

The ongoing experiment being conducted by Osa Conservation is trying to determine the most efficient and cost effective way to reforest large areas of land in the tropics. The experiment is exploring the effect of variable densities of Balsa trees (*Ochroma pyramidale*) planted in the area to determine the optimal percentage of Balsa stem density on the reforestation and rewilding of the ecosystem. The plots were arranged with 4 treatment types: low (0% balsa), medium (33% balsa), high (75% balsa), and natural regeneration. Balsa trees, native to the Osa Peninsula, are primary succession trees that grow quickly, therefore providing shade and nutrients to help the growth of secondary succession species. As of this summer, the experiment is in its second year of its predicted 20 year duration, due to the fact that the average lifespan of a Balsa tree is 20 years. Lehigh's work on the Osa Peninsula consisted of planting new saplings in experimental plots, collecting measurements on established trees, and establishing new plots. Furthermore, Harris Duling worked on standardizing the methodology of the various projects being conducted in the experimental plots while Anna Moragne conducted preliminary data analysis on the effect of initial sapling height and percent presence of Balsa trees on the success and growth rates of secondary species. Preliminary results indicate that the initial height of a sapling at the time it was planted does not effect survivorship and that tree height after one year is not effected by percent presence of Balsa tree.

A variety of methods were employed in the experimental areas of reforestation to enhance regrowth and rewilding:

- Biowaste soil rejuvenation and weed suppression through leaf litter translocation
- Increasing structural complexity by constructing nest boxes for birds and bats, planting fruiting trees to attract mammals and birds and planting sweet potato to attract terrestrial mammals.
- Increasing microhabitat availability with log piles, bromeliads, roosting bat plants.
- Increasing pollinator services through flowering plants.
- Forest Recovery Monitoring of recruitment, mortality, growth.
- Biodiversity monitoring of birds, dung beetles, butterflies, amphibians, bats.

Osa Conservation is working to reforest 40 hectares of land in this location.

~53 other species were including in this experiment as other primary growth species, secondary growth species, fruiting species, and habitat species to kickstart biodiversity.

Figure 2. Even though the entire experiment will take approximately 20 years, Anna was able to conduct preliminary analysis on the change in height of tree species just one year after they were planted to see if the percent presence of Balsa tree was already having an effect on the growth of other species. This would be helpful information to analyze from the beginning so that at the end of the study, people are able to observe whether or not growth after one year is indicative of growth after 20 years. By running a Kruskal-Wallis test and a Dunn test, the data showed that the change in growth for saplings after one year was significantly different for species in the medium (33% Balsa) plots.

