The Feasibility of Utilizing Vetiver (*Chrysopogon Zizaniodes*) as Silt Barriers for Sediment Control of Run Off from Open Pit Mines

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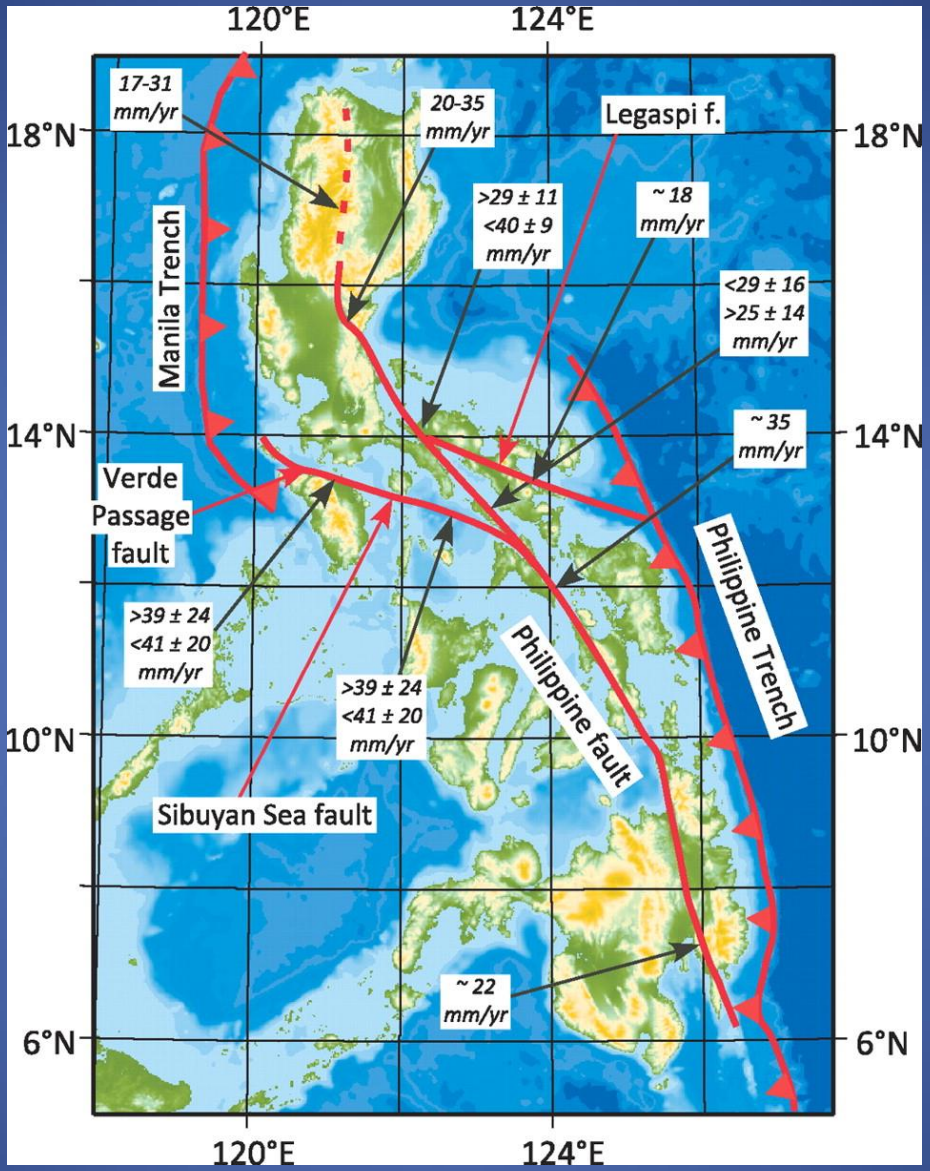

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•Nickel Lateritic soils have very fine sediments (63microns)
•Siltation in the run-off water is mitigated by employing siltation ponds and silt traps.

Carrascal Nickel Corporation

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Why Vetiver?

