Weed Management Approaches Continue to Expand in Clearfield® Production System for Rice

Command 3ME Added to Stewardship Guidelines
Grower Stewardship, Including Adoption of Weed Resistance Management Practices, Maximizes Rice Productivity

Rice growers know the value of controlling tough weeds in their crops, and that improved weed control translates to yield and profitability gains. The Clearfield® Production System for rice has been an important source of productivity gains over the past decade. Newpath® herbicide and Clearpath® herbicide have been important weed management tools, increasing in importance as some of the older rice herbicide brands have declined. In addition, Beyond® herbicide has helped to expand the versatile Clearfield portfolio of herbicides.

The Stewardship Guidelines for the Clearfield Production System for rice take on increased importance with increasing weed pressures and a growing list of herbicide resistant biotypes. Just as herbicide resistance issues have impacted the performance of crop protection in corn and soybeans, key rice management practices and products are also vulnerable.

Stewardship practices employing weed resistance management principles are today’s best available defense against resistant weeds. Of the seven herbicide sites of action present in rice and targeted by rice herbicides being marketed today, weed biotypes carrying resistance to four of these have already been verified. Stewardship includes measures

**STEWARDSHIP GUIDELINES**

*In-Season Clearfield Rice Production*

- Purchase new seed (registered or certified) every year from an authorized Clearfield rice seed retailer. Saving seed to plant next year’s crop is not allowed (NO “brown-bagging” or “bin-running”).
- Start clean — utilize a burndown herbicide at planting.
- Plant Clearfield rice according to seed company recommendations for best cropping practices.
- Apply a preemergence herbicide, such as Command 3ME or Prowl H20 herbicide to strengthen season-long grass control. Moisture is required for activation of preemergence herbicides. Following application, fields should be flushed if precipitation does not occur.
- Grower may obtain a license to apply an imidazolinone herbicide registered for use with Clearfield rice — like Newpath herbicide or Clearpath herbicide – by purchasing such products.
such as starting with clean fields, using preemergence herbicides, applying post-emergence herbicides to small weeds, alternating different herbicide sites of action and employing crop rotation, to slow the development of resistance.

**Weed Resistance Management Practices — Rationale for Clearfield Rice Stewardship**

- Start with weed-free fields.
- Apply preemergence herbicides, such as Command® 3ME herbicide or Prowl® H2O herbicide.
- Control weeds by alternating herbicide approaches. Post-emergence products Newpath herbicide, Clearpath herbicide and Beyond herbicide, bring different sites of action compared to Command or Prowl H2O herbicide.

  - After obtaining the applicable license by purchasing the herbicide, apply two applications of Newpath herbicide as labeled, or one application of Newpath herbicide followed by one application of Clearpath herbicide, or vice versa. Clearpath herbicide may be substituted for one of the Newpath herbicide applications, but not both. The second application provides for extended residual weed control. Beyond herbicide may also be applied as the second application after the first application of Newpath herbicide or Clearpath herbicide.

- Water management:
  1. Flush within two days of first application.
  2. Initiate permanent flood within two days of second application, or as soon as the growth stage of the rice permits.
  3. Maintain good soil moisture until permanent flood.
- Maintain weed-free levees and red rice-free ditches and turn rows.
• Scout the results of early season rice herbicide applications. If a weed escapes or new flushes appear, apply a herbicide with a different site of action for “clean up” of these weeds before permanent flood.

• Implement crop rotation, rotating rice fields to alternate crops. Weed management programs for different crops utilize different products and sites of action, helping to reduce rice weed pressure before returning fields to rice.

Value of the Clearfield Production System for Rice in the U.S. Rice Industry

The Clearfield Production System for rice, commercially available since 2002, has brought rice growers essential productivity gains in a globally competitive industry. Clearfield has led the way in both improved weed control and higher performing rice varieties and hybrids. Future prospects for U.S. rice growers require solutions, like the Clearfield Production System for rice, that contribute to maximizing yields, reducing risks and helping to contain operational costs.

