Using Reduced Herbicide Rates

For Weed Control In Soybeans

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$1.00

MP686

Acknowledgements and disclaimers

The University of Missouri does not warrant herbicide performance. Be aware that the herbicide manufacturers also do not warrant reduced rates. **You will be on your own.**

This information is provided to allow you to choose the best system for weed control for your production situation. The suggestions are based on limited-scale field plot research and are suggested for trial use until you are comfortable with the systems.

In addition, Missouri law requires that when requesting reduced rates from a custom applicator, you must make the request in writing and you must accept full responsibility for the application. **However, the U.S. Environmental Protection Agency has determined it is legal to use a pesticide at rates below those stated on the label.**

We gratefully acknowledge major support from the Bonnie Clark Memorial Fund to prepare this reduced herbicide rate publication. Mrs. Clark's family requested the memorial funds be used to help farmers reduce agricultural chemical rates and assist them in being profitable. The work reported here is in the vanguard of such research-based recommendations for Missouri farmers.

We are also grateful for the support granted from the Missouri Soybean Merchandising Council. Financing for most of this research in Missouri has been provided by the council.

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How are label rates determined?

Discussions of below-label herbicide rates frequently leave the impression that existing label rates must be too high. This is definitely not true.

Herbicide manufacturers make a large investment in the discovery and labeling of a new herbicide. It currently takes six to 10 years and costs $40 million to $100 million to label a new herbicide. With an investment of this size, pesticide manufacturers cannot afford to develop a herbicide that is not properly labeled and does not work as advertised.

Herbicide performance testing for effective weed control and acceptable crop response is conducted by scientists working for the manufacturers as well as universities. This is a cooperative effort to discover the most effective uses of new and older herbicides. Testing is conducted on a large sampling of crop species and varieties, weed species, herbicide application timings, soil types, climate and weather conditions, tillage practices, rotations, herbicide additives and other agronomic and economic variables in addition to application rates.

It is this diversity of uses and the unpredictability of many of these factors that leads to the establishment of labeled application rates that will provide effective weed control over the greatest possible range of conditions.

It is also important to realize that manufacturers set herbicide prices based on the total number of acres likely to be treated and the price the market will bear. This price is not related to the cost of developing and manufacturing the actual product. Thus, the larger the market and higher the price the customer will pay, the more profit the manufacturer will make.

This total potential return must be more than the sizable cost to develop and manufacture the product. It is actually to the herbicide manufacturer's advantage to sell the lowest possible rate per acre, because the potential selling price is not related to the manufacturing price. Even so, most manufacturers will set a label rate that is a balance between what is needed to provide reliable performance (and minimize poor performance problems that cost money to correct) and a lower rate that could bring greater profit.

If it is true that labeled rates are already as low as they can be to provide reliable performance, then how can you reduce herbicide rates and cost? There are several ways. These depend on your individual production system, the amount of increased effort and time you are willing or able to make in the management of your farm, *and the degree to which you are willing to personally accept some of the risk involved* in the outcome of your weed management program.

Current herbicide rates are correct for most uses and applications. Using reduced rates requires you to study and understand specific situations and conditions as well as the increased level of management and risk necessary to make them work.

The objective of this publication is to outline the options available for weed control in soybean production, define their advantages and limitations, and discuss the techniques and risks involved in using below-label herbicide rates.

How can herbicide use be reduced or made more efficient?

Effective weed management involves the integration of many practices. Herbicides are undeniably the most efficient, reliable technology available today for weed control in soybeans. However, proper use of other cultural and management techniques can assist with weed control and minimize the amount and cost of herbicide inputs in your production system.

Scout for weed problems

Scouting for the extent and time of weed emergence can help you find the most effective timing for weed control practices such as herbicide application and cultivation.

Proper weed identification is also required to formulate the most effective herbicide program for each soybean field. Improper herbicide selection will result in poor weed control, which causes lower soybean yields. This often leads to another costly herbicide application for 'salvage' weed control.

Cultural practices

Crop rotation

Crop rotation provides some weed suppression by creating a varying environment that may not be favorable for certain weed species. For instance, alfalfa and clover are more competitive to many weeds than soybeans planted in relatively open rows. Also, frequent cutting of forage crops prevents tall weeds, such as giant foxtail or cocklebur from going to seed.

Crop rotation frequently leads to herbicide rotation. This allows you to control weed species for which no herbicide is available in the other crop. Herbicide rotation also helps to prevent herbicide-resistant weed populations.

Narrow rows

Planting soybeans in narrower rows allows the crop to form a canopy over the soil earlier and shade the soil surface sooner than soybeans planted in 30-inch rows. This can reduce late-season weed seed germination.