The dense root system of the Vetiver grass has been used for soil erosion control, agriculture, and for waste and sewage treatment with significantly increasing research on its capability to absorb heavy metals and toxic wastes.

Current Applications of Vetiver

Slope Stability

Vetiver used for slope stability along the embankment of LosBaños, Laguna in 2013.

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Kalibo- Caticlan erosion control and revegetation on cut slope

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Pythoremediation

Vetivers placed in pontoons used for minimizing algal bloom to regulate oxygen for fish and other aquatic life in a pond at Balog Creek, in Itogon, Benguet

In 2013.

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Current Applications of Vetiver

Pythoremediation

Vetivers placed in pontoons used for cleaning the Pasig River and Ad campaign for Hana Shampoo by Vetiver Farms Philippines

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Objectives of the Study

- To utilize Vetiver as silt barriers
- To demonstrate the ability of vetiver to trap silt
- To determine relationship of vetiver density and efficiency in trapping silt

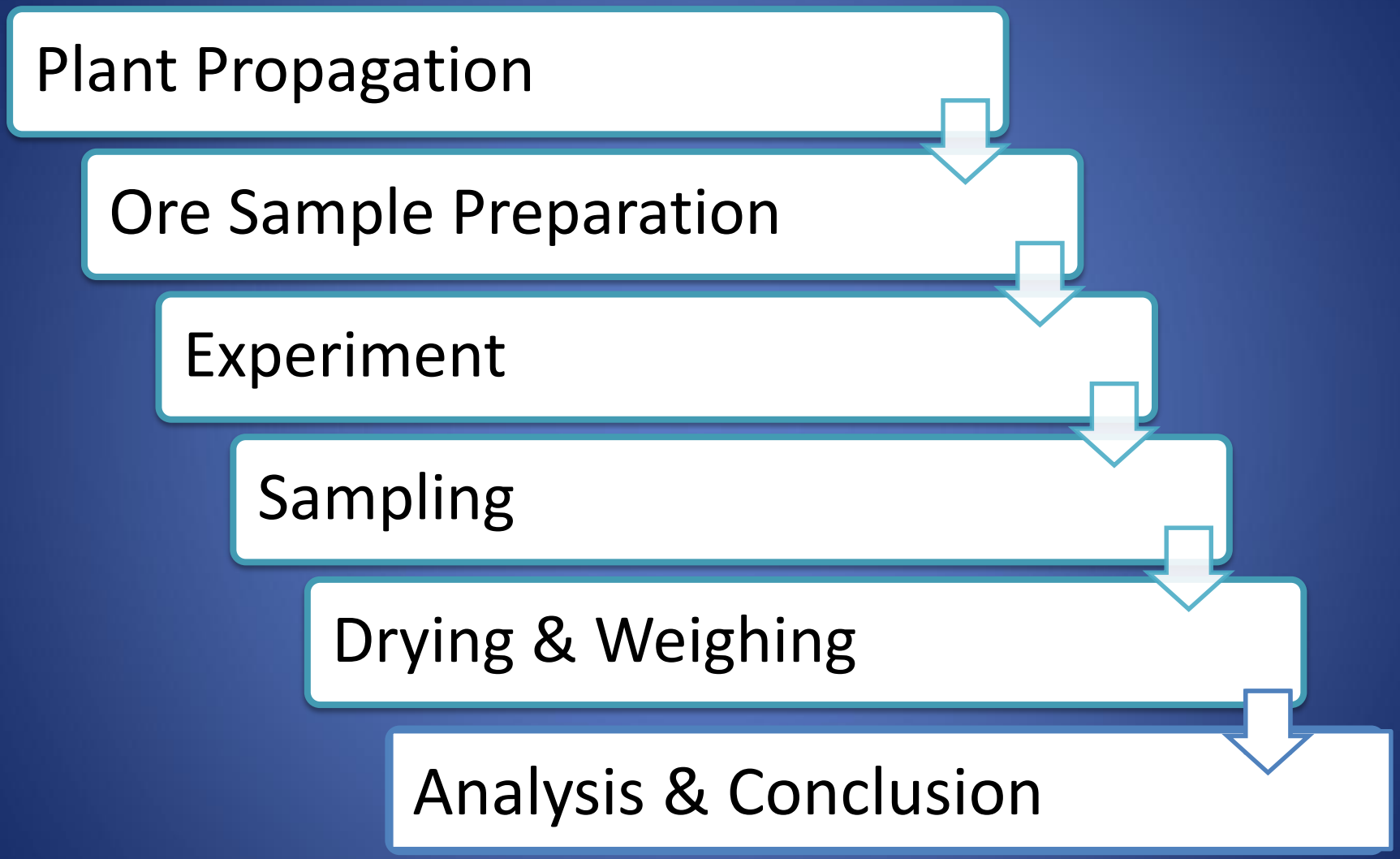
Scope and Limitation

- The study intends to show only the capacity of the Vetiver Root System to trap and accumulate silt in recirculated water and quantify its effectivity.

- Results and conclusions are only applicable for heavily silted water.

- Silt of Nickel Lateritic origin with size less than 63 microns

Methodology



Methodology : Plant Propagation

Figure 1. Propagation of Vetiver Grass.

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Methodology : Plant Propagation

Figure 2. Washing of Vetiver Root Bundles.

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Methodology : Plant Propagation

Figure 3. Propagated Vetiver Root Bundles

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Methodology: Particle Size Reduction

Figure 4. Particle size reduction by Ball Milling, and RoTap and sieving.

