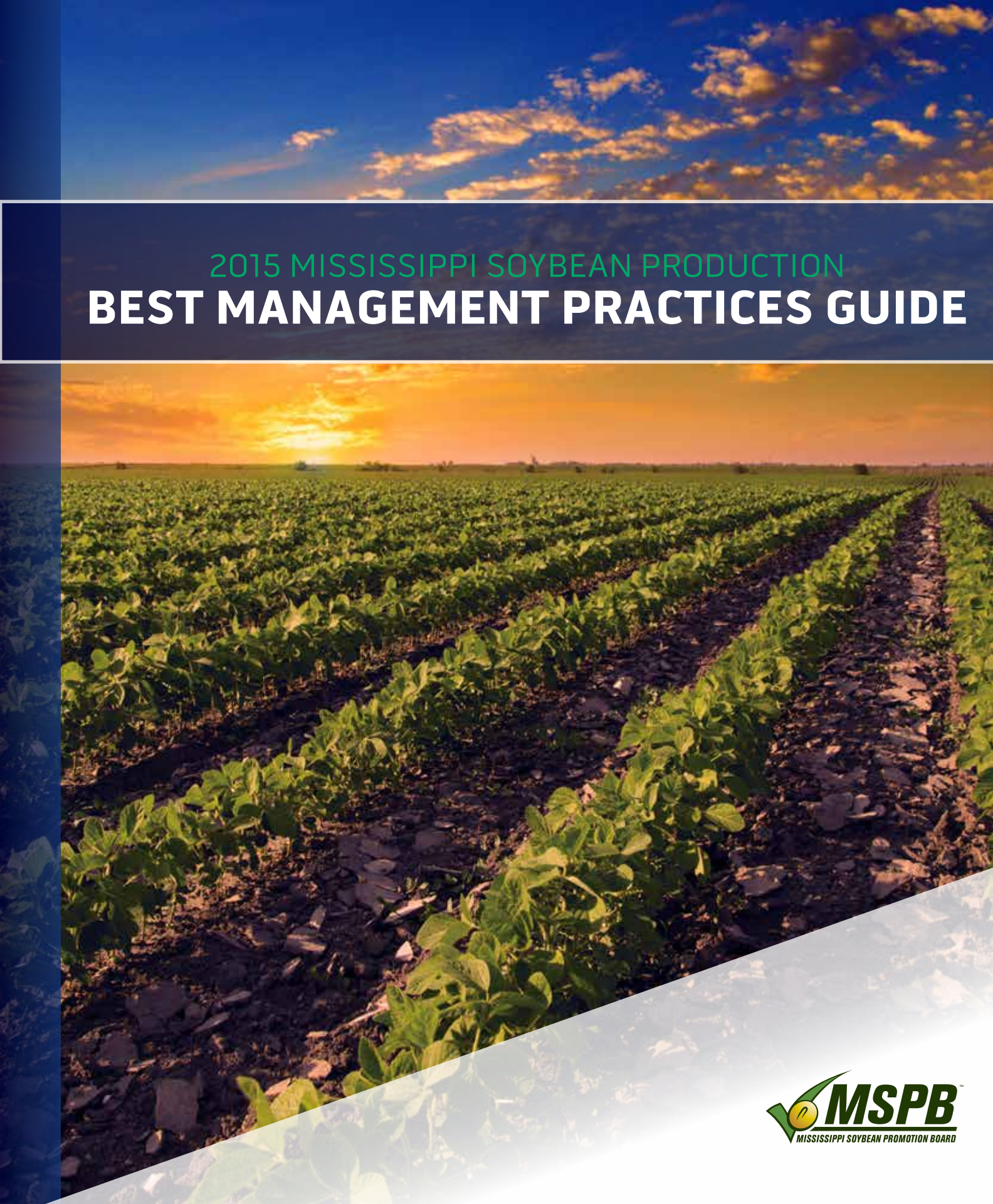

2015 MISSISSIPPI SOYBEAN PRODUCTION

BEST MANAGEMENT PRACTICES GUIDE

MSPB
MISSISSIPPI SOYBEAN PROMOTION BOARD

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CONGRATULATIONS MISSISSIPPI SOYBEAN FARMERS!

Another great crop year is behind us. Current projects show that Mississippi's soybean farmers may again produce a record soybean crop, which could turn out to be greater than 50 bushels per acre. This is exceptional and will be hard to beat in the coming years.

Several factors contributed to these outstanding yields. The most obvious factor was the weather this year, with cooler temperatures and timely rains during the growing season. Even though many received too much rain in the early growing season, conditions later in the season helped overcome any initial problems. I also believe genetics play a very important role in these exceptional yields. The technology available to us is incredible and helps us produce higher yields.

But weather and excellent genetics are not the only keys to producing high yields. Many other factors contribute to success at harvest.

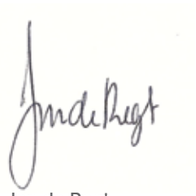
The following Best Management Practices (BMP) guide provides a summary of significant management practices that can help you be more successful in your soybean-growing operation. The highlighted practices are proven to contribute to higher yields in both research environments and producers' fields.

