Assessing the total microbial population and soil characteristic of abandoned tin mining area for aagriculturalal sustainability.

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Assessing the total microbial population and soil characteristic of abandoned tin mining area for agricultural sustainability

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Background

- Tin mining has been conducted for hundreds of years and has a potential to increase community welfare, but it has also caused land degradation, which eventually has reduced natural productivity of the land.
- Once the land is damaged and loses function physically, chemically, and economically, it is classified as critical land and could not be used optimally.
- Because degraded land has several limiting factors, only a few plants can grow. Identifying critical land limiting factors is needed to take appropriate action in land reclamation activities.

Aim

- To assess total microbial population and identify limiting factors in abandoned tin-mining areas needed to take appropriate action in land reclamation activities.

Materials and Method

Step 1	Identifying and Classifying land condition.	To purposively classified the study site into Abandoned Tin Mining Area (ATMA) and Undisturbed Land as a control.
Step 2	Soil Sampling.	To collect 20 soil samples (10 samples from each site) were taken at a depth of 0-30cm.
Step 3	Characterizing soil samples.	To define total microbial population (TMP), soil hardness, and organic C content.
Step 4	Classifying soil degradation status.	To determine the status of land damage, namely by comparing the characteristics of the soil with the applicable criteria.

Result and Discussion

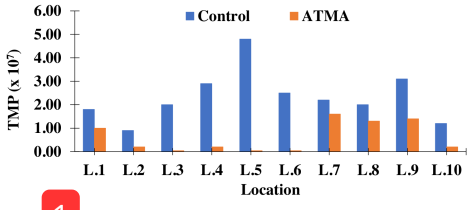

Figure 1. Total microbial population at the study site.

- Soil TMP was significantly affected ($p < 0.01$) by the status of the area, and
- The TMP of the soil in abandoned tin mining area in all locations was signicantly lower than in the control area. However, it was still far above the critical threshold ($<10^2$ cfu/g soil).

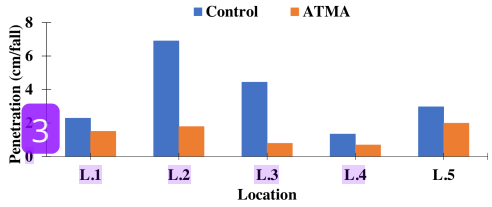

Figure 2. Soil hardness at the study site.

- Soil hardness was significantly affected ($p = 0.05$) by the status of the area, and
- Soils in the abandoned tin mining area in all locations was harder than those in control area so they were classified as degraded areas.

Result and Discussion

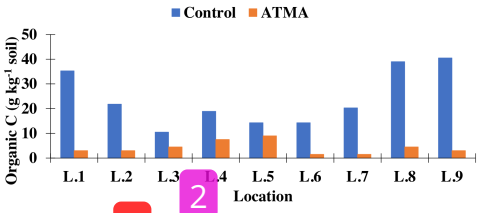

Figure 3. Soil organic C at the study site.

- Organic C of soil was significantly affected ($p < 0.01$) by the status of the area, and
- Organic C of soil in the abandoned tin mining area in all locations was significantly lower than those in control area so they are classified as degraded area.

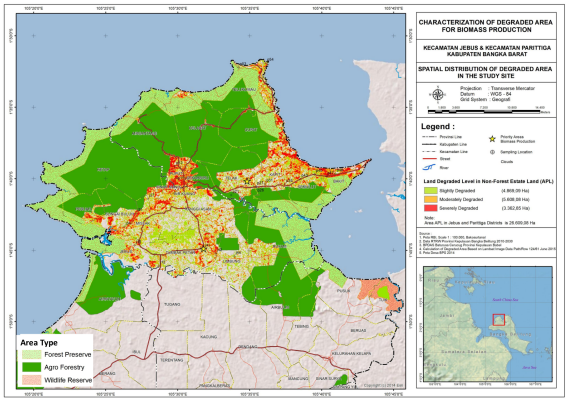

Figure 4. Spatial distribution of degraded area at the study site.

- 52.01% of the study site has been identified as degraded land, either as a result of tin mining activities or poor land management.
- The level of land degradation at the study site was grouped into 3 classes, namely slighty degraded (4,869.09 ha), moderately degraded (5,608.08 ha), and severely degraded (3,362.85 ha).

Conclusions

1. Although the soil TMP in the study sites was still far above the ctitical threshold, both the Undisturbed Area as a Control has actually been slightly degraded, and the ATMA has been moderately to severely degraded,
2. Both soil hardness dan organic C content of the soil appeared to be important indicators of land degradation in the study sites, and
3. Taking into account the current condition of the soil at the study site which has been slightly to severe degraded, it is recommended that reclamation efforts be carried out through the application of organic matter and chemical fertilizers, as well as planting endemic tree species that have important ecological and economic value.

Future Research

Considering the possibility of heavy metal residues at the study site, it is necessary to carry out further research related to the phytoremediation aspect using local tree species that have important ecological and economic values combined with bioremediation by optimizing in situ microorganisms.

Source: Personal documentation

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