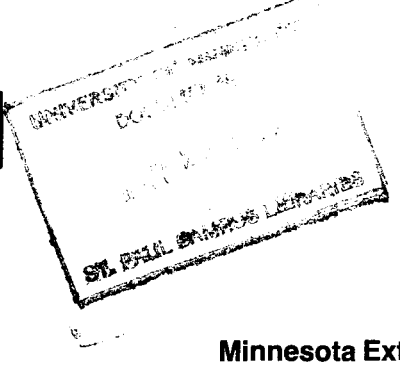
TIPS FOR

Reducing Weed Control Costs



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Minnesota farmers applied pesticides at least once to approximately 96 percent of corn and soybean fields and 89 percent of the wheat fields planted for harvest in 1984. The 1984 pesticide survey conducted by the Minnesota Agricultural Statistics Service indicated that herbicides accounted for 9 out of 10 acres treated. This indicates chemical weed control is being used by a large percentage of farmers in the state. Herbicides cost between $3 and $50 per acre. It is important to get the most effective weed control available for your herbicide dollar. Here are some suggestions for maintaining an effective but more economical weed control program.

WEED IDENTIFICATION

Weed identification should be the first step in an effective weed control program. Many herbicides need to be applied when weeds are small to be effective; therefore, it is important to accurately identify weed seedlings. There are several extension publications available from your county agent that can aid in weed seedling identification (see publications list). Another publication that may be useful in weed seedling identification is an extension publication from the Cooperative Extension Service University of Georgia, titled "Common Weed Seedlings of the United States and Canada". This publication is available from the Georgia Cooperative Extension Service, Athens, Georgia, for approximately $3.

Accurate weed identification is important for effective and economical control. Many weeds look similar in the seedling stage; however, their control may be quite different. For example, wild buckwheat and field bindweed are often confused early in the growing season. However, field bindweed, a perennial, requires a different control program than wild buckwheat, an annual.

Once the weed problem has been accurately identified, it is important to choose the best control method. A series of fact sheets on weed control in soybeans, corn, small grains, sunflower, flax, forages, dry beans, and pastures are available from your county agent. These can help you plan an effective weed control program for your individual situation. (See publication list.) Also available at your county extension office is a computer program developed in 1985, entitled WEEDIR. Your county agent has a computer and printer available to run the program and supply you with a copy of the recommendations. The program can help you with weed mapping, weed control recommendations, herbicide use information, and weed control cost analysis. To use this program you need to know the weed species, the crop, and the severity of the weed infestation. You can also supply the computer with the cost of a particular herbicide in your area in order to determine the economics of the particular herbicide treatment.

Mapping weed locations in a field can also help reduce weed control costs. Often it is possible to treat only parts of a field rather than the entire field. Perennial weeds such as Canada thistle and quackgrass, which are difficult to control, usually occur in patches. Scattered patches and individual weeds can be spot treated or cut. Many annual weeds, such as barnyard grass, can move into a field from the roadside. These weeds can be adequately controlled by treating only the margins of the field.

SPRAYER CALIBRATION

Accurate calibration of your spray equipment will also help reduce weed control costs and increase the effectiveness of the herbicides used. Applying too much herbicide results in higher chemical costs, potential crop injury, and risk of chemical residues in the crop. Applying too little herbicide often results in ineffective weed control and decreased yields due to weed competition. Nationally, losses due to poor herbicide application are estimated at $1 billion annually. A recent study conducted by agricultural engineers at the University of Nebraska found 60 percent of the applicators missed their estimated application rate by more than 10 percent. Nearly a third of the applicators overapplied or underapplied by more than 30 percent. A similar study in Montana found that 25 percent of applicators were overapplying by 30 percent. An overapplication of 30 percent can be expensive. For example, overapplying a $20 herbicide treatment by 30 percent will increase your herbicide cost $6 per acre.

The most common equipment problems found in these studies were leaking nozzles and hoses, and defective pressure gauges. Calibration errors can also result from use of damaged or worn nozzle tips, use of different size nozzles on the same spray boom, clogged nozzles or nozzle screens, and failure to accurately check the ground speed and pressure. Nozzle spacing and sprayer boom height also play an important role. The sprayer boom must be adjusted to give the proper overlap of nozzles for broadcast application or to give the proper boom height for band application. A boom that is too low will concentrate the herbicide into a smaller area, with spaces between nozzles left without adequate herbicide. A boom that is too high increases the amount of overlap causing excess pesticide in the area between nozzles and increases the potential of herbicide drift. The sprayer boom height is determined by the height of the target area (soil surface for soil-applied herbicides and plant height for postemergence herbicides) and the nozzle spacing.

