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Decision-Making Process for Flood-Damaged Crops due to Hurricane Florence

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Hurricane Florence recently caused massive flooding in North Carolina (NC) and South Carolina (SC) that resulted in flood-damaged crops. This brief aims to document the important decisions farmers need to consider when dealing with flood-damaged crop.

Flood Water vs. Pooled Water. In order to make the appropriate actions when planted crops are affected by floods, one needs to first understand the difference between flood waters and pooled waters. Flood water can be distinguished from pooled water based on the guidance provided by the US Food and Drug Administration (FDA): *"Flooding is the flowing or overflowing of a field with water outside a grower's control. Pooled water (e.g., after rainfall) that is not reasonably likely to cause contamination of the edible portions of fresh produce is not considered flooding."* This language implies that pooled water should simply be water from rainfall that has not been contaminated with other water sources outside the grower's control (like lakes, rivers, or lagoons). In contrast, if the water that came into contact with the crop is from (or partly from) bodies of water not in the farmer's control, then this water is considered flood water.

The FDA's recommendation when crops are exposed to floodwaters is as follows *"If the edible portion of a crop is exposed to flood waters, it is considered adulterated under section 402(a)(4)(21 U.S.C. 342(a)(4)) of the Federal Food, Drug, and Cosmetic Act and should not enter human food channels. There is no practical method of reconditioning the edible portion of a crop that will provide a reasonable assurance of human food safety. Therefore, the FDA recommends that these crops be disposed of in a manner that ensures they are kept separate from crops that have not been flood damaged to avoid adulterating "clean" crops."*

Although it is clear from the FDA recommendation above that "adulterated" crops are not to enter the human food supply chain, FDA has a process by which requests can be submitted to divert these products to the animal feed market (i.e., diversion requests), provided that they pass a testing protocol. The diversion request typically includes a description of the process that the grower went through to assure the safety of the crops to be diverted.

Covered by Crop Insurance? If the flood-damaged crop is considered to be adulterated and is covered under a federal crop insurance policy (e.g., yield or revenue insurance policies administered by the Risk Management Agency (RMA)), then the producer needs to report a notice of loss to their crop insurance agent or company as soon as possible. In this case, it is important that the affected grower work with their agent and loss adjuster to ensure that they comply with the required claims procedures. Moreover, it is critical that nothing is destroyed (or the crop is not put into other use) without receiving consent from the loss adjuster. When a crop is required to be destroyed by any federal or state agency, the production from the crop may qualify as zero market value for crop insurance purposes, as long as this zero valuation meets the criteria laid out in the underlying crop insurance policy. The loss adjuster will assess the damage and provide options to the producer as applicable under the policy. No crop should be destroyed before it is appraised by the loss adjuster.

Calculating the Break-Even Yield. From the discussion above, it is clear that only crops damaged by pooled water could still be marketed and sold. To determine whether or not to harvest and sell crops that have been damaged by pooled water, a break-even yield needs to be calculated.

The following information needs to be gathered (or estimated) to calculate the break-even yield. First, information about the *market price* (e.g., in dollars per bushel for grain crops) one would expect to receive for the damaged crop is needed. The market price used here should be net of all quality discounts applied for damage. It is important that samples of the crop damaged by pooled water be taken to the local buyer for them to evaluate the amount of discounts applicable.

Second, the *harvest cost* (in dollars per acre) need to be estimated, which is the total cost the grower would incur if he/she is to harvest the crop and deliver it to the local buyer. The break-even yield is then simply equal to the harvest cost divided by the market price:

$$\text{Break-Even Yield} = \frac{\text{Harvest Cost (\$/ac)}}{\text{Market Price (\$/bu)}}.$$

The break-even yield is the minimum yield required in order to make it economically profitable to harvest the crop damaged by pooled water.

A break-even yield matrix that shows the break-even yields for various combinations of harvest cost and market prices may also be useful, especially if there is uncertainty in the harvest cost and market price estimates. An example of this matrix for damaged soybeans is presented in Table 1. In this case, the break-even yield is 4.2 bu/ac if soybean price is at $9.50/bu and harvest cost is at $40/bu. Thus, it is not economical to harvest the damaged soybean if the yield you expect is less than 4.2 bu/ac. In general, a producer should not harvest a crop damaged by pooled water if the yield he/she can expect to get from this damaged crop is less than the break-even yield. Hence, one is in a net loss situation where the revenues expected to be received for harvesting the crop is less that the cost of doing so.

In the break-even calculation above, we assume that the damage is from pooled water and the crop is still to be sold in the food supply chain. However, as we noted above, one can sell the crops damaged by flood waters (e.g., adulterated crops) in the animal feed market as long as a diversion request is submitted and approved by the proper authorities (e.g., the NC Dept. of Agriculture and Consumer Services (NCSDA&CS). The same break-even yield calculation and decision process (whether to harvest/sell or not) can be used as above, except that the market price to be used should be the price the producer expects to receive for the crop to be sold as animal feed (i.e., not the food market price).