The more uniform distribution of the soybean plants in drilled fields helps to maximize the use of resources for the crop, while maximizing the competitive ability of the crop against the weeds. However, narrow rows prevent the use of cultivation as a weed management option.

If weeds are controlled, wide-row soybeans usually provide an equivalent yield to narrow-row soybeans (see Table 1).

Table 1. Effect of row spacing on number of days until soybean canopy closure and soybean yield (data averaged over eight trials at two locations in two years).

	Days to canopy closure	Yield (bushels/acre)*
Narrow rows (10-inch)	73**	21
Wide rows (30-inch)	95	19

**Yield averaged over 18 treatments, several of which had poor weed control that lowered the overall averages.*

***The number of days from soybean planting until crop canopy closure (full coverage of the soil) was statistically significant. Yield was not significantly different overall.*

Planting date

You can eliminate early flushes of weeds that germinate in the spring by delaying planting. Many weed species, such as lambsquarters, common ragweed and Pennsylvania smartweed, germinate in April or early May. These can be eliminated with tillage or a burndown herbicide before planting.

Delayed planting allows more time for the maximum number of weeds to emerge and be killed with these preplant weed control practices. The disadvantage is the possible loss in yield potential as you delay planting. Also, missing favorable weather and field conditions involves considerable risk.

Tillage and cultivation

Tillage was primarily adopted by early agriculturalists for the purpose of controlling weeds. In 1721, Jethro Tull proposed planting crops in wide rows to allow for "horse hoeing" weeds out of the crop. Access to more abundant and efficient "horsepower" during the industrial age of the next two centuries led to increasing use of tillage for weed control and seedbed preparation. Several factors have led to the development of production practices that minimize or eliminate the use of tillage in crop production. These include the discovery of herbicides, the rapid loss of topsoil in cultivated regions of the world and the rising cost and environmental impact of fossil fuel energy.

Missouri has ranked as high as second in the United States in soil erosion. Herbicides are the primary technology that allow the adoption of no-till crop production. The selection of herbicides for soybeans is larger than for any other crop. However, tillage and cultivation are still widely practiced for weed control for many reasons. They will continue to be an important option in some situations.

Primary tillage, such as plowing and discing, control most weed problems before planting soybeans. This is the principal area where no-till increases the requirement for herbicides. A burndown herbicide treatment must replace tillage before planting.

Post-planting cultivation can provide from near zero to almost perfect weed control, depending on the number and type of weeds present and soil conditions. Wet soil during cultivation often leads to ineffective control as the weeds re-root and continue to grow. Grasses are also difficult to cultivate effectively because of their fibrous root system. Cultivation requires good soil conditions (moist, but not wet), proper timing (small weeds that lack extensive root development), properly adjusted equipment, and adequate time to cover all of the acres being managed.

Under good conditions, 50-percent to 60-percent weed control can be expected with cultivation (either sweep-type or rotary hoeing). Most of the weeds missed are those growing within a few inches of the crop row.

These weeds are also the most competitive with the crop. Applying a herbicide in a band over the row can control these weeds and reduce herbicide usage and cost. This is a popular and effective practice in the Mississippi Delta region of the Missouri Bootheel. In this region, band application equipment is common for cotton production. Band application equipment is also used for ridge-till production systems.

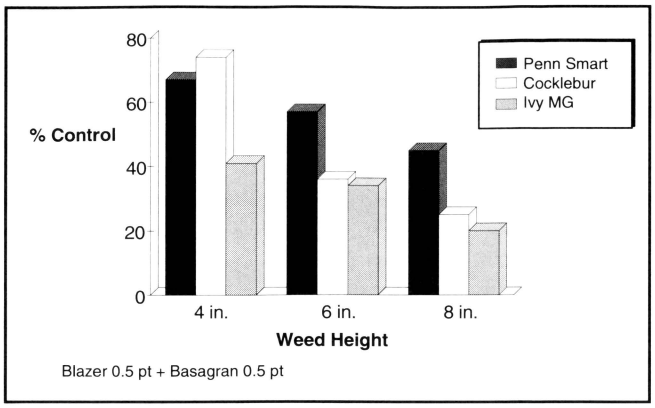


Figure 1. Effect of application timing on weed control (Columbia, 1987).

The main disadvantages of tillage and cultivation are increased soil erosion and greater energy use per acre than with most herbicide programs. Also, sweep cultivation is not possible with narrow-row soybeans.

Rotary hoeing has not been a popular practice in Missouri, as compared with the upper Midwest, because of the claypan soils in much of the state. Shallow soils are not as suitable as the deeper, higher organic matter soils to the north. There is also greater variability in effectiveness of rotary hoeing compared with between-row cultivation or herbicides.