With each practice, you will find a certain rationale for why you should consider using it. This may be expressed through a yield advantage or promoted to protect the growing crop and improve the quality of the harvested seed. Some will clearly be no-brainers, while others may require more careful consideration, potentially giving you options that can lead to better yields.

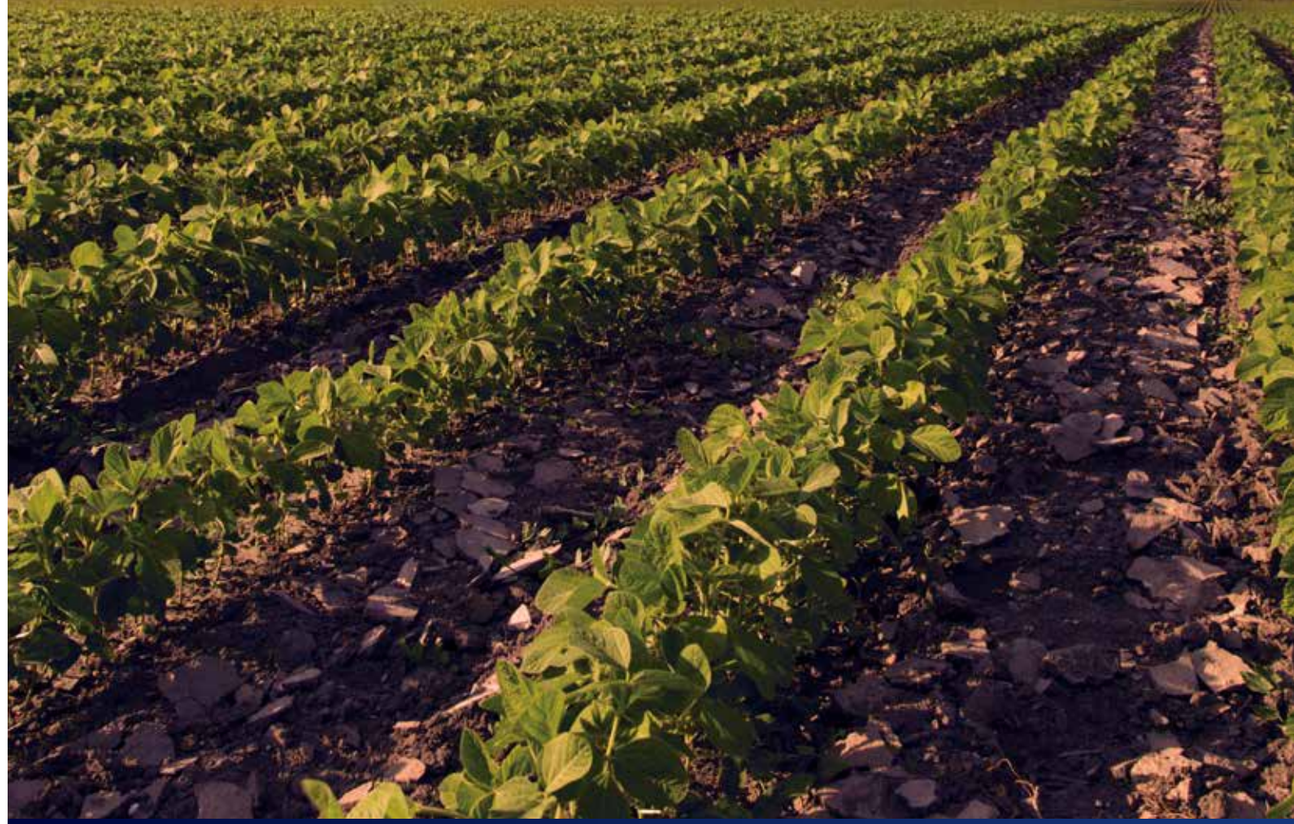
The Mississippi Soybean Promotion Board (MSPB) and your state soy checkoff will do their best to continuously invest your checkoff dollars in research projects that can lead to better quantity and quality of your soybean crop. This guide is the result of these investments!

We wish you success in determining which practices are applicable to your situation and ultimately will lead to better yields on your farm.

Sincerely,



Jan de Regt,
MSPB Chairman



BEST MANAGEMENT PRACTICES

The primary goal of the Mississippi soy checkoff is to increase the profit potential of the state's soybean farmers.

The 12 volunteer farmer-leaders who serve on the Mississippi Soybean Promotion Board (MSPB) invest your checkoff dollars in ongoing research and extension programs that address Mississippi production challenges. This research helps determine the best management practices (BMP) to help make your farm more profitable and ensure the sustainability of Mississippi soybean production.

This guide provides specific BMP and recommendations to help you operate efficiently and effectively.

MSPB would like to thank Mississippi State University and its talented research and extension personnel for providing technical editing for this guide.

VARIETY SELECTION

One of the first decisions you make for each growing season is selecting varieties. The right varieties can make a big difference in a farmer's bottom line. By selecting varieties that address the unique history and conditions of each of your fields, you can maximize soybean yields and subsequent profit potential.

To assist you, MSPB invests in variety trials that can help farmers to make seed decisions based on yield potential, pest management, quality traits and herbicide tolerance.

Visit ***www.mssoy.org/variety-trials*** to search, compare and evaluate seed varieties.