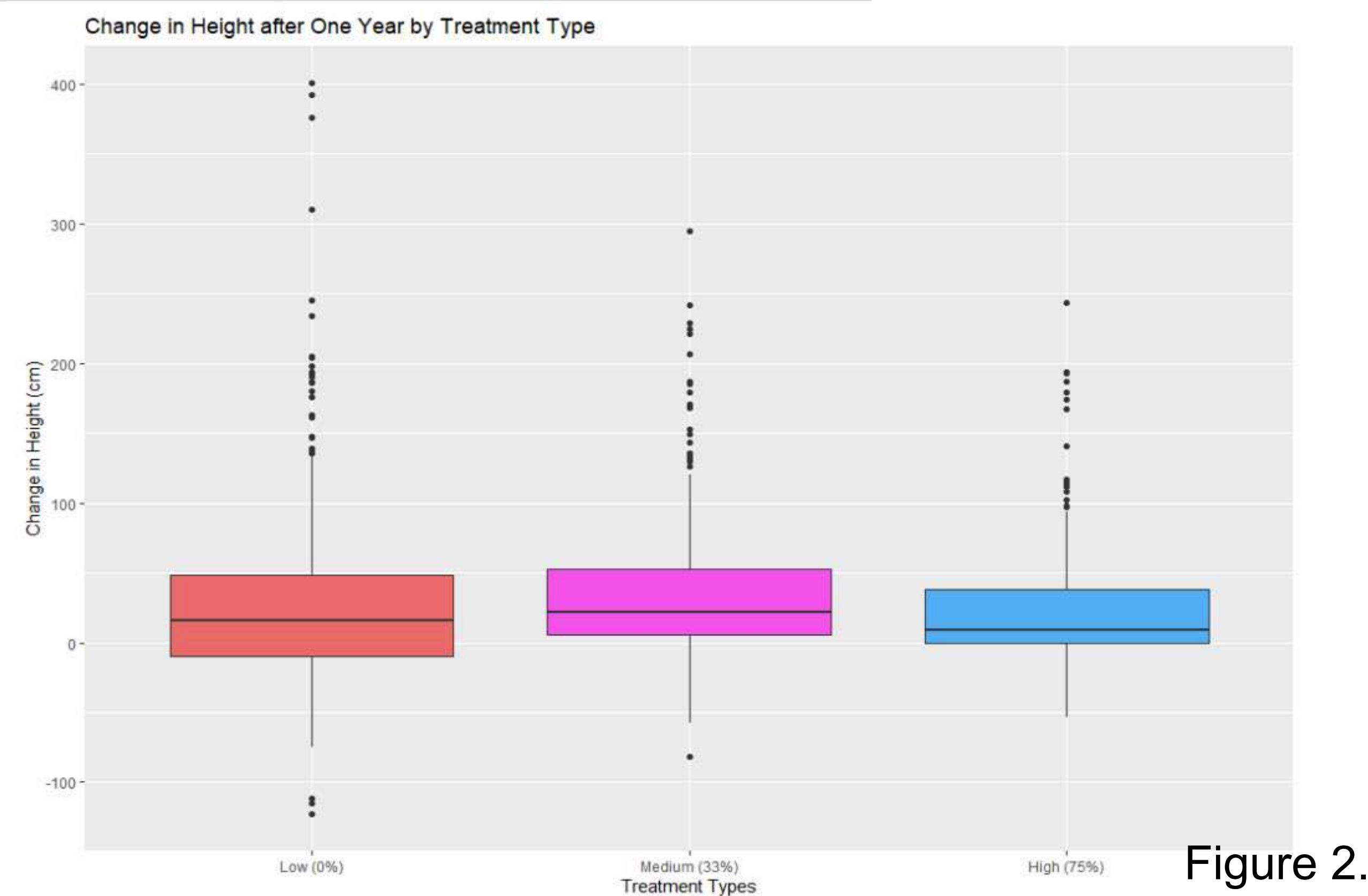


Figure 2.

Figure 3. The final analysis ran was to observe if the plot treatment type has an effect on growth of a species after one year but broken down by individual species. The graph above shows boxplots for Balsa trees and the first 13 species, one plot for each treatment type of each species. The graph is able to show that there may be generalized effects when all the species are grouped together but, when broken down, each species is effected by the treatment types differently.

