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Hurricane Preparation and Recovery in the Southeastern United States

Rice Producers Guide

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Prepared in coordination with and/or based on information from Mississippi State Extension Services, Mississippi Rice Promotion Board, and Louisiana State Extension Services.

This is 1 of 23 guides to help Southeastern U.S. producers of economically important agricultural commodities build resilience to, prepare for, and recover from hurricane impacts. All guides can be found on the USDA Southeast Climate Hub Hurricane Preparation and Recovery Commodity Guides website.

Disclaimer: This guide contains a compilation of information from multiple coastal States in the Southeastern United States. Therefore, some of the links and resources may not be relevant or even appropriate for your location. Information in this document was provided by USDA and various university Extension staff and based on shared experiences preparing for and recovering from hurricane impacts; however, individual producer situations will vary. This guidance should not be interpreted as required actions by regulatory or insurance agencies. STATE OR LOCAL GUIDANCE/REGULATIONS AND INSURANCE POLICIES SUPERCEDE THE RECOMMENDATIONS IN THIS GUIDE. Check with your local Extension agent; county, State, or Federal contact; consultant; or insurance agent regarding the appropriateness of these recommendations to your specific situation.

Pesticide Statement: Pesticides used improperly can be injurious to humans, animals, and plants. Follow the directions and heed all precautions on the labels.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Note: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State Extension specialist to be sure the intended use is still registered.

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Hurricane Preparation and Recovery
in the Southeastern United States

Rice Producers Guide

This guide will focus on:

- Evaluating the growth stages of rice and forecasting the time to physiological maturity in relation to hurricane landfall
- Preparations to minimize downed, lodged, or shattered rice panicles
- Evaluating hurricane damage and determining a post-hurricane plan of action

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Introduction

Preparing for and recovering from hurricane events

People who live and work in the Southeastern United States are unfortunately familiar with the devastation and loss of life and property that can accompany a hurricane event. While hurricanes have always been a threat to the Southeast, with an average of over two strikes per year since 1900, the threat posed by hurricanes is growing. Recent studies suggest that as ocean temperatures continue to rise, hurricane intensity is increasing. Hurricanes of the future will likely be slower moving, higher category hurricanes that produce destructive winds and flooding.

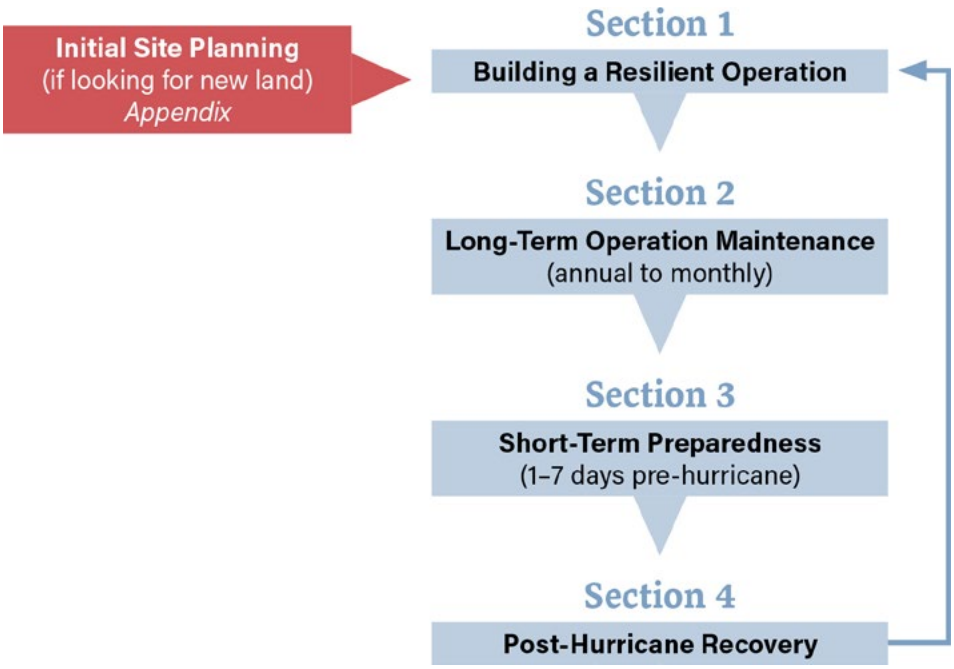
To help producers remain resilient and productive in the face of this threat, the U.S. Department of Agriculture (USDA) Southeast Climate Hub developed this guide containing steps that can be taken to prepare for and recover from hurricane events. This guide is separated into four primary sections:

- The **Building a Resilient Operation** section outlines a range of considerations and systems that producers can put in place to increase their resilience to hurricanes.
- The **Long-Term Operation Maintenance** section lists specific pre-hurricane actions and periodic checks to be done on an annual basis (before hurricane season) and monthly basis (during hurricane season).

- The **Short-Term Preparedness** section lists specific actions to be done in the week before a hurricane arrives.
- The **Post-Hurricane Recovery** section outlines activities that producers can take to minimize their losses following a hurricane. It begins with actions immediately following a hurricane that are focused on safety and continues with ongoing actions a week out and a month out.

The guide also includes an appendix with two customizable templates for a **Farm Emergency Plan** and an **Emergency Contacts List**. Directions on what to include in these two documents are outlined in the **Building a Resilient Operation** section. Their use is described in the **Short-Term Preparedness** section. Both the plan and list should be periodically reviewed, as mentioned in the **Long-Term Operation Maintenance** section. The appendix also includes an **Initial Site Planning** guide that can be referenced if purchasing or leasing new land, and **Resource Links** to helpful Federal, State, and Extension websites that are also referenced throughout the guide.

The flowchart below shows the layout of this guide and how it is intended to be used. Note that after recovering from a hurricane, producers should start back at the **Building a Resilient Operation** section, and incorporate guidance and any lessons learned into their operational and emergency management plans.



Layout and use of the hurricane preparation and recovery guide.

SECTION 1

Building a Resilient Operation

Systems that are recommended to be put in place well before the arrival of any hurricane to increase productivity and reduce your risk of damage and recovery time

Agricultural operations in the Southeastern United States can implement a range of measures to increase their resilience to hurricanes and tropical storms. Contact your local Extension office and other State and Federal resources for further information.

Personal safety

For safety tips and resources that facilitate informed decision making before, during, and after a hurricane strikes, see the Ready.gov Hurricanes website and U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) Hurricane Safety Tips and Resources website.

Recordkeeping, documentation, and insurance

- The importance of pre- and post-hurricane documentation cannot be overstated. Assistance for disaster recovery may not be available until weeks or months after a hurricane. Therefore, it is important for purposes of insurance compensation and recovery assistance to do thorough recordkeeping of the damages and losses sustained on your farm as well as your cleanup and recovery efforts.
- The worst time to find out that you do not have enough insurance, or the right insurance, to cover your damages is when you need help recovering. Regularly review your insurance policies with your agent to be sure you have adequate coverage, including flood insurance, for your facilities, vehicles, farm buildings and other structures, and crops. Be aware that there are limitations on how soon insurance coverage will take effect. Generally, insurance policies will not cover damage if the policy was not in place before a hurricane has formed.
- Establish an inventory system so that you know exactly what's on your farm at all times for potential insurance claims and disaster recovery assistance. It is critical to have a documented inventory (photos, videos, and written lists and descriptions) of your farm buildings, vehicles, and valuable equipment on your farm before a disaster occurs. Maintain accurate records of harvest, equipment inventories, and supplies purchased. This inventory and documentation will be essential for filing insurance claims after the hurricane. Keep copies of this inventory in multiple places such as on your computer, offsite in a safe location, and on a cloud-based server using an established procedure to update and transmit the information weekly.

- Take these records with you when evacuating for hurricanes:
  - Inventories and documentation for insurance and disaster recovery
  - Farm Emergency Plan
  - Emergency Contacts List
- For more information, see:
  - USDA Risk Management Agency (RMA) Crop Insurance website for news and information about insurance, including the Hurricane Insurance Protection—Wind Index (HIP-WI) Endorsement
  - RMA Agent Locator to search for approved insurance providers
  - U.S. Department of Homeland Security Federal Emergency Management Agency (FEMA) Flood Insurance website to learn more about flood insurance options for qualifying home and business owners

Infrastructure

Buildings

- Consult topography and flood maps when building new facilities.
- Locate buildings above the 100-year flood zone whenever possible, and construct buildings and other structures to a minimum wind rating of 140 miles per hour (mph), preferably 180 mph. For more guidance on protecting farm structures and buildings from winds and flooding, see the FEMA Compilation of Wind-Resistant Provisions and Design Guide for Improving Critical Facility Safety from Flooding and High Winds.