For best results, select seed varieties based on a combination of these factors:

- **Proven yield potential:** This is the most important factor to consider when selecting varieties. It is important to remember that the average soybean variety may yield significantly less than the best variety. The annual soybean variety "short list" is comprised of recommended varieties that are selected based upon overall consistency, performance, results from small plot variety testing and/or on-farm demonstrations and ability to perform across a broad range of environments.
- **Maturity group:** Select varieties based on desired length of growing season and ability to avoid drought by being planted on a given date.
- **Resistance to nematodes and diseases:** Resistance is the first line of defense against nematodes and diseases that rob soybean fields of yield. Selecting resistant varieties protects yield and profit potential.
- **Herbicide resistance:** Herbicide-resistant weeds are a growing problem for soybean farmers. Selecting seed varieties with diverse herbicide-resistant traits will help to maximize weed control. See pre-emergent herbicides under the "Controlling Weeds" section for more information.

Trent Irby, Mississippi State University (MSU) Soybean specialist

"It can be difficult to make variety selection decisions given the large number of varieties available" says Trent Irby, Mississippi State University (MSU) Soybean Specialist. "Given the importance of planting the right variety to maximize your bottom line, consider using resources such as annual variety trial data, soybean short list, and results of on-farm variety demonstrations."

Photo credit: Kat Lawrence, Mississippi State University.

"We really use Mississippi State's trials, because they provide accurate, unbiased information. We take their variety short list, their test results and study that. We then try to grow varieties they recommend."

– Bill Spain, Boonville, Mississippi farmer

SEED TREATMENTS

Evaluating the value of a seed-applied fungicide or nematicide treatment is not an easy task. Seed treatments do not have an outright visible effect on the plants, but they offer a variety of benefits, such as ensuring uniform stand emergence and desired population, both of which help achieve maximum yield.

Tom Allen, Mississippi State University (MSU) Extention plant pathologist

"Seed treatments are cheap compared to the potential cost of having to replant due to a stand failure," says Tom Allen, MSU Extention plant pathologist. "Using seed treatments should be an automatic decision, even in double-crop situations. **But don't use a seed treatment just to use one. Make sure it will be effective for the issues in each individual field based on the general history of the field. For example, seed to be planted into a field with a history of Pythium rot should receive a fungicide product with activity against Pythium."**

Seed treatments help maintain value because of their ability to ensure the establishment of a stand. Many studies have reported that the appropriate fungicide seed treatment helps secure a better stand compared to not using one. Using the proper seed treatment can increase soybean stands by over 10 percent. This allows farmers to reduce seeding rates while maintaining a similar number of emerged plants per acre. Oftentimes, the reduced seed cost will more than pay for the seed treatment.

Consider the following when selecting seed treatments:

- **Fungicide seed treatments:** Not all seed treatments are created equal. Be sure to use a seed treatment that controls a broad range of fungal pathogens. Refer to Table 1 below for information regarding fungicide seed treatments.
- **Insecticide seed treatments:** Several all-in-one products, such as Trilex® 6000 (Bayer) and CruiserMaxx® (Syngenta), offer a fungicide and insecticide treatment in one product. However, as most insecticide treatments generally have a short period of efficacy (30 to 45 days), consider insecticide treatments only when you're confident that early-season insect damage will occur. Insecticide seed treatments do not replace late-season insect control in fields.
- **Nematicide seed treatments:** Nematicides may help reduce early-season root infection from nematodes such as the reniform and root-knot nematode. Most seed-applied nematicides are not as effective against the soybean cyst nematode. In addition, seed-applied nematicides do not provide season-long control and do not replace the use of resistant varieties and crop rotation as the primary nematode management methods.

Table 1

Seed-treatment fungicide combinations (contact + systemic) available for broad-spectrum control of soybean seed and seedling diseases and organisms controlled or suppressed by each fungicide product as stated on its label* or in extension publications.

Trade name	Ingredients	Pathogens controlled or suppressed
ApronMaxx (RTA & RFC) & Warden RTA	Mefenoxam, Fludioxonil	Phytophthora, Pythium, Fusarium Rhizoctonia, Phomopsis
Bean Guard/Allegiance	Metalaxyl, Captan, Carboxin	Pythium, Phytophthora, Fusarium, Rhizoctonia, Phomopsis
Prevail	Metalaxyl, Carboxin, PCNB	Pythium, Rhizoctonia, Phomopsis
Protector-L-Allegiance	Metalaxyl, Thiram	Pythium, Rhizoctonia, Phomopsis
Trilex 2000	Trifloxystrobin, Metalaxyl	Pythium, Fusarium, Rhizoctonia, Phomopsis, Phytophthora

Cautions: Check product label for compatibility with B. japonicum inoculant and do not feed or sell treated seeds that are not planted.
Resources: University of Arkansas and University of Nebraska

PLANTING DATE

Early planting is standard practice in Mississippi. Soybeans planted earlier (April) in the season offer better protection from late-season stressors, such as insects, heat and drought.

Emerging plants are susceptible to frost and freeze damage, so consider last spring's frost and freeze dates when planting soybeans. Planting as soon as possible after the last frost date offers the most protection from stressors later in the season.