Crop insurance for Pooled Water Damage. The "break-even yield" decision process described above (for pooled-water-damage) would be straightforward if the crops affected are not covered under the federal crop insurance program. If the crop is indeed covered by federal crop insurance products, then the loss adjuster's appraised yield of the crop damaged by pooled water and the yield/revenue guarantee for the policy are also important factors in the farmer's decision of whether or not to harvest the crop.

For example, assume that a soybean crop is covered under a revenue protection (RP) policy and the planted price (and eventual harvest price) used for the coverage is $10 (i.e., for simplicity we assume that the crop insurance price at planting and at harvest is the same). Say, the producer had an average yield (also called actual production history (APH)) of 36 bu/ac and he/she bought an RP policy at the 75% coverage level. These figures suggest that the guaranteed yield is 27 bu/ac ($36 \times 0.75 = 27$) and the guaranteed revenue is $270/ac (27 yield guarantee × $10). This means that if revenue falls below $270 the RP policy will pay out an indemnity.

Let us further assume that after the crop was damaged by pooled water, the loss adjuster evaluated the damaged crop and established the appraised yield to be 5 bu/ac (i.e., this is the amount that can be harvested based on the loss adjuster assessment). Therefore, the actual revenue (for insurance purposes) that the producer can get based on this appraisal is $50/ac (5 bu/ac × $10/bu crop insurance harvest price).

Since this revenue is below the RP guarantee of $270/ac, the producers will receive $220/ac in indemnity payment ($270 - $50). If the producer does not harvest the crop damaged by pooled water, the crop insurance coverage will provide him $220/ac in indemnity.

Suppose the farmer also took a sample of the damaged crop to the local buyer and the net market price (where discounts are accounted for) was determined to only be $7/bu. Further, assume that if the farmer indeed harvested the soybean, the yield he will get is 5 bu/ac (i.e., same as the estimate of the loss adjuster). In this case, the farmer still gets the $220 in indemnity payment, but gets an additional $35 (5 bu/ac × $7/bu net market price), for a total return of $255/ac ($220/ac + $35/ac). However, the cost of harvesting the damaged soybeans would have been $40/ac, which means that the net return would be $215/ac ($255/ac - $40/ac). Therefore, it is more prudent for the soybean farmer to not harvest the crop with pooled-water-damage because the net return from harvesting is $215/ac while the return for not harvesting (and just getting the indemnity payment) is $220/ac (i.e., $215/ac < $220/ac).

But now assume that the net market price (inclusive of damage discounts) from the local buyer is $9/bu. In this case, the soybean farmer will get $45/ac (5 bu/ac × $9/bu) for the harvested crop damaged by pooled water. Hence, the total return would be $265/ac ($220/ac + $45/ac) and the net return (less harvest cost) is $225/ac. For this, the producer will receive $5/ac more if he/she harvests the damaged crop ($225 > $220), as compared to not harvesting and just receiving the indemnity payment.

The example above will likely be more complex if there is a difference in the planted and harvested price used for the crop insurance coverage. Nevertheless, what the example illustrates is that the following factors are important when determining whether or not to harvest a crop damaged by pooled water: appraised yield, yield/revenue guarantee, damage discounts, harvest cost, and planted/harvest price. Also, the complexity of the calculations above when there is insurance coverage, underscores the importance of working with the crop insurance agent and the local buyer.

Furthermore, as with the break-even yield calculation in the previous section, the crop insurance example/decision process described here may also be applicable for the case of "adulterated" crops diverted for the animal feed market (with appropriate changes to the net market price that should be for animal feed).

FOR MORE INFORMATION (links):

US Food and Drug Administration "Guidance for Industry: Evaluating the Safety of Flood-affected Food Crops for Human Consumption.": https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/EmergencyResponse/ucm2687808.htm

Interview with Nicholas Piggott at SFNToday after Hurricane Matthew (with PowerPoint presentation): http://sfntoday.com/to-harvest-or-not-to-harvest-flooded-crops/

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Note: This publication can be downloaded at the *Crop Insurance Resources* website of the Dept. of Ag. and Resource Economics: https://cals.ncsu.edu/are-extension/business-planning-and-operations/crop-insurance/

Table 1. Example Break-Even Yield Matrix for Soybeans (Yields in bu/ac)

		Harvest Cost ($/ac)				
Net Market Price ($/bu)		$35.00	$37.50	$40.00	$42.50	$45.00
	$8.00	4.4	4.7	5.0	5.3	5.6
	$8.25	4.2	4.5	4.8	5.2	5.5
	$8.50	4.1	4.4	4.7	5.0	5.3
	$8.75	4.0	4.3	4.6	4.9	5.1
	$9.00	3.9	4.2	4.4	4.7	5.0
	$9.25	3.8	4.1	4.3	4.6	4.9
	$9.50	3.7	3.9	4.2	4.5	4.7
	$9.75	3.6	3.8	4.1	4.4	4.6
	$10	3.5	3.8	4.0	4.3	4.5

* If Harvest Cost is $40/ac and Net Market Price is $9.50/bu, then the break-even yield is 4.2 bu/ac. This means that if the yield one expects from the flood-damaged crop is less than 4.2 bu/ac, it is not economically optimal to harvest and sell the flood-damaged crop.