



Food and Agriculture  
Organization of the  
United Nations

**Hunga Tonga–Hunga Ha’apai Volcano Eruption**  
Data in Emergencies  
Hazard Impact Assessment  
(DIEM-Impact) – Update No. 2

22 February 2022

## Context

The Hunga Tonga–Hunga Ha’apai undersea volcano in Tonga erupted on 15 January 2022 at 17.10 local time in a blast that was felt across the entire Pacific region. The eruption resulted in two events with potential impact on agriculture livelihoods and all agriculture sub-sectors: (i) a volcanic ash cloud; and (ii) a tsunami. The Government of Tonga declared a state of emergency on 16 January 2022.

The government’s initial damage assessment is still ongoing and the report is forthcoming. Communication with the islands remains a challenge due to the broken undersea communication cables, hampering data collection and consolidation.

The government has now confirmed four deaths, 14 people injured, 2 400 people internally displaced and 84 800 people overall affected by the volcano eruption ashfall and tsunami waves (Office for the Coordination of Humanitarian Affairs [OCHA], 2022).

As of 21 February 2022, there have been 233 confirmed cases of COVID-19 in Tonga (World Health Organization [WHO], 2022). On 21 February, the government has extended the lockdown measures until 27 February 2022 (Government of Tonga, 2022).

### About Data in Emergencies Hazard Impact Assessment (DIEM-Impact)

The Food and Agriculture Organization of the United Nations (FAO) established DIEM-Impact to provide a granular and rapid understanding of the impact of large-scale hazards on agriculture and agricultural livelihoods, using a variety of assessment methodologies, including primary and secondary information, remote sensing technologies and FAO’s damage and loss methodology.

This update presents additional information available since the Hunga Tonga–Hunga Ha’apai Volcano Eruption DIEM-Impact – Update No. 1 was released on 17 February 2022.

> **Update No. 1 is available at** [www.fao.org/3/cb8693en/cb8693en.pdf](http://www.fao.org/3/cb8693en/cb8693en.pdf)

## Ash cover and flood impacts

According to FAO's geospatial assessment, Tongatapu incurred the greatest impact on land cover (72.15 percent), followed by 'Eua (66.17 percent), Ha'apai (61.81 percent), and Vava'u (38.79 percent) divisions. Grassland (83.68 percent) and shrubland (74.69 percent) show the greatest impact across all divisions; cropland the least (14.56 percent). Forests, built-up areas, barren land, water bodies, mangroves and coconut dedicated impacts are presented in Table 1.

Table 1. Detected impact on land cover by landcover type in percent

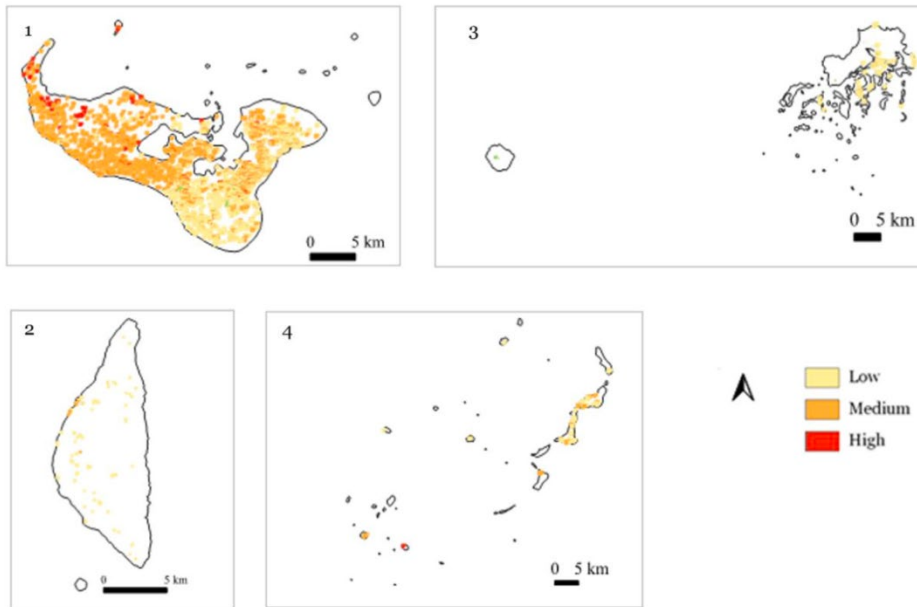
Land cover type	Land cover impact in percent (%)
Grassland	83.68
Shrubland	74.69
Mangroves	64.65
Forest	63.25
Build up areas	44.98
Water bodies	38.03
Coconut	26.46
Barren land	19.94
Cropland	14.56

