

To Spray or Not to Spray

Soil Fumigation in Southern Forests

VOCABULARY

Vocabulary marked in article in italics

Fumigant

An agent used in fumigation

Fumigation

To apply smoke, liquid vapor, or gas to destroy harmful organisms

Fungicide

An agent that destroys fungi or prevents fungal growth

Herbicide

An agent that destroys plants or prevents plant growth

Methyl Bromide

Poisonous gas used to kill plants, worms, or insects

Nurseries

Area where plants and trees are grown from seed

Ozone Layer

Upper layer of atmosphere which protects earth's surface from harmful solar radiation

Questionnaire

Printed or written form of questions used to gather information

Seedlings

Small, young trees

Sometimes scientists use methods from both social and biological sciences. This is called using **mixed methods**. This scientist wanted to know about people's use (social science) of a chemical before he began to explore alternatives to the chemical (biological science). With the results of the social science research, the scientist was better prepared to explore alternatives that would meet the needs of the people who use the chemical.

Discovery

You are a scientist who would like to develop a biodegradable plastic container for soft drinks. You want to know how many people prefer using recyclable plastic bottles as compared with aluminium cans. You also want to know if people would use a biodegradable container, even if it would cost more. As a class, develop a short questionnaire that would answer these questions. When you go home, ask your family, friends, and neighbors the questions your class has developed and record their answers. Keep these answers! You will use them after you read this article.



Why biodegradable soft drink container?
What if it cost more than a regular plastic container?

Adapted from: Fraedrich, Stephen W. 1994. Soil fumigation in southern forest tree nurseries: Current status and future needs for pest management. *Diseases and Insects in Forest Nurseries*, Dijon (France), October 3-10, 1993. Ed. INRA, Paris, 265-280.

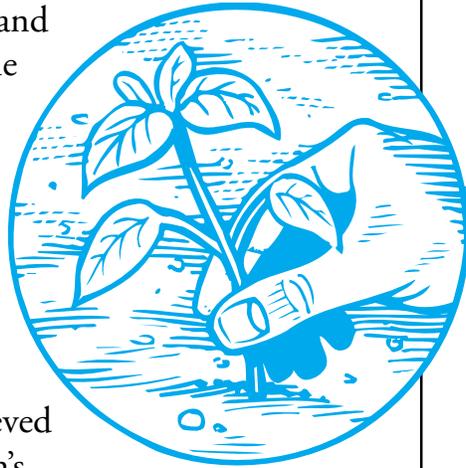
Introduction

Forestry operations depend on the continuous supply of healthy tree *seedlings*. *Seedlings* are small trees grown from seeds in *nurseries*. To provide healthy seedlings, chemicals are applied to the soil in a procedure called soil *fumigation*. The chemicals kill weeds, insects, and diseases. One of the most effective chemicals used is *methyl bromide*. Although *methyl bromide* is effective in helping healthy seedlings grow, it is also believed to damage the earth's *ozone layer*. The *ozone layer* helps to protect the earth's surface from the sun's harmful rays. Some people feel that *methyl bromide* should not be used by the nursery operators because it may be causing problems with the *ozone layer*. Because of these concerns, restrictions are being placed on the future use of *methyl bromide* as a *fumigant*. Nursery operators will no longer be able to use methyl bromide after the year 2002. Scientist Stephen W. Fraedrich has begun studying potential alternatives to the use of methyl bromide. But before he could begin studying the alternatives, he needed to know about the current use of methyl bromide.

(Now do the Reflection at right!)

Methods

To help him understand the current use of methyl bromide, Dr. Fraedrich mailed a *questionnaire* to nursery operators in the southern United States. The purpose of the *questionnaire* was to determine how



Reflection

- 1 Why do you think the scientist needed to study the current use of methyl bromide?
- 2 If you were the scientist, how would you find out about the current use of methyl bromide?

many *nurseries* used methyl bromide, and how often they used it. Although 95 questionnaires were sent, not all of the operators responded. Fifty-seven, or 60 percent of the questionnaires, were returned to the scientist. After the questionnaires were returned, the scientist calculated the percentage of the responses to each of the questions. This research provided the scientist with a way of learning about the use of methyl bromide as a *fumigant*.

Reflection

- 1 What does the scientist know about the fumigation practices of the nursery operators who did not respond to the questionnaire? Why is this important?
- 2 What are some other ways to find out about the fumigation practices of nursery operators?

Results

Dr. Fraedrich found that soil *fumigation* is practiced at 96 percent of the *nurseries* that responded to the questionnaire. Between 65 percent and 79 percent of the operators fumigate either before each crop or before every other crop of *seedlings* are planted. Methyl bromide is the most commonly used chemical for soil *fumigation*. Only one nursery operator said he or she had never tried methyl bromide. Ninety-four percent of the operators said that the main reason they used methyl bromide was because it is more effective than other chemicals at killing weeds. *Herbicides* are also chemicals used to kill weeds. According to operators, the weeds soon grow resistant to *herbicides* and more of the herbicide is needed for effective results. Other types of chemicals used

as alternatives are *fungicides*. Most operators prefer not to use *fungicides* because they are too expensive and can harm the environment. Even the best alternatives were not as effective as *methyl bromide*. Because known alternatives are not as effective, and little is known about effective alternatives, operators will be faced with a dilemma when the use of *methyl bromide* is restricted.



Soil is fumigated by pouring liquid into the soil and covering it with plastic.

Reflection

- 1 What dilemma will be faced by operators when they can no longer use methyl bromide?
- 2 Although methyl bromide may possibly hurt the earth's ozone layer, we also need healthy seedlings that can grow into healthy trees. What are some solutions to this problem?

Further Discovery

As a class, combine all of your answers together and calculate the percentage of responses you found for each question. Here is how you calculate percentages:

Assume your class has asked 60 people the questions in your questionnaire. Twenty-five of them prefer plastic, 30 prefer aluminum, and five do not prefer one over the other. To calculate the percentage of people who prefer plastic:

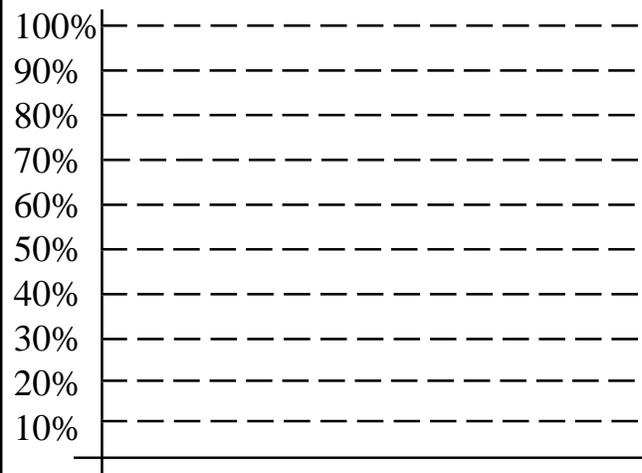
60 people total
25 prefer plastic

Divide 25 by 60 total people. You get an answer of .416, which you should round to .42. To get the final answer, multiply .42 by 100. This gives you a final answer of 42%.

$25/60 = .416$, rounded to $.42$
 $.42 \times 100 = 42\%$

After you have finished calculating percentages, create a bar chart to show your results. If you need help with creating the bar chart, go to page 10 to see an example.

Use the following to create your bar chart



Labels for your questions: