Contact Cooperative Extension for more information.

- Measure amount of water needed to refill tank. The above amount was applied to 1/8 acre; thus, eight times this amount is the gallonage per acre.
- Adjustment in gallonage may be made either by varying tractor speed or changing nozzle sizes or pressure. Recalibrate after making an adjustment.
- Calculate acres to be covered by tank of spray mixture and add required amount of pesticide for total area to be sprayed.

Calibrate your spray equipment frequently and regularly.

Adjuvants

Adjuvants are nonpesticide chemicals that are added to pesticides or to pesticide spray mixtures to improve their chemical or physical characteristics. Adjuvants can reduce or eliminate many spray application problems by performing specific functions. These functions include spreading, wetting, sticking, reducing drift, buffering, improving compatibility, reducing foaming and improving the effectiveness of certain pesticides. Although several adjuvants perform more than one function, no one adjuvant can perform all of these functions.

The most important source of information you have to determine whether or not to use an adjuvant is the pesticide label. Some prohibit the use of adjuvants. Sometimes the use of an adjuvant will cause severe crop injury or loss. Some labels provide no mention of adjuvants; in this case, consult the manufacturer or pesticide dealer.

The most common types of adjuvants are nonionic surfactants, crop oil concentrates, spreader/stickers, drift control agents, buffering agents, compatibility agents and foam-reducing agents.

Water

Protect Groundwater

There is considerable public concern about water quality, and agriculture is coming under increasing scrutiny regarding practices that can affect water quality. Many pesticides and fertilizers are soluble in water and can leach through the soil to contaminate underlying groundwater. Several factors affect the movement of chemicals in the soil and their likelihood of reaching groundwater. Consideration of these factors can minimize the threat to groundwater.

Pesticide Characteristics: Solubility is very important in the leaching of a pesticide. Chemicals that are highly soluble in water are easily leached as water moves downward. If practical, use the least soluble material at the lowest effective rate.

Adsorption is the binding of a chemical to the surfaces of soil particles and organic matter. Some chemicals are tightly adsorbed and do not easily leach from soils.

Persistence refers to the amount of time a chemical will stay in the environment before being broken down into nontoxic substances. The rate of breakdown is affected by sunlight, temperature, soil pH, moisture and microbial activity. Pesticide persistence is measured in terms of half-life which is the length of time needed for one-half of the amount applied to break down. Persistent chemicals break down slowly, increasing the chance for them to leach from the soil. Conversely, short-lived materials may be degraded before significant leaching occurs. Many pesticides are broken down by sunlight (photodegradation) and/or microbial action. Incorporation of pesticides into the soil reduces or eliminates photodegradation. As depth in the soil increases, there is less microbial degradation. Any practice that slows degradation increases persistence and the likelihood of leaching. Generally, foliar applied materials are more likely to break down before significant leaching occurs than those that are applied to the soil.

Soil Characteristics: Soil texture and organic matter greatly influence the movement of pesticides and fertilizers. Fine textured soils and those with high amounts of organic matter are highly adsorptive, whereas sandy soils low in organic matter are not. Highly permeable soils with permeable underlying layers allow for rapid downward movement of water and dissolved chemicals. Know your soils and apply chemicals accordingly.

Water Table: High water tables are especially vulnerable to contamination because little time is required for chemicals to reach groundwater.

Fertilizers: Nitrogen (N) in the nitrate form is highly soluble, persistent and not adsorbed to soil particles. Nitrate N is not only leachable but is recognized as a health threat at concentrations above 10 ppm in drinking water. Infants are most susceptible to nitrate in drinking water. The ammonium

form of N is adsorbed by soil particles and is less subject to leaching. However, ammonium N is converted to nitrate N in the soil, and this can occur quite rapidly. Note that urea, a common form of fertilizer N, is converted in the soil to ammonium and then to nitrate.

Appropriate management practices can reduce the likelihood of nitrate leaching. Any time large amounts of N are applied, significant leaching can occur if there is heavy rain. By applying some of the needed N at planting and the rest during one or more topdressings, you can avoid having large amounts of nitrate present at any one time. Not only can this reduce leaching, it can improve production by providing N during periods of greatest crop uptake.

Nitrogen left over in the soil at the end of the season is highly subject to leaching. A cover crop should be planted to take up unused N. The N will again become available for future crops as the cover crop breaks down.

Contact Cooperative Extension and the Natural Resource Conservation Service about questions you may have regarding the use of certain pesticides on your soils.

Know Your Water

The pH of the water in your tank mix can sometimes affect the efficacy of pesticides. Insecticides, in particular, have a tendency to break down (hydrolyze) rapidly in alkaline water. Water pH can vary, depending on the source, from 5.0 to 9.5. Neutral water has a pH of 7.0, while alkaline water is higher than 7.0. If your water pH is much higher than 8.0, you may want to consider using an acidifying agent such as vinegar to lower the pH in the tank. Many of the pH-sensitive pesticides have acidifying agents in the formulation that moderate the effect of alkaline water. However, growers who suspect a pH problem should have their water tested. This can be done on the farm with pH test kits. Also, organic matter can tie up certain pesticides or clog nozzles.

Fumigation: Materials and Risks

The practice of soil fumigation, while providing significant benefits as outlined above, also carries with it significant risks. One such risks is reintroducing pathogens on transplant material or farm equipment. This can cause a phenomenon called “the boomerang effect” in which a pathogen is (re)introduced in a partially sterilized soil and proliferates rapidly because checks and balances no longer exist in that soil. In such a case, the resulting epidemic is worse than if the soil had never been fumigated. So, it is very important to take care to plant very clean transplant material and to use only clean equipment when working in a newly fumigated field.

Fumigation is also a costly practice, one which a

Table 9. Fumigant rates and spectrums of activity.

			LEVELS OF CONTROL			
Common Name	Trade Name	Rates/A	nematodes	fungi	weeds	Comments
metam-sodium	Vapam HL	37.5-75.0 gal	yes	yes	yes	Water-soluble liquid that decomposes to a gaseous fumigant. Efficacy affected by soill moisture, temperature, texture, and organic matter content.
dazomet	Basamid	265-350 lb	yes	yes	yes	Granular product. Incorporate thoroughly in soil. Toxic gasses released following absorption of soil moisture by product. Affected by same factors as metam-sodium. 365 days-to-harvest limitation.
1,3 dichloropropene	Telone II	15-27 gal (annual plantings) 27-35 gal (perennial plantings)	yes	no	no	Liquid that diffuses as a gas through soil. Effective against nematodes and insects. Rates vary with soil texture; efficacy strongly affected by soil moisture and temperature
1,3 dichloropropene + chloropicrin	Telone C17 Telone C35	32.4-42.0 gal 39-50 gal	yes yes	yes yes	no[a] no[a]	Most effective for control of weeds, soil-born diseases; nematodes, and insects; requires plastic seal; highly toxic.

[a] Sealing with plastic and/or using higher rates may also result in good weed control

Courtesy of PennState University’s 2002-2004 Commercial Berry Production & Pest Management Guide