Nozzles are among the most critical items in ensuring proper application of herbicides. It is hard to predict the useful life of a spray nozzle. Hardened or stainless steel nozzles have the longest life, whereas brass nozzles generally have the shortest

life. However, nozzle life is influenced by the type of herbicide sprayed, the pressure used, and the method of tip cleaning. Abrasive materials such as wettable powders wear nozzles more than liquids. Never use a metal object to clean nozzle tips because this can enlarge the nozzle orifice. Compressed air, a toothbrush, or toothpick can be used. Nozzles should be checked regularly and any nozzle that deviates more than 10 percent from the flow designated by the manufacturer or more than 5 percent from the average of all tips should be replaced.

Variation in ground speed can result in application errors because the rate applied varies directly with ground speed. For example, reducing the ground speed by one-half doubles the rate of application. Always check ground speed under field conditions and over a measured course.

The performance of any pesticide depends largely on precision of application. The time required to make precise application will always be paid back in profitable returns and more effective weed control.

BAND VS. BROADCAST HERBICIDE APPLICATIONS

In row crops such as corn, soybeans, sugarbeets and sunflowers, herbicides can be applied in a band to help reduce herbicide cost. The herbicide rate in the treated area is the same for both band and broadcast applications; however, with a band application only a fraction of the total acreage is being treated with a herbicide. For example, applying a herbicide at 3 pounds per acre requires 3 pounds of herbicide per crop acre when a broadcast application is used; but only 1.5 pounds of herbicide per crop acre is needed if a 15 inch band is treated on rows spaced 30 inches apart. In other words, by applying a herbicide in a 15 inch band over a 30 inch row spacing, you are treating half the area that would be treated if the herbicide was broadcast applied. Thus, herbicide cost is cut in half. For example, assuming an average cost of herbicides used on soybeans in Minnesota is $18 per acre, the herbicide cost saving from banding could be from $9 to $12 per acre. This savings would be partially offset by an additional cultivation at an approximate cost of $4.50 per acre; however, banding herbicides could still give a savings of $4.50 to $7.50 per acre. To be effective, the banded herbicide must remain in the row area. Windy conditions during band application may drift the herbicide off the row, resulting in poor weed control in the row. Drift can be reduced by equipping the sprayer with windshield devices to keep wind from distorting the application pattern. Extension fact sheet AG-FS-0917, "How to Calculate Herbicide Rates and Calibrate Herbicide Applicators,"is available from your county agent to help in calibration of band sprayers.

There are several other factors that you should consider before you decide to band apply herbicides. The type of nozzle used for banding is different than those used in broadcast applications. For band application you will need to use an even fan or solid cone nozzle. Control of sprayer boom height is also important. If spray boom height is too low, the herbicide rate will be too high in the band, and if the boom is too high, the herbicide rate in the band will be too low.

Finally, cultivation will be needed between the rows to control the weeds that were not treated. You will need to consider the cost of cultivation, the time it takes, and the possibility of adverse weather conditions that could prevent cultivation.

HERBICIDE COST

Herbicide costs vary depending on location and dealer. You should always compare herbicide prices between dealers whenever possible. Compare prices of different formulations and brands on the basis of cost per pound of active herbicide. Although some of the new formulations may be easier to handle, weed control is essentially the same for the same herbicide. A review of 1985 prices for commonly used herbicides revealed a $7 per acre savings, by selecting the low cost formulation. Recently, some herbicides such as alachlor (Lasso) have been sold in bulk by dealers. Buying a herbicide in bulk is usually less expensive and there are no containers that need to be disposed. Another way to reduce the herbicide costs is to buy in large quantity with your neighbors. Dealers may give discounts for large orders that are placed well in advance of the spraying season.

Chemical mixtures usually cost more than single herbicides. Use mixtures only if they are needed to control more kinds of weeds or to improve weed control over varying soil conditions. In some fields, one herbicide may be sufficient. If you do need to use a combination of herbicides, tank mixing the herbicides yourself is usually less costly than buying premixed mixtures. In addition, doing your own tank mixing allows you to adjust rates to your specific conditions.

