \times 100 = \$1{,}371.15 \text{ per } 100 \text{ pounds.}$$

For species "B":

P = \$25.75 per pound.
C = \$2.60 per pound.
C* = \$2.60 per pound.
G = 61 percent.
G* = 78 percent.

$$\left[\frac{\$25.75 + \$2.60}{.61} - \frac{\$25.75 + \$2.60}{.78}\right] \times 100 = \$1{,}012.93 \text{ per } 100 \text{ pounds.}$$

Table 1.—*Cost savings from processing 100 pounds of viable seed by increasing the mean germination rate by one percentage point*

Market price (or cost) plus processing cost per pound of field-run seed	Savings per 100 pounds of seed processed at current mean germination rates (percentages)													
	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
Dollars	***Savings in dollars***													
50	537.60	396.80	304.90	241.50	196.10	162.30	136.60	116.60	100.60	87.70	77.20	68.40	61.10	54.80
48	516.10	381.00	292.70	231.90	188.20	155.80	131.10	111.90	96.60	84.20	74.10	65.70	58.60	52.60
46	494.60	365.10	280.50	222.20	180.40	149.40	125.70	107.20	92.60	80.70	71.00	62.90	56.20	50.40
44	473.10	349.20	268.30	212.60	172.50	142.90	120.20	102.60	88.50	77.20	67.90	60.20	53.70	48.20
42	451.60	333.30	256.10	202.90	164.70	136.40	114.80	97.90	84.50	73.70	64.80	57.50	51.30	46.10
40	430.10	317.50	243.90	193.20	156.90	129.90	109.30	93.20	80.50	70.20	61.70	54.70	48.80	43.90
38	408.60	301.60	231.70	183.60	149.00	123.40	103.80	88.60	76.50	66.70	58.60	52.00	46.40	41.70
36	387.10	285.70	219.50	173.90	141.20	116.90	98.40	83.90	72.40	63.20	55.60	49.20	44.00	39.50
34	365.60	269.80	207.30	164.30	133.30	110.40	92.90	79.30	68.40	59.60	52.50	46.50	41.50	37.30
32	344.10	254.00	195.10	154.60	125.50	103.90	87.40	74.60	64.40	56.10	49.40	43.80	39.10	35.10
30	322.60	238.10	182.90	144.90	117.60	97.40	82.00	69.90	60.40	52.60	46.30	41.00	36.60	32.90
28	301.10	222.20	170.70	135.30	109.80	90.90	76.50	65.30	56.30	49.10	43.20	38.30	34.20	30.70
26	279.60	206.30	158.50	125.60	102.00	84.40	71.00	60.60	52.30	45.60	40.10	35.60	31.70	28.50
24	258.10	190.50	146.30	115.90	94.10	77.90	65.60	55.90	48.30	42.10	37.00	32.80	29.30	26.30
22	236.60	174.60	134.10	106.30	86.30	71.40	60.10	51.30	44.30	38.60	34.00	30.10	26.90	24.10
20	215.10	158.70	122.00	96.60	78.40	64.90	54.60	46.60	40.20	35.10	30.90	27.40	24.40	21.90
18	193.50	142.90	109.80	87.00	70.60	58.40	49.20	42.00	36.20	31.60	27.80	24.60	22.00	19.70
16	172.00	127.00	97.60	77.30	62.70	51.90	43.70	37.30	32.20	28.10	24.70	21.90	19.50	17.50
14	150.50	111.10	85.40	67.60	54.90	45.50	38.30	32.60	28.20	24.60	21.60	19.20	17.10	15.40