Methodology: Set-up Design

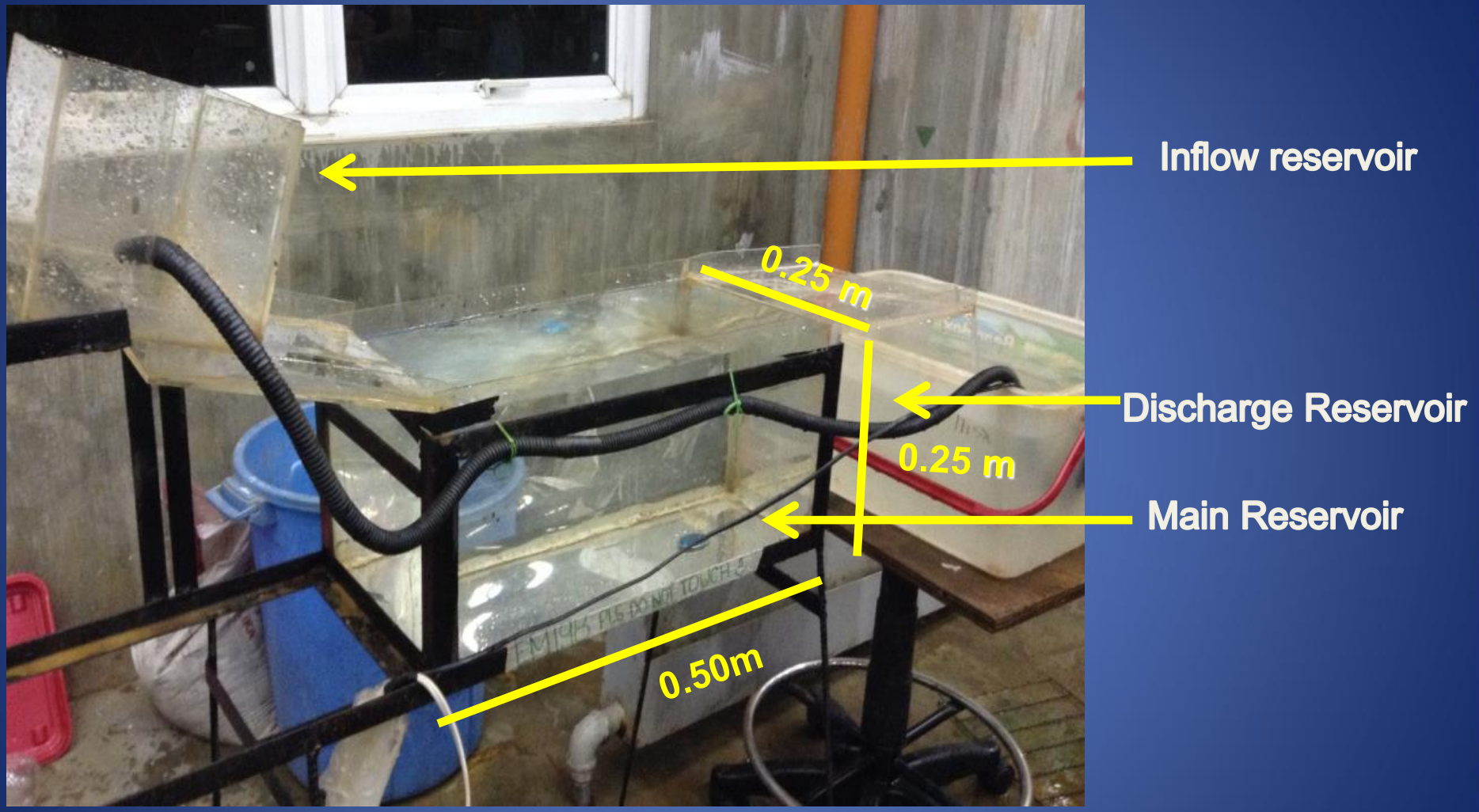

Figure 5. Experimental Set-up without Vetiver System, without silt.

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Methodology: Experiment

Vetiver Density	Amount of silt (g)
0	50
0	100
0	150

Table 1. System 1: No Vetiver System, Varying Silt Concentration

Vetiver Density	Amount of silt (g)
1 row	100
2 rows	100
3 rows	100

Table 2. System 2: Varying Vetiver Density, Constant Silt Concentration

Vetiver Density	Amount of Silt (g)
4 rows	50
4 rows	100
4 rows	150

Table 3. System 3: Varying Silt Concentration

Constant Vetiver Density

Methodology: Experiment

Methodology Experiment

SYSTEM 1 *No Vetiver, Varying Silt Concentration*

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Methodology Experiment

SYSTEM 2: Constant Silt Concentration, Varying Number of Vetiver Rows

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Methodology Experiment

SYSTEM 3: Constant Number of Vetiver rows, Varying Silt Concentration

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Methodology: Sampling and monitoring

Figure 6. Samples collected from system 3

Methodology

Filtering and Drying

Figure 7. Silt collected from the system is decanted and filtered

Figure 8. Silt filtered from the system.

