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## Damages to Louisiana Agriculture from Natural Disasters

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Losses caused by natural disasters such as drought, excessive rains or hurricanes have had dramatic impacts on agricultural revenue and costs and the well-being of humans and animals. Losses of capital assets and other farm infrastructure have had far-reaching effects on economic viability. Louisiana State University Agricultural Center (LSU AgCenter) personnel are uniquely positioned and often called upon to assess the economic damage resulting after the occurrence of such natural disasters.

Unfortunately, Louisiana has had its share of natural disasters over the last several years. Since 2000, assessments of the physical damage sustained to the agricultural industry have been conducted and economic impacts have been estimated in eight out of 12 years for four major hurricanes, two tropical storms, three incidences of prolonged drought conditions, and one summer of excessive rains. The economic impacts associated with natural disasters have been estimated at nearly \$5 billion to the Louisiana's agriculture, aquaculture, and fisheries industries.

While similarities can be found across agricultural disasters, the one thing that became increasingly evident over the years is that each disaster event has its own unique set of issues and impacts depending on the magnitude and duration of the event. In some cases, as with drought conditions, the impact tends to focus on lost revenue due to crop failure and lower productivity. In others, as was the case with the 2005 hurricanes, the number and extent of the impacts can be much more varied and challenging. Identifying these impacts and potential effects through assessments of physical and quality losses and estimates of resulting economic damages is important to policy makers, government

**Table 1:** Estimated Impacts to the Louisiana Agricultural, Aquacultural and Fisheries Industries from Natural Disasters, 2000 - 2011

Year	Event	Estimated Economic Impact (Million Dollars)	Estimated Aggregate Louisiana Farm Gate Value <sup>1</sup> (Million Dollars)	Impact As a Percentage of Farm Gate Value (Percent)
2000	Drought	\$571	\$4,039	14.14%
2001	Tropical Storm Allison	\$225	\$3,900	5.77%
2002	Tropical Storm Isadore and Hurricane Lili	\$540	\$3,490	15.47%
2004	Early Season Excessive Rains Followed By Drought	\$232	\$5,035	4.61%
2005	Hurricanes Katrina and Rita	\$1,500	\$4,685	32.02%
2008	Hurricanes Gustav and Ike	\$1,100	\$5,320	20.68%
2009	Excessive Rains at Harvest	\$363	\$4,855	7.48%
2011	Mississippi River Flooding and Drought	\$436	\$6,086	7.16%
Total		\$4,967	\$37,410	13.28%

Source: LSU AgCenter, Department of Agricultural Economics and Agribusiness, Various issues of economic impact reports

<sup>1</sup>The estimated combined farm gate value of plant, animal, and fisheries enterprises in Louisiana.

agencies, and researchers in targeting assistance. Since these assessments are often requested of Extension with very short timelines, having a set of strategic procedures has proven to be necessary to meet deadlines and still maintain the reliability and accuracy of the assessment.

Damage assessment requests are typically made by government agencies and private organizations after a natural disaster. For Louisiana, these requests usually come to the Extension Service. The one common theme in the requests is that they all require the provision of estimates in a very short time, often less than a month.

The desire to respond quickly to these requests can compromise the ability to adequately and accurately depict the nature of the damage. Experience has shown that damage estimates calculated in haste can be significantly overstated. Overestimated damage does however provide additional political leverage to increase the money received from federal disaster programs (Kliesen, 1994). As such, there is a delicate balance that must be navigated between the timeliness and accuracy of a damage assessment.

Historically, agricultural damage assessments have been used to provide policy makers with a basis for seeking disaster assistance not provided in traditional farm policy legislation. The need to understand the depth and breadth of the impacts is critical to effectively assist the agricultural industry in formulating a plan to respond to and recover from a natural disaster. While the agricultural industry can experience multiple impacts, many such as crop failures, yield reductions, or liquidation of livestock typically have an effect of a year or less. Other impacts such as saltwater intrusion or coastal erosion resulting from hurricanes are longer run in nature and may need more comprehensive policy solutions to restore agricultural productivity or improve societal welfare. However, Extension's initial role in

the time given is generally to come up with an assessment of more immediate agricultural damages.

