

Guidance for Harvesting Produce Affected by Flood Waters for Human Consumption

1 February 2023 (v1.0)

1. The following guidance for disposition of produce following flooding events has been developed by New Zealand Food Safety based on international guidance, scientific evidence and best practice.
2. The guidance applies to produce affected by flood waters (immersion or contact), not product directly damaged by rainfall. Produce that has been damaged by rain and has not come into contact with any floodwater should be safe to consume. Wash your hands before and after picking or harvesting such produce, and wash fruit and vegetables before eating. Clean food-contact surfaces thoroughly.

Sources of Contamination

3. Flood waters may be contaminated by sewage, dead animals, decaying plants, chemical contaminants such as pesticides, heavy metals, petroleum products and may harbour pathogenic microorganisms, and physical contaminants such as glass and debris.
4. The level of contamination in flood water is important and will vary depending on source and can originate from sewage, excrements from animals, leaks from home septic tanks, resulting in a high or very high concentration of pathogenic microorganisms. The level of contamination in flood water is important and will vary depending on source and can originate from sewage, excrements from animals, leaks from home septic tanks, resulting in a high or very high concentration of pathogenic microorganisms.
5. Similarly, chemical contamination is also important, and can come from leaks from submerged farm and personal vehicles (petrol, oil) or other mechanical equipment, pesticides stored nearby by farms or by individuals, buried farm waste chemical dumps, petrol stations and any industrial factory or manufacturing plant. Similarly, chemical contamination is also important, and can come from leaks from submerged farm and personal vehicles (petrol, oil) or other mechanical equipment, pesticides stored nearby by farms or by individuals, buried farm waste chemical dumps, petrol stations and any industrial factory or manufacturing plant.
6. In contrast to point contaminations occurring in a field during normal production and harvest of a crop, the flood water will contaminate all units in the crop, and none will be spared, especially when the field has been submerged, even for short periods of time.

Risk Assessment

7. A flooding event of a produce crop can therefore represent a major increase in risk compared to a normal risk existing during production and harvest.
8. If the degree of contamination cannot be determined, it is advised to consider the worst-case scenario, and to assume that flood waters are contaminated, and the produce is contaminated. Consideration should be given to not harvesting and destroying produce that has been in contact with flood waters.
9. It is not possible to test (microbiological and chemical) the flood water to identify the nature of the contamination, because a large range of different contaminants could be present.
10. It may also not be possible to identify the exact sources of the contaminations, and it is likely that there will be multiple sources.
11. It is unknown over what distance the contaminants could be carried and still represent a significant risk of contamination for the produce crop. It depends on multiple factors (type of contaminants, strength of the flow, water flow rate, volume of water, nature of the debris being carried away, etc).
12. However, growers may have robust evidence and expert advice for a given crop and specific production area that enables them to identify the type and level of contamination, and hence estimate the risk of the produce. For example, certainty that there has not been run-off from farms or sources of contamination described above could not have occurred. In the presence of robust evidence, growers may be able to justify harvesting affected crops for human consumption.
13. There is only one scenario where growers would have a good level of confidence that their produce is unlikely to be affected and contaminated by flood waters. This is when fields are situated on elevated points where there is no physical and geographical possibility for the fields to be submerged by an overflowing river or run-off coming from other places. In this case, a submerged field could be only from pooled rainfall water and the risk would be negligible.
14. If the fruit or vegetable crop has not been directly affected by flood waters, meaning that the edible parts of the crops have not been submerged by flood waters or have not been in contact with splashing flood water, then consideration should be given as to how the produce could be harvested and consumed. The risk assessment should be driven by consideration of:
 - The type of crop
 - The stage of growth
 - The distance between the edible parts and the ground
 - For later on, consider the potential development of moulds and subsequent production of mycotoxins, especially during storage, when fruit and vegetables have been exposed to prolonged period of moisture.