Methodology

Root System

Figure 9. Vetiver Root System without silted water

Figure 10. Vetiver Root System with silted water

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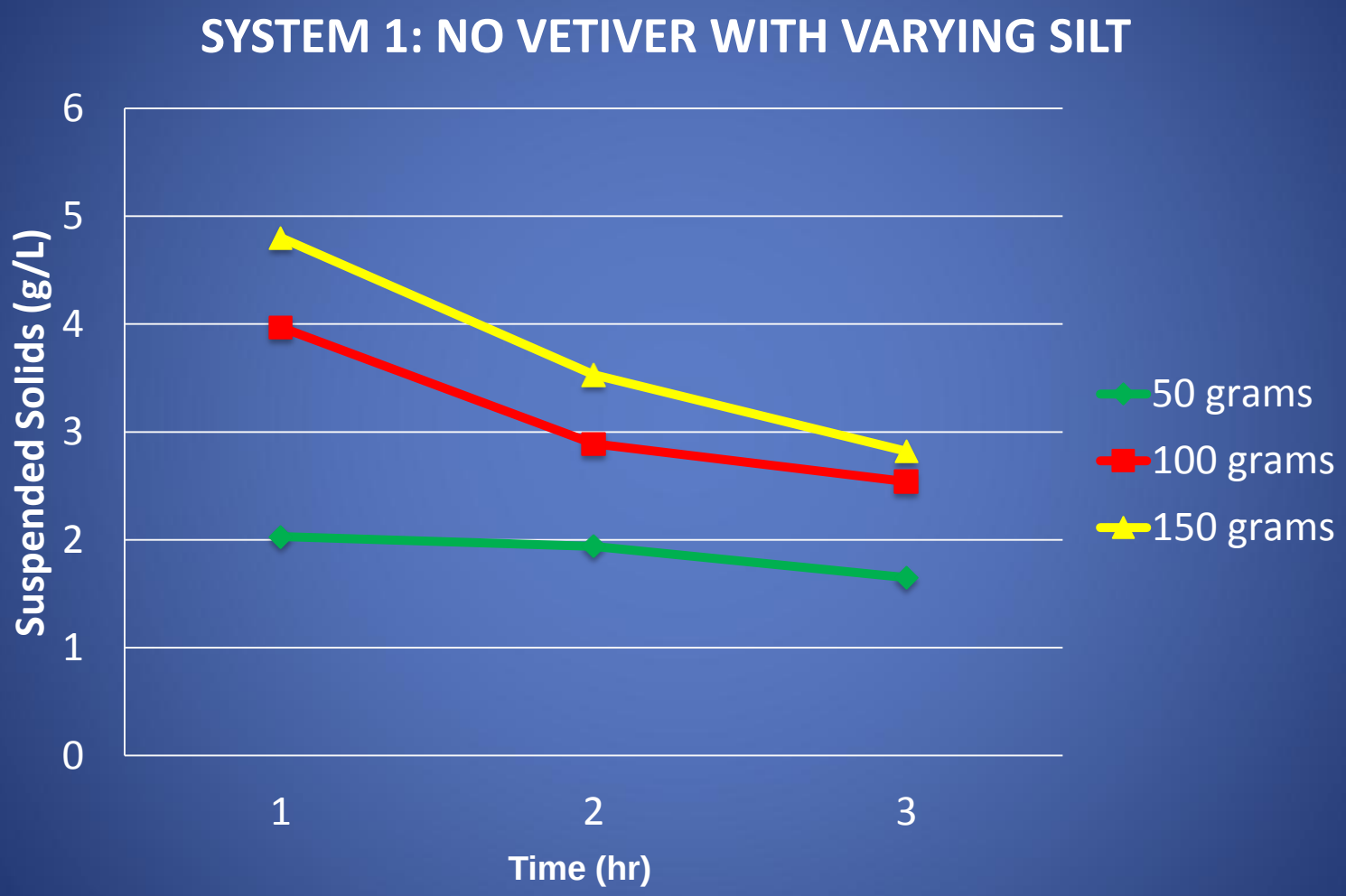
Data and Interpretation



