

## THE ECONOMICS OF USING SOIL FUMIGANTS IN POTATO PRODUCTION IN THE COLUMBIA BASIN

by

Philip B. Hamm, Russ Ingham, and Dan Hane. First and third author, Extension Plant Pathologist and Research Agronomist respectively, Hermiston Agricultural Research & Extension Center, Oregon State University, Hermiston OR 97838. Second author, Research Nematologist, Dept of Botany & Plant Pathology, Corvallis OR.

### Introduction

Soil fumigation using metam sodium (Vapam, Soil Prep, etc.), 1,3-dichloropropene (Telone II), Telone II alone, Telone II + chloropicrin (Telone C-17), or Vapam + Telone II, are common practices used to control soilborne diseases (particularly *Verticillium* Wilt) and nematode disease problems (root-knot and corky ringspot) of long season potatoes in the Columbia Basin. When used alone or in combination, costs of the product, application, and soil preparation can be as low as \$225.00/A or as high as \$480.00/A, depending on number of products used, application method, and the amount applied. Using graded yield data obtained from replicated experiments with Russet Burbank potatoes over 4 years, and crop value based on a processor contract, gross and net return to the grower was calculated.

These soil fumigants are also intermittently used with short season cultivars, like Shepody and Russet Norkotah, as well as cultivars like Ranger Russet that are reportedly somewhat resistant to early dying problems. Cost effectiveness of using Vapam on early maturing or early dying resistant cultivars was investigated in 1996.

### Methods

Trials were established beginning in the fall of 1991, using one or more common soil fumigants (Table 1). Typical planting and harvest dates of the area were followed for these tests. Plots were individually harvested and yields determined by grade in each year. Value at harvest for each treatment with Russet Burbank was based on a 1996 processor contract (Table 2).

Another trial in 1996 measured the effects of fumigation rates of Vapam on yield and quality of Shepody and Russet Norkotah potatoes in one trial and Russet Burbank and Ranger Russet in another. Russet Norkotah and Shepody were allowed to grow for 123 days before vine kill. Ranger Russet and Russet Burbank grew for 150 days before vine kill. Three Vapam rates were used, 0 gallons/A, 27.5 gallons/A, and 55 gallons/A, using the old product formulation. Value at harvest for Ranger Russet and Shepody was based on a 1996 processor contract (Table 3).

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Value of Russet Norkotah was based on both 1995 and 1996 prices since fresh prices fluctuated widely in those years. Land preparation charges and the 1996 costs of Vapam (\$3.60/gallon) and Telone II (\$9.10/gallon) were used to calculate costs associated with treatments (Table 4).

Net return was determined by the following method. Value of yield for each treatment was first determined using the processor or fresh market prices defined above. From that figure, the value of the control (untreated) plots was subtracted as was the cost of applying individual fumigation treatments. The value left was that amount of additional return gained by using that specific soil fumigation treatment.

## Results

Actual dollar return over 4 years of trials was greatest for a single use of Vapam than any other product used singly or in combination (Figure 1). Specifically, gross return was consistently higher, often significantly, using Vapam at the 55 gallon/A rate in the absence of nematodes. Net return using Vapam alone was consistently higher but was not significant in the absence of nematodes. The use of Telone II, alone or in combination with chloropicrin, was not as cost effective without nematode pressure. Vapam + Telone II was expensive but was most cost effective when soilborne fungi and nematode control was needed. However, when root-knot nematodes or Corky Ringspot was present, the use of Telone II with Vapam was necessary to produce high potato yields and salable quality.

The dollar return using Vapam in other cultivars is shown in Figure 2. With Shepody, Vapam returned nearly \$200/A over the untreated at the 55 gallon/A rate. A large increase in net return/A was obtained using either the 1995 or 1996 price using the 27.5 gallon/A rate of Vapam; higher net return/A was obtained at 55 gallon/A rate. As expected, both rates returned dollars to growers with Russet Burbank, though the high rate returned more dollars/A. The least dollar return, \$50/A, was measured with Ranger Russets. Nematode issues were not considered during these 1996 tests.

## Conclusion

Using 55 gallon/A of Vapam alone to control Verticillium Wilt in Russet Burbank was economically justified when the threat of nematode damage was absent. If nematode pressure (root-knot or stubby-root with tobacco rattle virus) was present, the use of Telone II, in addition to Vapam, was required for crops to produce high yields and acceptable quality.

Information from the 1996 trial indicated that Vapam usage was also cost effective when growing other potato cultivars. The high rate (55 gallon/A) of Vapam returned more net dollars when growing Ranger Russet and Russet Norkotah while the lower rate returned more net dollars when growing Shepody. This test will be repeated in 1997 to confirm the findings reported here.

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**Table 1. Treatments & Fumigation Dates**

Treatments	1992	1993	1994	1996
Control (Untreated)	Fall	Spring	Spring	Spring
Telone II at 20 GPA	Fall	Spring	Spring	Spring
Telone C-17 at 27.5 g/A	Fall	Spring		
Metam-Sodium at 55 GPA	Fall	Spring	Spring	Spring
Telone + Metam-Sodium 20 & 55 GPA	Fall	Spring	Spring	Spring

**Table 2. How Russet Burbank Tuber Values Were Calculated:**

Base \$87.50/ton

% > 6 oz over 50% added \$.60/ton

% Payables > 50% added \$.50/ton

Value Not Included:

Specific Gravity

Processed culls

Culls

Table 3. Value Used to Determine Return in Other Cultivars

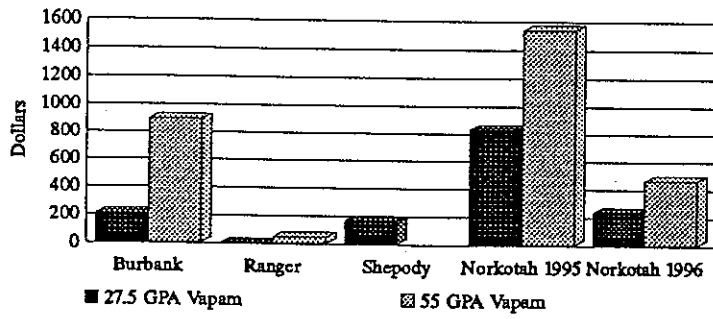
<b>Shepody</b>	<b>Ranger Russet</b>
Base \$92.20/ton, no incentives	Base \$95.20/ton, no incentives
 <b>Russet Norkotah</b> Using both 1995 & 1996 Prices	
1995 9-14 oz \$20.00/cwt	1996 9-14 oz \$8.00/cwt
< 9 oz \$13.00/cwt	< 9 oz \$5.00/cwt

Table 4. Values Used For Fumigant Costs

- Telone II  
\$182/A using 20 g/A + \$35/A ground prep = \$252/A
- Telone C-17  
\$252/A using 27.5 g/A + \$35/A ground prep = \$287/A
- Metam Sodium (water run)  
\$192.5/A using 55 g/A + \$70/A ground preparation = \$262.5/A
- Telone II + Metam Sodium  
\$410/A using 20 & 55 g/A + \$70/A = \$480/A
- Metam Sodium (shanked)  
\$217/A using 55 g/A + \$35/A ground prep = \$252/A

Figure 1. Net Dollar Return/A Due to Fumigation

Additional Value Over Control



1996 trial

Figure 2. Net Dollar Return/A in Russet Burbank

Additional Value Over Control

