



Glyphosate-Resistant Weeds

Will They Decrease Land Value?

Do glyphosate¹-resistant weeds affect the economic value of your farmland?

If it's rental property, do they affect the annual rental rate (cash rent)? And should a prospective tenant farmer's approach to managing glyphosate-resistant weeds give him preference for receiving the rental contract?

These questions are gaining greater consideration today for two reasons. One, Roundup Ready[®] (RR[™]) technology has become the dominant production practice in this country for soybeans and cotton, and is quickly growing in popularity for corn (all RR crops rely on glyphosate herbicides). And two, weed resistance to glyphosate herbicides has recently been documented in various on-farm locations throughout the United States.

Suddenly, glyphosate-resistant weeds have become more than an in-season production and profitability issue. They can also affect the long-term value of farmland and even determine who receives preference as the tenant farmer.

This white paper reviews a recent survey of professional farm managers and rural appraisers across the United States regarding this issue, as well as a recent survey of farmers themselves in western Australia about the impact of herbicide-resistant weeds on farmland values in that country.

¹ Glyphosate is the active ingredient in Touchdown[®] herbicide with IQ Technology[™], and Roundup UltraMAX[™] and its generic equivalents. Touchdown features an innovative glyphosate molecule, diammonium glyphosate, whereas Roundup[®] and the generic glyphosate-based herbicides feature glyphosate isopropylamine.

CHANGING THE WAY WE FARM

These survey findings should make both farm managers and landowners take notice. For example, farm managers interviewed in the U.S. survey said that weed resistance can reduce the rentable value of a farm by 17 percent. For a landowner leasing a farm for \$150 per acre, that means weed resistance could reduce the rental rate to \$124.50 per acre – the loss of \$25,500 on 1,000 acres. The economic consequences are significant.

When RR soybeans were commercially introduced in 1996, it marked the beginning of what has arguably been the fastest technological adoption in the history of American agriculture. Advances such as the moldboard plow, hybrid seed corn and self-propelled combine all changed the face of farming. But none were adopted as quickly as RR crops. By 2002, three-quarters of all soybeans and a significant portion of all cotton and corn in this country are being grown with herbicide-tolerant crop (HTC) technology – predominantly RR systems.

RR technology can make weed control easy and relatively inexpensive, while fitting nicely with conservation tillage systems. But if it has a potential drawback, it's that it encourages the over-reliance on one type of herbicide chemistry – glyphosate. Normally, this is the only type of herbicide that is applied over-the-top following crop emergence in these RR systems. Meanwhile, many growers also use glyphosate as a pre-plant burndown herbicide. Year in and year out, that can result in a lot of glyphosate being applied to the same fields.

It's only natural to use a technology that is proven and effective. But the over-use of any single herbicide chemistry will eventually result in weed resistance to that herbicide compound. This directly affects both the short-term productivity of farmland and the long-term value of the land itself.

HOW ARE THESE VALUES SET?

The economic value of American farmland is based on free-market economics and is, therefore, highly subjective at any given point in time. Rental rates are likewise based on a variety of subjective measures. Furthermore, both are heavily influenced by professional third parties, most notably farm managers in the case of rental rates and rural appraisers in the case of farmland values.

In early 2002, Syngenta Crop Protection commissioned a market research study of a representative cross-section of the American Society of Farm Managers and Rural Appraisers (ASFMRA), the leading national organization representing these professionals.

The study had two primary objectives. First, it sought to determine the influence that professional farm managers have on cultural practices in farming, including the use of RR technology and methods to manage weed resistance to glyphosate herbicides.

And second, it sought to determine how practices for managing glyphosate weed resistance would influence farm managers' selection of tenant farmers and the requirements they would ultimately place on them in this regard.

OF MORE THAN PASSING INTEREST

While weed resistance to glyphosate is not yet a widespread problem, it is more than a laboratory or greenhouse theory. The first on-farm cases in this country were recently documented. Glyphosate-resistant marestail (horseweed) was confirmed by university weed scientists in Delaware and Tennessee, while more than five cases of glyphosate-resistant rigid ryegrass were reported in California orchards. The high volume of glyphosate being used across the country as a result of RR technology adoption makes this a very real concern for growers, professional farm managers and the owners of farmland.