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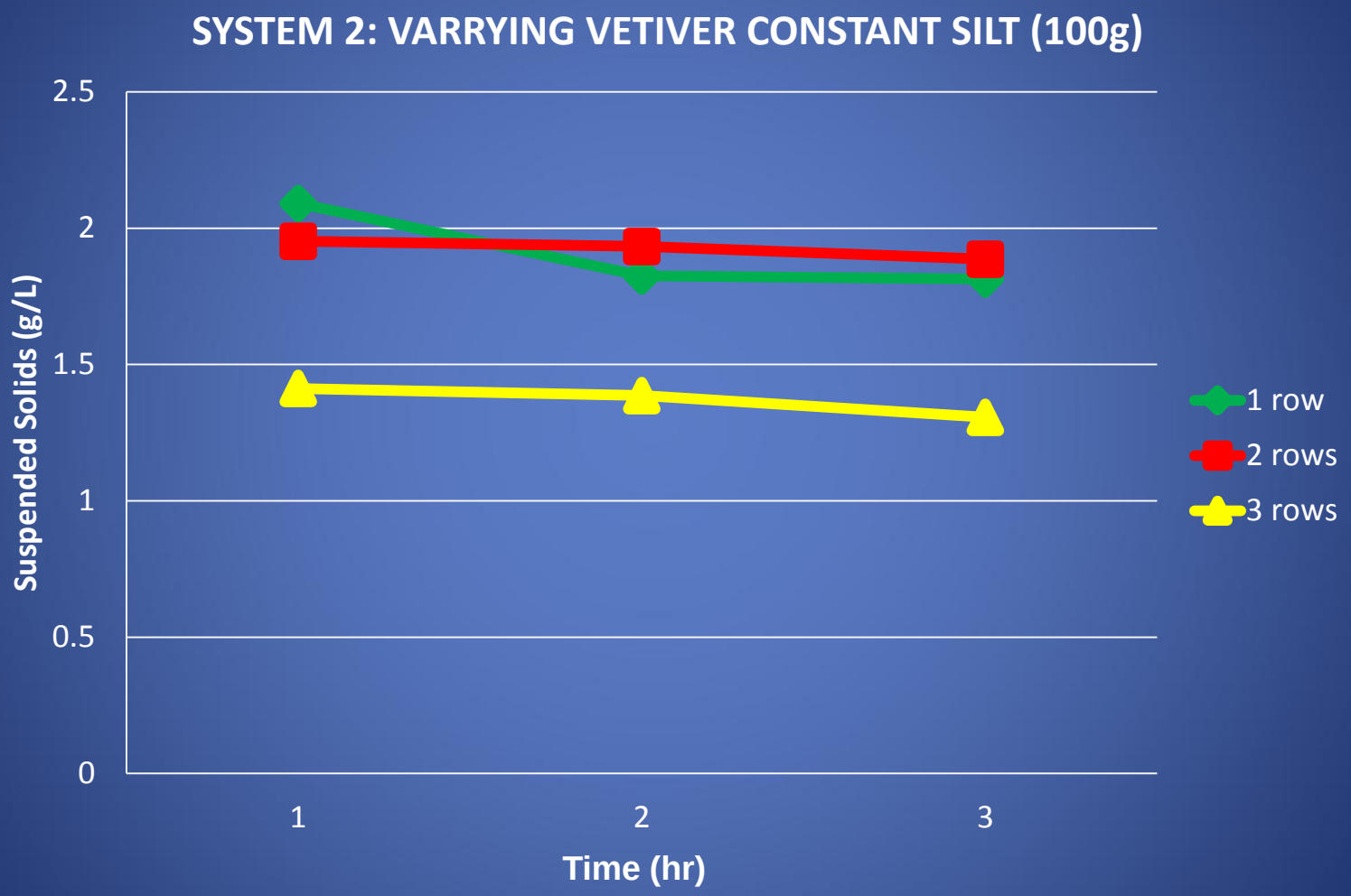
Data and Interpretation



