Rehabilitation in a Bauxite Tailing Dam System: A Pilot Project

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Abstract

The study aimed to test plant species and revegetation methods into degraded areas previously occupied as bauxite mining tailings dams in the Brazilian Amazon. To this end, revegetation methods were tested, comparing which technique is best to be employed in the revegetation of degraded areas resulting from dams filled with tailings and sterile soil. The tested techniques were employed in 16 study blocks, where different plant species and soil treatments were used, which considered the addition of organic fertilizers, chemical fertilizers and soil micronutrients, and the results were compared statistically and by visual and ecological evaluation. The study area comprises areas of Paragominas mine operation, installed in the municipality of the same name and owned by Hydro. The success of the result can significantly impact the recovery of degraded areas by mining dams, which create strong adverse environmental conditions, both chemical and physical. The use of Bauxite tailings material to fill dams is not a usual practice and presents great environmental improvement by avoiding the importation of landfill material which result in new environmental impacts. The tree growth obtained with the proposed environmental treatments shows great potential to generate new technical guidelines for the recovery of degraded areas with new technologies focused on dam areas filled with Bauxite tailings material.

1. Introduction

Hydro Paragominas is a project located in the municipality of Paragominas, in the state of Pará, Brazil, which mines and beneficiates bauxite ore, transforming it into pulp (50 % water and 50 % ore), that is sent by pipeline to the municipality of Barcarena (244 km), to transform into alumina and later aluminium (Figure 1).

Figure 1. Hydro Paragominas mining and Alunorte refinery geographical location. Source: Hydro.

Mining activities in the region, have as the first step the removal of vegetation before the excavation of topsoil and overburden to reach the bauxite deposit. After this last stage, the organic rich topsoil, which is removed and stored, is returned to the mined area, following contour reshaping with overburden to initiate forest recovery. Three different techniques are used for reforestation: traditional revegetation with seedlings; foster natural regeneration; and a third and innovative technique, nucleation. Currently, Hydro Paragominas has more than 2 900 hectares of mined areas in the rehabilitation process.

As for the management process of the tailings generated in the ore beneficiation stage, Hydro Paragominas operates on two different fronts. The first is the Vale Tailings System, that has been operational since the beginning of the mining activities (2007). It is currently in the process of operation closure. The second is the Plateau Dike Tailings System, which takes advantage of the mining pit from previous years implementing an innovative solution for drying the tailings and later returning them to the pit where the ore was mined, thus avoiding dam expansions and heightening, resulting in huge environmental and operational gains (this methodology is called Dry Backfill).

Aiming to carry out forest recovery in the dam areas as well, Norsk Hydro Brazil signed a technical cooperation agreement with the Brazilian Agricultural Research Corporation (EMBRAPA), to carry out a pilot project study integrating science and academy to make this action feasible, as detailed in the present paper.

2. The Valley Tailing Dam System

The Valley's tailings system, located on Hydro Paragominas' properties, with a total area of approximately 470 hectares, is basically composed of three dams, Dam B1 which is used for tailings disposal; the B5 which aims to protect the nearby springs; and B6, where the water clarification process in the tailings system takes place. This system began its operations in 2007 and is currently in the final operationalization phase, being gradually replaced by the tailings system called “Plateau Dike” (Figure 2).

As for the characterization of the waste, according to NBR 10004/2004, it is characterized as a Class II B – Inert, that is, non-hazardous and when in contact with water, they do not undergo physical, chemical, or biological transformations, remaining unaltered for a long period of time.

8. References

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