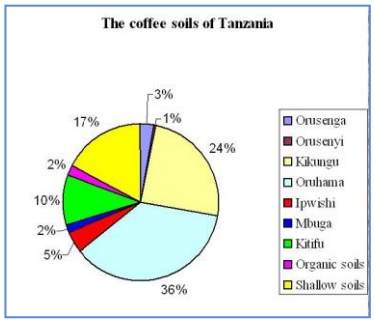
Soil Fertility

Relevance for climate change adaptation



Soils are the foundation of agricultural production. Looking into coffee, soil fertility is one crucial element determining quantity and quality of the produce. Coffee production in Tanzania takes place between 750 and 2,000 metres above sea level and the coffee soils are mainly of moderate to low fertility with, for example, Oruhama, Kikungu and shallow soils or Orusenga, Orusenyi and Ipwishi sandy soils. Only 14% of Tanzanian coffee soils are of high soil fertility with Mbuga vertisols, Kitifu andosols and organic soils. Low soil fertility is caused by soil mineralogy, erosion, nutrient leaching in slopy areas with strong rainfall, agricultural practices like ploughing and improper fertilizer management. Its effects range from yellowing of leaves, defoliation coupled with higher levels of flower abortion and shedding of immature cherries to poor tree growth, low yields, smaller coffee beans and poor cup quality.

With increasing temperatures, reduced rainfall and prolonged drought periods as expected for Tanzania such effects will be even more severe. Proper soil management is an effective measure to keep negative impacts as low as possible – and it starts with knowing nutrient and pH levels.

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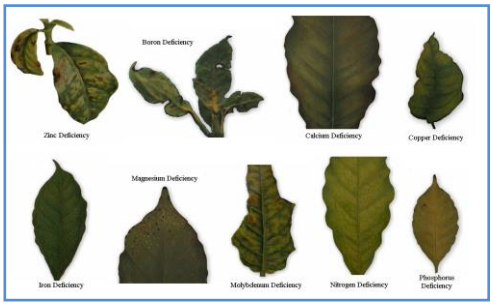
The pH level indicates the acidity of the soil. It is measured on a scale of 1 to 14 whereby results below 7 indicate acidic (or sour) soils and results above 7 alkaline soils. Soils with a pH between 6.2 and 7.2 are neutral, which is preferred by the majority of the plants. To reach neutral pH levels acidic soils may need some lime, alkaline soils some sulfur. Generally, the correct application of supplements or fertilizers such as CAN, gypsum and sulphate of ammonia respectively leads to neutral soils.

The soil pH is so important as it determines the plants' ability to take up nutrients from the soil. The nutrients are tied to individual soil particles and these particles are tighter bound in acidic soils than in alkaline soils. Thus the more acidic the soil, the less available are the nutrients to the coffee. Soils with high pH levels are neither suitable for coffee production as they attract bacteria, which in high concentration quickly use up available organic matter depleting the necessary soil balance. For coffee production pH levels are best between 6.0 and 7.5.



As explained above fertilization is closely linked to adequate pH levels. In order to know about the specific fertilization needs in a certain field, soil analysis is crucial. For this purpose a soil sample is taken and then analyzed in a laboratory. The most important nutrients include nitrogen, phosphorus, potassium, zinc and boron. Mineral deficiencies in the soils can typically be detected in the leaves of the coffee tree. Bright green leaves usually indicate a nitrogen deficiency while faulty leaves indicate, for example, zinc, boron or copper deficiencies. However, site-specific tests are required. To achieve good yields in the face of climate change adequate pH and nutrient levels are crucial and for determining a suitable feeding program pH and soil analysis are necessary. For further information contact the Tanzania Coffee Research Institute (TaCRI) or your local agronomists.

Version: April 2013 I References: Baker 2013, ICP Tanzania 2008, TaCRI 2006, Coffeeresearch.org 2013; Graph + picture: TaCRI 2006, Coffeeresearch.org 2013