The acceptance of the Clearfield Production System for rice has been enthusiastic, with more than 60 percent of U.S. rice acres planted in Clearfield varieties and hybrids. Growers choose the Clearfield Production System for rice for its benefits: cleaner fields, higher yields and increased convenience. Given these strong benefits, more and more growers adopt the Clearfield Production System for rice each year as higher performing Clearfield varieties and hybrids have become available.

But challenges in agricultural systems do not stand still. With the increasing prevalence of tough, herbicide-resistant species, product advancements alone will not always ensure clean fields and higher productivity. As weed shifts and resistant biotypes have accelerated, unfortunately the rate of new technology introductions has slowed. Hence, today’s innovations are systems of best available products used with updated practices, to ensure long-term sustainability.

The good news for U.S. rice is that there is a sense of urgency. Crop protection suppliers continue to invest in new product innovation, as well as pressing for ways to deliver the most value from their existing solutions. This is the rationale for the Clearfield Production System for rice — to promote a stepped-up emphasis on stewardship.

STEWARDSHIP GUIDELINES continued

• Treat with Beyond herbicide to control escaped red rice at a proper growth stage according to the label.

• Rogue for red rice escapes.

• DO NOT ratoon crop if red rice is present at harvest, regardless of plans to harvest or utilize as habitat.

• Roll and flush Clearfield rice fields after harvest to promote germination of weeds in the fall.

• After frost in the fall, destroy all remaining rice plants.

Crop Rotation Following Planting of Clearfield Rice

• DO NOT plant Clearfield rice in the same field for at least two years.

• Rotate to another crop such as Roundup Ready® soybeans or corn; use alternate herbicide site of action for red rice control.

• In rotation crop, use a residual herbicide for red rice and grass control, such as Outlook® herbicide, an Authority® brand herbicide.
Clearfield Production System for Rice — Meeting Tough Challenges Since Its Beginnings

The Clearfield genetics were discovered using a laboratory approach to natural selection. In the late 1980’s, Louisiana State University AgCenter (LSU AgCenter) scientists, Tim Croughan, Ph.D. and Steve Linscombe, Ph.D., began seeking a rice plant with naturally evolved resistance to imidazolinone herbicides. Imidazolinones were chosen for their broad spectrum of control, especially their effectiveness against red rice, and low use rates. The project required examination of over a billion rice seeds and plants before genetics surviving this powerful herbicide were isolated. Upon finding the first imidazolinone-tolerant rice plant, the LSU AgCenter launched into research and plant breeding programs to incorporate its herbicide-tolerant trait into established and higher-yielding varieties and hybrids.

As the Clearfield Production System for rice has helped to revolutionize U.S. rice production, it remains growers’ only in-season herbicide solution for red rice control. In heavily infested areas, growers originally had to remove red rice by flooding fields in the spring, and then work fields again in the fall

• If late-germinating red rice is present in a Roundup Ready crop prior to canopy closure, an application of Roundup® is recommended. A non-ALS herbicide should also be used to control red rice and other grasses in soybeans just prior to canopy closure.

• DO NOT grow crawfish following Clearfield rice. Plant non-Clearfield rice for use in crawfish fields.

• DO NOT follow fields following Clearfield rice without repeated field tillage and/or glyphosate treatments to control volunteer red rice.

• DO NOT allow any rice to go to seed in a non-rice year. This includes any fallow or crawfish production fields.

• When practical, cultivate all rotational crops regardless of herbicide program.
to destroy additional seedlings. The Clearfield Production System for rice has simplified red rice control, reducing tillage and water use, and greatly reduced soil erosion and water contamination issues.

The Clearfield Production System for rice brings superior return on investment through red rice and broad-spectrum weed control, high-performing hybrids, convenience, lower overall herbicide use and fewer trips over fields. Can Clearfield continue to help drive productivity increases, as it has in its first decade? Definitely yes; U.S. rice depends on it.