Syngenta is involved in this issue as one of the manufacturers of a glyphosate herbicide. These products include Syngenta's Touchdown herbicide with IQ Technology, Monsanto's Roundup and several generic glyphosate brands. Syngenta is committed to preserving the benefits of glyphosate herbicides and RR technology through proactive resistance-management strategies.

RESEARCH METHODS

The study involved 100 telephone interviews with ASFMRA members; 50 of them were from Southern states and the other 50 from Northern states. All interviews were conducted between February 11-29, 2002.

About The Respondents

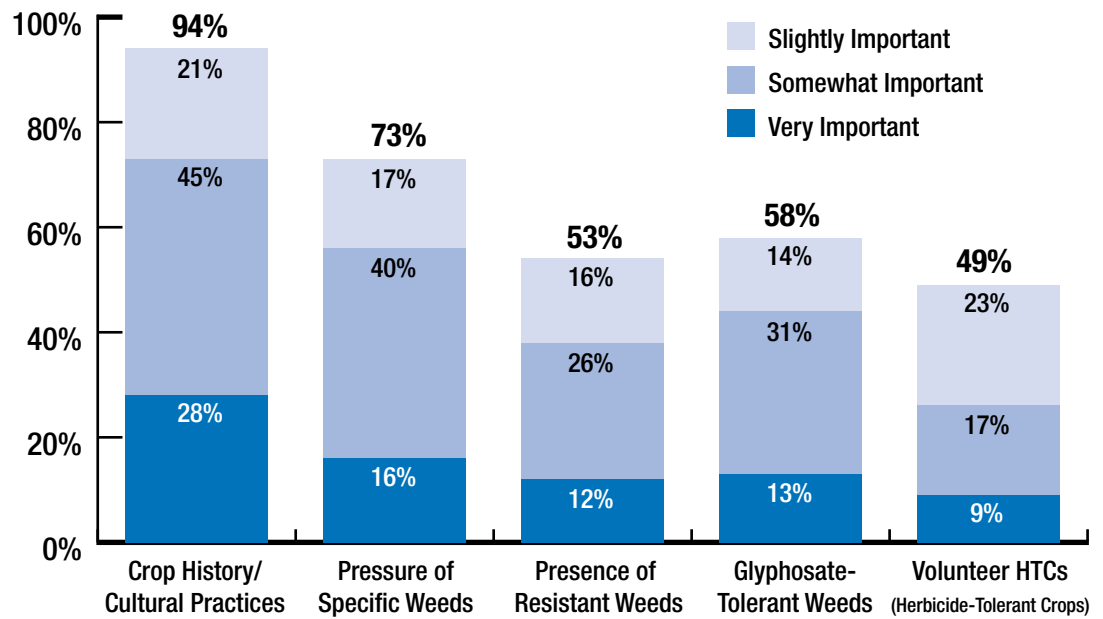
	Total	North	South
Provide Farm Management Services	94%	97%	73%
Rural Appraisal Service	52%	49%	67%
% Income from Management Fees	59%	63%	40%
% Income from Appraisal	12%	27%	23%