### **Challenges in Determining Agricultural Damage**

The short timeframe often faced when developing damage estimates requires having a strategic plan or system for conducting an assessment. During the first half of the previous decade, damage assessments in Louisiana focused predominately on revenue losses associated with drought and excessive rainfall. Given the direct nature of these impacts, little thought was given to developing a strategic plan for addressing more complex issues. When two major hurricanes made landfall in Louisiana, one in 2005 and then again in 2008, this informal approach to developing damage assessments proved to be inadequate to address the numerous impacts associated with the storms within a two to three week time frame that was being requested by policy makers.

The sheer magnitude of the 2005 and 2008 hurricanes showed the need for a system that would allow for an effective flow of information from the parish (county) level to the state level. Information on the physical damages collected at the parish (county) level had to flow to the state level where it was collected, summarized, and used in developing economic impact estimates. Variability in data collection made it extremely difficult to quickly and accurately develop statewide economic impact estimates. It was found that having a system that provided guidelines to parish (county) level personnel in conducting the physical damage assessment and which provided uniformity in the type and amount of information being collected, increased not only the timeliness of the assessment, but also provided an avenue to increase the detail and reliability of the estimates.

It also became apparent during the hurricanes that decisions had to

be made on what issues could and could not be adequately addressed. Unlike direct impacts, indirect impacts to rural economies were found to be more difficult to identify and often evolve more slowly over time. Also, depending on the severity of the storm, economic linkages used in the creation of an industry multiplier for a region may no longer exist making them invalid for assessment purposes (Guidry, Caffey, and Fannin, 2008; Fannin and Guidry, 2010).

### **Evaluating Agricultural Damage in Louisiana**

Louisiana economic assessments of natural disasters were limited to estimating short-term direct economic damage to agricultural commodities, aquaculture, fisheries and agricultural industries. This was mainly because LSU Agricultural Center personnel had the greatest knowledge and expertise in these areas.

A step towards a strategic set of procedures to evaluate damages was to develop a survey through which information could be collected and organized to be used in developing direct economic impacts. This involved a collaborative effort including all levels of the Cooperative Extension Service.

Once evidence emerged that significant damage had occurred over a large enough geographic area to warrant an economic assessment, an initial standardized survey was sent to parish (county) level agricultural agents and state-level commodity production specialists to get an overview of the physical damage experienced. This survey was typically limited to gathering information regarding yield losses and impacts on major commodities affected by the natural disaster.

To ensure that economic damage assessments reflected a uniform consideration of losses, multi-year impacts were qualitatively identified and discussed but were not included in the

economic damage totals. Indirect impact issues were also identified but not included in the economic damage totals provided by the assessment report.

The initial survey sent to parish (county) level and commodity production specialists provided a standardized approach for identifying commodities, acres, and the expected yield impacts. Yield impacts were requested on a percentage basis rather than per bushel or per pound basis. This was done to prevent the potential for over-estimation based on overly optimistic predisaster yield potential. Past experiences suggest that overly optimistic predisaster yield estimates can lead to overestimating yield impacts associated with the disaster.

The information collected from these surveys are combined with published data to develop economic estimates of losses. Where possible, U.S. Department of Agriculture's National Agricultural Statistics Service (NASS) yield data is used to develop five year average yields that serve as a proxy for predisaster yields. Likewise, estimates from the World Agricultural Outlook Board's *World Agricultural Supply and Demand Estimates* report are used to establish baselines for commodity market prices used in determining revenue levels. With the number of assumptions that must be made to develop damage estimates within a short time frame and the inherently subjective nature of physical loss assessments, the ability to supplement assessments with data that is widely recognized and accepted helps to improve the accuracy and credibility of estimates.

Louisiana is fortunate to have an annual publication developed by the Department of Agricultural Economics and Agribusiness that provides acreage, yield, and price data by parish (county) for every commercially grown commodity in the state. The *Louisiana Summary: Agriculture and Natural Resources* is a cooperative effort with parish and state level Extension personnel and has become

one of the most frequently used and referenced publications developed by the LSU AgCenter. If available, these types of additional data sources can be used to supplement data from USDA to add accuracy and credibility to damage assessments.

