



DeepL

Subscribe to DeepL Pro to translate larger documents.  
Visit [www.DeepL.com/pro](http://www.DeepL.com/pro) for more information.



*Sustainable Ecological  
Production Research Center in  
Macaraquita de Chepo de Las Minas*





## **Sustainable Ecological Production Research Center in Macaraquita de Chepo de Las Minas**

Cedeño, Francisco<sup>1</sup>

**Category I:** Generation and dissemination of knowledge, research, reports, forums/congresses through collaborative work among the members of the proposal, developing research, producing tools and building knowledge on sustainable development to address climate change issues.

**Summary:** Although the Panamanian climate is ideal for the development of orchids, coffee and citrus, it is not so easy to reproduce them naturally, because the plant takes up to a year to germinate from the time they are pollinated and it is not until the fourth year when they are able to reproduce naturally. There is a smaller number of producers, who sell their production to other actors that function as intermediaries to bring the products to the market, thus the need to develop an efficient methodology for the cultivation of orchids, coffees and citrus. Our objective is to create a research and sustainable ecological production center to improve the technological capabilities of specific crops in the region. This center will be the setting for research on the practical application of trends in sustainable ecological production, where the projects listed below will be located in facilities interconnected with towers and cables to move between them quickly and safely. The project is not only profitable for an individual, but also for the community. Profitability guarantees the viability of the project's implementation by considering the costs and the direct and indirect benefits obtained.

---

<sup>1</sup> Universidad Tecnológica de Panamá, School of Civil Engineering; francisco.cedeno3@utp.ac.pa



**Abstract:** Despite the fact that the Panamanian climate is ideal for the development of orchids, coffee and citrus, their reproduction is not so easy in a natural way, because the plant takes up to a year to germinate from the moment they are pollinated and it is not until the fourth year when they manage to reproduce naturally. There is a smaller number of producers, who sell their production to other actors who function as intermediaries to bring the products to the market, which is why the need to develop an efficient methodology for the cultivation of orchids, coffees and citrus fruits arises. Our goal is to create a sustainable organic research and production center to improve the technological capabilities of specific crops in the region. This center will be the scenario in which research will be carried out on the practical application of trends in sustainable ecological production, where the projects listed below will be located in facilities interconnected with towers and cables to move between quickly and safely. The project, in addition to being profitable for an individual, is also profitable for the community. Profitability guarantees the feasibility of executing the project by considering the direct and indirect costs and benefits obtained.

**Keywords:**

Direct benefits, indirect benefits, coffee, citrus, orchids, sustainable organic production.

**Keywords:**

Direct benefits, indirect benefits, coffee, citrus, orchids, sustainable organic production.



### a. Objectives

The purpose of this project is to actively involve the population in orchid, coffee and citrus cultivation and promotion programs, providing good quality seedlings at low prices along with professional advice on reforestation and protection of the region's flora and fauna. The massive deforestation and burning, carried out by farmers in the region, in search of expanding agricultural frontiers and increase crop production, has led to the brink of extinction to many species of orchids, coffee and citrus, throughout the country, including our national flower "La Flor del Espiritu Santo" which is a type of orchid of terrestrial class that inhabits the rainforests of our country especially in El Valle de Anton and Chepo, Las Minas.

In order to contribute to the environmental education programs, the community will be involved in the project by generating activities that involve organization and responsibility on the part of the students and will turn the Sustainable Ecological Production Research Center into a site for student and professional practices.

One of the main reasons for the development and construction of the Sustainable Ecological Production Research Center is to preserve for future generations a small sample of the varied wonders of the region's natural flora. Also, to ensure a space where people can visit and share the beauty and wonders of evolution, as well as to encourage the support of local communities to maintain and preserve their forests and vegetation.

Another purpose of the project is to be a space for consultation and information for future scientific studies.

The Sustainable Ecological Production Research Center will be open to all people from all walks of life. In addition, we want to encourage orchid societies to be encouraged to build different Orchid Gardens in different parts of Panama.