Rotary hoeing must be completed when weeds are in the "white root" stage after germination but before emerging from the soil surface. This usually occurs within one week of planting or pre-emergence herbicide application. It is difficult to schedule and complete this tillage operation, because it must be performed early in the season when other farm activities demand attention. Primary tillage and cultivation can also increase weed problems by pulling deeply buried weed seed to the soil surface where it can germinate.

Proper herbicide selection and application

Any practice that optimizes the performance of a herbicide application will provide the best possible weed control. This minimizes the need to make another herbicide application to clean up escapes.

Optimum weed control is accomplished by using the right application equipment and calibrating it properly and often. Use the right tillage equipment for preplant incorporated herbicides. Keep incorporation equipment properly maintained and adjusted.

Select the best herbicide or mixture based on proper weed identification. Apply the herbicide at the right time. Preplant herbicides should not be applied earlier than 15 days before planting to provide the most consistent and reliable weed control in Missouri.

Apply post-emergence herbicides to weeds that are no taller than the label specifies. Applying post-emergence herbicides to young weeds is much more effective because young weeds are easier to control (see Figure 1). Early emerging weeds are also more competitive with the crop than late-emerging weeds. Use only additives that are specified on the herbicide label. These additives have been tested and proven to work.

Use name-brand additives from reputable suppliers. Because the additive industry is not regulated, there is considerable variability in the quality of additives on the market. Be suspicious of any additive that claims to allow you to reduce herbicide rates.

As mentioned earlier, it is likely that the manufacturer would already use such an additive in the herbicide formulation to reduce manufacturing costs if such a thing really worked. Our research has shown that herbicide timing is much more important than the selection of an additive. Always apply post-emergence herbicides as early as possible.

What are the different ways to reduce herbicide rates?

Banding

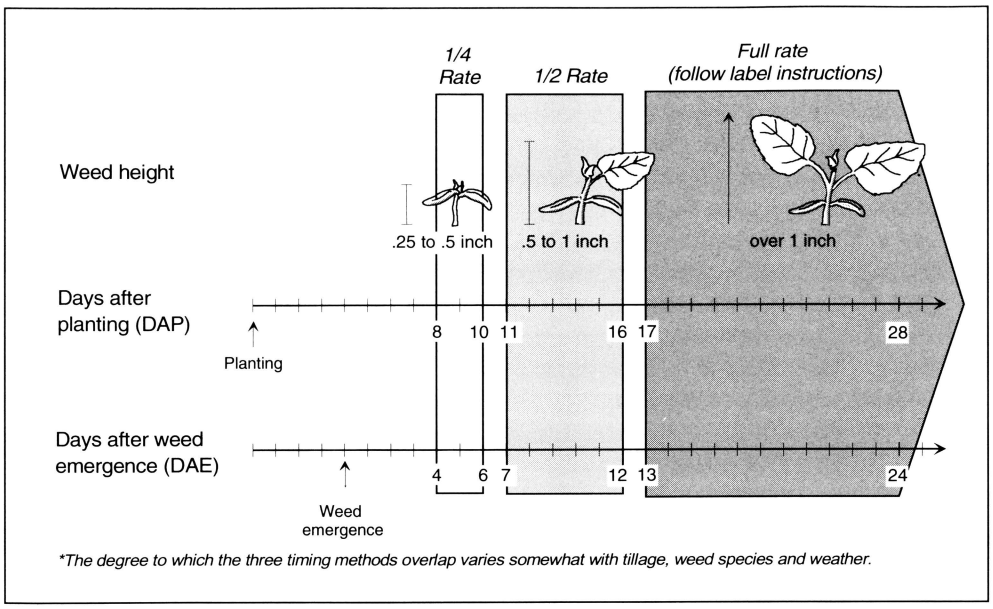
As discussed earlier, an obvious way to reduce rates is to apply herbicides at the normal rate per acre in a band and cultivate between the rows. However, this is not really reducing herbicide rates, it is using a full rate on a smaller treated area.

It is also possible to combine "true" reduced rates in the band with cultivation. The principles involved for using reduced rates in a band are the same as discussed below for broadcast applications.

Label instructions

Another way to reduce herbicide application rates is to scout fields and identify the weed species that require control. With a post-emergence herbicide program, you frequently have three options that can be used separately or together to reduce the application rate and still be in compliance with the label and the manufacturer's warranty for performance:

- Serious weed populations sometimes occur in smaller patches in a field. Spraying only these areas with a post-emergence herbicide lowers herbicide use by reducing the total treated area.
- Many labels allow for reduced rates for individual, highly susceptible weed species. These "special" weeds are more susceptible than the majority of weeds on the label. If you only need to control one primary weed problem in your field — and it is one of these species on a herbicide label — you can target the weed with the lower rate and save considerable expense.
- Many post-emergence herbicide labels also specify lower rates for some weeds when they are younger (earlier growth stage or height), but require higher rates for larger weeds.