Disposition

Fruit and vegetables directly affected by flood waters:

15. In the absence of evidence justifying safety, all produce, fruit, and vegetables that have been in contact with flood waters should not be harvested/consumed and should be destroyed.
16. This applies to all types of crops, fruit and vegetables, surface crops (e.g., tomatoes, cucumber, beans, leafy greens), underground crops (e.g., carrots, potatoes, beets), and produce with or without a skin or shell (e.g., melons, squash).
17. There is no practical method of reconditioning the edible portion of a crop that will provide a reasonable assurance of human food safety. While peeling and cooking will reduce the level of contamination, there is no certainty it would be sufficient.
18. Cooking will have no effect on any chemical contamination.
19. There is no method ensuring that contamination could be removed by washing the produce. Leafy greens such as lettuce or spinach contain ridges and crevices that cannot be properly cleaned.
20. Underground crops ready to be harvested, should also be discarded if they are in a field that has been submerged by flood waters, because vegetable roots may have been in contact with contaminated water seeping into the soil. Vegetable roots could internalize pathogenic microorganisms and may also take up chemical contaminants.

Fruit and vegetables not directly affected by flood waters:

21. Root crops, such as beets, carrots, onions, and potatoes, that are still early in their growth with at least 4-8 weeks before harvest, should be safe if allowed to grow to maturity and cooked before eating. Root crops that will be harvested within a month after the flood, such as new potatoes, should be thoroughly washed with cold water and dried, before cooking thoroughly.
22. Surface crops with fruits, such as tomatoes or peppers, that were present during the flood but were not contaminated by flood water, and which will be harvested within a few weeks after the flood, should be safe to use if cooked or peeled. Discard any that are soft, cracked, bruised, or have open fissures where contamination might have entered.
23. Fruits that develop from flowers produced after the flood waters have subsided should be safe to eat. This includes tomatoes, peppers, eggplant, squash, cucumbers, and similar vegetables. Consumers should be advised to wash produce thoroughly before use and consider using them in recipes requiring cooking to further reduce food safety risk.

Consideration of additional food safety measures:

24. Extra precautions need to be considered to separate produce directly affected by flood waters and produce still safe to eat, and to ensure that produce still safe to eat is not contaminated by flooded soil.
25. A 10-meter buffer zone between flooded and non-flooded fields could be considered to prevent cross-contamination.
26. Consideration also needs to be given to the possibility of cross contamination from hands, utensils, and equipment. Extra precautions need to be taken to avoid the spread of potentially pathogenic microorganisms from the affected produce to other food products. Growers, packers, and everybody involved in the supply chain to the final consumers, need to ensure that they are washing hands, and cleaning and sanitising equipment and utensils.
27. After a flooding event, a risk assessment of the water used for irrigation, washing and other packing operations should be undertaken, especially when this water is sourced from surface water, or wells, or any source potentially affected by the flooding event.

Testing produce

28. Growers may consider testing their produce not directly affected by flood waters to help them with their risk assessment.
29. However, growers should be aware that testing for *E. coli* and/or *Salmonella* may not be sufficient to ensure that their produce is safe to eat as a large range of diverse contaminants may be present, and *E. coli* may not be a good indicator to signal their presence. Furthermore, a robust, often prohibitively comprehensive and expensive, sampling plan would need to be considered to provide the desired assurances

If you have further questions, please email food.compliance@mpi.govt.nz or call 0800 00 83 33 and ask for Food Compliance.

References:

US FDA - Guidance for Industry: Evaluating the Safety of Flood-affected Food Crops for Human Consumption – October 2011, last reviewed 17/09/2018

University of Wisconsin-Extension - Safely Using Produce from Flooded Gardens.

University of Vermont Extension – Frequently asked questions about handling flooded produce.
Revised July 10, 2013

Script for Food Compliance inbox and 0800 number to ask:

Q: Has the edible part of the produce – the fruit, leaf etc. come into contact with flood waters (i.e. have been covered by flood waters or had flood waters splash on to them?)

A: YES – the produce will need to be discarded

NO – ask for more information in order for an SME from Food Risk Assessment to do a risk assessment:

- What type of crop do you grow?
- During what stage of growth did the flooding happen?
- What is the distance between the edible parts and the ground?
- Are there any farms near your growing area? If so how many and what animals?
- Have you seen or been informed of sewerage discharged/overflowed nearby and would have mixed in with the flood waters?
- Is there a storage space (e.g. a shed) for agrichemicals, petrol or any other chemicals near the growing area that was flooded? Can you provide a list?
- Are you near a river? Is there a possibility that the overflow from the river would have mixed in with the flood waters?
- If yes or unsure: Can you provide a site map which marks which areas were flooded, which crops were affected and any potential sources of contamination nearby (e.g. septic tanks, rivers, storage locations of agrichemicals and other chemicals, animal farms, stormwater drain outlets)?