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Mount Agung: A blessing in disguise

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Mount Agung in Bali is currently on the verge of eruption, with over 100,000 people having been evacuated to safer areas. The eruption is feared to be catastrophic, spewing lava and ash with temperatures of up to 1,250 degrees celsius, posing a serious risk to humans and their livelihoods. However, in the long term, it would create some of the world's most fertile soil.

Ash ejected from volcanoes is a considerable nuisance to farmers, burying agricultural land and damaging crops. The ash also has a negative impact on human health and animals, contaminating infrastructure and disrupting aviation and land transport. However, in the aftermath of volcanic eruptions are left the world's most productive soils: Volcanic soils. While volcanic soils only cover 1 percent of the earth's surface, they can support 10 percent

area of Tasikmalaya.

Volcanic eruptions are an opportunity to study the beginning of how soils formed, a process that could take thousands or even millions of years. Tephra, the scientific name for volcanic ash, contains primary minerals with an abundance of nutrients.

Over time, with chemical and biological weathering, the ashes will release the nutrients, and the ash will increase its surface area, along with more nutrients and water. In addition, it has the capacity to sequester a high amount of carbon, or take carbon out of the atmosphere and put it into the soil.

In April 2005, when Mount Talang in West Sumatra erupted, Dian Fiantis collected tephra deposited in Solok regency. She conducted an experiment by adding this ash to local soil to simulate ash deposition. Within two months, blue-green algae had already started to colonize the bare surface of the tephra layer.

After 16 months, the tephra surface had been transformed

of the world's population, including some of the highest human population densities.

As Indonesia is situated on the Pacific Ring of Fire, it has experienced many eruptions. Indonesia's volcanic eruptions have affected the world's climate, notably the volcano of Lake Toba with its super-eruption circa 74,000 BC, which caused a six-year volcanic winter.

The 1815 eruption of Tambora on Sumbawa island in present West Nusa Tenggara, ejected an estimated 160 cubic kilometers of pyroclastic material into the atmosphere. This catastrophic event affected populations on nearby islands including Bali where agriculture was destroyed by ash deposits and a shortage of sunlight. The misery lasted for 10–15 years before the ashes turned into fertile soil.

Recent eruptions, however, have been much smaller; the 1963–1964 eruption of Mt. Agung produced 0.95 cubic km of solid volcanic materials and 0.1 cubic km of andesite lava flow (liquid hot volcanic material).

In the past decade, volcanoes in various parts of Indonesia have been quite active and have erupted, notably Merapi, Central Java in 2010, Sinabung in North Sumatra in 2014, and Kelud in East Java, also in 2014. Despite the danger posed by these volcanoes, areas with high volcanic activity also have some of the world's most fertile farmlands due to the release of nutrients such as potassium and phosphorus.

Dutch scientist EJ Mohr observed in 1938 that near Mt. Merapi, higher population densities can be found in areas with soil derived from volcanic ash. Such soil is most probably why Java can sustain high population densities, estimated at 940 people per square km.

Ten years after West Java's Mt. Galunggung erupted in April 1982, a boost in crop productivity was recorded in the surrounding

into a mix of lichen. Grasses and shrubs were only established after two years. She also measured the amount of organic material that accumulated during the experiment. The pristine ashes contained negligible organic material or organic carbon. After 46 months, the tephra layer had accumulated carbon at a concentration of 1.75 percent. This study demonstrated that volcanic ash can sequester carbon rapidly and in large amounts.

On Jan. 28, 2014, Mt. Sinabung erupted with a pyroclastic flow and "mud rain." Ashes covered most of Sigarang Garang village, northeast of the foot of the volcano. We visited the village in January 2017 and saw that some of the ash had already been colonized by lichen, and some with grass.

The ash colonized by lichen had accumulated substantial organic matter, up to 4 percent of organic carbon. In addition, the ash contained a high amount of nutrients, notably calcium, magnesium, potassium and phosphate, and covered about 100 million cubic meters, which is equivalent to 250 million tons. This means that we already have a reserve of 1 to 10 million tons of fertilizer.

Regular eruptions throughout the country have been utterly devastating to the people living around the volcanoes. This natural phenomenon also renews its soil, however it takes time for the ashes to be weathered. We need to work on solutions that will fasten the rate of soil formation.

It remains a challenge to convince local farmers that the eruption is a blessing in disguise, as this natural phenomenon keeps Indonesian soils fertile.

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