The degree to which the three timing methods overlap varies somewhat with tillage, weed species and weather.

Figure 2. Application timing for reduced rates of post-emergence broadleaf herbicides in soybeans.*

Scout your fields early. You may apply the herbicide at this time if the weed species you need to control is listed on the herbicide label in the lower rate section for young weeds.

This is one of the most basic principles of herbicide use: the smaller the weed, the lower the rate required to kill it. We will use this principle to an even greater extent in the "reduced rate" section.

Below label-reduced rates

Reducing rates for special and younger weeds requires an intimate knowledge of herbicide labels, early weed scouting and weed identification.

Research conducted at the University of Missouri, University of Arkansas, Southern Illinois University and other universities, has defined another way to manage the use of reduced rates of soil-applied and post-emergence herbicides.

These systems have been tested for full-season soybean production. There is no information available at this time on the use of reduced herbicide rates for double-crop soybeans.

The use of reduced herbicide rates with post-emergence herbicides has been studied in greater detail. It is more successful for weed control than reduced rates of soil-applied herbicides.

Post-emergence reduced rates

As discussed earlier, the key to using post-emergence herbicides is to remember that the smaller (younger) the weed, the lower the herbicide rate required to kill it.

This concept has been extended to even lower rates while still providing good control of most weeds on the herbicide label. Successful weed control can be obtained with one-half and even one-fourth of the full label rate if you are willing to apply herbicides very early to extremely small weeds. The proper application timing for the use of reduced rates of post-emergence broadleaf herbicides in soybeans is shown in Figure 2.

An important exception is grass control with the post-emergence grass herbicides. We have not conducted enough re-search on grass weed control to be able to define a reduced-rate herbicide program. There is also considerable "antagonism," or reduction in performance, when post-emergence grass and broadleaf herbicides are mixed.

We have not had consistent successful grass control when reduced rates of post-emergence grass herbicides are mixed with reduced rates of broadleaf herbicides. We do not recommend their use for grass weed control for this reason. You should not mix full rates of grass herbicides with reduced rates of broadleaf herbicides either. This will still cause some reduction in performance. Follow label guidelines on time intervals to wait between sequential applications of broadleaf and grass herbicides.

In conventional tillage soybeans, application timing for reduced rates of post-emergence herbicides generally is based on the number of days after weed emergence or the number of days after planting. Both methods will work well under normal growing conditions of adequate moisture and warm daytime temperatures during the planting season. Using the number of days after weed emergence will be more accurate under dry, cool conditions. Using the number of days after planting is preferred when planning one-fourth rate applications because weeds are very small and hard to identify at this point.

Recently, we have discovered that application of reduced rates of post-emergence herbicides in no-till should be timed to weeds based on their height and stage of growth. This requires careful scouting. All three methods are illustrated in Figure 2. Note that the three times usually will coincide with each other. However, because weed emergence is more variable with no-till, this system requires greater observation.

Conventional tillage eliminates weeds before planting and creates a uniform "starting time" for the emergence of new weeds. This uniformity creates a relatively consistent environment for predicting when the first new flush of weed germination will occur under favorable crop planting conditions.

No-till systems do not have this single point in time when weed germination begins. Weed germination will be staggered over a longer period of time after the application of a burndown herbicide, due to the lack of a tillage operation to stimulate a quick flush of weeds.

However, we have found that properly timed reduced-rate applications of post-emergence herbicides in no-till work as well — and often better — than in conventional tillage systems.

This is probably due to at least three factors:

1) The residue cover on the soil surface helps to suppress germination of weeds after the herbicide is applied, because many post-emergence herbicides have no residual activity.

2) The residue helps to preserve soil moisture, which reduces water stress and maintains weed susceptibility to the herbicide.

3) In-the-row cultivation in conventional and reduced-tillage systems stimulates new weed germination by bringing more weed seed near the surface.

Timing of reduced-rate applications

The use of one-fourth rates of post-emergence herbicides requires very early application to very small weeds. This rate will only work if applied about eight to 10 days after planting soybeans. Usually, this coincides with four to six days after weed emergence in conventional tillage systems to weeds that are one-fourth to one-half inch tall in conventional and no-till systems. Weeds will often be so small that they are difficult to see. Before committing to a large acreage, try this system on a small acreage the first few times to convince yourself it will work.