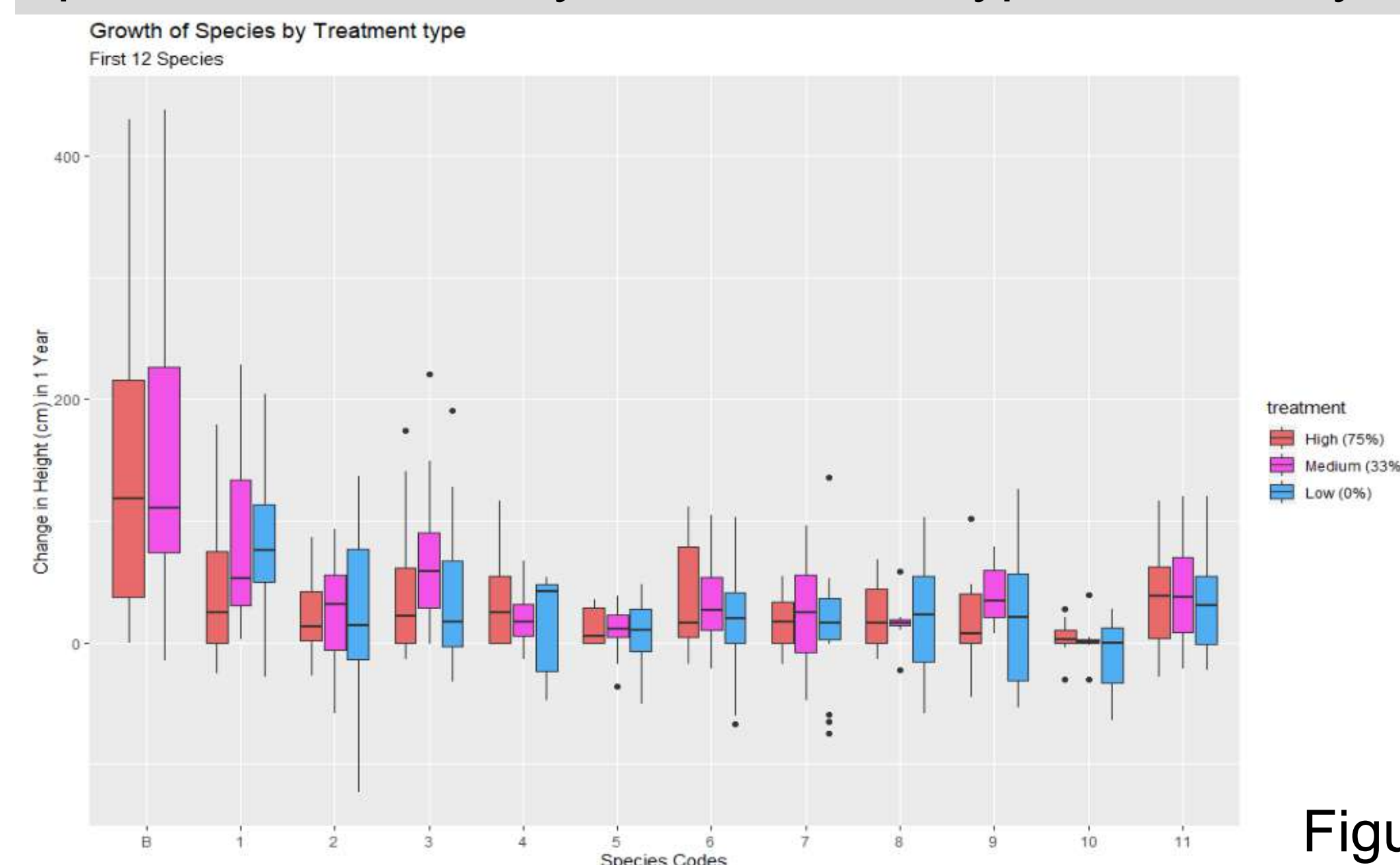


Figure 3.