Source: FAO, 2022.

Overall, the greatest amount of ash coverage was observed for Tongatapu, and the least for Vava'u, with all other divisions experiencing no to medium ash coverage. The greatest impact of the ash on cropland was identified in Tongatapu, followed by 'Eua and Ha'apai, while crops in Vava'u remained generally unaffected. The population of Tongatapu was the most impacted by ash coverage (80 percent) 62 236 people (FAO, 2022).

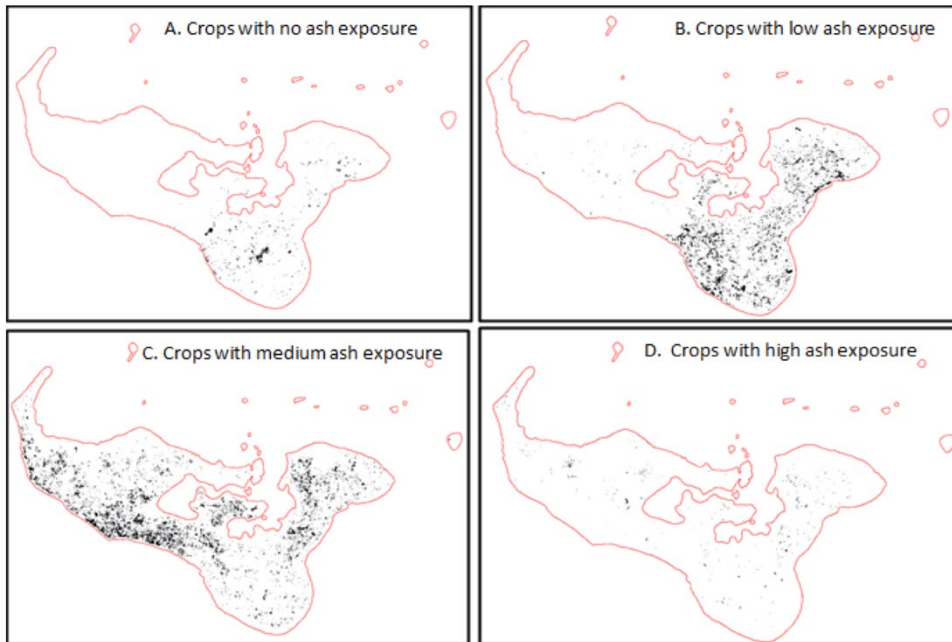
A total of 35.7 km<sup>2</sup> (85 percent) of cropland was exposed to ash cover in Tonga – with 32.97 km<sup>2</sup> (93 percent) in Tongatapu, 0.88km<sup>2</sup> (85 percent) in 'Eua, and 1.56 km<sup>2</sup> (61 percent) in Ha'apai division (FAO, 2022).

Figure 1. Detected high, medium and low ash cover on crop land in all priority divisions (1. Tongatapu, 2. 'Eua, 3. Ha'apai, 4. Vava'u)



Source: FAO, 2022.

