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Teak Efficiency and Environmental Education Methods for Batipa

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Abstract
We have addressed three issues in this project regarding the Batipa Peninsula and the surrounding areas: solutions for teak by-products, reconnecting wildlife corridors, and the sustainability of the Chiriquí Province through education. Our mission was to create effective and attainable solutions for these issues. We conducted primary research, via interviews and on-site visits, to find low-cost, low-risk solutions for these problems. Our recommendations included new equipment for better teak efficiency, construction of permanent structures for wildlife, planned future projects, proposed classes, critiqued Oteima's online presence, and generated new tourism itineraries for Batipa.

Key words: teak production, environmental education, wildlife corridors, agroecology sustainable practices

Resumen:
En este proyecto hemos abordado tres cuestiones relativas a la Península de Batipa y sus alrededores: soluciones para los subproductos de la teca, reconexión de los corredores de vida silvestre y la sostenibilidad de la provincia de Chiriquí a través de la educación. Nuestra misión era crear soluciones efectivas y alcanzables para estos temas. Llevamos a cabo una investigación primaria, mediante entrevistas y visitas in situ, para encontrar soluciones de bajo costo y bajo riesgo para estos problemas. Nuestras recomendaciones incluyeron nuevos equipos para mejorar la eficiencia de la teca, la construcción de estructuras permanentes para la vida silvestre, la planificación de proyectos futuros, la propuesta de clases, la necesaria presencia en línea de Oteima y la generación de nuevos itinerarios turísticos para Batipa.

Palabras claves: producción de teca, educación ambiental, corredores para la vida silvestre, prácticas agroecológicas sostenibles

The main objective of this project was to present Oteima University, with recommendations about the following four areas: Teak by-product, Altitudinal Biological Corridor of Gualaca (Corredor Biologico Altitudinal de Gualaca), sharing techniques with local farmers, and finding new academic and ecotourism initiatives. Oteima wishes to use their crown-jewel, Batipa Field Institute (BFI), as an example of how to apply sustainable foresting practices. We researched other facilities like Batipa to see how they conduct themselves and if their methods can be applied to Batipa. A common practice we found was to promote plant diversity using nurseries as well as conserve water while reducing erosion. Being in constant contact with our sponsor made certain that we were on the same page and ensured that our solutions met their needs. The project followed three objectives as followed:

Objective One: Strategic Planning and Prioritization of Needs. After analyzing 13 projects using the 'double diamond' method, we saw an overlap of three main ideas; economy, education, and ecology. With the narrowing of the projects at hand, instead of attempting to do too many projects at once, we focused on the three main projects that encompass multiple others. The first main focal point, economy, was chosen in order for Batipa to grow as an organization and a business whose focus is on agricultural sustainability. They require capital to implement projects and programs that promote environmentally conscious decisions to maintain their ecological self-sufficiency. The second main idea, education, was selected due to the importance Oteima places on education. The university is determined to develop Batipa into an educational hub, spreading the mission and influence of Oteima. Ecology was the third and most important main idea due to its ability to connect all of the projects presented to us to one another, tying in economy, education, and the environment.

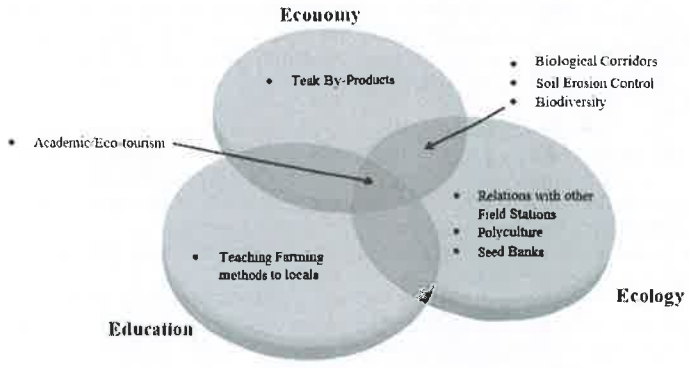

Figure 5: Venn Diagram of three main topics

Objective Two: Resource Evaluation

Once we determined the project objectives we started looking at the resources available to turn these goals into a reality. The first step once getting on-site was to get a full understanding as to whatBatipa looks like and how it operates.