Power and backup power

Circuit breakers

- Know the location of your main circuit breaker and breaker box. The box is generally located inside of buildings, but additional breakers may be located outside.
- Ensure that the breakers, including the main breaker, are correctly labeled. Correct labeling will help you ensure power is cut to the appropriate appliances or to the entire building.

Backup power

- Create a Backup Power Plan and store with your Farm Emergency Plan (see "Emergency planning" below).
- Check with local, county, and State codes for any requirements to supply backup power during short-term emergencies.
- To provide power when the main power goes out, supply critical operating areas with a standby generator wired with a transfer switch. Several types of generators and diesel-powered pumps are available. Ensure that your generator is

capable of supplying the power required by the irrigation pump to convey water to the entire area. Install generators with enough fuel storage for at least 2 weeks of full operation.

- Post the operating procedures near each generator. Consult your owner's manual for specific safety, maintenance, and operational recommendations.

Roads

- The primary driveway into the farm should have adequate drainage to prevent flooding. The road should be well packed with a solid base that will hold up to heavy equipment and trucks during extreme conditions. For more information on maintaining unpaved roads, see the USDA Environmentally Sensitive Road Maintenance Practices for Dirt and Gravel Roads.
- If you do not have a secondary entrance to your farm, construct one if possible to provide alternative access from a different road in the event the primary entrance is blocked.
- If the farm is in a location where all roads leading in and out may flood, purchase or make arrangements to rent or borrow a boat that can safely navigate the floodwaters to gain faster post-hurricane access to your property.

Water management

Total water management is essential, including irrigation and drainage systems, and must take into account the water table and soil drainage.

Drainage

- Clean ditches at least every 5 years to remove plant debris and soil that has built up from erosion.
- Maintain optimal grading in ditches when cleaning them.

Irrigation

Locate irrigation pumps in elevated areas to reduce flooding risks to the pump, and install them with a backflow prevention device to avoid contamination in case of power loss. Keep the access road to the pump clear so that it is easier to bring in generators or diesel-powered pumps after a hurricane.

Water table depth

- The amount of flooding will be determined by your land's topography, the amount of precipitation received, and the pre-hurricane water table. The higher the pre-hurricane water table, the more likely that flooding will occur for a given amount of precipitation. The chance of flooding can be estimated by measuring the pre-hurricane water table and considering the effects of varying precipitation amounts:

    A general rule of thumb is that 1 inch of rain will cause the water table to rise about 10 inches in fine-textured soils, 6 inches in most of the flatwoods sandy

soils, and 4 inches in coarse sands. It may take 4 to 6 days for the water table to return to its desired levels following rains of 1 inch or more. For example, if the water table is at 50 inches, 6 inches of precipitation will cause localized flooding on fine-textured soils, but no flooding would occur on sandy soils.

- For more information about water management, see:
  - Sustainable Agriculture Research and Education *Building Soils for Better Crops* Irrigation and Drainage chapters
  - Alabama Cooperative Extension System Agricultural Best Management Practices for Water Quality website
  - Georgia Soil and Water Conservation Commission Best Management Practices for Georgia Agriculture website
  - Louisiana State University AgCenter Irrigation website
  - Mississippi State Extension Service Irrigation website
  - North Carolina Cooperative Extension Irrigation Resources website
  - University of Florida Institute of Food and Agricultural Sciences (IFAS) Extension Water Management for Agriculture website
  - Virginia Cooperative Extension Water, Irrigation, and Drainage website

Trees and windbreaks

- Remove trees that could potentially blow down and block the entrance to the farm.
- If land is elevated and unprotected, consider creating windbreaks along the edge of fields. This is particularly valuable if adjoining land has bare soil and can prevent or reduce sandblasting of plants during a hurricane.
- Trees and shrubs used as windbreaks should be native species that will develop strong, deep root systems and be hardy enough to resist breaking during high winds. For example, red cedar (*Juniperus virginiana*) resists strong winds very well. Keep trees or shrubs pruned and free of dead or dying branches.
- For more information about how windbreaks can protect crops and provide economic, environmental, and commercial benefits, see the USDA National Agroforestry Center Windbreaks website.

Debris disposal

- Create a plan for salvage operations including a method of debris disposal. Learn what materials and the specifications regarding composition of materials the landfill nearest your farm will accept, and identify alternatives if needed. For disposal of chemicals or other hazardous materials, follow specific procedures to meet U.S. Environmental Protection Agency (EPA) requirements.
- For more information about debris disposal following natural disasters, see the EPA Dealing with Debris and Damaged Buildings website, including their Disaster Debris Recovery Tool.

Crop concerns

Variety selection

- Choose disease-resistant crop varieties to improve plant health and decrease susceptibility to outbreaks when plants are stressed. Use varieties of rice that are moderately resistant to lodging, as they will have a greater chance of withstanding high winds and remaining upright post-hurricane. All seed companies should have a list of available rice varieties with lodging ratings.
- For the latest rice variety testing results, see:
  - Louisiana State University AgCenter Rice Varieties and Management Tips website
  - Mississippi State University Agricultural and Forestry Experiment Station Rice Variety Trials website

Planting dates and seeding rates

- To ensure that any hurricane damage to your crop is covered by your crop insurance, plant your crop before the final planting day for crop insurance in your State. This may vary by county and year, so use the USDA RMA Actuarial Information Browser Tool to determine the final planting date for your crop. While the late planting period continues beyond the final planting date, check with your insurance provider for details that may apply if you plant during this time period. Look closely at insurance policies to determine specific details, as requirements can change.
- Rice-producing areas along the Gulf Coast of Texas and Louisiana should target planting dates earlier in the recommended planting window (March 10 to April 15) to target an earlier harvest date (late July to early August). This will help ensure that harvest occurs prior to the peak of hurricane season in September.

Emergency planning

U.S. Department of Labor Occupational Safety and Health Administration (OSHA) regulations require an employer with more than 10 employees to have a printed copy of an emergency action plan readily accessible to all employees. (If you have 10 employees or fewer, the emergency plan may be reviewed orally.) For more information about emergency action plans, see the OSHA Agricultural Safety Fact Sheet.

Farm Emergency Plan

- Your Farm Emergency Plan details how your operation will respond in the event of a hurricane, prepare for a worst-case scenario, and ensure continuity of operations.

- Consider bringing together a disaster planning team, which could consist of the farm owner and engaged family members, the farm manager, an insurance representative, local Extension agent, and other individuals.
- Create your Farm Emergency Plan. See Appendix: Farm Emergency Plan for a sample plan that you can customize for your operation. The plan should include a checklist of tasks necessary to secure the facilities, fuel supplies, chemical supplies, and equipment; disconnect electricity and gas service; ensure that critical supplies are well stocked; etc. Develop two pre-hurricane checklists: one if evacuating the area, and one if you are staying.
- Make sure all of your employees know the formats (electronic or hard copy) and locations where the Farm Emergency Plan is stored.
- Consider creating a "hurricane suggestion box" where employees can place ideas for training and planning they believe would increase the operation's resilience and safety in the face of a hurricane, based on their previous experience.

Maps and signage

Prepare or update maps for all facilities, including locations of alternate entry/exit routes, electrical equipment (with shut-off options), fuel storage tanks (both above and below ground), propane tanks, compressed gas (for welding, etc.), and chemical spill equipment.

Hurricane tracking apps

Download one or more computer and mobile device applications (apps) that model hurricane track predictions, send alerts, and track hurricane impacts. Given the rapid advance of mobile technologies, check for new options each year prior to hurricane season. The NOAA National Hurricane Center website is a good source for keeping up to date on the latest hurricane activities. For more information about emergency alerts, see the Ready.gov Emergency Alerts website.

Roles and responsibilities

- Designate an Emergency Response Team for your farm. Members of the team should be:
  - Thoroughly trained and physically capable of performing assigned duties
  - Knowledgeable about the hazards found on the farm
  - Trained in decision making regarding when to take actions themselves and when to wait for outside emergency responders
- Define a chain of command with clearly defined primary and secondary roles and each person's responsibilities. Some individuals may not be reachable after a hurricane, so alternative levels of authority need to be established to resolve critical issues quickly. In your Farm Emergency Plan, list who will be responsible for each task and how they'll report fire, flooding, building collapses, and other emergencies. Identify procedures to be followed by the people who remain to handle critical operations.

Communication

Emergency Contacts List

- Develop and maintain a list of all people connected with your operation that should be contacted in an emergency. See Appendix: Emergency Contacts List for a template that you can customize. The Emergency Contacts List should include names, phone numbers, and all other pertinent information (email addresses, locations, etc.) for individuals (owners, family members, employees, employee family members), emergency responders, State and local agencies, contractors and suppliers, and anyone else who is on your farm on a regular basis or provides crucial emergency services.
- Keep copies of your Emergency Contacts List (hard copies as well as electronic copies) in multiple locations, including your home, office, and vehicle, and with all family members and key employees. It is a good idea to have this information stored on your and your employees' cellular devices.

Lines of communication with local businesses and officials

Establish communication with your local law enforcement and fire departments, electricity and gas providers, and other key groups to help them understand the nature of your business so that they can respond as needed in the event of a hurricane. Let them know the number of employees typically onsite, the potential impact of the hurricane on crops, and the potential hazards that could lead to environmental contamination in the event of a flood or structural damage.

Post-hurricane communications

- Purchase a battery-powered or hand-crank radio to stay up to date about conditions beyond your property in case you lose electricity for an extended period of time.
- Consider ahead of time the locations where producers and others could meet if all communication lines are down (e.g., a local feed or equipment supplier).
- Contact a local AM radio station to see whether it could serve as a communication channel in the aftermath of a hurricane.
- For more hurricane-related communication recommendations, see the U.S. Federal Communications Commission FCC and FEMA: How to Communicate Before, During and After a Major Disaster website.

Electricity and gas

- Develop a plan for turning off electrical power before the hurricane and reconnecting immediately after the hurricane has passed.
- Contact your local utility company for guidance on how to disconnect power in the event of downed lines. Record their instructions in your Farm Emergency Plan.
- If certain equipment requires specialized shutdown procedures, train employees in these procedures.

Equipment operation

- Train personnel in the safe operation of unfamiliar equipment (such as generators or drainage pumps) that they may have to use in case of a hurricane.
- Make sure that appropriate employees are prepared to set up your backup generators. They should refer to your Backup Power Plan for information about where generators and generator fuel can be found, where they should be placed in preparation for a hurricane, and how they are to be connected to the electrical loads they will power.

Drones

Consider getting an unmanned aerial vehicle (UAV) (i.e., drone) pilot license and purchasing a UAV. Small UAV quadcopters or hexacopters that can be equipped with visual or RGB cameras are relatively inexpensive ($500 to more than $2,000). Use of UAVs will help with damage assessment if accessing fields directly is impossible or unsafe. For regulations and information about operating a UAV, see:

- U.S. Department of Transportation (DOT) Federal Aviation Administration Unmanned Aircraft Systems website
- University of Florida IFAS Extension Preflight and Flight Instructions on the Use of Unmanned Aerial Vehicles (UAVs) for Agricultural Applications

Chemical safety

Take the necessary steps to prevent chemical spills from storage tanks containing fuel, herbicides, pesticides, or other potentially dangerous liquids.

Basic emergency response skills

Train all members of your Emergency Response Team in the use of various types of fire extinguishers, first aid, and CPR (cardiopulmonary resuscitation).

SECTION 2

Long-Term Operation Maintenance

Periodic checks of systems already in place
(described in the previous section)

Prior to hurricane season

Contact your local Extension office and other State and Federal resources for further information specific to your circumstances.

Annual review of emergency planning tasks

Farm Emergency Plan review and reassessment

- Review your Farm Emergency Plan with your employees to ensure that they are familiar with all elements. Make any necessary additions or updates.
- Review your Emergency Contacts List with your employees and update it with current names and contact information.
- Review items provided in the "hurricane suggestion box," and add them to your Farm Emergency Plan or training list as relevant.

Employee training

- Identify key tasks that employees will need to complete during hurricane preparation and recovery operations.
- Once each year, provide training for all employees that will participate in the key tasks identified above.

Personal health and safety tasks

- Make sure you and your employees have up-to-date tetanus shots.
- For information and links to time-specific guidance for preparing yourself and your home, see the Ready.gov Hurricanes website.
- Download the FEMA Mobile App to learn emergency safety tips and receive real-time weather alerts, important disaster planning reminders, information about shelters and recovery centers, and more.

Recordkeeping, documentation, and insurance

- Meet with your crop insurance and/or USDA Farm Service Agency (FSA) representative to make sure you are signed up for eligible programs. Review your insurance policies with your agent to be sure that you have adequate flood insurance and coverage for vehicles, farm buildings and structures, and crops.

- Keep records of harvest, equipment inventories, and purchases of supplies up to date. Long-term records will help to establish a production baseline from which losses can be determined. Be sure that copies of each are in a safe location chosen in the Building a Resilient Operation section above.

Infrastructure

Buildings and facilities

Inspect all buildings and all facilities for structural soundness. Perform maintenance on facilities and infrastructure to repair items such as loose roofing materials or improperly/inadequately grounded electrical equipment to reduce hazard risk during a hurricane.

Drainage

- Clean out culverts and ditches to improve drainage, both before and during the peak hurricane season. Keep ditches clear through a good maintenance program including chemical weed control. Regrade areas of the property that are prone to flooding to improve drainage.
- Check any new construction areas, housing developments, or DOT projects nearby to see whether they are affecting your land's drainage. Determine where the water is draining now, and address any new drainage needs before hurricane season begins.

Maintenance of trees, windbreaks, and roads

- Cut limbs and remove any low-hanging branches that could damage buildings in a hurricane.
- Maintain windbreaks with regular pruning, especially if they are close to aerial power or telephone lines. To learn more about proper pruning practices, see:
  - Inland Urban Forest Council A Practical Guide to Proper Pruning of Trees and Shrubs
  - OSHA Line-Clearance Tree Trimming Operations website
  - University of Florida IFAS Extension Pruning Shade Trees in Landscapes website
- Evaluate roads for any repairs or improvements needed before a hurricane arrives

Harvest equipment

If possible, ensure that you have access to additional harvest equipment for increasing harvest capacity, as this can reduce the time required to harvest portions of your acreage under time-limited windows, such as when a hurricane is approaching. The demand for this equipment will rapidly increase as the hurricane approaches, so plan early for this contingency.

Generators

- During slow periods of the year, such as January, do routine annual maintenance on backup generators and supplemental pumps to make sure they are in good working condition. Replace old stored fuel with new, fresh fuel. Replace fuel filters, test all generator circuits, and make sure you have all necessary supplies on hand, including spare belts and fuel filters.
- Ensure that all essential equipment functions when powered by the backup generator.

Emergency equipment and supplies

- Maintain an ample supply of emergency medical supplies and have raincoats and boots available for employees.
- Maintain a supply of drinking water and dry and canned food sufficient for at least 2 weeks for employees who become stranded at the farm or who need to return to the farm before utility and emergency services are restored.
- Maintain an ample supply of weather-proofing supplies such as tarps and sandbags; fencing supplies; plumbing supplies; lumber, construction tools, nails, and ropes; portable lights; batteries; and battery-powered or hand-crank radios.

Soil samples

Collect soil samples from growing areas to establish a baseline for chemical or heavy metal contamination. If flooding does occur, soil samples are a useful tool to determine when previously flooded fields may be safe for replanting. A baseline from previously collected samples will assist with pre-planting risk analysis to determine if floodwaters may have introduced chemical hazards into the soil.

Monthly considerations during hurricane season

See Appendix: Resource Links for local Extension offices and other State and Federal resources which you may consult for further information.

Weather monitoring

During the June to November hurricane season, pay regular attention to long-term weather forecasts. Check your weather tracker daily if a hurricane is forecast to move closer to your area.

Equipment and supplies

- Check list of equipment and supplies for repairs that may be needed after the hurricane.

- Note supplies that take longer to deliver and order early to ensure they are available after a hurricane. Stockpile chemicals that are essential for your operation.
- Refresh emergency medical supplies, water, and dry and canned food supplies.
- Obtain sufficient quantities of plywood to protect windows and doors and store in a dry area. As the hurricane gets closer, plywood may be scarce or unavailable.