All herbicides which are sold as a pre-mix are registered for use as a mixture by the Environmental Protection Agency (EPA). You may tank mix any herbicides if all herbicides in the mixture are registered for use in the crop by the EPA. If the herbicide combination is not listed on the label, you must assume liability for crop injury, inadequate weed control, and illegal herbicide residues. Herbicide combinations should be used with caution until experience or research has shown that the mixture is effective and safe. If two herbicides are needed, tank mixing the two will be more economical by saving a trip across the field.

HERBICIDE RATES

Trying to decrease herbicide costs by reducing the rate below the labeled rate will not always increase profits. Reduced rates often lead to decreased weed control and decreased yields due to weed competition. However, it is possible to use the lowest labeled rate under favorable conditions, such as small weeds that are actively growing. Under adverse conditions of drought, prolonged cool weather, or for well established weeds, a higher herbicide rate is needed for effective control. Do not waste money on additives that are not needed. (See section on additives.) Most herbicide formulations contain the additives needed for effective control. However, always read the label to see if an additive is recommended.

SOIL FACTORS

Soil factors, such as texture, organic matter content and pH, are useful in determining the exact amount of a soil applied herbicide that should be used. The effectiveness of many soil applied herbicides, such as EPTC (Eptam/Eradicane) trifluralin (Treflan), or chloramben (Amiben) is influenced by soil texture and organic matter. Herbicides such as metribuzin (Sencor/Lexone) and chlorsulfuron (Glean) are influenced by soil pH. For example, applying metribuzin (Sencor/Lexone) on soils with a pH of 7.5 or greater can result in soybean injury. Use the labeled rate of a herbicide for your specific soil conditions. Do not exceed recommended rates for a given soil condition. Excessive rates not only add to your weed control costs, but may also result in crop injury. Applying too low a herbicide rate will result in inadequate weed control. Considerable savings may be accomplished by adjusting rates to different soils in a field and from field to field instead of treating the whole field or farm uniformly. Soil maps can be obtained from your local Soil Conservation Service office.

HERBICIDE ADDITIVES

There are many kinds and brand names of herbicide additives on the market. These include surfactants, petroleum and vegetable (crop) oils, stickers, spreaders, thickening agents,

compatibility agents and anti-foam agents. Many of these additives increase the weed control of herbicides; however, they can also increase the potential for crop injury. For example, the addition of oils or surfactants to cyanazine (Bladex) applied postemergence increases the potential for corn injury. If an additive is needed it is important to add the proper one. For example, vegetable or petroleum oils increase the weed control of postemergence applications of atrazine. However, various formublations of surfactants and detergents do not improve weed control with atrazine as much as using oils. A nonionic surfactant should be used with glyphosate (Roundup) and paraquat (Ortho Paraquat, Gramoxone). Other additives can decrease the effectiveness of these herbicides. Do not waste money on additives that are not needed. For example, research has indicated that additives do not increase the effectiveness of soil applied herbicides. Be sure to read the herbicide label to determine if an additive is needed and which one is recommended. Usually the herbicide rate can not be decreased by adding an additive.

WEED COMPETITION

The effect of weed competition on crop yield has not been studied on every weed species in every crop. However, it can be generalized that any weed species can reduce yields in any crop if the weed density is high enough and the duration of weed competition long enough. Many producers would like to predict yield losses due to various weed populations in order to determine if it is economical to apply a herbicide treatment. Also, if a soil applied herbicide does not give good weed control, many producers would like to know when it is economical to apply a herbicide post emergence to control these weed escapes.

Unfortunately, predicting yield losses due to weeds is not a simple process. Crop yield losses due to weeds are influenced by many factors such as weed density, weed species, soil moisture, and crop. Also, competition studies are done with one weed species in a crop at a time. However, many fields usually have more than one weed present. Even so, there are some generalizations that can be made about weed competition:

1. Weeds begin to compete with crops early in the growing season. In soybeans, weeds need to be controlled by four weeks after soybean emergence to prevent a yield loss. Yield losses continue to increase with each week of weed competition.
2. Weeds that emerge after the crop are less competitive than weeds that emerge before or with the crop.
3. Weeds that have a growth habit similar to the crop they are growing in are more competitive than weeds with a different growth habit. For example, wild oats and wheat are cool season plants and foxtail is a warm season plant. On a one to one basis, wild oat is more competitive with wheat than foxtail.
4. Crop yield losses increase as weed density increases. For example, research has shown that 8 wild oat plants per square yard reduced wheat yield 6 percent, whereas 200 wild oat plants per square yard decreased wheat yield 48 percent.