Making a herbicide application early will often require a sequential herbicide application at the same one-fourth rate in 10 to 14 days or cultivation for season-long weed control. The first herbicide application is so early that there is plenty of time for additional weed germination. However, this still amounts to only one-half the full rate.

The advantages are reduced cost and more reliable weed control, since herbicide application is almost always made to young, actively growing seedlings under good moisture conditions. Several disadvantages make the use of one-fourth herbicide rates a high-risk management option in return for the potential to reduce weed control costs:

- The cost of an additional application trip or cultivation if they are required.
- The need for a very quick return to the field, when other farm operations are demanding attention.
- The need for frequent and accurate scouting and favorable weather and field conditions each time an application is necessary
- The ability to complete the application with available equipment and labor or with a custom applicator during a small application window.

The use of a one-half rate of a post-emergence herbicide is more common and easier to manage in most cases. The proper timing for a one-half post-emergence broadleaf herbicide rate is about 11 to 16 days after planting soybeans. This usually coincides with seven to 12 days after weed emergence in conventional tillage systems and weeds that are one-half to 1 inch tall in conventional and no-till soybeans. Weeds are easier to see and identify at this stage.

The need for an additional herbicide application or cultivation 10 to 14 days later is not as great, although it is still a possibility under certain conditions, such as heavy weed pressure or high rainfall. Most growers make the mistake of using one-half label rates on larger weeds. This will often control a few of the more susceptible weed species (see above), but will not provide the good control of the wider spectrum of weeds on the label that you should obtain with an earlier timing.

Again, the advantages to this system are more reliable weed control and reduced cost. The disadvantages are the narrow application window and the potential to spend more than you would for a single full-rate application if an additional sequential one-half rate or cultivation is required. The trade-off for the one-half rate option over the one-fourth rate option is a higher cost for the one-half herbicide rate in return for easier application timing — there is a greater chance that you will only need to make one herbicide application with the one-half rate herbicide application.

Specific instructions for the use of reduced rates of post-emergence broadleaf herbicides are given in Table 2 (see page 8). We have limited experience with reduced rates of tank mixes of two broadleaf herbicides (for example, Blazer plus Basagran or Classic plus Pinnacle). However, mixing one-fourth or one-half rates of two herbicides leads to only one-half or full label rate applications. This is probably of marginal benefit unless your weed spectrum is a combination of highly susceptible weeds that closely match the spectrum of a particular herbicide mix.

One of the greatest benefits to using reduced herbicide rates is that it requires you to implement an early weed scouting program. This will give you much more time to plan and implement a post-emergence weed control program. You can plan to use a one-fourth rate program and still have ample time to adjust to a one-half rate or full-rate herbicide application if weather, equipment or labor considerations delay spraying.

It is very important to follow the application timings illustrated in Figure 2 (page 4). Be prepared to adjust herbicide rates upward as you move into the next application timing period and taller weed stages. A cost comparison of some of these options is provided in Figure 3 (page 7). You can also use this information to calculate your own cost and management scenarios.

Reduced rates of pre-emergence, soil-applied herbicides

Only one-half rates of pre-emergence herbicides have been investigated and used. Soil-applied herbicide rates are not as easily reduced because soil colloids (clay and organic matter) tie up a certain amount of the applied herbicide. This effectively reduces the rate of many pre-emergence herbicides by a factor greater than the one-half rate that is applied.

Again, only reduced rates of broadleaf herbicides have been tested. There is no data available on reduced rates of pre-emergence grass herbicides. Reduced rates are based on one-half the label rate for the soil texture and organic matter in the field to be treated.

Reduced pre-emergence herbicide rates must be targeted to specific weeds. Most pre-emergence herbicides have a few weed species on the label for which they provide exceptional control. These weeds can often be adequately controlled with lower rates.

Most other weed species listed on the label will not be controlled, however. Soybean fields with a large diversity of weed species will require follow-up with a targeted application of a post-emergence herbicide — also at a reduced rate if possible — or a cultivation. This system is more difficult to describe and implement than the post-emergence program.

Our research has shown that one-half rates of soil-applied herbicides will not provide weed control equal to full rates. The use of one-half rates of soil-applied herbicides always require the application of at least a reduced rate of a post-emergence herbicide. This is needed to control additional weed species and late-germinating weed flushes that occur after the one-half rate of pre-emergence herbicide has been degraded and lost.

Remember, you have already reduced the herbicide rate by one "half-life," two to four weeks of weed control for most herbicides. The positive side is that there is also a similar reduction in the possibility of herbicide carryover. If a full-rate pre-emergence herbicide program currently provides you with season-long weed control without the need for further control measures, then switching to a one-half rate pre-emergence program is not recommended.

