

Handling Flooded Produce: What Farmers Need to Know and Conducting Risk Assessments

Purpose & Scope

This document is intended to provide guidance to growers on how to evaluate produce crops that are intended for human consumption but have been affected by flood waters to ensure compliance with both state and federal law, [including M.G.L. c. 128, Section 124](#) and [330 CMR 34.00](#), which codifies the federal standards set forth in [21 CFR 112](#), and the [Federal Food, Drug, and Cosmetic Act](#). As explained more fully below, the grower's evaluation should include a risk assessment of all affected crops, whether the flood waters contacted the crops' edible portion(s). The evaluation should also include a risk assessment of fields affected by flood waters before replanting occurs as well as consideration of controls that can minimize the risk of cross-contamination after flooding occurs.

Flood waters are those that exceed the banks of surface waters, such as rivers, streams or ponds and run into fields. They pose a considerable threat to the safety of produce because they can contain a variety of contaminants, including but not limited to manure or feces from upstream farms, septic or sewage systems, agricultural chemicals, pesticides, or other chemical contaminants, fuel and heavy metals, and microbial pathogens. Under both the Federal Food, Drug and Cosmetic Act and Massachusetts law, food is considered adulterated, and therefore unfit for human consumption, if it is grown, held, or packed under unsanitary conditions.

Please note that pooled water that occurs as result of excessive rainfall and not from flood conditions caused by water exceeding the banks of surface water from rivers, streams, ponds, or other bodies of water is not considered flood water for the purposes of this guidance.

Background

Massachusetts, through the Massachusetts Department of Agricultural Resources ("MDAR"), adheres to the U.S. Food and Drug Administration's ("FDA") [interpretation of the federal language](#), which has stated that if the edible portion of a crop is exposed to flood waters, it is considered adulterated and cannot be permitted to enter human food channels in any way, including but not limited to, sale, donation, or offering to anyone in any manner. This applies to all crops where the edible portion came into contact with the flood waters, regardless of whether they are above-ground crops or root crops and how they will be consumed (e.g.: raw or cooked). The use of otherwise adulterated crops may be permitted for animal feed only if FDA has given approval for the use of each individual crop, as further detailed in this guidance.

Federal and state law provide more discretion for situations in which direct contact of flood waters with the edible portions of the crop does not occur but in which a risk of adulteration may still be present. In these situations, farms are strongly encouraged to conduct an individual review of the circumstances that impact their crops (i.e., risk assessment) that considers all flood-related hazards that may impact crop safety and fitness for human consumption. MDAR strongly encourages farms to memorialize its risk assessments in writing to reference for future use. Farms should also be aware that under the state law, adulterated produce may be subject to an order for embargo, recall, quarantine, or destruction by MDAR, regardless of the farm's risk assessment.

Suggested Evaluation Protocols

1 If Flood Waters Contacted Edible Portions of the Crops

Adulterated

When the edible portion of a crop is exposed to flood water at any stage of development, it is considered adulterated under federal and Massachusetts law and is not permitted to enter human food channels.

Scope

‘Adulterated’ applies to all food crops which have had flood water contact with their edible portions, including but not limited to, surface crops (e.g., leafy greens, tomatoes, string beans, berries, corn), underground crops (e.g., peanuts, potatoes, carrots, garlic), crops with a hard outer skin or shell (e.g., watermelon, winter squash), and grains, nuts, corns, and similar products stored in bulk.

Suggested Disposal

If a crop’s edible portion has been exposed to flood waters, the crop should be tilled or harrowed into the soil or discarded in a manner that ensures it is kept separate from any other crops that were not exposed to flood waters.

2 If Flood Waters did not Contact Edible Portion of Crops or Edible Portion was not Developed at Time of Flood

Consider the possible contaminants in the floodwater

Potential contaminants include but are not limited to, sewage, fecal pathogens from breached septic systems and/or livestock, heavy metals, chemicals, pesticides, and dead animals. Farms should consider all possible sources of contamination. The following questions should be considered:

- i. What is upstream from the farm’s location and what may likely be in the water?
- ii. Are there obvious signs of contamination in the field (e.g., oil slicks, bad odors, carcasses)?

The growth stage of the crop

Some crops may not have had fruit present at the time of flooding. Nonetheless, research has shown that pathogens can attach themselves to plant surfaces, multiply quickly under appropriate conditions, and survive on crop surfaces and in silt for extended periods of time. Crops that are still several months from harvest may uptake pathogens long after flood waters recede.

Risk of Cross-Contamination

Farms should consider whether the edible portion of the crop will develop while pathogens might still be present in, on, or around the crop, or if a risk of cross-contamination is present during harvesting and post-harvest processing. For example, when harvesting tomatoes, harvest crates may contact the ground, which could be contaminated; crates may be stacked on top of other *full* crates, possibly spilling contaminated soil onto produce below. Workers or equipment moving through the field while picking the fruit may spread contaminants throughout the foliage and onto harvested produce. Workers should be cognizant of these risks and may wear appropriate personal protective equipment (e.g., rubber boots, rubber or nitrile gloves).