Crops Under Management

	Total	North	South
% Corn	39%	45%	11%
% Soybeans	34%	38%	18%
% Cotton	5%	0	28%

FACTORS THAT AFFECT RENTAL VALUES

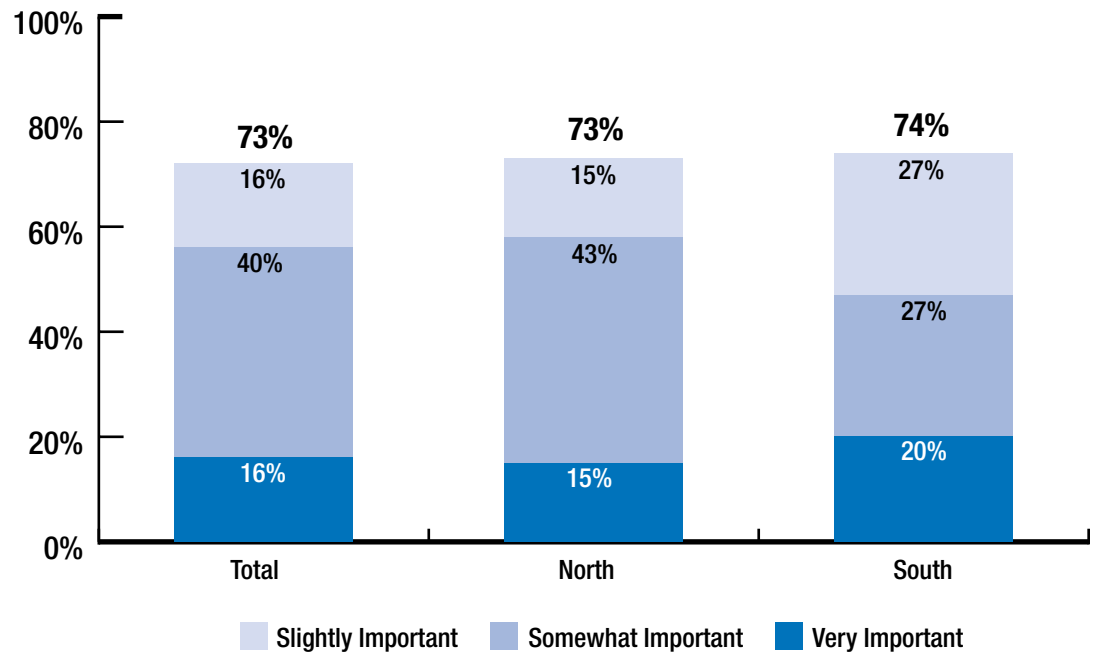
These farm managers and rural appraisers said the following factors present on a farm influenced how they determine the rental value of farmland.



WEED PRESSURE RANKS HIGHLY

As the following chart shows, the importance of specific weed pressure was important to 73 percent of the test respondents, including a roughly equal percentage from Northern and Southern states.

Importance of Specific Weed Pressure



RENTAL VALUES ARE THREATENED

Furthermore, specific weed resistance was said to reduce rental values by 17 percent, on average. Year in and year out, this represents a major loss of cash flow to landowners leasing their property to tenant farmers.

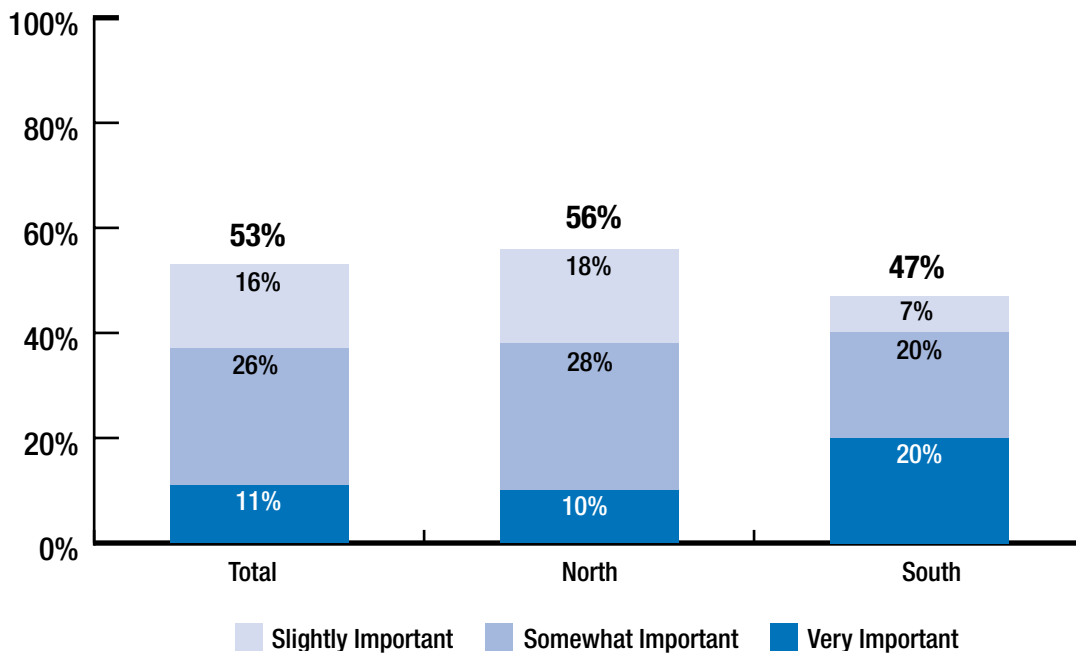
Percent of Value Influenced	
Total:	17%
North:	18%
South:	14%

IMPACT OF SPECIFIC WEED RESISTANCE

Resistant Weeds Important To Majority

The presence of weeds resistant to herbicides was cited as important by 53 percent of the survey's respondents.