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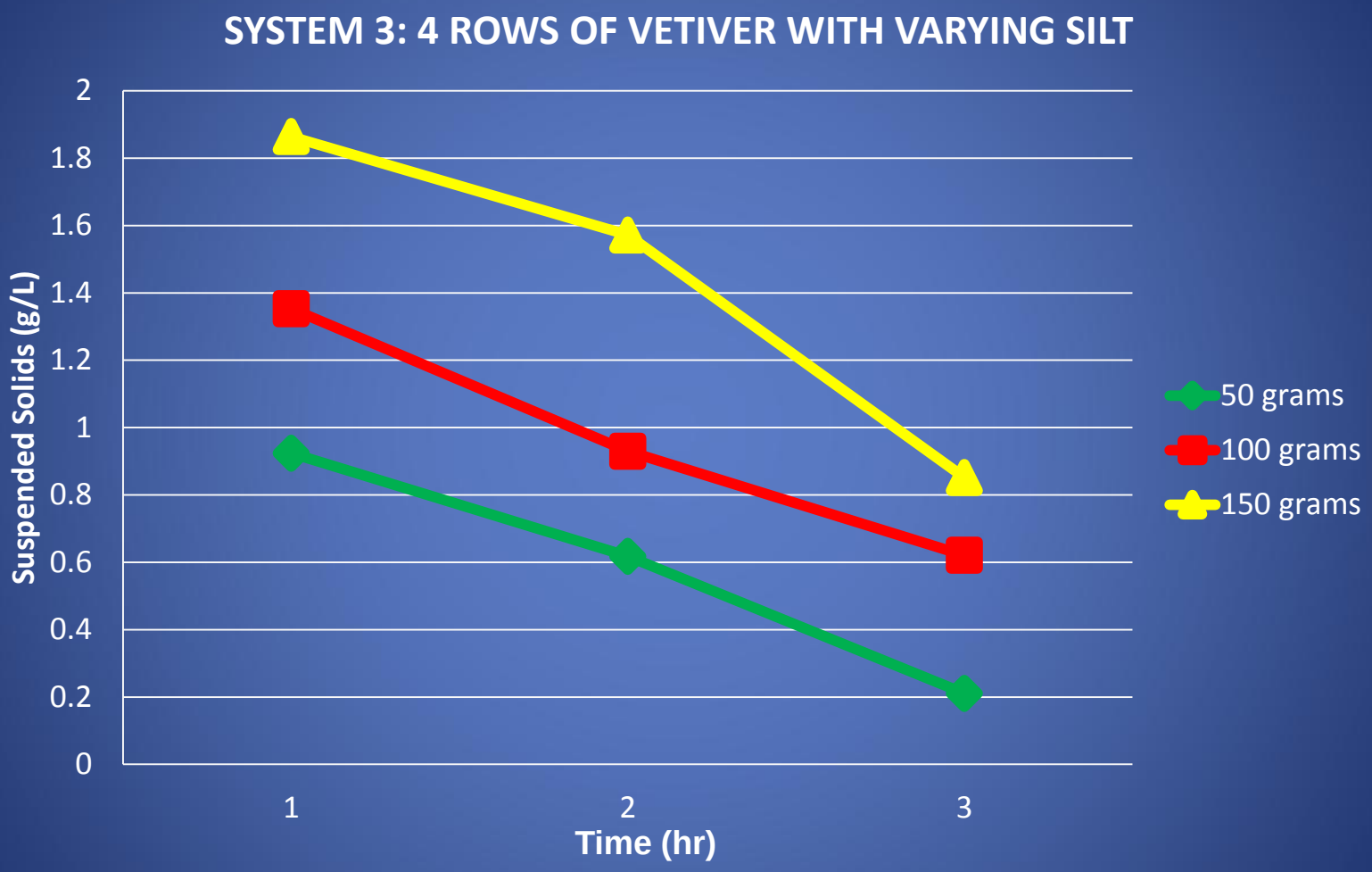