A table for estimated last spring frost and freeze dates for many Mississippi locations can be found by visiting the MSPB website, *www.mssoy.org*

Delayed Planting and Variety Selection

Plagued by many rainy days, soybean farmers had trouble getting soybeans in the ground in 2014.

Farmers may consider switching to a later variety when planting is delayed. But recent data from a Midsouth Soybean Board project shows that switching to a later variety is likely not advantageous.

"Using a determinate variety, generally a late MG V or MG VI, for a later planting date is an old-school train of thought and one not supported by current research," says Bobby Golden, Ph.D., MSU Extension/research assistant professor and cooperator in the study. "If you look at data from the last two years at Stoneville, choosing a MG IV soybean is going to be the best option in many instances, regardless of when you plant it."

After two years of research, Golden says the results show that MG IV soybeans will hold up and yield well in a much wider planting window than previously thought. Even MG III varieties out-yielded MG V varieties in later planting situations at Stoneville, he said.

TILLAGE

Soybeans in Mississippi are grown on a variety of soil types, from sandy loam to clay. Each of these soils has unique properties and might benefit from some sort of tillage. There is no set rule for if, when or how much of a particular type of tillage you should use to grow soybeans or any other crop on any of these soils.

- **Which system should I use?** A minimum- or no-till system reduces time and fuel costs and decreases erosion. But there are times when tillage is necessary. Evaluate these situations on a case-by-case basis.
- **When should I use tillage?** Use fall or spring tillage only where needed. Use tillage only at sites that are not highly susceptible to erosion or as a last resort in minimum-tillage systems.
- **Why should I use tillage?**
  1. Soil compaction may inhibit root development, according to Trent Irby, Ph.D., Mississippi Extension Soybean Specialist. "This can result in a poor root system that may not be able to support the plant's nutrient and moisture needs. Tillage in this situation can break the compaction zone allowing, roots to develop further into the soil profile."
  2. Tillage may be the only available remedy to control some herbicide-resistant weeds. Tillage can kill weeds and prevent seed production. Clean fields in the fall and spring will reduce the number of weeds that are present at planting, allowing for more effective weed management during the growing season.
  3. Tillage can be used to correct physical problems in the soil. Know the soil type to predict physical and chemical barriers to expansive root growth.
- Reduced tillage lowers expenses, curtails erosion and preserves beneficial surface residue.

CONTROLLING PESTS

INSECTS

Mississippi farmers face economic losses from insect pests annually. The Midsouth region has a temperate climate that is conducive to routine pest outbreaks. Soybeans can be attacked at any stage, from seedling to harvest, but are most susceptible to yield-robbing injury during the reproductive phase.

Entomologists use economic injury levels (EIL) when setting thresholds for various pests attacking soybeans and other row crops. The EIL is the lowest population density of an insect pest that will cause economic damage. To determine EIL, researchers consider many factors, such as cost of control, the number of particular pests present per unit area, value of the crop and the percentage of the crop that is injured. Most farmers are much more familiar with the term economic threshold (ET). This is the point when the level of the pest calls for a control application to keep a pest from reaching an EIL.

Angus Catchot, Ph.D., MSU Extension entomology professor

"For insect pests, determining bushels per acre lost for every pest can be almost impossible," says Angus Catchot, Ph.D., MSU Extension entomology professor. **"However, based on the research that we do, in nearly every situation yield will be protected by applying appropriate insecticides targeted at the pest of interest when economic thresholds developed and published by the Mississippi State Extension Service are reached."**

Naturally occurring diseases (fungal, bacterial and viral) and beneficial predators and parasites are important in the control of soybean insects. They can often keep insect pests from reaching levels requiring treatment.

- The presence of diseased insect larvae indicates that a population of harmful insects is being controlled naturally. Farmers should withhold insecticide applications for a short period to determine if the disease will effectively control the population.
- Some early-season applications of insecticides to soybeans can significantly reduce beneficial predators and parasites that control insect pests. This often results in outbreaks of secondary caterpillar pests. Regular scouting of soybean fields to determine levels of both harmful and beneficial insects is important. This protects the beneficial insects so that their full benefit will be realized.

Soybean insect pests of can be grouped into three classes – stem feeders, fruit feeders and foliage feeders. To control insects in each of the classes, use criteria in Table 3 for each species to determine when insecticide applications are warranted.

DISEASES

Just like insects, diseases can and do cause economic losses in mid-southern soybean production systems. Several major diseases, including frogeye leaf spot, can be managed with fungicides once the disease is detected in the field. Other diseases, such as sudden death syndrome (SDS), charcoal rot and Phytophthora root rot, may only be prevented, not cured once present in the field. Table 4 details some of the major diseases mid-southern farmers face and methods of management or prevention.

Fungicide resistance: Just as herbicide-resistant weeds plague farmers around the country, farmers in the Mid-south have begun to struggle with fungicide resistant diseases, too. Fungicides are still the primary method to manage some foliar diseases when they appear, but varieties that are tolerant to many of the

Table 2

Insecticide class and insecticides in each class that can be used for effective insect-resistance management in soybeans.