Importance of Resistant Weeds



Furthermore, they were primarily concerned about weeds resistant to glyphosate. Fifty-three percent of respondents in Southern states and 44 percent in Northern states (46 percent overall) identified it as their top weed-resistance worry, placing it ahead of concerns about resistance to atrazine, Pursuit®, ALS herbicides and propanil.

SPECIFIC HERBICIDES/CROPS CAUSING GREATEST CONCERN

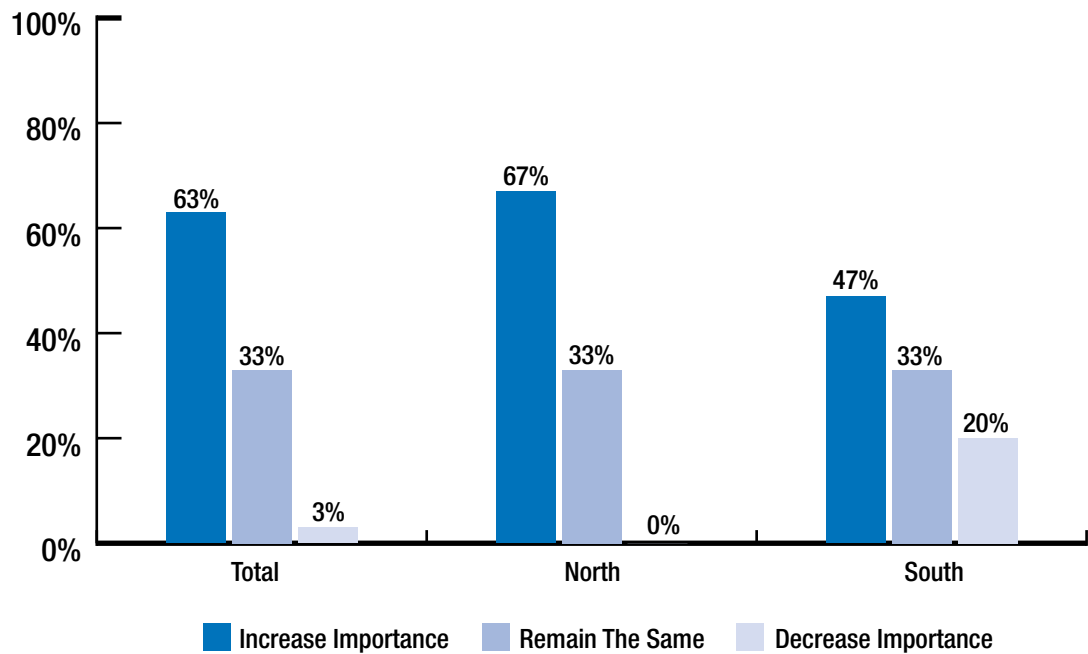
	RESISTANT HERBICIDES			SPECIFIC CROPS			
	Total %	North %	South %	Total %	North %	South %	
Roundup/Glyphosate	46	44	53	RR Soybeans	28	32	7
Atrazine	18	21	7	RR Corn	20	24	-
Pursuit	13	15	-	RR Cotton	5	3	13
ALS Herbicides	1	1	-	Soybeans	5	6	5
Propanil	2	0	13	Corn	-	-	-
None	40	39	47	Cotton	1	-	7
				None	48	49	47

Forty-six percent of farm managers surveyed said weed resistance to glyphosate was their top weed-resistance concern.

THE PROBLEM IS INCREASING

Given the increasing adoption of RR technology in corn, soybeans and cotton, these professional farm managers and rural appraisers felt the importance of glyphosate-resistant weeds will increase in the future. Overall, 63 percent said it will become a bigger problem.

Importance of Glyphosate-Resistant Weeds



REQUIREMENTS OF TENANT FARMERS INCREASE

And to that end, almost half (47 percent) currently require specific practices of tenants to address weed-resistance issues. Furthermore, 54 percent said they will require these practices in the future.