Figure 2. Detected crop lands with no, low, medium and high ash exposure in Tongatapu



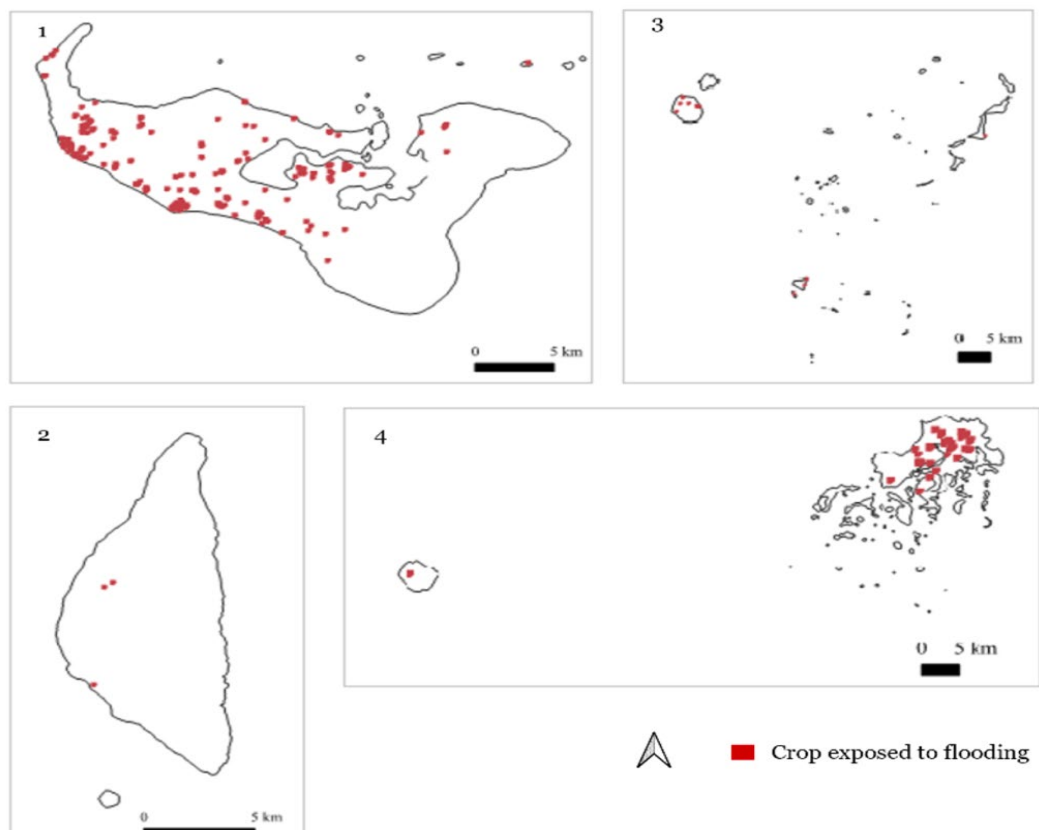
Source: FAO, 2022.

Furthermore, there was a clear surge in precipitation following the eruption. The same trend was also observed for sulphur dioxide in the stratosphere and the ultraviolet aerosol index for the four divisions in Tonga. The volcanic plume was observed to travel to neighbouring countries, containing elevated amounts of sulphur dioxide, thus affecting the subregion after the eruption (FAO, 2022).

In terms of inundations, Ha'apai exhibited the greatest amount of flooding (5.00 percent), Tongatapu (3.95 percent), Vava'u (3.29 percent) and 'Eua the least (1.17 percent). Analysis of cloud free areas suggests that built-up areas, barren land, and mangroves were the most effected by the floods (FAO, 2022).

The biggest flood impact on crop lands was detected for Ha'apai with 8.00 percent (16 ha), followed by Vava'u 5.97 percent (11ha), Tongatapu 1.00 percent (31ha) and 'Eua the least with <0.01 percent (300 m<sup>2</sup>). Additionally, Ha'apai was found to experience the greatest change in coastline, and Tongatapu the least (FAO, 2022).