Type of crop

The following questions should be considered:

- i. Will the crop be consumed raw, or will the crop be cooked? Crops frequently cooked before eating are less risky than those commonly eaten raw. Find the list of crops rarely consumed raw [here](#).
- ii. Is there a reason to suspect contamination or that the edible portion will eventually contact contaminated soil?
- iii. Does the crop grow close to the soil surface? For example, if root crops will eventually, in the process of growing and comes into contact with contaminated soil, they cannot be harvested. Certain crops that had not yet fruited (*e.g.*, tomatoes, peppers) or did not yet have any part of any edible portions formed (*e.g.*, broccoli) at the time of flooding may be allowed to continue growing and be harvested only if the farm determines such action is appropriate considering these factors. If any of the edible portion of the crop was present at the time of flooding or otherwise came into contact with flood waters (*e.g.*, because soil had not dried before the edible portion developed), the crop is considered adulterated and may not enter human food channels.

Degree and duration of flood water exposure

The following questions should be considered:

- i. How long was the crop affected by floodwater? How long did the field take to dry out?
- ii. What conditions existed (example: continued heavy rains) that may have exacerbated plant stress, possibly fostering fungal and mycotoxin growth?

Location of Edible Portion of Crop

If the edible portion of a crop was above the flood water, the farm may determine that it can be sold if the risk of contamination is deemed low based on a totality of the circumstances and potential hazards that the farm considers. Risk of contamination through direct sources (*e.g.*, contaminants on stems or in soil that transfer or splash onto fruits) and indirect sources (*e.g.*, during harvest or post-harvest handling through contact with contaminated water, soil on hands, or other contact surfaces) may still exist and should be considered. The following questions should be considered:

- i. How high did the flood waters reach on the plant, or is the plant tall (*e.g.*, sweet corn, staked tomatoes, tree fruits, or other crops where the edible portion grows high above flood waters even if the soil surface is flooded)?
- ii. Does the farm observe any evidence that flood water splashed onto the crop?

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For Animal Pasture Grazing or Foraging in Flood-Affected Areas

Consider the possible contaminates in the floodwater. (See Section 2)

Animal Health

Events such as floods increase stress levels in animals and weaken their immune system. Silt can also harbor unknown contaminates and could adversely affect animals. Wet conditions can result in fungal and mycotoxin growth.

Flooded Pasture

The following questions should be considered:

- i. How long was the pasture affected?
- ii. How heavy is the silt load?
- iii. Can the pasture be mowed off and allowed to regrow? Rotting plant material can harbor clostridia organisms and other pathogens. Listeriosis can be present. Egg washing will be important given the increase in mud and silt.

Hay and Forage

The following question should be considered:

- i. Can flooded affected hay/storage be kept separate from non-damaged hay/forage? Silage should be tested for mycotoxins prior to feeding. Silt can infiltrate wrapped bales, and mold can grow slowly over time.

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Considerations for Replanting Flooded Fields

Consider the possible contaminants in the floodwater. (See Section 2)

Determine a waiting period

Waiting before replanting is strongly recommended. Waiting periods are determined by the farm based on local weather conditions, the type of contamination (actual or potential), temperature, soil type, and the type of crop to be replanted. Fields should be drained and dry of floodwaters and sufficient time should pass to permit microbial pathogens to decline. While the farm's risk assessment should control, guidance documents and Extension fact sheets generally suggest that low risk crops, such as those crops rarely consumed raw (e.g. beets, eggplants, winter squash), may be replanted within 3-4 weeks. Medium risk crops in which the edible portion is grown above and away from soil level, including those which are trellised or on plastic mulch (e.g. tomatoes, peppers) may be replanted within 30-60 days. High risk crops, such as those that make direct soil contact or are close to soil level and are commonly eaten raw (e.g., cabbage are strongly recommended not to be planted for 60 to 120 days. It is strongly suggested that crops that might be eaten raw and grow directly in previously-flooded soils (e.g., leafy greens,) not be replanted until at least the following year's growing season.

Diversion of Crops

Diversion of Flood-Affected Crops to Animal Feed

Under certain circumstances, human food that would otherwise be considered adulterated for its intended use may be diverted to an acceptable animal feed use provided all necessary approvals are obtained and the crop is not still under an order from MDAR that would prohibit such diversion. Requests for diversion should be submitted by the farm in writing to the appropriate FDA District Office and contain the information outlined in FDA's [Compliance Policy Guide Sec. 675.200](#). Farms should provide a copy of all diversion paperwork, including requests, allowances, and denials, to MDAR, who may maintain an order of embargo as to the requested diverted crop until such time as the diversion request is allowance by FDA and MDAR receives notification of the allowance.

July 2023 Flooding

Applicability of Guidance to July 2023 Flooding

Western and Central Massachusetts farms experienced a significant flooding event in July, 2023. Inspection and assistance to farms are ongoing and the full scope and impact of this event remains to be determined. In light of this uncertainty, MDAR strongly encourages farms to carefully assess flood damage and conduct a risk assessment as outlined above, and likewise discourages farmers from harvesting any crops in flood zones in the 2023 season until such risks are better understood or resolved. Likewise, the Department strongly discourages farms from replanting flooded fields with crops commonly eaten raw, especially leafy greens, in the 2023 season. MDAR remains available to assist all farms with determinations of adulteration and risk. MDAR reminds farmers that adulterated crops may not enter commerce or be offered for donation, and any alternate use should be coordinated with FDA and MDAR.