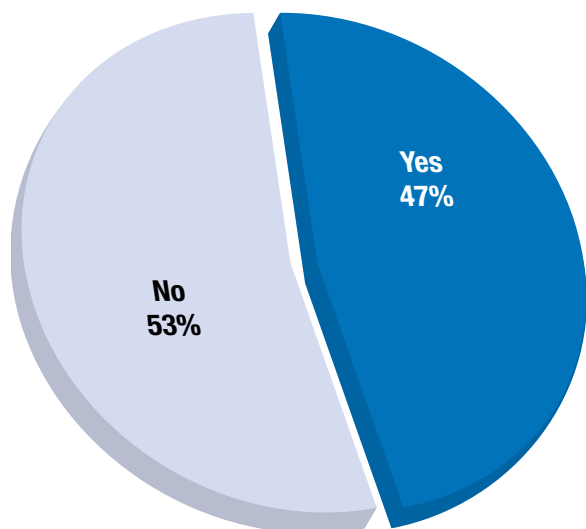
Moreover, this is already a significant issue in the selection of new tenants. Seventy percent of respondents said the use of sound resistance-management practices favorably influenced their tenant selection today.

The practices most required included chemical and crop rotation.

Tankmixing was not viewed as a viable resistance-management strategy, with only 5 percent saying they required it.

THOSE REQUIRING WEED RESISTANCE-MANAGEMENT PRACTICES

And The Practices They Require



Practices required (of the 47% at left who stated that they required practices):

Chemical Rotation 76%

Crop Rotation: 59%

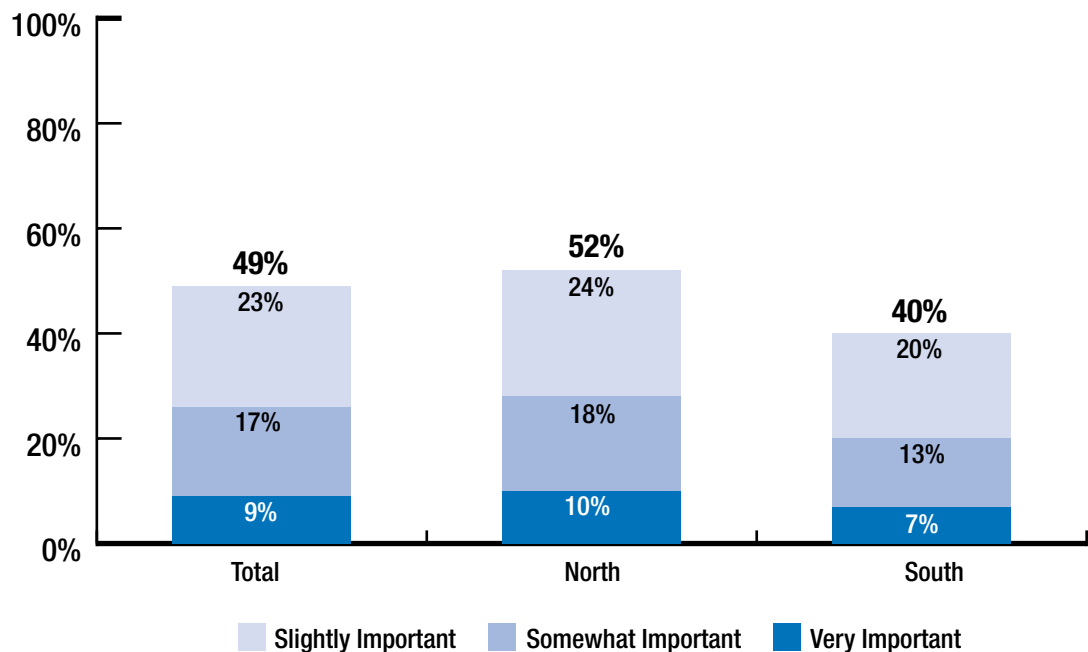
Tankmixing: 5%

VOLUNTEER HTC CONTROL REQUIREMENTS TO INCREASE

While 49 percent of respondents said volunteer HTCs were important, only 22 percent currently require specific practices to address this problem. However, 54 percent said they intend to require these practices in the future.

Perhaps more important, 76 percent of respondents felt the use of these practices currently influenced their selection of new tenants. The practices most required include chemical rotation (63 percent) and crop rotation (53 percent). Again, tankmixing was not seen as a viable approach by most of these farm managers, with only 11 percent requiring it.

