The program for Recovery of Degraded Areas includes the scientific research "Desenvolvimento de metodologia para recomposição vegetal de áreas impactadas pela mineração de ferro utilizando gramineas nativas resistentes" (Development of Methodology for Plant Recovery in Areas Affected by Iron Mining Activities Using Resistant Native Grass Species), coordinated by the professor Eduardo Gusmão from UFV. The current work derives from a previous study, conducted as part of a joint call for tender between Vale and the Research Support Foundations from Pará, Minas Gerais, and São Paulo, launched in 2010.

In the first initiative, laboratory studies allowed researchers to identify species of tropical grass species with satisfactory physiological performance and growth in soils with tailings, capable of accumulating potentially phytotoxic quantities of elements that occur naturally in the regional soils (such as iron and manganese, among others), without presenting expressive physiological and morphological changes in their tissues.

Underway since 2015 and with conclusion planned for 2019, a team led by Eduardo Gusmão (See table on page 37) is using experiments on the field and in a greenhouse (sheltered structure that protects plants against outdoor meteorological agents) to develop a reliable methodology that can be easily replicated to recover the native vegetation cover in areas degraded by iron mining. That is why it works with previously identified resistant grass species.

Eduardo Gusmão is a professor and biologist with a doctorate degree in Plant Physiology from UFV. Working in a coordinated manner with the other researchers from the program for RDA, he commented: “We proposed a change in paradigm, an innovative action for the mineral segment. The knowledge on species as well as physical and environmental attributes of the areas will serve as basis for the definition of the species that can...”
be used in each site, reducing the recovery time and boosting the efficiency of the process."

The research has reached an advanced phase. Dozens of planned stages and sub-stages have produced studies covering the following topics: ecophysiology of the germination of resistant grass species and their response to water stress; effects of humic acids (produced from the biodegradation of dead organic matter) on the growth and physiological metabolism of native grass species; colonization and development of arbuscular mycorrhizal fungi (AMF) on mining tailing substrates; and plant growth analysis and morphological characterization (See the table with the organizational chart for the studies on page 36).

“The grass species are the starting point of the ecological succession process, favoring the introduction of other species or the natural colonization of the area,” explained Eduardo Gusmão. “Because exotic species can cause an imbalance in the biodiversity of the environment, we are working to select native species that can compete with the exotic ones, efficiently use resources as nutrients, and stabilize the substrate.” Based on the work done so far, two species presented satisfactory growth in all test conditions and have already been selected – *Setaria parviflora* and *Paspalum densum*.

The research has given the university the opportunity to qualify its human resources by supporting a post-graduate and two master’s degrees, as well as granting four undergraduate research scholarships. The study also gave UFV the opportunity to acquire important equipment for its laboratories that can be used for scientific progress in the area of RDA.

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### Researchers

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<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Title</th>
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<tbody>
<tr>
<td>Eduardo Gusmão</td>
<td>Federal University of Viçosa</td>
<td>Doctor</td>
</tr>
<tr>
<td>Luzimar Campos</td>
<td>Federal University of Viçosa</td>
<td>Doctor</td>
</tr>
<tr>
<td>Maria Catarina Megumi</td>
<td>Federal University of Viçosa</td>
<td>Doctor</td>
</tr>
<tr>
<td>Marihus Altoé Baldotto</td>
<td>Federal University of Viçosa</td>
<td>Doctor</td>
</tr>
<tr>
<td>Advânio Siqueira</td>
<td>Federal University of Viçosa</td>
<td>Doctor</td>
</tr>
<tr>
<td>Marilane Soares</td>
<td>Federal University of Viçosa</td>
<td>Doctor</td>
</tr>
<tr>
<td>Talita Oliviera</td>
<td>Federal University of Viçosa</td>
<td>Doctor</td>
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**Further Information**

To learn more about the topic, access [http://www.locus.ufv.br/bitstream/handle/123456789/7794/texto%20completo.pdf?sequence=1](http://www.locus.ufv.br/bitstream/handle/123456789/7794/texto%20completo.pdf?sequence=1), [http://dx.doi.org/10.15244/pjoes/68429](http://dx.doi.org/10.15244/pjoes/68429), and [http://www.locus.ufv.br/bitstream/handle/123456789/10614/texto%20completo.pdf?sequence=1&isAllowed=n](http://www.locus.ufv.br/bitstream/handle/123456789/10614/texto%20completo.pdf?sequence=1&isAllowed=n).
Approach Procedures Produtos

**Approach**

Selection of native species in greenhouse

Characterization of the environment to be recovered and initial responses from resistant species

Research of the resistance mechanism

Research of the propagation method

Research of the substrate enrichment method

Prospection of microorganisms and method for use and inoculation

Consolidation of techniques

**Procedures**

Climate-environmental characterization, material collection, and initial on-site evaluation of the resistant grass species responses

Selection of resistant species using physiological indicators, based on chlorophyll fluorescence

On-site simulation of the deposition of MSPF and on resistant native grass species

Resistant grass species response to water and nutritional stress

Influence of interactions among growth station, substrate nutrient content, and water availability regarding the on-site revegetation dynamic

Ecophysiology of resistant grass species germination and allelochemical interactions

Sowing method and on-site interspecific interactions

Humic acid action on grass physiology metabolism

Evaluation of the addition of humic acids and organic matter in substrate containing mining tailings

On-site methodological application of organic component and interactions with environmental variables

Prospection of microorganisms that help the colonization process

Mycorrhizal development and growth of tropical grass species in mining tailings after inoculation with AMFs

On-site methodological application of AMF inoculation on plants and interactions with environmental variables

**Produtos**

Consolidation of physiological indicators for the selection of new resistant species

Proper method to incorporate resistant species to the affected area

Method to improve the seed germination process

Proper method to enrich the substrate with organic compounds based on plant nutrition

Proper method to inoculate and cultivate resistant grass species with AMFs

Integrated method to recover the vegetation cover