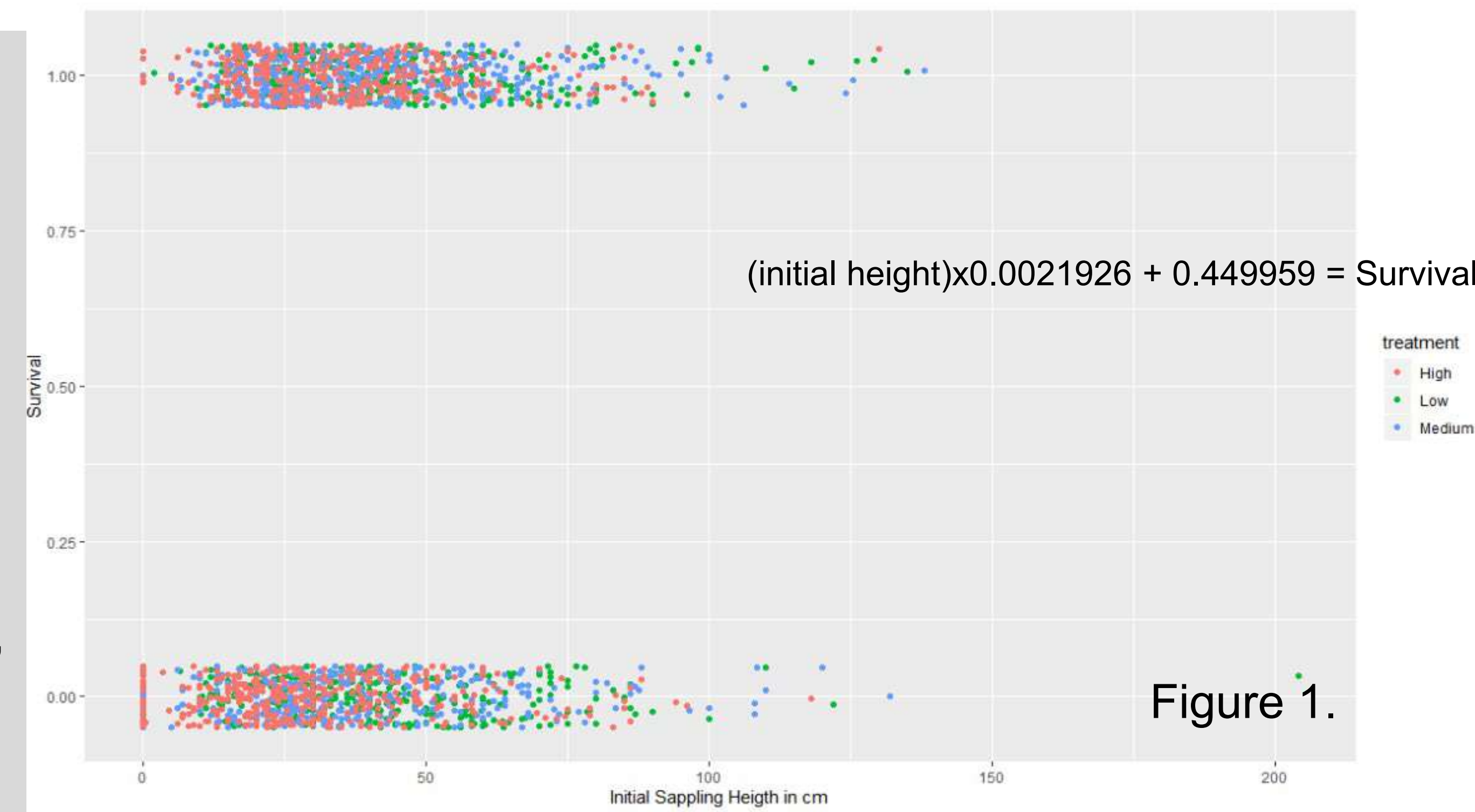
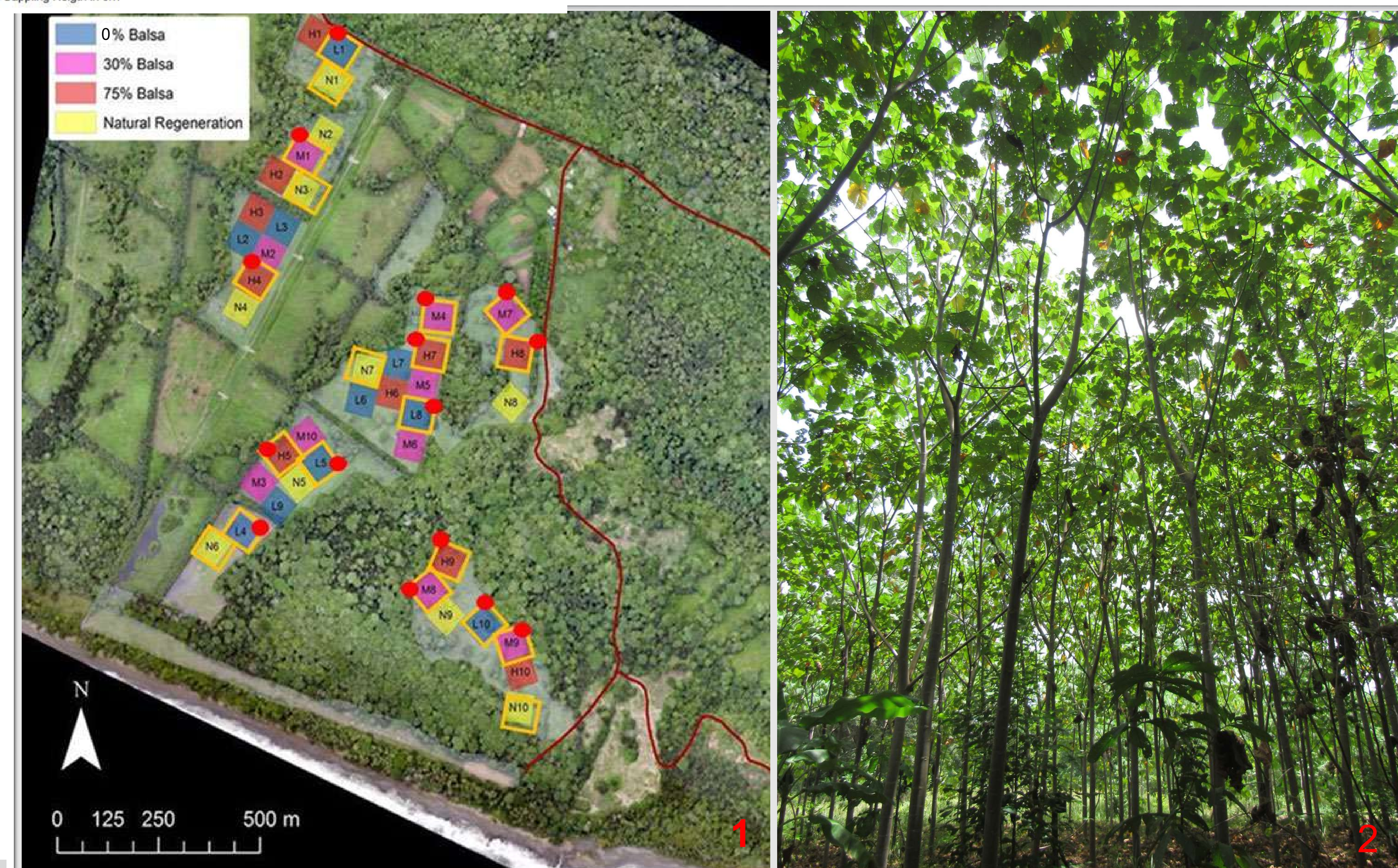


Figure 1.

Figure 1. Adjusted R-squared = 0.008346
Interpretation: In the graph, the height of the saplings in centimeters, when planted, is on the x-axis. Survival after 1 year of an individual sapling is on the y-axis, with 0 representing the individual was dead after one year and 1 representing the individual was alive after one year. Survival is a bivariate response, the spread on the y-axis is only for visual purposes. The adjusted r-squared value of 0.008346 means that 0.83% of the variation in survival can be explained by the initial height of the sapling. This adjusted r-squared value is extremely low and signifies that initial sapling height does not have an effect on the survivorship after one year.



Starting at the top left and moving clockwise:

1. An overhead view of all 40 experimental plots including which are rewilding plots (yellow outlines).
2. A view from beneath the canopy of balsa trees in plot H8.
3. Anna Moragne in experimental plots standing next to a sapling.
4. Sapling nursery at the farm.
5. Harris Duling in the nursery.