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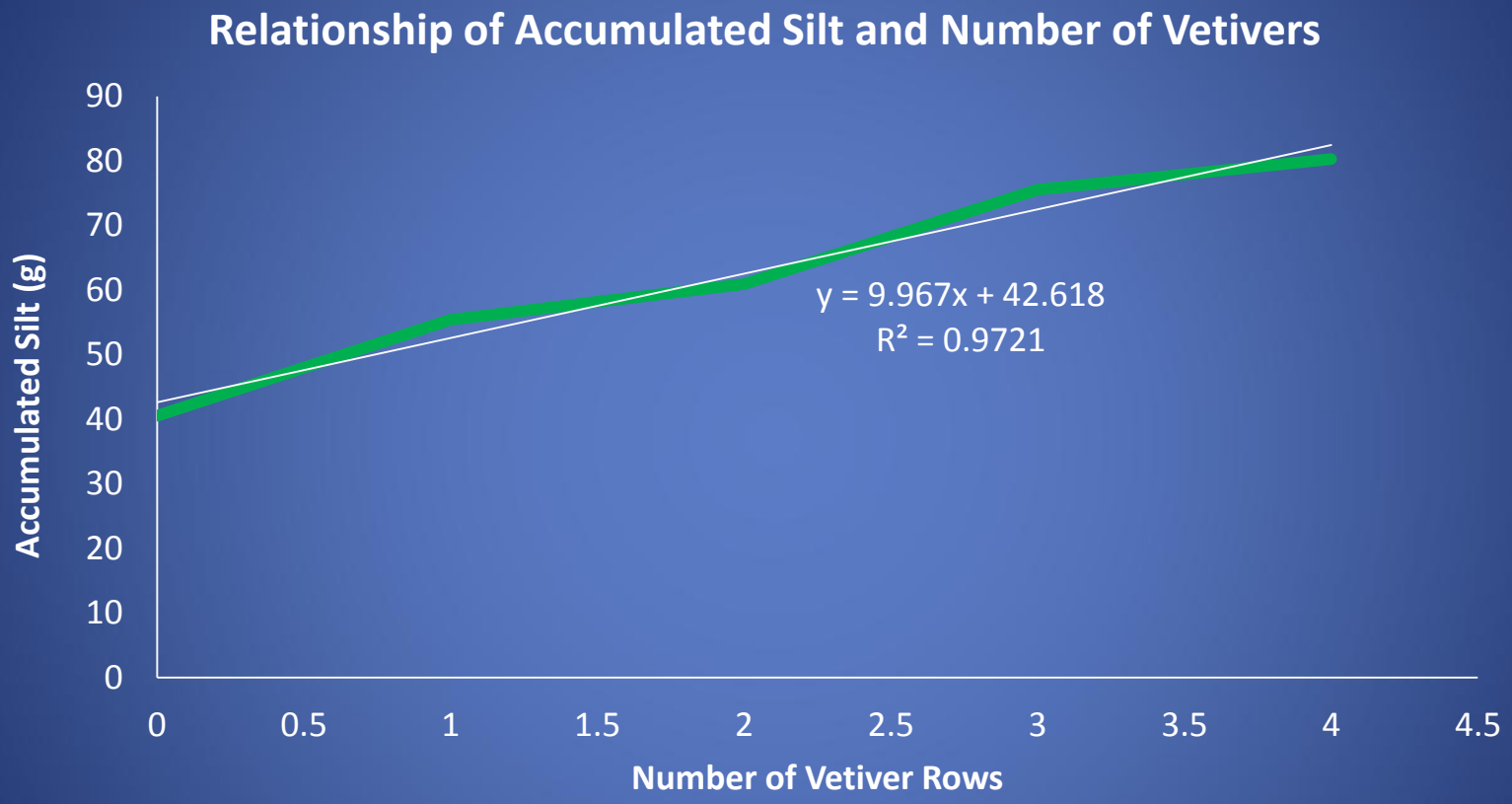
Data and Interpretation



Silt (g)	No. of Rows	Mass $(g)_0$	Mass $(g)_4$	Percent Change (%)
50	0-4	16.78	25.86	54.11
100	0-4	40.56	80.32	98.03
150	0-4	59.06	104.28	76.57

Table 5: Percent Change from zero to four rows of Vetivers

Conclusion

System 1 and 3 - The amount of total silt accumulated in the main reservoir relatively increased as compared to no Vetivers at all.

System 2 – The amount of Vetiver rows introduced into the system is proportional to the amount of accumulated silt.

Conclusion

Statistically significant differences were observed between the no vetiver system and the vetiver-present system

Recommendation

The researchers recommend that a further and more comprehensive study be conducted involving:

- More species of plants
- Industrial silt barriers such as Geotextiles
- Optimum time to allow saturation of silt barrier
- Perform the experiment in the actual mine set-up

Photo Credits

1. Streambank Rehabilitation. (n.d.). Retrieved February 20, 2015, from http://calabarzon.denr.gov.ph/index.php/photo-releases/398-streambank-rehabilitation

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