Figure 3. Spatial extent of flooding in cropland in four divisions of Tonga (1. Tongatapu, 2. Eua, 3. Ha'apai, 4. Vava'u)



Source: FAO 2022

## Crops

Current estimated damages on food crops amount to about TOP 38.8 million (USD 17 million) as indicated by the Ministry of Agriculture, Food and Forest (MAFF) (MAFF, 2022a; 2022b). However, this includes mainly data from crops cultivated in Tongatapu only and focuses on the immediate damages to annual and perennial crops. These figures omit any longer-term economic losses incurred due to loss of production because of damages to perennial crops and necessary rehabilitation investment. More detailed damages and losses for the agriculture sector are expected in the forthcoming government's initial damage assessment.

As per the freshly released World Bank GRADE report, using the same MAFF data above, the agriculture sector is one of the sectors most impacted by the eruption with damages estimated at TOP 48.1 million (USD 20.9 million). Tubers and root crops (cassava, yams, sweet potato, taro, etc.) making up the largest proportion of planted crops, are considered largely unaffected by the ash. Only a small proportion of these crops were affected by the tsunami waves, and might have some damages. The most impacted by the ash cover likely are surface crops, like vegetables (lettuces, tomatoes, cabbage, cucumber, capsicum and squash) as well as other tree fruits (pawpaws, mangoes and pineapples). Impact on cash crops like vanilla bean and kava have been reported, with varying degrees depending on location (World Bank, 2022).

Long-term impacts and rehabilitation needs for the soil influencing crop, grass and tree productivity are unknown. However, current understanding of ash impact on soil indicates limited negative impacts (World Bank, 2022), besides possibly increased salinity.

## Livestock

While the ash composition has been confirmed as non-toxic for humans and animals, available livestock feed and water is still a concern. However, groundwater, tap and rain water have been confirmed safe for consumption by the government. While precipitation continues, storage for rainwater is reported to be sparse. However, overall sufficient safe water should be available to care for livestock needs (P. Likiliki, personal conversation, 10 February 2022).

No information is available on any current animal diseases outbreaks in link with the volcano eruption. This is most likely due to limited movements by animal health workers due to the continuing lockdown in Tongatapu and Vava'u. However, no animal diseases due to the volcano eruption impact are reported from other divisions either.

Concerns are growing about a possible introduction of African swine fever to Tonga due to importation of goods and foods. Hence measures are carefully enforced the Government of Tonga's biosecurity guidelines for all imported foods and origin of pork and pork products originating from any African swine fever infected countries (OCHA, 2022).

## Fisheries and aquaculture

Detailed impact on the fisheries sector remains unknown. However, deep sea fishing industries are expected to be largely unaffected, and nearshore and reef fishing activities and areas, as well as aquaculture to be affected by ashfall and tsunami pressure waves (World Bank, 2022). Latest information indicates that around 200 small fishing boats were damaged (OCHA, 2022). Detailed information on the type of vessels, the extend of damages and their location is expected to be in the forthcoming government's initial damage assessment report.

Current main concerns about reef and near shore fish toxicity and impacts continue and are being addressed through ongoing sampling and chemical analysis. Some chemical elements in the ash have potential to boost growth of algae in coastal waters, and are feared to lead to fish poisoning (ciguatera) due to the development of algal bloom (eutrophication). The fall out of acidic ash (nitrogen oxides and sulphur dioxide) into the ocean (acid rain) may lower the pH value of coastal waters, with potential impact on local fish leading to death in inshore and reef

fishing areas. Current advisory indicates that within a month or more from the eruption, people should avoid eating seafood from coastal and reef fish origin due to unclear chemical toxicological issues. People are advised to rely on deep water fish such as tuna and snapper species until the reef fish are declared safe for consumption (Ministry of Fisheries, 2022).

In the interim, the government supports safe fish consumption through subsidies to deep water snapper and tuna fisheries, and provision into the local markets for safe consumption of fish (Ministry of Fisheries, 2022).