Importance of Volunteer Crops in HTCs



CONCLUSIONS

- ▶ Specific weed resistance can reduce a farm's rentable value by 17 percent.
- ▶ **The greatest weed-resistance concern is glyphosate tolerance in RR crops. More than half of farm managers placed it ahead of their concerns about weed resistance to atrazine, Pursuit, ALS herbicides or propanil.**
- ▶ Almost two-thirds (63 percent) of these professional farm managers expect the importance of glyphosate tolerance to increase in the future when determining rental values and land appraisals.
- ▶ Almost half (47 percent) now require practices to manage weed resistance – predominantly crop and chemical rotation. This is expected to grow to 54 percent in the future.
- ▶ Seventy percent said the use of weed resistance-management practices influence their tenant selection today.

WHAT WE CAN LEARN FROM AUSTRALIA

With cases of weed resistance to glyphosate still rare in this country, most farm managers and growers are still learning about the issue. But it's an entirely different matter in western Australia, a region of the world generally considered by weed scientists as the worst for weed resistance to herbicides.

This is predominantly a wheat-growing area, and the most common herbicide-resistant weed is annual ryegrass. Growers rely on herbicides including ACC-ase inhibitors, ALS inhibitors and glyphosate.

Because of the severity of the problem, the Australian government has initiated a program to study the biology of resistance and how current farming practices influence it. This has included an extensive survey of farmers' attitudes about weed resistance to herbicides, conducted by professors from the University of Western Australia and published by the Sustainability and Economics in Agriculture GRDC Project.

More than 130 farmers in two regions of western Australia were surveyed. Resistance is widespread in one region and sporadic in the other. The researchers' goal was to understand the extent to which farmers understood how resistance develops as a result of their herbicide use patterns.

Several important conclusions can be drawn.

For one, there has been extensive debate in Australia about whether the development of weed resistance to herbicides imposes a direct cost to growers. But according to the survey, growers expected annual returns on lands where weed resistance has eliminated all herbicide options to decline from 37 to 50 percent.

These farmers were also asked what they would pay for land with different levels of herbicide resistance in the weed population. They indicated that if only ACC-ase inhibitors had been eliminated by resistance, they would pay approximately 15 percent less than normal. If they lost both ACC-ase and ALS-inhibitors, they would pay 25 percent less for that land. And if they lost these two, plus glyphosate, they would pay more than 50 percent less for the land.

In an area where weed resistance is a widespread issue, the economic consequences to growers are clearly perceived through both lost income and reduced land values.

SYNGENTA'S COMMON SENSE GUIDELINES

As an industry leader, Syngenta endorses this common-sense approach to managing weed resistance to glyphosate herbicides:

1. In RR corn and RR soybeans, don't make more than two applications of Touchdown herbicide with IQ Technology, Roundup or any other glyphosate-based herbicide in a given field during any two-year period.
2. Don't plant RR soybeans followed by RR corn year after year. Use the RR system that makes the most sense on your farm.
3. Use alternative burndown chemistry for RR corn and RR soybean fields that are likely to require more than one application of glyphosate.
4. In RR cotton, use Gramoxone[®] Max plus 2,4-D 30 days before planting, or Gramoxone Max plus dicamba 21 days before planting, followed by Gramoxone Max plus Caparol[®] or diuron to clean up escapes. Furthermore in cotton, do not exceed three glyphosate applications in a crop per season, use conventional non-glyphosate herbicide chemistry at layby, and do not allow weed escapes to produce seeds or vegetative propagules.

Now is the time to act. RR technology is simply too valuable to lose. For every farmer who grows RR crops, this technology is important to a single season's productivity and profits. But perhaps more important, preventing glyphosate-resistant weeds will also help preserve the long-term value of the land they now farm.

**For more information, visit Syngenta Crop Protection's website at
www.syngentacropprotection.com**



©2002 Syngenta Crop Protection, Inc., P.O. Box 18300, Greensboro, NC 27419 Touchdown[®], Gramoxone[®], IQ Technology[™], Caparol[®] and the Syngenta logo are trademarks of a Syngenta Group Company. Roundup[®] and Roundup Ready[®] are registered trademarks of Monsanto Company. Roundup UltraMAX[™] and RR[™] are trademarks of Monsanto Company. Pursuit[®] is a registered trademark of BASF Corporation. **Gramoxone Max is a restricted-use pesticide.**

Important: Always read and follow label instructions before buying or using these products.