However, many growers find that the diversity of weed species and high weed pressure on many of their soybean fields frequently require the use of a full-rate pre-emergence herbicide program, followed by a full rate of a post-emergence herbicide to control different weed species or late-germinating weed flushes. Usually, these fields can be switched to a one-half rate pre-emergence followed by a one-fourth to one-half rate post-emergence or cultivation program with no loss in weed control if each application is targeted to the correct weed species.

Because this is a reduction from a completely full-rate program, the grower will save money on the pre-emergence application even if a full post-emergence rate is required. These are the only fields that will benefit from switching to a one-half rate pre-emergence herbicide application. When compared to full-rate pre-emergence plus full-rate post-emergence programs, we have seen equal or better control with one-half rate pre-emergence followed by one-half rate post-emergence programs in almost every situation tested. These programs have worked in conventional tillage and no-till soybean production. However, no-till soybeans will require the use of a full-rate burndown herbicide before planting for successful weed control.

The pre-emergence herbicides we have tested and the weed species they are likely to control at one-half rates are listed in Table 2 (see pages 8 and 9). Again, we want to emphasize that the application of a post-emergence herbicide or the use of tillage will nearly always be required after the use of one-half rates of soil-applied herbicides. This is an improvement over full-rate, sequential pre-emergence plus post-emergence programs, but may not be as much of an improvement as a total post-emergence program.

You should experiment with these options on a small scale to see which system will provide you with the greatest savings and still provide reliable weed control on your farm. A relative cost comparison of some of these options is presented in Figure 3 (see page 7).

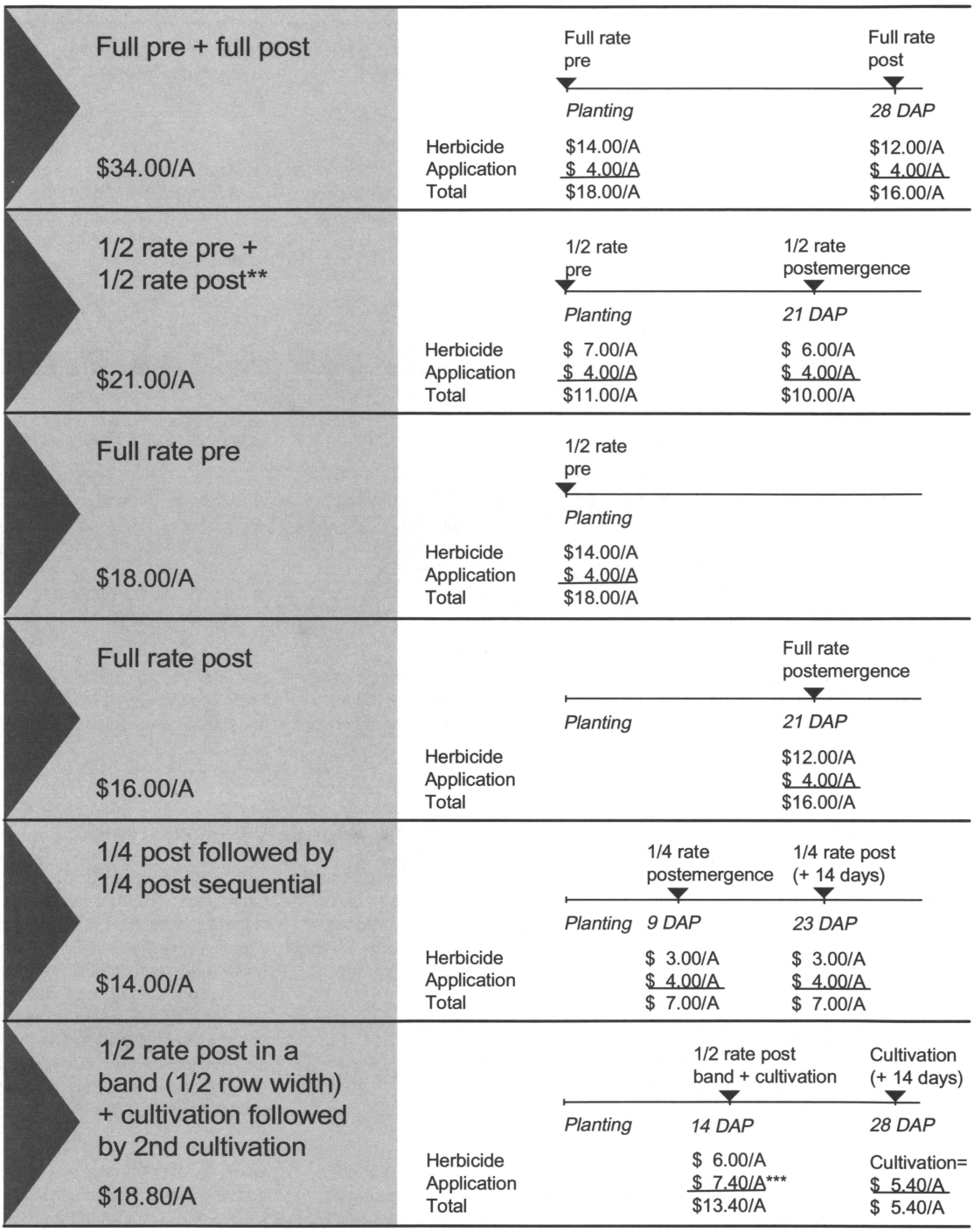
A final important note: These programs were developed and tested to provide soybean growers with an option to reduce the input cost of weed control in exchange for greater risk and management.