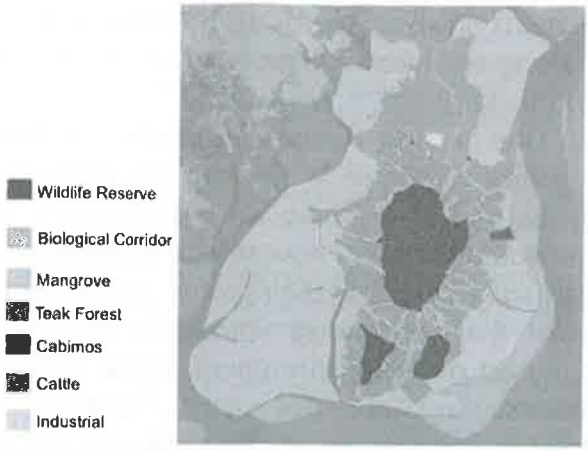

Figure 6: Map displaying land use of Batipa Peninsula (Palacios, 2017)

Evaluation of the current practices at Batipa allowed us to address the issues that were presented to us. Regarding teak by-products, it was key that we evaluated the growth rate of the trees, the frequency of cutting and planting trees, and the total number of trees and waste produced. We also analyzed the cutting methods performed at Batipa and how well maintained the zones were kept. The main corridor of the region is the Altitudinal Biological Corridor of Gualaca. The Corridor is important to evaluate because it provides animals safe routes to move along the different areas. Various maps were analyzed to investigate the areas where Batipa promotes this animal movement. The land in these areas is diverse and connects different ecosystems. However, there were some limitations to the animals' movement due to a lack of connectivity in some areas of the Corridor and the expansion of the Pan-American Highway. Lastly for education, we evaluated the locations where Batipa could develop a learning center. We also took into consideration the resources available for the learning center and analyzed what would be the most applicable teaching material and the most effective teaching methods.

Objective Three: Finding Possibilities

Once the scope of our project was refined, along with the evaluation of on-site needs and wants, we were able to construct possibilities for Batipa to consider in the future improvement of the site and the biological corridor. Giving multiple timelines and budgets were crucial in making sure Oteima University had options to choose from and knew what was necessary for the immediate solving of the problems and what could be added to improve the quality or magnitude of the solution or proposal.

- **Analyzing Teak By-Products**

Our initial concerns were when and how often the trees were trimmed or cut. With this knowledge, we could estimate how much material we potentially could be working with. With that in mind, it was established cut teak has a long shelf life, so it can be stored with little protection until sale.

- **Expanding the Altitudinal Biological Corridor of Gualaca**

Panamá is an interesting country when it comes to biodiversity. This thin and long country gets both Atlantic and Pacific biological influences, creating many different ecosystems with a wide range of flora and fauna in each. This area is classified as a biological corridor, which is a stretch of land to which animals travel across to get from one region to another, sort of like a highway. Batipa is part of the Altitudinal Biological Corridor of Gualaca, which spans from the Pacific coast up to the mountainous region of Fortuna. This corridor connects to the larger Mesoamerican Corridor that spans across most of the northern part of Panamá into Costa Rica. There are two problems currently; the cutoff of Batipa from the rest of the corridor due to the construction of the Pan-American Highway, as well as soil erosion that is devastating grazing pastures throughout the region. We investigated possible solutions of reconnecting the Batipa peninsula and mangrove regions to the rest of the corridor by creating animal crossings traversing the four-lane highway. "Monkey bridges" are currently installed, but there are no vines or natural foliage present. We looked at methods to speed up the process of vine production on these bridges as well as the installation of a bridge or tunnel across the highway for larger non-climbing animals such as deer or coati. Modifications to currentbridges may be made as well.

Figures 7 & 8: Pan-American Highway bridge spanning a creek

We investigated methods for controlling soil erosion both in Batipa as well as in the surrounding regions of the corridor. This involved looking at methods used in other regions as well as pioneer species seen growing on these erosion banks currently. We came up with the idea of creating a nursery of native species where tree saplings can be introduced to these barren patches of land to start the restoration process.

- **Establishing Ways of Sharing Techniques with Local Farmers**

Part of Batipa's vision includes the spreading of knowledge obtained at Batipa to local farmers. This includes the sharing of sustainable and environmentally conscious methods of farming. Batipa strives to be a center of knowledge in the Chiriquí province for proper agricultural practices. The two main sectors that Batipa would like to share knowledge on are the benefits of wildlife corridors have on cattle and farming, along with how to prevent and fix erosion from improper farming. Analyzing Oteima and Batipa's available combined on-site resources, we planned to develop a handbook or hands-on method of teaching for local farmers. This handbook would focus on how to use technology to their advantage to increase their profits and better the economy of the area, along with decreasing their negative impact on the environment. While choosing demonstration methods for local farmers, we considered the simplest and clearest ways of relaying information from the university or field institute to the farmers.

- **Attracting Ecotourism**

Another one of Batipa's goals is to establish an ecotourism initiative to attract environmentally conscious visitors who seek to learn more about Batipa. Small packages could be offered for non-academic persons to stay in Batipa and experience the Panamanian countryside. This has never been done at Batipa before and is a new project with a lower priority than other projects of interest at Batipa. To help Oteima and Batipa with thinking about bringing ecotourists around, we analyzed the differences between an academic tourist and an ecotourist, investigated and presented plausible and attractive activities they could offer to ecotourists, and how to alter their existing academic tourism program to fit the needs of traditional recreational tourism.

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