Insecticide class	Insecticides*
Carbamate (C)	Sevin (carbaryl), Larvin (thiodicarb), Lannate (methomyl)
Diamide (D)	Belt (flubendiamide), Prevathon (chlorantraniliprole)
Insect Growth Regulator (IGR)	Dimilin 2L (diflubenzuron), Intrepid 2F (methoxyfenozide)
Organophosphate (OP)	Orthene (acephate), Penncap-M (methyl parathion), Dimethoate (dimethoate)
Oxadiazine (OX)	Steward (indoxacarb)
Pyrethroid (P)	Baythroid XL (beta-cyfluthrin), Brigade and Discipline (bifenthrin), Asana XL (esfenvalerate), Prolex and Declare (gamma-cyhalothrin), Karate Z (lambda-cyhalothrin), Ambush and Pounce (permethrin), Mustang Max (zeta-cypermethrin)
Spinosyn (SPN)	Tracer (spinosad)

**Rotate insecticide chemistries for resistance management and always be aware of the class of insecticide used at each application. C = Carbamate; D = Diamide; IGR = Insect Growth Regulator; OP = Organophosphate; OX = Oxadiazine; P = Pyrethroid; SPN = Spinosyn*

Table 3

Major insect pests of soybeans, their treatment thresholds and classes of insecticides that can be used for control. Three-cornered alfalfa hopper (TCAH) is a stem feeder; the other insects are classified as foliage feeders.

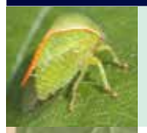
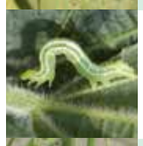
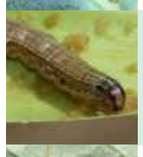
Insect		Thresholds	Insecticide Classes*
	TCAH	Plants less than 10 inches tall, check for stand reduction. Plants more than 10 inches tall, treat when scouting results in 50 hoppers per 25 sweeps.	OP, P
	Bean leaf beetle	Apply insecticide: Before bloom – defoliation reaches 35%. After bloom – defoliation reaches 20%. When 50% of plants show feeding injury on one or more pods per plant.	C, OP, P
	Velvetbean caterpillar (pictured), Green Cloverworm (GCW)	Apply insecticide: Before bloom (R1) – when there are 75 worms per 25 sweeps, or 35% defoliation After bloom (R1) – when there are 38 worms per 25 sweeps, or 20% defoliation	C, D, IGR, OP, OX (GCW), P, SPN
	Soybean looper	Apply insecticide: Before bloom (R1) – when there are 38 worms per 25 sweeps, or 35% defoliation. After bloom (R1) – when there are 19 worms per 25 sweeps, or 20% defoliation.	C, D, IGR, OX, SPN
	Corn earworm	Before bloom (R1), treat at 35% defoliation. After bloom (R1), treat when there are nine worms per 25 sweeps.	C, D, OX, P, SPN
	Beet armyworm	Before bloom (R1), treat at 35% defoliation. After bloom (R1), treat at 20% defoliation.	C, D, IGR, OX, SPN
	Fall armyworm	Before bloom (R1), treat at 35% defoliation. After bloom (R1), treat at 20% defoliation.	C, D, IGR, OP, OX, P, SPN
	Stink bugs (southern green, brown)	Apply insecticide: Before R6: when there are 9 bugs per 25 sweeps. After R6: use double the normal thresholds for next 7-10 days to prevent damage to seed.	OP, P

Photo credits: Velvetbean Caterpillar, Fall Armyworm: Scott Stewart, Univ. of Tennessee. All other photos: Mississippi State University.

prominent diseases (e.g., frogeye leaf spot) are available and should be selected for planting. Using tolerant varieties is an appropriate management strategy to reduce the need for fungicide applications and thus reduce input costs.

"Fungicides remain a valuable tool for farmers to combat disease," says Tom Allen, "but it is imperative that the appropriate fungicide is applied for the problems in the field and not based on cost. Just as farmers have lost the ability to control weeds with certain herbicides, they will also lose the ability to control diseases with certain fungicides if they are used when they're not needed or if the same class of fungicide is used continuously."

Consider the following when applying fungicides:

- Scout to detect the first occurrence of disease(s) or to accurately determine the reproductive stage recommended for the most effective preventive fungicide application prior to disease presence.

After scouting, only apply a curative fungicide (e.g., triazole) if diseases are present.

Preventive fungicides are most effective when applied prior to or at the earliest appearance of the targeted disease. Based on a decade of research results, as a general rule, the first fungicide application has been reported to provide good results, based on yield, following an application at R3/R4 growth stages, or beginning of podset.

Table 4

Major Midsouth soybean diseases and potential methods of prevention.