Therefore, it can be concluded from competition studies that weeds need to be controlled early in the season to prevent a yield loss, and yield losses increase as weeks of competition increase.

CULTURAL PRACTICES

Cultural practices that are optimum for crop growth should be followed. These practices include seedbed preparation, adequate fertility, optimum stands and row width, proper seeding date, and use of clean seed that is free of weed seeds. Tillage, if used, should be timed to decrease weed competition. Tilling the soil immediately before seeding will kill weeds that have germinated, thus giving the crop a competitive advantage and often improving weed control from herbicides that do not control weeds that have germinated. For annual weed control, the rotary hoe used at the proper time will control small, emerging annual weeds, at a cost of $3 per acre per time over the field, as effectively as widely used $10-$20 per acre herbicide treatments. Research has shown that weeds that emerge before the crop are more competitive than weeds that emerge after the crop has become established. In row crops, cultivation between the rows can be used to control weeds.

PERENNIAL WEED CONTROL

Perennial weeds such as Canada thistle, field bindweed, quackgrass and nutsedge are difficult to control. Further, it may take two or more years to get adequate control of these weeds. Control is usually accomplished best with a combination of cultural practices, cropping systems and herbicides.

Fall tillage of perennial weeds can be as effective as more expensive herbicide treatments in reducing weed vigor next spring by preventing fall buildup of food reserves in the underground storage organs. For example, a disking or field cultivation at $5 per acre could replace a glyphosate (Roundup) or dicamba (Banvel) treatment at $20 per acre. Infestations of perennial weeds can be reduced in row crops by frequent cultivations. Time cultivations to kill top growth when it is not more than 6 to 8 inches tall, this eliminates small seedlings before they develop rhizomes or other storage organs and will increase the effectiveness of cultivations.

Frequent mowing will weaken and suppress perennial weeds. Weeds should be mowed by the time the first flower appears so that seeds will not form and then clipped whenever top growth warrants it. Areas infested with perennial broadleaf weeds, such as Canada thistle, may be planted to hay crops and cut for hay over several years to weaken the weeds and keep them from spreading.

There are several herbicides available that can greatly reduce or eliminate perennial weed infestations. However, these herbicides can be costly. Many perennial weeds occur in patches that can be spot treated. Using rope-wick or roller applications can also reduce the cost of controlling perennial weeds. Applying herbicides at the proper growth stage and at the proper rate will increase the herbicide effectiveness. Do not apply herbicides to perennial weeds that are not actively growing or are under drought stress.

It is possible to reduce weed control expenditures and still maintain an effective weed control program. The time required to evaluate weed control choices from among the many alternatives will be paid back in profitable returns and more effective weed control.

Below is a list of publications that are available to help you design an effective, economical weed control program. These publications are available from your county agent or Communication Resources Distribution Center, 3 Coffey Hall, St. Paul, MN 55108.

Publication	Number
Weed Seedling Identification	AG-FO-0776
Annual Broadleaf Weed Seedling Identification	AG-FS-1350
Annual Grass and Perennial Weed Seedling Identification	AG-FS-1351
Annual Grass and Perennial Weed Identification	AG-FS-1352
Wild Oat Identification and Control	AG-FS-0918
Identification and Control of Wild Proso Millet	AG-FS-0912
Broadleaf Weed Identification	AG-FS-1350
How to Calculate Herbicide Rates and Calibrate Herbicide Applicators	AG-FS-0917
Cultural and Chemical Weed Control in Soybeans	AG-FO-0841
Weed Control in Established Alfalfa and other Forage Legumes	AG-FS-0922
Weed Control in Corn	AG-FO-0892
Weed Control in Small Grains	AG-FO-0771
Weed Control in Sunflowers	AG-FS-0920
Weed Control in Flax	AG-FS-0910
Weed Control in Dry Beans	AG-FS-0921
Establishing Forage Legumes with Herbicides	AG-FS-0924

Others: Available only at county extension offices.

WEEDIR (computer program)	AG-CS-2163

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