

ECONOMIC EFFICIENCY OF PEST MANAGEMENT DECISIONS: DISEASES
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INTRODUCTION

The economics of disease management is affected in much the same manner as weed and insect management. Costs increase unnecessarily when a product is applied at the wrong time, when the wrong product is used, or a product is used when it is not needed. Also, keep in mind that alternatives to chemical control do exist. Many potato diseases can be avoided by purchasing certified seed or simply by maintaining optimum plant health by proper nutrition and irrigation management. This discussion will focus on chemical control because of the significant costs involved. Costs for disease management have risen due to potato late blight, caused by the fungus *Phytophthora infestans*, a disease that has taken center stage in Idaho over the last four years. In spite of the expense, disease control is all but mandatory because of the tremendous potential for yield losses, both in the field and in storage.

GROWER AND IN-FIELD SURVEYS FROM 1998

During the 1998 season, fields were surveyed for late blight infection patterns and disease severity. These field visits were followed by grower surveys to determine what methods growers were using for application of fungicide, what they were paying for chemicals and the cost of these applications as well as irrigation type and practices. This information is presented in the following tables.

Presented in Table I is the late blight severity ratings for the fields that were investigated (0=no blight - 7=severe blight). Note that chemigation and ground application slightly outperformed both aerial and dedicated boom application. The table contains disease ratings from fields where the above methods of fungicide application were used. This data does not represent identical numbers of chemical applications or chemical usage between the application methods. One-on-one comparisons of the effectiveness of various methods of application when the same fungicides are applied on the same application interval cannot be made from this data.

Table 1. Application Method vs Blight Severity

Method	Mean Rating	# of Fields
Chemigation	1.22 a	42
Ground	1.33 a	9
Airplane	2.24 b	54
Dedicated Boom	2.50 b*	2

*Means significantly different (Fisher's LSD, P=0.0003)

Table 2. Cost of Late Blight Control

	Cost/A	# of Applications
Mean	\$96.91	7
Maximum	\$187.11	11
Minimum	\$23.40	2

Data represents 29 growers, 78 programs, 129 fields, 518 applications.

Costs per acre differed greatly depending on the number of fungicide applications. The cost of late blight control for the surveyed growers is presented in table 2. This data (table 3) was further broken down by cost per acre depending on what method of application was used. To clarify these costs further, comparisons of both costs and characteristics of the various application methods are presented in Table 4.

Table 3. Late Blight Control Cost by Method

Method	Cost/A	# of Programs
Chemigation	\$81.66 a	20
Chem/Air	\$90.91 ab	13
Airplane	\$100.63 b	29

Means with different letters are significantly different (Fisher's LSD P=0.028)

Table 4. Application Comparison

	Ground	Aerial	Chemigation
Cost	~\$5-8 /A	~\$6-8 /A	~\$2 / A
Ease	Hard	Easy	Moderate
Residue distribution	????	Upper canopy	Entire canopy
Crop impact	High	None	None
Control	????	Adequate	Better?

Tables 5 and 6 are the amounts that the surveyed growers reported they spent on the various protectant chemicals. Please note that there are fungicides available that are not included on this list.

Table 5. Late Blight Fungicide Costs

Product	Rate/A	Cost /A
Dithane F45	1.6 qts	\$6.53
Penncozeb 75DF	2.0 lbs	\$5.80
Bravo 720	1.5 pts	\$9.19
Echo 720	1.5 pts	\$8.63
Super Tin	3.0 oz	\$5.35

Table 6. Cost of "Section 18" Products

Fungicide	Rate/A	Cost /A
Curzate 60 DF*	3.2 oz	\$6.40
Acrobat MZ*	2.25 lbs	\$24.08
Tatoo C	2.3 pts	\$24.44

*These products now have full registration status.

The rest of the tables represent possible late blight control decisions. Tables 7 and 8 are comparisons of different chemicals applied by different methods. These two sample programs are for 7 applications and are targeted for eastern Idaho although, other production regions may find this scheduling to be effective.

**Table 7. Late Blight Spray Programs
EBDC @ \$6.00 /A
Cost Estimates**

Chemical	Air	Chem	Total
\$42	\$45		\$87
\$42		\$14	\$56

Difference = \$31/A aerial vs chem application
Times 132 acres = \$4100/privat

**Table 8. Late Blight Spray Programs
Bravo @ \$9.20 /A
Cost Estimates**

Chemical	Air	Chem	Total
\$65	\$45		\$110
\$65		\$14	\$79

EBDC vs Bravo = \$3200 / Privat
EBDC (chem) vs Bravo (air) = \$7,300 / Privat

The remaining tables (9-11) are possible large blight programs specifically for central or western Idaho where more applications may be necessary. Note that these examples do not contain application costs but are for the cost of chemical only. In any case, when it comes to late blight management, more applications of fungicide are more effective for control.

**Table 9. Late Blight Spray Programs
2 Full-season spray programs**

10 Day spray interval	7 Day spray interval
2 X EBDC = \$12 /A	7 X EBDC = \$42 /A
2 X Acrobat = \$48 /A	2 X Su Tin = \$11 /A
4 X EBDC = \$24 /A	4 X Chithl = \$36 /A
Total = \$84 /A	Total = \$89 /A
= 8 Applications	= 11 Applications

**Table 10. Late Blight Spray Programs
Another example**

10 Day spray interval	7 Day spray interval
2 X EBDC = \$12 /A	7 X EBDC = \$42 /A
2 X Acrobat = \$48 /A	4 X Chithl = \$36 /A
4 X EBDC = \$24 /A	2 X Curz = \$36 /A
Total = \$84 /A	Total = \$89/A
= 8 Applications	= 11 Applications

**Table 11. Late Blight Spray Programs
One last example**

7 Day spray interval
7 X EBDC = \$42 /A
4 X Bravo = \$36 /A
Total = \$78 /A
= 11 Applications

We hope that this information will help growers make informed decisions about methods of application and fungicide use to provide the most cost-effective late blight management options.