Disease	Varietal Resistance	Foliar Fungicide	Additional Information
Anthracnose	No	Yes	Use seed treatment for early-season control
Soybean rust	No	Yes	Resistant germplasm is commercially available
Cercospora leaf blight, purple see stain	Yes	Yes	Use seed treatment for early season control
Charcoal rot	No	No	Prevent/reduce plant stress
Frogeye leaf spot (FLS)	Yes	Yes	Resistant to strobilurin fungicides has been identified and appears to be widespread
Phytophthora root rot	Yes	NA	Use seed treatment to prevent damping-off
Phomopsis seed decay	No	Yes	Use seed treatment to prevent damping-off
Pod and stem blight	Yes	yes	
Pythium seed decay, damping off	No	NA	Use seed treatment
Aerial blight	No	Yes	Strobilurin fungicides are the most effective, but resistance has been identified in Louisiana
Stem canker	Yes	No	Varietal resistance very effective
Sudden death syndrome	Yes	No	Use less-susceptible varieties, monitor for nematodes, specifically the soybean cyst nematode

Note: responses with a (?) are still in question since little information exists regarding the field resistance of the varieties presently available with reported resistance to Cercospora blight. In addition, little if any information exists on the efficacy of fungicides to manage Phomopsis seed decay.

WEEDS

The majority of Mississippi soybean farmers now face herbicide-resistant (HR) weeds in their fields, most notably weeds resistant to glyphosate. This major production problem threatens the production of a profitable crop.

But certain BMP can reduce the incidence of HR weeds and mitigate costs associated with the issue. The following is a summarization of BMP for HR weeds.

ROTATING HERBICIDE MODES OF ACTION (MOA)

The most important practice to prevent or manage HR weeds is using herbicides with different mechanisms or MOA prior to planting and throughout the growing season. Farmers should check the MOA group number on the herbicide label to ensure selection of the correct MOA to match targeted weeds. Frequent use of herbicides with the same MOA is the single most important contributor to the development of HR weeds.

- Each acre should get a minimum of two MOA that are effective for control of the weeds you're targeting. If glyphosate-resistant (GR) weeds are present, farmers should use two MOA in addition to that of glyphosate.
- Rotate herbicides with different MOA yearly. Simply rotating herbicides that have the same MOA will only delay the inevitable occurrence of HR weeds.
- If there are no HR weeds in a field, it is still very important to rotate herbicides with different MOA to prevent or delay the establishment of HR weeds. If a weed's resistance to glyphosate is not documented in a particular field or fields, then using glyphosate remains a viable option when used in rotation with other herbicide(s) with a different MOA. In fact, glyphosate used in rotation is an excellent resistance-management option if there is no documented glyphosate resistance.
- Rotate herbicide MOA to reduce the pressure applied by any one product. Tank mixes work best for this activity. Note: In some cases, multiple chemical families that have similar chemical structures and cause similar injury symptoms exhibit the same MOA. Rotating between chemical families with the same MOA is not the same as rotating among MOAs.

CULTURAL PRACTICES often contribute to the effectiveness of the weed-control methods being used. Some of the most important soybean-production practices that can be used to avoid weed problems include:

- Planting quality seed
- Planting weed-free seed
- Achieving uniform stands
- Avoiding weed-seed distribution
- Rotating crops
- **Scouting and documentation:** Document weed species present in individual fields each year to allow you to make decisions based on the MOA used in that field and the level of weed control it exhibited. Create records of the most problematic weeds and plan for appropriate herbicide programs using multiple MOA. Know your weeds. Know when they grow and pollinate, and stop them before they go to seed. Recognize their strengths and exploit their weaknesses.
- **Tillage:** Use tillage as a control measure on sites that are not highly susceptible to erosion or when needed as a last resort in a minimum-tillage system.
- **Use the full rate:** Use the full labeled rate for all herbicides you apply. Spray before weeds get too tall to kill them before they can propagate and produce seed. For example, Palmer amaranth should be sprayed before it reaches 2 inches tall.

- **Crop rotation:** Crop rotation offers opportunities for herbicide MOA rotation to prevent or delay development of HR weeds. Crop rotation will determine the frequency and type of herbicide that you apply. It is a major factor in the selection of non-chemical weed-control options. The principle of crop rotation as a resistance-management tool is that different crops will allow rotation of herbicides that have different MOA.
- **Plant narrow rows:** Using narrow rows (30 inches or less) promotes earlier and more complete canopy closure at the beginning of the growing season and later opening of the canopy at the end of the season. This will help impede weed infestation at both times.

HR weeds can significantly decrease yields and sharply increase input costs if additional herbicides must be applied. Successful weed management is a yearlong process. Weed control begins with burndown before planting and continues throughout the growing season and following harvest. Use the following best management practices when using herbicides throughout the year:

- **Burndown:** Weed control success begins before crops are planted in the field. Applying the proper mix of burndown herbicides is your first line of defense against weeds for the growing season. Rotating effective herbicides, based on MOA, is a proven and effective way to prevent HR weeds in fields. Use different MOA to manage weeds if combining burndown herbicides with residual herbicides.

For example, if resistant weed populations have emerged prior to soybean planting or emergence, tank-mix a burndown herbicide with another herbicide, such as 2, 4-D (MOA Group 4), Clarity (MOA Group 4) or Sharpen (MOA Group 14).

- **In-Season Weed Control:** The most critical time to control weeds is up to four weeks after emergence. When using a pre-emergence herbicide, fewer weeds emerge, which reduces the number of weeds that will need to be controlled by post emergence herbicides. This reduction in weeds exposed to the post-emergence herbicides is the primary goal to proactively manage against herbicide resistance.

Scout for early-season weeds that survived the pre-emergence application, especially HR species. Control them soon after planting to avoid competition with soybean plants.