Farm equipment

- Make sure that sprayers, tractors, and harvest equipment are in good working order to ensure that the crop can be harvested as efficiently as possible when conditions allow.
- Contact your equipment manufacturers to establish procedures for dealing with damaged equipment. Make sure you won't invalidate your warranty if you attempt repairs yourself.

Fuel

Consider fuel needs for tractors, generators, and farm vehicles. During hurricane season, maintain at least a 2-week fuel supply on the farm in elevated tanks protected from flooding. This could even be in trailer- or truck-mounted diesel tanks. Any fuel stored onsite poses a contamination risk if storage tanks are not adequately protected from flooding, especially if stored at a low elevation. If secure storage facilities are available onsite, arrange for fuel deliveries several days prior to the expected hurricane impact.

Generators

Verify there is adequate fuel to power the generators for at least 2 weeks.

SECTION 3

Short-Term Preparedness

Bracing for the hurricane: specific actions to be done in the week before a hurricane arrives

1–7 days before a hurricane is forecast to strike

Hurricane season officially begins on June 1 and ends on November 30. During this time, the main rice crop will range in maturity from beginning reproductive growth to main crop harvest. The later months of hurricane season will also cover the ratoon crop in rice-producing areas along the Gulf Coast of Louisiana and Texas. Potential rice crop yield and quality damage can vary depending on the growth stage when the hurricane occurs.

Hurricane season spans the timeframe in which most Mississippi rice fields are reaching physiological maturity and producers have begun harvesting rice. Forecasts of hurricanes moving from the Gulf of Mexico inland typically leave producers with a short timeframe to make preparatory decisions.

First and foremost, take whatever precautions necessary to protect your family, your employees, and yourself. After that is accomplished, focus on protecting your farm. Once forecasters have put your area in a hurricane's path, there are a number of precautions you should take to prepare.

Employees' roles and responsibilities

- Review your Farm Emergency Plan with all employees and discuss each person's responsibilities.
- Continue to monitor hurricane track and strength updates. Listen closely for evacuation orders in your area.
- Determine whether individual employees plan to evacuate or stay during the hurricane. For those who evacuate, establish a schedule for checking in after the hurricane so that they know the extent of the damages and when it is safe to return. For employees who stay, be sure they have safe lodging, sufficient food and water, and an established plan for checking in.
- Ensure that all managers know their responsibilities prior to, during, and after the hurricane. Handling the hurricane damage is too much work for one or two people.
- Ensure that personnel have training in first aid and key personnel know how to operate emergency equipment they may be unfamiliar with (e.g., a chainsaw to remove trees blocking roads).

Communications

- Have all employee contact information listed and accessible for everyone to obtain in order to maintain contact.
- Ensure that all communication equipment is available and working properly. Mobile devices are good for communication, but ensure radios are available and working properly. Keep mobile devices fully charged. Have rechargeable battery packs or charging cables for your vehicle to maintain communication. Texting may be a more valuable form of communication than calling when the phone networks may be overwhelmed.

Food, water, and cash

- Make sure your operation still has at least a 2-week supply of drinking water as well as dry and canned food.
- Secure cash reserves for purchasing supplies after the hurricane. In widespread power outages, credit and debit cards will not work, and many vendors do not accept checks.

Recordkeeping, documentation, and insurance

- Ensure that important documents are in a safe, dry place and that duplicates are in alternative locations offsite.
- Document the growth stage of all rice fields and estimate yield, as numerous, high-quality, pre-hurricane photos and video (where helpful) will be useful for insurance purposes and disaster recovery assistance. If crops are damaged or lost, these records will help with the damage assessments and post-hurricane claims. Check with your local Extension office or crop advisor on the best way to calculate a yield estimate for your crop.
- Take multiple pictures of each field using a digital camera or a drone/airplane, and capture multiple angles. Take your time and cover all areas thoroughly.
- If you have insurance through FEMA's National Flood Insurance Program, your policy may cover up to $1,000 in loss-avoidance measures such as installing sandbags and water pumps to protect insured property. Check with your insurance provider to confirm. Keep copies of all receipts and a record of the time spent performing the work and submit these documents to your insurance adjuster when you file a claim to be reimbursed.

Equipment

- Ensure that all emergency equipment is ready (e.g., compressors and heavy machinery).

- Make sure chainsaws are in good working condition. Stock up on fuel mixture and bar and chain oil. Sharpen the chain, keep the saw file and saw wrench close at hand, and make sure you have a spare chain.
- Start securing and relocating equipment, etc., to safety or higher ground. Move equipment, portable fuel containers and pesticides to higher ground or place them in a reinforced shelter.
- Place any farm equipment with glass windows—such as tractors or combines—in enclosed shelters to prevent glass from shattering due to flying debris.
- Move pesticides, herbicides, and fertilizers to a secure place, on high ground above any potential flooding if possible.
- Ensure that tanks containing fuel, fertilizer, and other liquids are kept full and tied down.
- Make sure that farm equipment you will need after the hurricane, such as tractors with front-end loaders or skid-steer loaders, is fully fueled and operational.
- Unplug computers and other electronic equipment to protect from electrical surges, and store these items safely.

Infrastructure

Backup generators

Be sure your backup generators are serviced according to the owner's manual to ensure everything is operating as needed, and make sure full fuel tanks and portable fuel storage tanks are full. Your generators may have to run for several days until the power company can restore electricity. Review the owner's manual for the maximum run time and other unit specifics.

Fuel

- Make sure that you have at least a 2-week supply of diesel and gas. Be sure the supplier understands how much you use daily and that it is necessary for farm operations. If secure storage facilities are available onsite, arrange for fuel deliveries several days prior to the expected hurricane impact. Consider fuel needs for tractors, generators, and farm vehicles.
- Service stations will not be able to supply fuel if they do not have electric power for the pumps, so make sure portable fuel storage tanks are full.
- Any fuel stored onsite poses a contamination risk if storage tanks cannot be adequately protected from anticipated flooding. Fuel tanks should be moved to higher ground with the equipment and firmly secured to prevent them from being blown or floating away. If severe flooding is a possibility, empty all fuel tanks and firmly secure them to prevent pollution or having tanks float off.

Electricity and gas shut-off

Consult your Farm Emergency Plan and follow procedures for disconnecting electrical power and gas to some or all buildings and any non-critical equipment in danger of being flooded.

Buildings and grounds

- To secure building components:
  - Check on the security of roofing, siding materials, windows, and doors.
  - Make sure all other building components are tied down securely.
  - Disconnect power from buildings that could flood.
- Secure objects around your farm so that they don't blow away or become hazardous projectiles.

Roads

If the roads leading to the farm are likely to flood, stage your boat in a secure, easy-to-access location.

Drainage

- Check drainage ditches and culverts around your facilities and remove any debris.
- Pump down all water from ditches to the maximum extent possible.
- The decision of whether and how much to drain fields depends on the crop's stage of development. Grain that is more mature can withstand flooding, whereas less mature grain cannot. Any rice that is left in the field past the hard dough growth stage may even benefit from floods because it may better withstand the high winds, and anything past the hard dough stage can withstand flooding without subsequent yield loss. However, less mature grain will not withstand high flood levels, due to either the grain rotting in the flood or post-flood disease development. Therefore, if grain is in the soft dough stage or earlier, drain fields as low as possible if high levels of rainfall are predicted for your area. There are many factors that determine the amount of water lowering that should be done. Contact your local Extension agent for answers to questions about your specific situation.

Supplies

Review inventories and order any additional supplies that can be delivered before the hurricane.

Crop

Harvesting

- If the crop has reached maturity, harvest the fields most vulnerable to flooding or restricted access, and/or the fields that are most mature.

- Pull up field maps and evaluate growth stages for each rice variety and field to determine whether harvest is feasible or not.
- Apply harvest aids and harvest what you can prior to the hurricane. In a best case scenario, fields with grain moisture ranging from 18 to 25 percent may benefit from a sodium chlorate application. This will allow producers to begin harvesting approximately 4 days after application and harvest as much grain as possible within the 7-day timeframe before the hurricane arrives. Sodium chlorate should not be applied if you will be unable to complete harvest within 7 days after application, as this will cause a reduction in grain quality and yield loss due to shattered kernels. Applying a desiccant, such as sodium chlorate, can also reduce the amount of moisture in the stem of the plant. Moisture retention in the stem of the rice plant provides turgor pressure, which acts as a backbone for the plant, providing stability that will allow the rice to keep standing.
- For additional guidance on harvesting rice before a hurricane arrives, contact your local Extension office.

