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Leibniz Centre for Agricultural Landscape Research (ZALF)

ZALF research project on silicon fertilization in Africa:

## Better yields in Kenya through fertilization with volcanic ash

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Nutrient deficiencies and acidic soils are major challenges for agriculture in large parts of East Africa. Although the important plant nutrient phosphorus is present in the soil, it is not available to the plants in sufficient quantities. In addition, due to the low pH, increased amounts of aluminum ions are released, displacing important plant nutrients and thus harming the plants. A research project led by ZALF biogeochemist Dr. Jörg Schaller is now working with local partners to investigate how fertilization with local volcanic ash can improve soil fertility in croplands and thus improve crop yields.

Lack of rain, extreme weather and drought events have hit the East African country of Kenya hard in recent years, further exacerbating the population's harvest and crop situation. According to Welthungerhilfe, around 2.1 million people were estimated to be at risk of acute food insecurity in the period from July to October 2021, an increase of 34 percent compared to the previous year. But agriculture is not only suffering from a lack of rainfall. In order to supply plants with sufficient nutrients, farmers in many African countries also have to apply large quantities of expensive fertilizers every year. In order to increase agricultural self-sufficiency and the associated food security, Dr. Schaller's researchers will use a substrate called "tephra". This is obtained from local volcanic ash and is to be used as fertilizer for agricultural land. According to the researchers' hypothesis, silicon present in the ash applied to the soil can mobilize the phosphorus bound to iron in the soil and thus make it available to plants. At the same time, the silicon from the ash is said to reduce the toxic effect of aluminum on the plants, as plants increasingly take up silicon instead of aluminum.

### Transferability into smallholder practice

The aim of the project is to analyze the effect of silicon fertilization with tephra on soil pH and aluminum as well as on phosphorus availability for agriculture. In

collaboration with local stakeholders as well as scientists in the field from the Jomo Kenyatta University of Agriculture and Technology, the research team aims to identify the key issues that need to be addressed in realizing sustainable use of tephra for the benefit of smallholder farmers in the region.

During a first visit in Kenya, two agricultural areas with the typical soil conditions were selected for field experiment with the help of local farmers. In addition, two tephra deposits located at Lake Baringo and Lake Nakuru were analyzed. Before the field experiment begins in February, these materials will be analyzed in the laboratory for usability and potential for the desired release of elements. At the end of February, before sowing maize, tephra will be incorporated into the soil on a larger scale and according to local cultivation methods.

#### Project partner:

- Bountifield International Kenya
- Jomo Kenyatta University of Agriculture and Technology

#### Funding:

The project is funded by the Seeding the Future Foundation.



Nutrient deficiencies and acidic soils are fundamental challenges in agriculture in large parts of East Africa - silicon from volcanic ash could provide a remedy. | The picture can be used for editorial purposes by stating the source: © Eric Scherwietes/ZALF | Picture in color and print quality: <http://www.zalf.de/de/aktuelles>



Fertilization with local volcanic ash containing silicon is hypothesized by the researchers to make phosphorus in the soil plant-available again and reduce the toxic effect of aluminum on plants. | The picture can be used for editorial purposes by stating the source: © Eric Scherwietes/ZALF | Picture in color and print quality: <http://www.zalf.de/de/aktuelles>

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Mission of ZALF is to deliver solutions for an economically, environmentally and socially sustainable agriculture –together with society.

As a contribution to overcoming global challenges such as climate change, food security, biodiversity conservation and resource scarcity, we develop and design crop systems, integrated in their landscape contexts, that combine food security

with sustainability. Therefore we process complex landscape data with a unique set of experimental methods, new technologies and models as well as socio-economic approaches.

ZALF research is integrated systems research: starting from processes in soils and plants to causal relationships on the field and landscape level up to global impacts and complex interactions between landscapes, society and economy. [www.zalf.de](http://www.zalf.de)