Overlap residual herbicides during all applications from burndown to canopy closure to minimize the number of weeds that survive during the growing season.

When weeds survive pre-emergence applications, use timely applications of post-emergence herbicides that have a MOA different from that of glyphosate.

Add a herbicide with in-crop residual activity in combination with post-emergence contact herbicide applications in cases where multiple flushes of weeds are expected.

- **Fall weed control:** Use fall weed-control measures, such as residual herbicides, to provide an edge going into the following growing season. Depending on the severity of weeds, tillage could also be a viable option to control weeds.

TakeACTION HERBICIDE-RESISTANCE MANAGEMENT

For more information on herbicide resistance, visit www.TakeActionOnWeeds.com

IRRIGATION

Soybean plants have the ability to withstand a certain amount of stress, whether it be from diseases, insects or drought. However, plants can only withstand these pressures for so long before losing yield. Drought is no exception. For this reason, an increasing number of Mississippi soybean farmers irrigate their acres.

Irrigation can substantially increase yield but the practice does not come without additional costs and labor. However, certain practices and tools can make irrigation more efficient and farmers more profitable.

Consider the following best management practices when irrigating on your farm:

- Drought affects soybeans most during the reproductive stages, when plants begin to flower and produce pods and seeds. During these stages, a soybean plant can use 0.25 inch of water per day. A plant's supplemental water needs from irrigation are greatest during these times. Begin irrigation at R3 for maturity group IV soybeans planted from early April to May; begin irrigation at or just before R1 for maturity group V soybeans planted after early May.
- Increase the efficiency of your furrow irrigation through the use of the PHAUCET or Pipe Planner computer programs. These programs help farmers determine the best hole sizes to punch along the length of a polypipe irrigation set. The tool calculates these hole sizes based on pressure changes along the tubing, pipe diameter, different row lengths and the elevation changes in a field.
- Soil-moisture sensors take the guesswork out of scheduling irrigations. Using these sensors may eliminate one or more irrigations per field without reducing yields.
- Improve the water infiltration in fields through the use of surge valves. The valves divide a standard irrigation run into two sides, alternating irrigation between the two sides. Water flow oscillates between the two sides of the valve for predetermined periods until the water reaches the tail ditch. The system then moves to a soaking cycle and sends a pulse of water out until it reaches the tail ditch on one side and then alternates to the other. This allows farmers to have better control over how much water is actually needed to infiltrate the soil profile.
- Terminate irrigation when soybeans have reached the R6 growth stage. Beans will have completely filled the pod cavity at this point.

Jason Krutz, Ph.D.,
MSU Extension
Irrigation Specialist

Photo credit: Mississippi State University

Research from Jason Krutz, Ph.D., MSU Extension Irrigation Specialist, shows that the use of PHAUCET/Pipe Planner, surge valves and soil moisture sensors can reduce water use by 47 percent while maintaining yields.

Prepare Now for 2015

The winter months offer a great opportunity to prepare for the 2015 growing season, which includes your irrigation plans. Information can be collected during the offseason to be used with the PHAUCET or Pipe Planner computer programs. Research conducted by Jason Krutz, Ph.D., shows that the use of the PHAUCET computer program can cut water use by 20-25 percent. "If the average field needs 15 to 18 inches of irrigation water to reach yield potential, at $3 per acre inch, a cost saving of $12 to $14 can be expected," says Krutz.

The following information can be collected now and used for PHAUCET or Pipe Planner implementation at a later date.

1. Flow rate from wells (gallons per minute).
2. Field dimensions.
3. Maximum number of hours that can be pumped in one set.
4. Lengths of the longest and shortest row in each set.
5. Length and slope of turn row.
6. Row spacing and whether you irrigate every furrow or every other furrow.

Visit the MSPB website, ***www.mssoy.org***, to find a video detailing the steps to use PHAUCET or Pipe Planner on your farms.

SOIL SAMPLING

Healthy soil is a farmer's most important asset. Under-fertilized soil can decrease yield and overall profitability for farmers. In addition, the presence of plant-parasitic nematodes, such as the reniform, root-knot and soybean cyst nematodes can reduce yields when susceptible varieties are planted. Soil sampling and testing are the only ways to ensure that soils can meet the increased demands of high-yielding soybeans. Follow the BMP listed below when sampling soils for the presence of nematodes and fertility levels

Sampling for Nematodes

Soybean producers in the Mid-south must contend with nematodes, several of which could inhabit a single field. Significant yield losses caused by soybean cyst nematode (SCN), southern root-knot nematode (RKN) and reniform nematode (RN) can occur in Mississippi soybean fields.

Farmers often rotate soybeans with corn and cotton or grow them on soils previously cropped with cotton. Because of these rotations, there is an added risk of infestation from RKN and RN. The SCN is predominately present in field situations with a continuous history of soybean production. Due to the changing crop landscape and high commodity prices the need to sample for nematodes has become even more important.