While an initial survey can be accomplished and a damage assessment developed within two to three weeks of the disaster event, there is generally a need for one or multiple subsequent assessments. This is particularly true depending on the time of the year that the natural disaster occurs. Disaster events that occur early in the growing season can prove extremely difficult in assessing yield impacts. With several weeks or months before the commodity is to be harvested, weather conditions that follow the disaster event can have as much or more impact on the final yield. As such, a second assessment is typically conducted at or around harvest time.

A second survey is sent to parish (county) Extension personnel which requests much more detailed information for all impacted commodities on a wider array of issues. This survey asks for updated estimates for acreage and yield losses and for other information that can be used to develop impacts such as increased production costs and infrastructure losses. Again, this information is combined with USDA data along with other published data such as estimated commodity production costs and returns found in enterprise budgets developed by the LSU AgCenter. Once this information is collected and tabulated, it is sent to commodity production specialists that help to verify and validate the numbers.

### **Crop Related Impacts**

Drought or excessive rain conditions can result in fields going unharvested but, more typically, will result in some percentage yield reduction and quality loss. Information is gathered on acreage that experiences a total

yield loss as well as on acreage that experiences partial yield loss.

Events that prevent harvest in a timely fashion can often cause lower grain quality and test weights in feed grain crops and lower fiber quality in cotton. Given that estimates for quality losses are generally much more subjective than yield loss estimates, the survey only requests information on the number of acres that would be expected to have quality losses. This information is combined with information obtained from a survey of commodity buyers throughout the state asking for the range in price discounts being seen for quality damage. Once the average price discount is determined, it is used to adjust the assumed market price for the commodity to determine the economic impact of quality losses from the natural disaster. An important point here is that the price discounts for quality losses are only applied to those acres identified from the survey at the reduced yield levels. Since the yield loss is accounted for, applying a price discount to "normal" or predisaster yields would result in overestimating potential impacts.

Depending on when a disaster impacts the agricultural industry, prevented plantings can also be experienced. Excessive drought or rain at planting can push planting beyond recommended time frames. In these instances, surveys provide estimates on the number of acres that were not able to be planted to the intended commodity and were not subsequently planted to any other commodity. In this case, the impact is defined as a loss of net revenue to the producer. LSU AgCenter enterprise budgets are used to estimate net returns that would have been expected under normal conditions and are used to determine the economic impact associated with prevented planted acres.

Another issue that is typical of many of the disasters faced in Louisiana is increased production costs.

Increased production costs are more typical with excessive rain events at harvest which reduce harvest efficiency and increase harvest time. However, in the 2011 drought, increased irrigation demand was a significant impact faced by many agricultural producers. Surveys provide information on acreages impacted by increased production costs as well as other information needed to estimate the economic impact of these increased costs.

### **Livestock Related Impacts**

Assessing economic damages resulting from natural disasters to a livestock industry requires a different approach than for row crops. Yield losses from hay production are accounted for in a similar manner to crop damage estimates as hay production may suffer a reduction in yield, but also a decrease in the number of annual cuttings. Prices from USDA AMS' Market News Service are used to calculate an economic estimate of the total decrease in hay production. Hay prices are also important to value the lost grazing potential associated with pastures. Parish (county) Extension agents provide state specialists with information on the number of acres and days that grazing was impacted which are then used to place an economic value on the lost grazing potential through increased feeding of purchased hay. Losses are assumed using typical stocking rates and consumption of forages per cow.

Reduced grazing potential and hay production are only two aspects of livestock disaster estimates. Direct impacts on livestock production are also assessed through forced liquidation of breeding stock above normal culling rates. The value of those breeding stock which are forced to be liquidated is calculated, but this only accounts for part of the economic loss. Should producers who cull above normal rates wish to replenish their breeding stock, they typically have to

pay higher prices than what the animal sold for. The difference per head between the replacement value and the cull value is used to determine the economic estimate for forced liquidation of breeding stock. Higher than normal mortality is also accounted for in calculated economic damages for all classes of cattle.

The drought that Louisiana experienced in 2011 added a new dimension to calculation of livestock damage estimates. Previous experiences with natural disasters had not led to accounting for early weaning of calves to help maintain available pasture for mature females. Extension agents provided state specialists with estimates on the number of calves that were early weaned and the average difference in sale weight due to drought compared to normal weaning weights. Using information from USDA AMS' Market News Service and selected auction markets in Louisiana, the reduced value of calves sold was calculated.