1 day before the hurricane strikes

- Perform a final verification of the hurricane track and strength. Listen closely for evacuation orders for your area.
- Obey all mandatory evacuation orders. Failure to do so can put you and your workers at risk and could tie up rescue resources. Do not require your personnel to be present on the farm either, since they also have to prepare themselves and their families.
- Make sure your employees have evacuated to secure areas at least 1 day prior to hurricane impact. If some staff will remain onsite, confirm that they have access to structures on high ground or elevated slabs or pylons that can withstand hurricane winds and rain, sufficient stores of clean water and food, medical supplies, working radios or cell phones, and sufficient battery or generator power. Those workers remaining onsite will likely need to rely on cell phone/text communication with evacuated supervisors and colleagues, since local radio and television communications often black out for several hours as a hurricane passes. Local first responders may also be out of communication at the time of hurricane impact.
- Personnel remaining onsite to monitor the farm until the last moment should observe water levels in low-lying and problematic areas so they have sufficient time to exit the operation before levees and surrounding roads and highways are blocked with floodwaters.

SECTION 4

Post-Hurricane Recovery

Activities that can be taken to minimize losses immediately after, a week after, and a month after a hurricane

Immediately after the hurricane has passed

Safety

- Make safety your first priority. Do not rush back into a facility until you are sure it is safe. Note the integrity of buildings, power lines, trees, equipment, and electrical and gas systems that may have been damaged during the hurricane. Address all hazards to ensure safety before proceeding with recovery actions.
- Continue to watch the weather forecast. Are waters still forecast to rise more than they are now? Some floodwaters peak up to a week after the hurricane.

Electricity and gas

- Avoid downed power lines, as these may still be live and present an electrocution hazard. Operate on the assumption that all downed power lines are live.
- When restoring electricity to buildings that have flooded, use extreme caution and consult with an electrician and your power provider. See the Alabama Cooperative Extension System Restoring Electrical Service website.
- Natural gas or liquid petroleum (LP) gas leaks can cause deadly explosions. Check for natural gas or LP gas leaks, and if a leak is suspected, turn off the gas, evacuate the area, and notify your gas company and local law enforcement. Tell employees to stay clear.

Ground water

After a flood event, ground water should be used with caution if contamination is suspected anywhere in the general vicinity.

Roads and buildings

- Before entering any buildings, check for levee breaches, rising or incoming water, and evidence of structural fire or damage.
- As soon as it is safe, call in the employees needed for inspection and clearing debris from roads. Cordon off areas that are unsafe.

Security

Watch your farm for unwelcome visitors like looters. Secure your equipment and farm entrances, and make sure your security cameras are operational.

Recordkeeping, documentation, and insurance

- Do not begin cleaning up or repairing damage until you have thoroughly documented the damage. Contact your crop insurance adjuster as soon as possible to decide on the best plan moving forward with potential damage to your crop. (See "Within a week following hurricane impacts" below regarding post-hurricane documentation.)
- If you have experienced flooding and have flood insurance through the FEMA National Flood Insurance Program, visit their How do I Start My Flood Claim? website for information about starting a claim.

Decisions on harvesting and draining of fields

Rice grain at the soft dough growth stage or earlier that was submerged in floodwaters over 2 days will not be suitable for human consumption due to the grain rotting. Scout fields and document the severity of grain damage to determine whether or not to harvest. A top priority should be draining off all flooded fields in which the rice grain can be harvested.

Within a week following hurricane impacts

Personal health and safety

Take care of yourself during recovery. Disasters and the recovery period afterward take a toll on human health. Disaster recovery takes a long time and can be very stressful. For guidance to help you through this difficult time, see:

- U.S. Department of Health and Human Services Disaster Mental Health Resources website
- North Carolina Cooperative Extension Tips for Handling Family Stress After Disasters

Communications

- The local supply/seed stores are often natural sources of information if the power is down and electronic communication is limited. In addition, radio stations have generators that allow them to transmit if their towers are not damaged.
- Once the area is safe and accessible for everyone after the hurricane, you may consider holding in-person meetings on an as-needed basis to inform and devise future plans.

Recovery assistance

Before beginning cleanup, talk with your insurance company and consult with disaster assistance program agents to learn about available programs, eligibility requirements, and application procedures. (See "Disaster assistance" below for more information about assistance programs.)

Documentation of damage

Many disaster assistance programs will become available after the disaster, perhaps even years later, and an operation can only receive assistance for damage that was documented. For instance, the Emergency Conservation Program (ECP), administered by FSA, can provide funding and technical assistance to rehabilitate farmland damaged by natural disasters. The work must be documented, and farmers must receive authorization from their local USDA office in advance.

Photos and video

- In the aftermath of a hurricane, take detailed notes of fields damaged with accompanying photographs of each field demonstrating the losses. This may be critically important later on. When inspecting fields, determine if a crop has enough fruit remaining to save or to be terminated at this point.
- Take photos or video first before beginning any cleanup or repairs. Photograph and take video of damaged crops and property, with written notes describing what is in the pictures and where they were taken. This "after" documentation will be used with your pre-hurricane, "before" documentation to clearly show your losses.

Drones

If you own and have a license to operate a UAV (i.e., drone), utilize it now to take aerial photographs of damage to your fields. Some local Extension offices might have access to drones and personnel with a drone pilot license to assist you.

Written records

Keep a notebook with you throughout the recovery period. Describe the work you did and record all expenses. Keep a running log of names and what was discussed during conversations with insurance, State, and Federal agency contacts to create a valuable, third-party record of your recovery efforts that can be used later as documentation for disaster assistance programs. You may not remember everything that was discussed at these meetings, so have a second person involved in the conversations if possible so that one can ask questions and the other can take notes.

Disaster assistance

- Communicate early and often with recovery assistance contacts. Check in with them throughout the recovery process. Note that assistance will vary from one hurricane to the next and one budget year to the next.
- Call your local FSA Office to report any losses or damages and inquire about available assistance programs, application procedures, and deadlines.
- Check in with your local Extension office, USDA agencies, and your State Department of Agriculture to see what assistance may be available following the hurricane.

- Consult the following resources:
  - FEMA Disaster Recovery Center Locator and Individual Assistance website to find the closest recovery center and other resources to assist you during your recovery
  - USDA Disaster Resource Center website for updates on emergency designation areas and available assistance programs
  - Farmers.gov Protection and Recovery website, including the five-step Disaster Assistance Discovery Tool to learn which USDA disaster assistance programs are available to assist you with your recovery
  - U.S. Department of Labor Disaster Unemployment Assistance website
- To learn more about USDA Disaster Assistance Programs that may be right for you, see:
  - Noninsured Crop Disaster Assistance Program (NAP)—FSA program that provides assistance for eligible farmers who suffer losses or are prevented from planting agricultural commodities that are not eligible for protection by Federal crop insurance
  - Emergency Farm Loans—FSA program that provides eligible farmers and ranchers low-interest loans to help them recover from production and physical losses
  - Disaster Set-Aside Program—FSA program that allows eligible FSA borrowers to skip an annual installment payment and move it to the end of the loan repayment period
  - Emergency Watershed Protection (EWP) Recovery Assistance—USDA Natural Resources Conservation Service (NRCS) program that provides financial and technical assistance to quickly address serious and long-lasting damage to infrastructure and land
  - EWP Floodplain Easement Program (EWPP-FPE)—NRCS program option for converting land to permanent easements for the purpose of improving flood plain management and reducing the threat to life and property
  - Environmental Quality Incentives Program (EQIP)—Year-round NRCS rehabilitation program with funding authority to provide financial assistance to repair and prevent excessive soil erosion caused or impacted by natural disasters
  - Emergency Conservation Program (ECP)—FSA program with technical assistance through NRCS that helps eligible farmers and ranchers repair damage to farmlands caused by natural disasters

Insurance claims process

Begin the insurance claims process (Federal, private, or both). Accurate losses of inventory and equipment may not be fully documented yet, but start the paperwork now since insurance claims can take months to resolve following hurricane events.