Consider the following when sampling for nematodes:

- Properly collected and evaluated soil samples are the best tool for detecting the presence and species of nematodes in the soil. Diagnostic labs can accurately identify the nematode species and population levels present in a field from good samples. Soil samples should be collected from areas of the field that have performed poorly and be sent to the laboratory with a sample from an area of the field that has had high performance in the past. Keep samples in freezer bags (e.g., Ziplock) out of the sun and in a cool place prior to submission to the laboratory.
- Properly analyzed samples will indicate where farmers should use a control practice.
- The best time to sample is generally near or just after harvest. Sampling in the fall will allow enough time for analysis so that results can be used as a guide for variety selection or choosing an alternative crop for the next growing season. In addition, the greatest nematode population is generally present at the end of the year.
- Nematicides will not replace the use of resistant varieties and crop rotation as primary nematode-control practices. Nematicides applied to seed or used in-furrow can reduce early-season root infestation by nematodes, although they will not provide season-long control and may not be economical.
- Nematode-infested soil that remains on field equipment can transfer nematodes to a previously non-infested field.

"Farmers may be deterred by the cost of sending their samples, but at $11 a sample, less than two bushels of yield loss could pay for the sample," says Allen.

Sampling for Fertility

As soybean yields continue to increase (national average increase since 1980 is about 0.5 bu/year), more nutrients are pulled from the soil, and additional fertilizer may be needed to replace them. Soil testing is the only way to know if supplemental fertilizer is necessary prior to planting.

When implementing a soil-testing program, follow these BMP:

- Collect soil samples soon after harvest.
- Test each field as least once every three years.
- To ensure sampling consistency of nutrient removal across years, sample at the same time of year and following the same crop in a rotational system.
- Soil tests should be used mainly to test for phosphorus, potassium and pH, but can also be helpful in determining possible micronutrient issues.
- In tilled fields, gather soil samples from a depth of 6 inches. In minimum- or no-till fields, take samples from a 4-inch depth. And in pasture and hayfields, take samples from a 2-inch depth. Note: Most fertility recommendations are based on soil-sampling at a six-inch depth.
- Consistency when collecting samples and keeping records from year to year is critical to fully understanding the nutrient needs of your fields. The more data generated over time will allow for better fertility recommendations from specialists.

Getting a good soil sample is critical to the accuracy of your soil-test results. Visit ***www.mssoy.org*** and ***www.MSUcares.com*** for specific soil-sampling protocols.

"Soil sampling should be considered an integral part of every management plan since it impacts the way farmers will implement every other action on their crops," says Bobby Golden.

Stoneville farmer Dale Weaver works with mostly silty clay soils and samples every other year. He believes it is an essential tool in maximizing yields.

"Sampling is extremely beneficial," Weaver says. "If you don't sample, it would be like shooting in the dark."

Soil samples allow for adequate application of fertilizer. Under-fertilizing may cost farmers money through lower yields. Over-fertilizing may add costs to the operation that are not recouped through increased yields.

Especially with increased yields in recent years, adequate fertilization becomes even more important. More bushels per acre also mean greater levels of nutrients are removed from the soil.

"The primary nutrient deficiency observed in the Mississippi Delta and the hill areas of soybean production is potassium deficiency," says Golden. "Soybeans remove more potassium than any other row crop we produce in Mississippi, removing approximately 1.2 pounds K_2O per bushel of harvested yield."

Use the chart below to estimate how many pounds of nutrients are removed from your fields each year based on varying levels of yield.

Yield	Nutrient Removal (lbs per bushel across the 1:1 rotation)			Fertilizer Replacement (lbs product)		Dollar Value
Corn : Soybean	P_2O_5	K_2O	S	TSP*	MOP*	$
150:40	82	86	19	178	143	85.36
180:50	100	105	23	217	175	104.34
210:60	117	125	28	254	208	123.32
225:70	130	140	31	283	233	137.58
250:80	146	159	34	317	265	154.98

**Triple super phosphate*
**Muricate of potash*

Your Checkoff Dollars at Work

A MSPB-funded project conducted from 2010 to 2012 by Mark Shankle, Ph.D., tested fertilizer recommendations from the Mississippi State University Extension Service (MSU-ES) and private soil-testing laboratories. The MSU-ES lab recommended 30 lb/acre of phosphorus (P_2O_5) and 60 lb/acre of potassium (K_2O) each year. Private lab fertilizer recommendations were 62 to 72 lb/acre of P_2O_5 and 99 to 115 lb/acre of K_2O. Shankle's research showed that soybean yields and net profit were greatest when following MSU-ES recommended rates. Soybeans did not show a response to the higher fertilizer rates recommended by the private lab, and therefore net profits were lower when more nutrients were applied. On low-fertility soils used in this study, applying fertilizer nutrients according to soil test recommendations for soybeans grown in a dryland system resulted in a three-year average yield that was 40 percent greater (50.9 vs. 36.3 bu/acre) and a net return that was 32 percent greater than those from unfertilized soil.

The Mississippi Soybean Promotion Board (MSPB) and the soy checkoff work to increase the profitability of soybean production in Mississippi. MSPB is made up of 12 farmer-directors who oversee the investments of the soy checkoff on behalf of all Mississippi soybean farmers. For more information on MSPB and the soy checkoff, visit *www.mssoy.org*. The Mississippi Soybean Promotion Board/soy checkoff neither recommends nor discourages the implementation of any advice contained herein, and is not liable for the use or misuse of the information provided.

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