As in other states, one challenge that has arisen in developing economic damages for the cattle industry has been a lack of price information. Market News Service cattle prices for Louisiana have not been available since September 2010. The Market News Service is a partnership between USDA AMS and participating states to document prices and transaction volumes of agricultural commodities. Limited and sporadic pricing information is available from selected auction markets in Louisiana through the Louisiana Department of Agriculture and Forestry's (LDAF) website. However, available prices are self-reported by the sale barns and may not cover the bulk of sales as with the Market News Service. Additionally, those barns that self-report prices through the LDAF website do not offer unbiased, third party verification which USDA AMS' Market News Service provides. The result of using prices from biased sources

is economic damage estimates that are less reliable than for other agricultural commodities. As sale barns infrequently post prices, important information on the number of head liquidated pre- and post-disaster and price of animals sold is lost.

### **Issues and Lessons Learned**

While conducting damage assessments can be viewed as an inexact science, years of conducting assessments in Louisiana have provided several lessons which might be applied in other states. First and foremost, a strategic plan for conducting and implementing the assessment is critical to guard against potential biases as well as the temptation to overestimate damages. Also, a plan is critical to be able to address in as accurate manner as possible policy makers, industry leaders, and others with a vested interest in the assessment. Since moving toward a standardized, strategic approach after the 2005 hurricanes, the ability to quickly respond to Louisiana agricultural damage assessment requests has improved as has the level of detail and the number of critical issues that are able to be addressed. The strategic survey approach has accomplished this by creating an environment in which all personnel involved have a clearer understanding of why and how the assessment will be conducted.

Every attempt is made to balance accuracy with timeliness. Credibility of the disaster estimates is improved by limiting initial assessments to major commodities directly impacted and by supplementing assessments with published data from respected sources. Follow-up can be done at a later time to conduct a more detailed, comprehensive assessment of the impacts of a natural disaster. However, in the future proposals for reducing data collected and the number of reports provided by the USDA and by state agencies may make use of published data more limited.



Another lesson learned is that the timing of the natural disaster will likely impact the accuracy of assessments. If a natural disaster event is experienced during the early part of the growing season, the exact nature of the impact on yield and quality will not likely be known for several weeks or months until harvest is completed. As a result, initial estimates need to err on the conservative side. Impacts will likely look worst shortly after an event. Taking an aggressive stance in estimating damage at that time, particularly when harvest is still several weeks away can lead to over estimation. In addition, crops are remarkably resilient and often can and will recover considerably following a natural disaster particularly if ideal weather conditions follow the event.

Impacts on commodities from natural disaster can vary significantly from disaster to disaster and within a disaster event. For some commodities, the impact may be limited to yield losses while others may have experienced yield losses in addition to quality losses and increased production costs. Lumping all of the impacts into one single damage estimate may miss the fact that a commodity was faced with multiple issues and impacts. Where possible, assessments conducted by the LSU AgCenter are categorized by major impacts on specific commodities such as yield reduction, quality losses and increased production costs.

The same shortcoming of lumping different types of impacts into a single damage estimate can be found by combining both short-term and longer-term impacts. Potential multi-year impacts that seem evident during the current production year can change drastically in a few months as weather conditions change. For example, during the 2005 hurricanes one of the multiyear impacts expected was a reduction in yields on acreage that had been impacted by storm surge. However, the full nature of that

impact depended on weather conditions in the subsequent year. A year with average to above average rainfall would likely mitigate the impacts of salt levels deposited by the storm surge. Including estimates in the assessment for the 2005 hurricanes on the potential of storm surge on subsequent production would have brought in an additional level of error to the assessment. To prevent this type of error, assessments by the LSU AgCenter limit estimates of economic damages to current year disasters.

Finally, as noted in the discussion of valuing the sale of breeding stock and its replacement cost, consideration is given to the values of stock and flows for capital assets. Sales of capital assets such as breeding stock will result in higher farm incomes in the year of a natural disaster, but farm incomes will decline in subsequent years unless that stock asset is replaced. Estimates attempt to account for the increased cost incurred by agricultural producers to replace capital assets where appropriate. While producers have an incentive to replace capital assets and restore production as quickly as possible following a disaster, each disaster is different in nature. As a result, it can be difficult to accurately determine the true length of the disaster's impact and how long it will take an operation to return to normal.

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