Infrastructure assessment and repairs

- Check all machinery to determine whether any equipment incurred damage by the hurricane and create a prioritized list of needed repairs.
- Check with your equipment manufacturer before starting any repairs since they are unlikely to stand behind any future problems if the you attempt to fix the current problem yourself.
- Gather quotes from qualified vendors to make repairs to facilities and equipment. Vendors are often overwhelmed in the months following a hurricane, so making contact soon after the hurricane is important for an expedient response.
- Contact your local grain terminals to determine whether or not they can be up and running and will be accepting grain once harvest can resume.
- Inspect all structures, including any personal grain bins, to be sure they were not damaged during the hurricane.
- Monitor fuel levels in backup generators and order additional fuel as needed.

Floodwater contamination

"Floodwater" refers to the overflow of external sources of water such as rivers or canals and not to direct precipitation that may pool in or near your fields or facilities.

Water supply

- All water should be tested prior to use for drinking, cleaning food contact surfaces or produce, or production activities. Ground water sources should be submitted for microbial and chemical testing, regardless of whether the wellhead was flooded, to ensure that the aquifer was not contaminated and to monitor wells for coliform contamination. This is particularly critical for drinking water and water that will come into contact with food. Some growers on municipal water systems, particularly those a substantial distance from the distribution center, may be advised to submit a microbial water test (after boil water advisories are no longer in effect) to verify the integrity of the distribution line to their farm or operation. If a surface water source was flooded, water should undergo microbial and chemical testing prior to reuse for production activities. If microbial levels exceed acceptable levels, a water treatment system (e.g., ultraviolet [UV] light, peroxyacetic acid) may need to be used until subsequent tests indicate the levels have stabilized.
- Leave contaminated crops in the field until that field dries, and then disc it under or burn it. Document any fields that cannot be harvested for insurance purposes.

- If you have a well, regardless of whether the wellhead was flooded, submit ground water samples for microbial and chemical testing to ensure that the aquifer was not contaminated. Also monitor wells for coliform contamination.

Crops

Soil contamination

- If floodwater entered your fields, consult with your State Department of Agriculture, and industry and/or local Extension specialist for guidance on how to proceed. The U.S. Food and Drug Administration (FDA) recommends determining the source of floodwaters (and likelihood that they carried human pathogens), letting fields dry before reworking, and testing for pathogens. Other specialists suggest a 30- to 60-day wait period to reduce bacterial contamination of soil. Chemical contamination may require a longer waiting period depending on the chemical and the level of contamination.
- Collect soil samples throughout the flooded portion of your fields and test them for known contaminants and general chemical contamination. For more information about soil testing, see:
  - Alabama Cooperative Extension System Submitting Samples for Soil Testing website
  - Clemson University Cooperative Extension Service Soil Testing website
  - Louisiana State University AgCenter Soil Testing and Plant Analysis Lab website
  - Mississippi State Extension Service Soil Testing website
  - North Carolina Department of Agriculture and Consumer Services Agronomic Services - Soil Testing website
  - University of Florida IFAS Extension Soil Testing website
  - University of Georgia College of Agricultural and Environmental Sciences Laboratory Services website
  - Virginia Tech Soil Testing Lab website
- See the FDA Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables.
- Take measures to avoid cross-contamination between flooded and nonflooded fields. Do not use equipment in a nonflooded field that was used in a flooded field unless it has been cleaned and sanitized.
- Restrict access to the affected area by delimiting a 30-foot buffer zone between the flooded area and adjacent fields to make sure that no cross-contamination happens to the non-flooded fields.
- Make sure that workers wear rubber boots and rubber or disposable gloves (not fabric gloves) when working in flooded fields. Discard disposable gloves after using them.

Crops for human consumption

- According to FDA regulations, if floodwater has contacted the edible portion of the crop, it is prohibited from entering the human food supply. Keep it separate from uncontaminated crops and dispose of it. This applies to surface crops; underground crops; crops with a hard skin or shell; grain, nuts, corn, and similar crops; and others. See the FDA:
  - Guidance for Industry: Evaluating the Safety of Flood-affected Food Crops for Human Consumption
  - Safety of Food and Animal Food Crops Affected by Hurricanes, Flooding, and Power Outages
- If floodwater was nearby but did not contact the edible portion of the crop, work with State regulators and FDA offices to determine whether the crop is considered adulterated.

Crops for animal consumption

If your crop was intended for animal food, see the FDA:

- Crops Harvested from Flooded Fields Intended for Animal Food: Questions and Answers
- Center for Veterinary Medicine (CVM) Updates website and scroll through the updates for resources to help animal food producers affected by hurricanes

Equipment

Thoroughly clean and sanitize all food contact equipment and food handling environments that may have become contaminated during the hurricane. First, physically remove dirt or debris with a brush or with water and detergent. Then, sanitize with an antimicrobial chemical to reduce microorganisms on the surface of the equipment.

Crop

Harvesting assessment/decisions

- Determine what can be salvaged and whether or not to harvest certain fields.
- Consult with crop insurance adjusters to determine what they will cover as far as grain quality.
- Contact your local Extension agent/specialist or crop consultant for second opinions if needed to determine the severity of damage.
- All fields should be evaluated for hurricane damage. Harvest least damaged fields that will not have an insurance claim first to maximize yield potential. Fields with potential insurance claims should not be harvested until after consulting with your insurance company. After receiving guidance from your insurance company, harvest fields with the greatest yield potential first.

Fungicide application
Fungicides should be used on undamaged rice according to State agronomic recommendations at the normal recommended timings when warranted. Contact your crop insurance company prior to applying any agricultural chemicals to a damaged rice crop. Fungicide applications to damaged rice may not be warranted. Contact your local Extension agent/specialist and crop consultant to determine if applications are economically viable.

Diseases, pests, and weeds
- Diseases may develop on the rice panicles that have been submerged in the floodwater for prolonged periods of time.
- If your fields have been flooded with off-farm water sources, be aware of weed seeds that have not traditionally been a problem on your farm but could have been carried in, and be aware of the management implications from this in subsequent seasons.

Potential salt damage
- Higher soil salt levels can accompany hurricane surges and cause severe damage and dieback to your crops. Rice is classified as sensitive to saltwater, and yields will decrease with elevated salt levels.
- Soil tests should be taken to determine the extent of the potential salt contamination. Your State soil testing laboratory should provide analysis that determines the Total Soluble Salts (TSS) content and the Sodium Absorption Ratio (SAR) of your soil. These test results can provide estimates of potential salt damage to current and future rice crops.
- If surface water is being used to irrigate rice, the salinity content of that water should be determined prior to its use for irrigation.
- Contact your local Extension office if you suspect your crops have been damaged by saltwater.

Within a month after hurricane impacts

Recovery assistance and insurance claims

- After many natural disasters that result in widespread damage, additional programs often become available to aid with agricultural losses. These programs are not guaranteed, however, and are generally handled on a case-by-case basis depending on the hurricane's impact. In addition, some programs require additional processing time for a special appropriation from the U.S. Congress and Presidential approval.
- While a special allocation may not be immediately available, it is important to document losses and to illustrate to your legislators the impact of the hurricane on your operation. This information will help promote policy decisions and additional allocations that may become available.

- Continue to follow up on the insurance claims process. Begin filing for any additional State or Federal disaster assistance programs for hurricane recovery.
- See the USDA Disaster Resource Center website for updated information about FEMA aid and other disaster programs.
- Continue to document everything and keep a record of conversations with agency contacts. This creates a valuable, third-party record of your recovery efforts that may be used later as documentation for assistance programs.

Organic certification

If your farm is organic, it is important to consider how the hurricane impacts may affect your certification. Temporary variances from some organic practices are possible, so contact your certifier to determine whether your practices qualify. It is most important to report prohibited substances that may have infiltrated your farm during the hurricane.

Infrastructure and equipment

- Continue to gather quotes from qualified vendors to make repairs to facilities and equipment. Vendors are often overwhelmed in the months following a hurricane, so making contact soon after the hurricane is important for an expedient response.
- Monitor buildings for water damage or mold development, and monitor wells for coliform bacteria.
- Continue to refill fuel tanks and check backup generators until full power is restored.
- Perform general and preventative maintenance on any equipment that was flooded. Keep all receipts for parts and labor as well as a list of any equipment that is determined to be a total loss.
- Examine drainage ditches and canals to determine to what extent they were silted in by floodwaters and need repair and cleaning of debris. Clean and/or repair drainage ditches onsite.