**Addition of FMC Command 3ME Herbicide to Stewardship Guidelines**

Recommending Command 3ME use in the Stewardship Guidelines for Clearfield rice is a significant move toward weed resistance management principles. Command 3ME herbicide performs as a preemergence, with use directions for preplant, at plant or early post-emergence (to two leaf stage) applications. Command 3ME, a pigment inhibitor, controls weeds through a different site of action than Newpath herbicide, Clearpath herbicide and Beyond herbicide. Barnyard grass resistance to Command 3ME is not widespread; with no new resistant barnyard grass biotypes having been verified since 2010. As with all products recommended in the Clearfield Production System for rice, Command is known and trusted in the rice industry, and readily available.

“It all starts with putting down an effective residual herbicide,” says University of Arkansas Weed Scientist and Professor, Jason Norsworthy, Ph.D. “By laying down a residual herbicide, it takes undue selection pressure off post-emergence herbicides. The more sites of action we have out in that field, the more likely we are to prevent barnyard grass from being resistant.”

In 1988, Dr. RJ Smith Jr., ranked the most damaging weeds to Arkansas rice yields. Of the grasses, red rice reduced yields the most, followed by barnyard grass, bearded sprangletop and broadleaf signalgrass. Today, Southern weed scientists consider barnyard grass the most problematic weed in rice, given its impacts on yields, lodging and grain quality.

From “Herbicide Programs for Managing Herbicide Resistant Barnyard grass in Arkansas Rice”:

“Barnyard grass has always been considered a competitive weed in crop production, but its status
of being a problem has increased due to herbicide resistance ... Barnyard grass is now resistant to four different modes of action making herbicide programs for managing all resistant biotypes in growers’ fields a necessity.”

**Command** assists in season-long rice weed management programs, by protecting rice seedlings from germination through stand establishment. **Command** controls barnyard grass, sprangletop, broadleaf signalgrass, crabgrass and panicum species; and is easy on rice. **Command** herbicide provides crop safety for all **Clearfield** rice varieties and can be mixed with other herbicides, insecticides or liquid fertilizers. “Most everyone in the rice industry knows just a few sprigs of barnyard grass, or any type of grass, can really be detrimental to your yield,” says Louisiana rice grower Edward Greer. “When **Command** is applied and managed properly, a lot of these weed issues that we’ve dealt with in the past are just not there anymore.”

Leveraging **Command** early, consistent with the “start clean” strategy outlined in the **Clearfield** Production System for Rice Stewardship Guidelines, can help protect the technology against the threat of resistant barnyard grass. “If growers don’t start adopting these practices (the variety of) solutions we have available to use today is going to continue to shrink, making it harder to control weeds like barnyard grass,” Norsworthy said.

**Situations Where Stewardship of Clearfield Rice Requires Rotation**

The Stewardship Guidelines of the **Clearfield** Production System for rice recommend crop rotation to manage down the incidence of outcrosses and off-types in **Clearfield** Production System history fields. A four-year research study recently published by Eric Webster, Ph.D., LSU AgCenter, supports the premise that crop rotation is necessary and is the most rapid means of depleting these populations. Dr. Webster’s research shows that even land with heavy populations of outcrossed red rice can be reclaimed with three years of soybean rotation, with rotation of sites of action and an aggressive weed management program using non-ALS herbicides. The Stewardship Guidelines of the **Clearfield** Production System for rice requires that **Clearfield** rice should not be planted in the same fields for at least two consecutive years, supporting the findings of Dr. Webster’s research.
Stewardship of Clearfield Production System Crucial to Sustaining U.S. Competitiveness in Rice

Herbicide programs calling for product use according to agronomics-based weed resistance management principles are growing in importance, as prolific, difficult to control species overwhelm some existing technologies. The Clearfield Production System for rice, the leading crop improvement and weed management system in U.S. rice, through its established Stewardship Guidelines process, is transitioning to increasingly robust, more sustainable practices. For instance, the addition of Command 3ME to the Stewardship Guidelines strengthens the System’s commitment to use of preemergence herbicides and use of multiple modes of action. By stepping up their prevention and control of ALS resistance biotypes, growers will continue to receive the unsurpassed weed control, higher yields and quality and sustainable practices that they expect from the Clearfield Production System.


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