For several important reasons, the use of one-fourth to one-half herbicide rates provides very little increase in environmental safety as compared with full rates. First, herbicides are tested extensively for toxicological properties and environmental impact. There is little risk from the proper handling and use of herbicides. Second, newer herbicide technologies provide much greater reductions in per-acre application rates than the one-fourth to one-half reductions possible with these programs. Most older herbicides developed in the 1940s through the 1970s had application rates in the range of 0.33 to 6.0 pounds of active herbicide per acre.

Herbicide technologies developed in the 1980s and 1990s continue to produce products that are used at rates from ⅛ pound down to $\frac{1}{250}$ pound per acre! These newer herbicides often have more conservative (lower) toxicity and environmental impact profiles. Low-rate herbicide use must be balanced with practical limitations, however, such as the need for consistent and efficient weed control to provide a reliable and economical food and fiber supply while providing long-term preservation of soil resources.

Research efforts to improve weed control technology are integrated with more refined application technologies and crop production and management techniques. This will allow us to continue to produce profitable soybeans while preserving our natural resources.

Figure 3. Cost comparison of selected weed control systems.*



Assumptions in chart:

1. Grass control is obtained with a pre-emergence or post-emergence grass herbicide program and is equivalent in all scenarios.
2. Spray application cost is based on average custom rate of $4/A with a flotation sprayer or a spray coupe. Cultivation cost of $5.40/A is based on a 6-row cultivator, 100 hp tractor operating at 8A/hr including labor. (Grower cost to spray with a 12-row sprayer and a 100 hp tractor covering 8A/hr would be approximately $4.70/A.) Pre-emergence herbicide estimated at an average of $14/A. Post-emergence herbicide estimated at an average of $12/A at full rate.

**½ rate pre followed by ½ rate post has been the most consistent program where a single pre-emergence herbicide program, or a single application post-emergence program has not been adequate.

***Estimated cost of cultivation plus herbicide sprayer energy requirements and tank-refill time.

Table 2. Reduced rate herbicide recommendations in soybeans.

Herbicide and formulation	Formulated material *(amount broadcast/acre)*	Herbicide *(lbs. active ingredient/acre)*	Weeds controlled	Application method and precautions
Preplant incorporated or pre-emergence				
Canopy 75DF	3 to 6 oz./acre	0.14 to 0.28 lbs./acre	Cocklebur, pigweed,waterhemp and suppression of other weeds on the label.	Find the recommended full rate for your soil type and geographic region on the label and use one-half of that rate. Requires a post-emergence herbicide application and/or cultivation for adequate full-season broadleaf weed control.
Command 4EC	0.75 to 1.25 pt./acre	0.375 to 0.625 lb./acre	Velvetleaf and suppression of other weeds on the label.	Find the recommended full rate for your soil type and geographic region on the label and use one-half of that rate. Requires a post-emergence herbicide application and/or cultivation for adequate full-season broadleaf weed control.
Sencor/ Lexone 75DF	0.16 to 0.5 lb./acre	0.125 to 0.375 lb./acre	Pigweed, waterhemp and suppression of other weeds on the label.	Find the recommended full rate for your soil type and geographic region on the label and use one-half of that rate. Requires a post-emergence herbicide application and/or cultivation for adequate full-season broadleaf weed control.
Scepter 1.5AS	0.33 pt./acre	0.0625 lb./acre	Cocklebur, pigweed and suppression of other weeds on the label.	Requires a post-emergence application and/or cultivation for adequate full-season broadleaf weed control.
Post-emergence				
Basagran 4S plus Crop oil concentrate (optional)	0.5 to 1 pt./acre plus 1 qt./acre (1pt./acre by air)	bentazon 0.25 to 0.5 lb.	Cocklebur and most weeds listed in the full rate section of MU publication MP 575, *Guide for Missouri Field Crops*.	Use the lower rate up to six DAE (see above), which is about 10 DAP. Use the higher rate of seven to 12 DAE (10 to 16 DAP). After 12 DAE, use labeled rates. Usually, soybeans will be in the unifoliated stage at five to seven DAE. If needed, make a second application at the same rate at 10 to14 days after the first application. Instead of the second application, you may cultivate 10 to 14 days after the first application. The use of 28 percent urea is recommended only for velvetleaf. It may reduce the control of other weeds.
Blazer 2L plus Non-ionic surfactant (80 percent) **or** percent (UAN) nitrogen (optional) rate should	0.5 to 1 pt./acre plus 1 to 4 pt./100 gal.	acifluorfen 0.125 to 0.25 lb.	Pigweeds, pitted morningglory and most weeds listed in the full rate section of MP 575.	Use the lower rate up to six DAE (see above), which is about 10 DAP. Use the higher rate of seven to 12 DAE (11 to 16 DAP). After 12 DAE, use labeled rates. Usually, soybeans will be in the unifoliated stage at five to seven DAE. If needed, 28 make a second application at the same 10 to14 days after the first application. Instead of a second application, you may cultivate 10 to 14 days after the first application. The use of 28 percent urea is recommended only for velvetleaf. It may reduce the control of other weeds.