Crop concerns

- Any fields where damage to the grain may have occurred yet are still able to be harvested should be prioritized from the worst to the best condition to ensure minimal profit losses.
- Flooded fields cannot be harvested, but the land could potentially be temporarily leased to hunters.

APPENDIX

Farm Emergency Plan

Hurricane preparedness can have a direct effect on your farm's profitability and long-term survival. For agricultural operations in hurricane-vulnerable regions, it is critical to have a Farm Emergency Plan in place outlining key tasks and different people's roles and responsibilities as you brace for the hurricane. Your Farm Emergency Plan can save valuable time in a chaotic situation when multiple challenges clamor for immediate attention, helping you prioritize your actions and recover from the hurricane as efficiently as possible.

Use this sample plan to customize for your operation. Preparation for these tasks—putting the systems in place—is described in the main guide (see "Emergency planning" in the Building a Resilient Operation section). Though there is some overlap with the tasks listed in the Short-Term Preparedness section, this sample plan is intended to be a document you can use during an actual emergency.

Before the hurricane

Tracking the hurricane

Use your hurricane tracking app. The NOAA National Hurricane Center website is a good source for keeping up to date on the latest hurricane activities. Learn more about emergency alerts at the Ready.gov Emergency Alerts website.

Emergency Response Team

- Gather the members of your farm's Emergency Response Team, who have been thoroughly trained in their respective tasks and are knowledgeable about the hazards found on the farm.
- Review the chain of command and individuals' primary and secondary roles and responsibilities.
- Discuss modes of communication as well as alternatives in case any communication channels become unusable during or after the hurricane.
- Review your farm's Emergency Contacts List.

Employees' status and location

Review procedures to account for all employees after an emergency evacuation. Determine who will evacuate and who (if anyone) will stay during the hurricane. For those who evacuate, establish a schedule for checking in after the hurricane. For those who stay, be sure they have safe lodging and sufficient food and water and establish a clear plan for them to check in.

Maps and emergency escape routes

Using the map of your farm with all buildings and contents, review emergency escape routes and hurricane preparation procedures for each building, facility, and area of the operation.

Emergency equipment and supplies

Locate the following equipment and supplies:

- Emergency medical supplies
- Raincoats and boots
- Weather-proofing supplies such as tarps and sandbags
- Fencing supplies
- Plumbing supplies
- Lumber, construction tools, nails, and ropes
- Portable lights, batteries, and battery-powered or hand-crank radios

Food, water, and cash

- Make sure there is a 2-week supply of dry and canned food and drinking water (at least ½ gallon per person per day) stored onsite if personnel will be staying onsite.
- Secure cash reserves to use for purchasing supplies after the hurricane.

Facility security

- Ensure that important documents are in a safe, dry place.
- Check on the security of roofing and siding materials and windows and doors, and make sure all other building components are tied down securely.
- Secure outside objects around your farm, so that they don't blow away or become hazardous projectiles.
- Protect greenhouses (if applicable).
- Check drainage ditches and culverts around your facilities for debris.
- Pump down all water from ditches.

Equipment

- Ensure that all emergency equipment is ready (chainsaws, compressors, heavy machinery, etc.).
- Move all non-critical farm equipment to secure locations or higher elevations.
- Move pesticides, herbicides, and fertilizers to a secure place, on high ground if possible.
- Make sure that farm equipment you will need after the hurricane, such as tractors with front-end loaders or skid-steer loaders, is fully fueled.
- Be sure your backup generators are fully operational. Fill the fuel tanks and portable fuel storage tanks.

Fuel

- Make sure you have a minimum of a 2-week supply of diesel and gas. Be sure the supplier understands how much you use daily and that it is necessary for farm operations. If secure storage facilities are available onsite, arrange for fuel deliveries several days prior to the expected hurricane impact. Consider fuel needs for tractors, generators, and farm vehicles.
- Any fuel stored onsite poses a contamination risk if storage tanks cannot be adequately protected from anticipated flooding. Move to higher ground or secure in place.
- Since fuel may be unavailable if service stations have no power, make sure portable fuel storage tanks are full.
- Ensure that tanks containing fuel, fertilizer, and other liquids are kept full and are tied down.

Backup generators

- Retrieve backup generators and fuel and place them where needed.
- Connect generators to critical electrical loads as outlined in your Backup Power Plan.

Electricity and gas shutdown

[Outline the shutdown procedures for electricity and gas, according to instructions you are given by your utilities and other experts.]

[Outline the shutdown procedures for specific equipment.]

Service or equipment to be shut down	Procedures for shutdown

Crop

- Harvest all mature rice fields prior to hurricane impact.
- Pre-harvest desiccants like sodium chlorate can be used to reduce grain moisture and speed harvest. Do not desiccate fields that cannot be harvested before hurricane arrival.
- Take photos and video to document all non-harvested crops and estimate yield potential.
- Keep documentation in a secure location.

Immediately after the hurricane

Safety

- Make safety your first priority. Do not rush back into a facility until you are sure it is safe. Use extreme caution due to the potentially injurious situations presented by weakened trees and damaged structures, equipment, and electrical and gas systems.
- Continue to watch the weather forecast. Are waters still forecast to rise more than they are now? Some floodwaters peak up to a week after the hurricane.

Electricity and gas

- Avoid downed power lines as these may still be live and present an electrocution hazard. Operate on the assumption that all downed power lines are live. Remember that a downed power line on a fence may energize the fence.
- When restoring electricity to buildings that have flooded, use extreme caution and consult with an electrician and your power provider. See the Alabama Cooperative Extension System Restoring Electrical Service website.
- Natural gas or liquid petroleum (LP) gas leaks can cause deadly explosions. Check for natural gas or LP gas leaks, and if a leak is suspected, turn off the main property gas line, evacuate the area, and notify your gas company and the authorities. Tell employees to stay clear.

Roads and buildings

- Before entering any buildings, check for levee breaches, rising or incoming water, and evidence of structural fire or damage.
- As soon as it is safe, call in the employees needed for inspection and clearing debris from roads.
- Cordon off areas that are unsafe.

Security

Watch your farm for unwelcome visitors like looters. Secure your equipment and farm entrances, and make sure your security cameras are operational.

Insurance and documentation

- Do not begin cleaning up or repairing damage until you have thoroughly documented the damage. Contact your crop insurance adjuster as soon as possible to decide on the best plan for moving forward with potential damage assessment, cleanup, and repair.
- If you have experienced flooding and have flood insurance through the FEMA National Flood Insurance Program, see their How do I Start My Flood Claim? website for information about starting a claim.

Emergency Contacts List

You may customize this for your operation. Delete items that do not pertain to your commodity or location and add companies or organizations specific to your commodity.

Individuals

Name(s)	Role(s)	Phone number(s)	Notes
	Owner(s)		
	Members of the Emergency Response Team		
	Other key employees or managers		

Emergency Services

Organization	Name(s)	Phone number(s)	Notes
Emergency medical responders			
Hospitals			
Fire department			
Law enforcement			
Emergency management agency			

Utilities, Roads, and Trees

Organization	Name(s)	Phone number(s)	Notes
Electric utility or cooperative			
Natural gas utility			
Water utility			
County road department or State Department of Transportation			

Insurance Companies

Organization	Name(s)	Phone number(s)	Notes
Commodity insurance companies			

Contractors and Suppliers

Organization	Name(s)	Phone number(s)	Notes
Electrical contractor			
Plumbing contractor			
Mechanic			
Fuel supplier			
Generator servicing			
Equipment dealer			
Equipment rental company (emergency generators, lifts, etc.)			

Federal, State, and County Organizations

Organization	Names(s)	Phone number(s)	Notes
State Department of Agriculture			
Local Extension office			
County emergency management agency			
County Health Department			
USDA Farm Service Agency			
USDA Natural Resources Conservation Service (NRCS)			
U.S. DHS Federal Emergency Management Agency (FEMA)			

Initial Site Planning

Considerations when deciding on a new location to establish or purchase farmland

Hurricane risk

No model or long-term forecast can determine when and where hurricanes will strike during any given hurricane season; however, return period maps have been developed to give a good indication of relative hurricane risk. Return period maps display the number of years between hurricane events and help quantify the vulnerability of coastal areas to hurricanes. To learn more about your area's hurricane return period, see the NOAA What are the chances a hurricane will hit my home? website.

