

SOIL SAMPLES ANALYSIS

SUMMARY REPORT

Background:

The soil samples were collected in Lencoh and Samiran villages lying in the corridor between Mt. Merbabu to Mt Merapi in December 2008, and analysed at the Department of Agriculture Laboratory, Gadjah Mada University, in January 2009. The two villages lie adjacent to each other and are two of the 3 villages that run across the landscape, covering both mountains. Six samples were randomly collected from each village in all the three main designated zones, known locally as i) *Pekarangan* - the area at the foot slopes of both mountains, about 1500 m above sea level, and is dominated by settlements and home gardens; ii) *Tegalan* - the immediate zone above i, about 1700m a.s.l, and is predominantly the farming zone, with a few settlements; iii) *Oro-oro* - the higher slopes, about 1800m – 2000m a.s.l; formerly part of the protected area of the forest reserve, but was opened for use due to high demand for land; currently a farming zone.

The soils were tested for five essential macro-nutrients (nitrogen, phosphorus, potassium, calcium and magnesium) and two micro-nutrients (iron and manganese), apart from carbon and organic matter contents.

It is important to note that no scientific method or recommended tools were used for obtaining the soil samples. Also, the number of samples (12) taken for analysis was small and therefore not statistically representative of the area of two villages. However, this was not meant to be a comprehensive soil study test; the few samples were meant to provide a very general view of the present conditions of the soils by characterization and fertility status, involving nutrient analysis only.

Results:

The samples indicate that:

1. Soils from Lencoh village (*tagelan* zone, Merbabu Mt) were characterized by low acidity (pH), and medium values of carbon, organic matter, nitrogen and calcium content. The site sample had very high phosphorus content value, low potassium and very low magnesium and manganese values, whereas the iron value was high. Samples from the adjacent Samiran village (*tagelan* zone of Merbabu Mt) had neutral pH value, and values of carbon, organic matter, nitrogen, potassium, calcium, magnesium, manganese and iron similar to the Lencoh village's, except the very low phosphorus value.

2. Samples from Lencoh village (*tagelan* zone, Mt Merapi) were lowly acidic, with very low values of carbon, organic matter, potassium, magnesium and manganese. The nitrogen, calcium and iron values were medium whereas the phosphorus content value was very high. The samples collected from Samiran village were also lowly acidic, but had medium levels of carbon and organic matter; they were also characterized by low nitrogen, calcium and manganese values and very low phosphorus, potassium and magnesium values. The site's iron content was very high.

3. Soil samples collected from Lencoh village (*Oro-oro* zone, Merapi Mt) had neutral pH value contrasting with the acidic samples from Samiran; the carbon, organic matter, potassium, calcium and iron value were found in medium levels, while phosphorus, magnesium and manganese values were very low in the same samples

In the adjacent Samiran village, nutrients values varied from low carbon and organic matter to very low phosphorus, potassium, magnesium and manganese; whereas medium nitrogen and calcium contrasted with very high iron values.

4. In the Lencoh village (*Oro-oro* site, Merbabu Mt), the soils were lowly acidic, with high carbon and organic matter content values; the nitrogen, calcium and manganese values were medium, whereas they had low values of phosphorus and potassium, and very low magnesium. They had very high iron content values.

In the adjacent Samiran village, the soils were characterized by low acidity, whereas carbon, organic matter and nitrogen values were low. The samples had very low values of phosphorus, potassium, magnesium, manganese; and medium values of calcium and iron.

5. In Lencoh village (*Pekarangan* zone, Merbabu Mt), the soils were lowly acidic, with high values of carbon, organic matter and potassium; they had medium nitrogen and calcium values, but were characterized by low iron and **very** low values of phosphorus, magnesium and manganese.

In Samiran, the pH values were also lowly acidic, but had high iron content, and very high carbon, organic matter and phosphorus values. The nitrogen content was similar to Lencoh village samples, but the very high phosphorus contrasted with the very low values found in Lencoh. The site samples also showed very low potassium, magnesium and manganese, but high iron value.

6. The Lencoh site (*pekarangan* zone, Mt Merapi) soil sample showed low acidity and high carbon and organic matter content values. They were also characterized by medium values of nitrogen, potassium, calcium and iron, but had very low magnesium and manganese in contrast to very high values of phosphorus.

In Samiran, the samples had neutral pH value and medium levels of carbon, organic matter and calcium. They were also characterized by low values of potassium; very low values of magnesium and manganese, and high iron content value.

Summary:

The few soil samples (12) provide a very general perspective (in terms of nutrient values) of the condition of the soils. The soils showed the following characteristics:

- i) pH values – generally lowly acidic in all samples
- ii) Carbon (%) - varied from medium to high values
- iii) Organic matter (%) – wide variation of values, no particular pattern shown.
- iv) Nitrogen (%) – varied from medium to low values
- v) Phosphorus – generally **very** low in all samples, except those from Merapi Mt samples (on foot slopes/settlements area or *pekarangan* zone).

- vi) Potassium – generally low in most samples, except medium values in Lencoh village samples from *oro-oro* zone on Mt Merapi, and a high value from samples from Lencoh (*pekarangan* zone, Merbabu Mt)
- vii) Calcium – generally medium in all samples, except for low values recorded in Samiran village samples (*pekarangan* zone on Merbabu Mt)
- viii) Magnesium – very low in all samples
- ix) Manganese – very low in all samples
- x) Iron – generally high, only medium in *pekarangan* zone on Merapi Mt site sample

In conclusion, the results indicate that the soil samples are generally deficient in the necessary nutrients essential for optimal crop production.

Note: Please refer to the details and quantitative criteria values (very low, low, medium, high and very high, etc) used in the analysis in the appropriate attachments (Tables 2a and 2b).

Some interesting observation(s):

Low values of organic matter in samples obtained from *Oro-oro* zone are confounding; one would expect the area soils to be rich in organic matter, given that it was until recently part of the forest reserve and therefore fairly well covered with organic matter. The depletion of the organic matter does indicate the fragility of the Merapi mountain area soils. Geologically, it is a relatively ‘young’ volcano, and the soils are not yet well formed, hence susceptibility to erosion agents. It also shows how demand and unsustainable land use practices on steep slopes have quickly eroded the soils - as evidenced by this example.

There is also the presence of very high values of phosphorus in some samples (excess of it may cause potassium deficiency); this ‘imbalance’ of nutrient values is observed in most of the soil samples.

It is not possible to draw conclusions from these results, but there is need for a comprehensive study of the area’s soils. In order to obtain a basis for fertilizer recommendations for different crops in the study area, a nutrient management program that is based on sound data and knowledge is necessary. Currently, the Selo farmers apply fertilizers without any information about the soil fertility status – it explains the vicious cycle of ever diminishing returns they receive in spite of increased fertilizer applications, every season. .