Table 2 (continued). Reduced rate herbicide recommendations in soybeans.

Herbicide and formulation	Formulated material *(amount broadcast/acre)*	Herbicide *(lbs. active ingredient/acre)*	Weeds controlled	Application method and precautions
Post-emergence (continued)				
Classic 25DF plus Non-ionic surfactant (80 percent) **or** Crop oil concentrate **and** 28 percent (UAN) or 10-34-0 liquid fertilizer (optional)	0.125 to 0.25 oz./acre plus 1 qt./100 gal. **or** 1 gal./100 gal. **and** 1 gal./acre or 1 to 2 qt./acre	chlorimuron 0.002 to 0.004 lb./acre	Cocklebur and most weeds listed in the full rate section of MP 575.	Use the lower rate up to six DAE (see above), which is about 10 DAP. Use the higher rate of seven to 12 DAE (11 to 16 DAP). After 12 DAE, use labeled rates. Usually, soybeans will be in the unifoliated stage at five to seven DAE. If needed, make a second application at the same rate 10 to 14 days after the first application. Instead of a second application, you may cultivate 10 to 14 days after the first application. The use of 28 percent urea or 10-34-0 is recommended only for velvetleaf. It may reduce the control of other weed species.
Cobra 2EC plus Crop oil concentrate **or** nitrogen (28 percent) **or** Non-ionic surfactant (80 percent)	3.2 to 6.4 oz./acre plus 0.5 to 1 pt./acre **or** 1 gal./acre **or** 2 pt./100 gal.	lactofen 0.05 to 0.1 lb./acre	Same as weeds listed in labeled rate section of MP 575	Use the lower rate up to six DAE (see above), which is about 10 DAP. Use the higher rate of seven to 12 DAE (11 to 16 DAP). After 12 DAE, use labeled rates. Usually, soybeans will be in the unifoliated stage at five to seven DAE. If needed, make a second application at the same rate at 10 to 14 days after the first application. Instead of a second application, you may cultivate 10 to 14 days after the first application. The use of 28 percent urea is recommended only for velvetleaf. It may reduce control of other weeds.
Pursuit 2AS plus Non-ionic surfactant (80 percent) plus 10-34-0 or 28-0-0 or 32-0-0 fertilizer	1 to 2 oz./acre plus 2 pt./100 gal. plus 1 qt./25 gal.	imazethapyr 0.016 to 0.031 lb./acre	Same as weeds listed in labeled rate section of MP 575.	Use the lower rate up to six DAE and the higher rate of seven to 12 DAE (see above). After 12 DAE, use labeled rates. If needed, make a second application at the same rate 10 to 14 days after the first application. Instead of a second application, you may cultivate 10 to 14 days after the first application. You must apply 28 percent urea, 32 percent urea or 10-34-0 with Pursuit.
Scepter 1.5AS plus Non-ionic surfactant (80 percent) **or** Crop oil concentrate	0.165 to 0.33 pt./acre plus 2 pt./100 gal. **or** 1 qt./acre	imazaquin 0.031 to 0.063 lb./acre	Cocklebur, pigweed, waterhemp.	Use the lower rate up to six DAE (see above), which is about 10 DAP. Use the higher rate of seven to 12 DAE (11 to 16 DAP). After 12 DAE, use labeled rates. Usually, soybeans will be in the unifoliate stage at five to seven DAE. If needed, make a second application at the same rate 10 to 14 days after the first application. Instead of the second application, you may cultivate 10 to 14 days after the first application.

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