It is important to remember that return period maps represent a long-term average and that even if the average return period for a hurricane is 25 years, hurricanes can still occur at one spot on successive years or even in the same year. It is also important to understand that while most data show only where hurricanes have made landfall, hurricanes can also move hundreds of miles inland causing significant wind damage and flooding.

Use NOAA's Historical Hurricane Tracks tool for a map and dates of hurricanes that have impacted your area in the past 150 years. The timing and track of historic hurricanes may be different than those for future hurricanes and should be used with caution.

Site characteristics

Topography

- When planning for long-term preparedness, evaluate a potential site for your operations with an eye toward reducing the risk of surface flooding or coastal storm surge. It is unlikely that all risks can be avoided. However, the negative considerations of an elevated open site are often less than those of low-lying areas susceptible to flooding.
- If possible, choose a site that has higher elevation areas so that farm equipment can be easily moved to avoid flooding.

Flood risk and storm surge

- Assess historic and predictable patterns of flooding to determine which areas are at the highest risk of damage during extreme weather.
- Consult the following Federal and State resources for estimating flood risk:
  - FEMA Flood Map Service Center website (for official flood maps)
  - Alabama Department of Economic and Community Affairs Flood Map website
  - Florida residents should contact their county government
  - Georgia Department of Natural Resources Flood Map Program website
  - Louisiana State University AgCenter FloodMaps Portal website
  - Mississippi Emergency Management Agency Floodplain Management website
  - North Carolina Flood Risk Information System website
  - South Carolina Department of Natural Resources Flood Mitigation Program website
  - Virginia Department of Conservation and Recreation Flood Risk Information System website
- In some areas, storm surge can cause flooding many miles inland from the coast. View the NOAA National Storm Surge Hazard Map to assess your risk and plan a safe evacuation route.

Roads and utilities

- Choose a site with good roads that will allow multiple escape routes when evacuating from hurricanes and tropical storms that can cause rising floodwaters, storm surge, or downed trees.
- Plan to have utilities and other critical infrastructure permanently constructed on higher ground to avoid equipment and infrastructure damage during flooding.
- Search for areas with resilient electrical grids. Avoid relatively isolated sites with limited access to electrical utilities.

Natural windbreaks

If possible, choose a site with natural windbreaks, such as wooded areas surrounding the field.

Resource Links

Extension, State, and Federal websites

Alabama

Extension Websites	Purpose
Extension Office Locator*	Contact information for Extension agents in your county
Disaster*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*Alabama Cooperative Extension System

State Websites	Purpose
Alabama Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
Alabama Department of Agriculture and Industries	Main source for answers to your agriculture-related questions
Alabama Emergency Management Agency	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes

Florida

Extension Websites	Purpose
Rice*	Resources to help farmers improve rice management and productivity
Extension Office Locator*	Contact information for Extension agents in your county
Disaster Preparation and Recovery*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*University of Florida IFAS Extension

State Websites	Purpose
Florida Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
Florida Department of Agriculture and Consumer Services	Main source for answers to your agriculture-related questions
Florida Division of Emergency Management	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes
Florida Emergency Response Team	Disaster assistance resources for residents

Georgia

Extension Websites	Purpose
Extension Office Locator*	Contact information for Extension agents in your county
Emergency Resources*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*University of Georgia Cooperative Extension

State Websites	Purpose
Georgia Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
Georgia Department of Agriculture	Main source for answers to your agriculture-related questions
Georgia Emergecy Management and Homeland Security Agency	Disaster assistance resources for residents

Louisiana

Extension Websites	Purpose
Rice*	Resources to help farmers improve rice management and productivity
Extension Office Locator*	Contact information for Extension agents in your parish
Disaster Information*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*Louisiana State University AgCenter

State Websites	Purpose
Louisiana Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
Louisiana Department of Agriculture and Forestry	Main source for answers to your agriculture-related questions
Louisiana Governor's Office of Homeland Security and Emergency Preparedness	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes
Emergency Louisiana	Disaster assistance resources for residents

Mississippi

Extension Websites	Purpose
Rice*	Resources to help farmers improve rice management and productivity
Extension Office Locator*	Contact information for Extension agents in your county
Disaster Preparedness*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*Mississippi State University Extension Service

State Websites	Purpose
Mississippi Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
Mississippi Department of Agriculture and Commerce	Main source for answers to your agriculture-related questions
Mississippi Emergency Management Agency	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes

North Carolina

Extension Websites	Purpose
Extension Office Locator*	Contact information for Extension agents in your county
Disaster Preparedness and Recovery*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*North Carolina Cooperative Extension

State Websites	Purpose
North Carolina Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
North Carolina Department of Agriculture and Consumer Services	Main source for answers to your agriculture-related questions
North Carolina Department of Public Safety Emergency Management	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes

South Carolina

Extension Websites	Purpose
Extension Office Locator*	Contact information for Extension agents in your county
Emergency Preparedness and Post Hurricane Impact Resources*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*Clemson University Cooperative Extension Service

State Websites	Purpose
South Carolina Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
South Carolina Department of Agriculture	Main source for answers to your agriculture-related questions
South Carolina Emergency Management Division	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes
Team South Carolina Emergency Response	Disaster assistance resources for residents

Virginia

Extension Websites	Purpose
Extension Office Locator*	Contact information for Extension agents in your county
Disaster Education Network*	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

*Virginia Cooperative Extension

State Websites	Purpose
Virginia Governor's Office	News and information from the Governor, including evacuation orders and emergency declarations
Virginia Department of Agriculture and Consumer Services	Main source for answers to your agriculture-related questions
Virginia Department of Emergency Management	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes

State (FSA and NRCS)

State FSA Websites	Purpose
USDA FSA Alabama	Focus on State FSA resources, including financial and technical information sharing
USDA FSA Florida	
USDA FSA Georgia	
USDA FSA Louisiana	
USDA FSA Mississippi	
USDA FSA North Carolina	
USDA FSA South Carolina	
USDA FSA Virginia	

State NRCS Websites	Purpose
USDA NRCS Alabama	Focus on State NRCS resources, including financial and technical information sharing
USDA NRCS Florida	
USDA NRCS Georgia	
USDA NRCS Louisiana	
USDA NRCS Mississippi	
USDA NRCS North Carolina	
USDA NRCS South Carolina	
USDA NRCS Virginia	

Federal

Federal Websites	Purpose
Ready.gov Hurricanes	Resources to help individuals prepare for and recover from hurricanes
U.S. Department of Agriculture (USDA)	News and announcements related to agricultural commodities and disaster recovery programs
USDA Disaster Resource Center	Resources to help you build long-term resilience to and recover from hurricanes and other disasters
USDA Office Locator	Contact information for USDA offices in your county, including FSA, NRCS, Rural Development, and Conservation Districts
USDA Farm Service Agency (FSA)	Assistance with securing loans, receiving payments, and applying for disaster relief programs
USDA Natural Resources Conservation Service (NRCS)	Financial and technical assistance for farmers, ranchers, and forest landowners
USDA Risk Management Agency (RMA)	Assistance with Federal crop insurance and managing risk
USDA RMA Agent Locator	Contact information for local RMA offices in your county
U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA)	Resources to see historical, current, and predicted hurricane activity and warnings in your area
NOAA National Hurricane Center	Current and forecasted tropical cyclone activity, educational resources, and advisory warnings for your area of interest
NOAA National Weather Service Weather-Ready Nation	Latest news, information, and technology to enable informed decision making before, during, and after a hurricane strikes
U.S. Department of Homeland Security Federal Emergency Management Agency (FEMA)	News and information to help you prepare for and recover from hurricanes and other disasters

Golden, Bobby; Harrell, Dustin; Mansour, Jeffrey. 2021. Rice producers guide. Gen. Tech. Rep. SRS-260p. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 48 p. https://doi.org/10.2737/SRS-GTR-260p. (McNulty, Steven; Gavazzi, Michael, eds. Hurricane preparation and recovery in the Southeastern United States).

This is 1 of 23 guides to help Southeastern U.S. producers of economically important agricultural commodities build resilience to, prepare for, and recover from hurricane impacts. All guides can be found on the USDA Southeast Climate Hub Hurricane Preparation and Recovery Commodity Guides website.

USDA Southeast Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

https://www.climatehubs.usda.gov/hubs/southeast/

To access this guide, as well as those produced for other commodities, please visit:
https://www.climatehubs.usda.gov/hubs/southeast/topics/

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