Additionally, the Ministry of Fisheries has already started the rehabilitation of aqua- and mariculture, in particular for sea cucumber (mokothonu) and mullet fish (kanahe) as part of its immediate response plan (Ministry of Fisheries, 2022; United Nations News, 2022).

## Remittances

Tonga has one of the highest remittances reliance in the world with remittances making up 38.98 percent of the national GDP in 2020 (World Bank, 2020). At the end 2021, close to six out of ten Tongan families received remittances in the past month, a similar trend to previous survey results (World Food Programme [WFP], 2022).

With approximately 150 000 Tongans out of the country, and at least 5 000 seasonal workers in Australia and New Zealand alone, the diaspora is essential to contribute to food and livelihood security back home. With the interrupted communication channels, sending money home has been challenging, with impacts felt in Tonga, due to lack of money to purchase critical items in the markets (DevPolicyBlog, 2022).

However, local reports indicate that family members are queuing at money dispensers and banks to receive transfers from abroad during the allowed shopping hours of the ongoing lockdown measures. The ability to access money will influence households' purchasing power, their ability to access food and essentials, and their need to employ possibly harmful coping strategies to deal with the current situation. This might further affect their livelihood base, especially for the most vulnerable population segments.

## Food security

Recent information from December 2021, indicates that 20 percent of Tongan families have insufficient food consumption, similar to levels in March 2021. This shows persistent food consumption limitations for the most vulnerable families. Female-headed households indicated high levels of insufficient food consumption with 25.2 percent versus 18.6 percent by their male counterparts. Additionally, rural areas reported high levels of insufficient food consumption with 23.3 percent versus 14.2 percent in urban areas, likely due to market access and food supply challenges in the remote rural areas (WFP, 2022).

Latest reports indicate that basic food commodity supply in 'Eua, such as flour, sugar and rice, is running low. There has been a request for incoming supplies to be airdropped to prevent further spread of COVID-19, given 'Eua has no cases reported yet (OCHA, 2022).

## Markets

Lockdown measures are in force on Tongatapu and Vava'u Islands, with a stay-at-home order with no access to public transportation and a curfew from 18.00 to 06.00. Shops, markets and essential services are allowed to open on Tuesdays and Fridays from 06.00 to 18.00 for people to restock and access essentials services. Other divisions in the country are not under lockdown at this time (OCHA, 2022).

Latest information reported from Tongatapu indicates that prices are largely stable; however, prices for imported bottled water have increased. Additionally, no vegetables and only some fruits have been reported as available, with prices without any drastic changes (P. Likiliki, personal conversation, 10 February 2022).

Supply continues to arrive in Tonga, with all cargo, aid and supplies needing to abide by contactless delivery, and all pallets unloaded from aircraft or ships being isolated for 72 hours before going into public distribution (Reuters, 2022).

These lockdown measures will likely affect people's ability to go to the market and restock for food and other essentials goods. Additionally, it might lead to hoarding behaviours based on purchasing power disparities between different segments of the local population. Additionally, prices might fluctuate based on availability and delays of clearance based on the cargo and supply isolation procedures laid out by the government.

## Recommendations

While the government's initial damage assessment is delayed until the COVID-19 lockdown is lifted, it remains critical to understand the full extent of the eruptions' impact on agricultural livelihoods in all four priority divisions.

Possibilities of livelihood impact assessments in areas that are currently not under lockdown, i.e. Ha'apai and 'Eua, should be considered to advance the analysis of impacts and needs of the affected population, and continue the rehabilitation process in these areas.

Especially the more in-depth understanding of impacts on the fisheries sector, including aqua- and mariculture, and changes of the reef structures should be advanced soon to ensure appropriate rehabilitation measures can be taken.

Lastly, careful monitoring of food prices and access to food by the most vulnerable households will be critical to prevent additional hardship incurred by the lockdown measures.



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