The Sustainable Ecological Production Research Center will be an opportunity to bring together nationals and foreigners to share innovations in the technological capabilities of specialty crops, the plant world and even animal life. We seek to become a source of inspiration for farmer groups to take control of the destiny of their forests by supporting the preservation of virgin and unexplored parts of their forests by helping them to establish seedbeds to produce local flowers and plants with national and international market potential. We will be a source of information for new ideas and research innovations in the technological capabilities of specialty crops and the biodiversity of the Las Minas region; an oasis surrounded by lush natural beauty.

#### **b. Methodology**

To achieve our objective we studied the area and the possible uses for the land of the project, all our research consists of proposing after making an analysis of the information collected the best way to develop this space through the Technological University of Panamá for the benefit of the community of the Province of Herrera and the whole country.

As we know, this region has an abundance of flora, fauna and an exuberant climate perfect for the cultivation of orchids and other plants characteristic of the region.





Overall, the main income and wealth generating products for the construction project of the Sustainable Ecological Production Research Center in Macaraquita de las Minas are shown in the following table:

Projects	Products
Wind Generation	Electric Power
Biopark	Orchids (Phalaenopsis, Periphery Elata) <sup>1</sup>
Healthy Fruits Greenhouse (Citrus and Citrus Seedlings Coffee and Coffee Fruits)	Citrus Seedlings, produced
Water Processing Plant	Bottled Water
Aquaculture	Red Tilapia
Training Center	Education

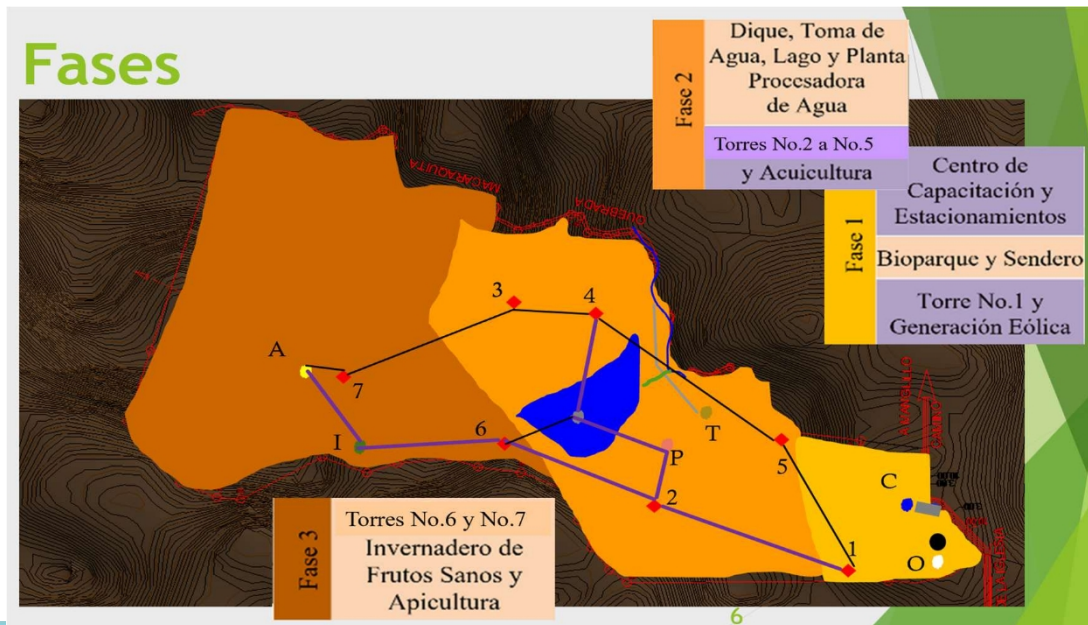
### c. Work Schedule

This center will be the setting for research on the practical application of trends in sustainable ecological production, where the projects listed below will be located in facilities interconnected with towers and cables to move between them quickly and safely.





The master plan for the development of the 50 hectares proposes to achieve the objective of "Creating a sustainable ecological research and production center to improve the technological capabilities of specific crops in the region" by dividing the project into three phases.



	Proyectos	Costo de Inversión por Proyecto (B./.)	Ingresos Anuales por Proyecto (B./.)	Costo de Operación Anual por Proyecto (B./.)	
Fase 1	Centro de Capacitación y Estacionamientos	95,690.37	41,500.00	27,200.65	<b>264,145.18</b>
	Bioparque y Sendero	44,747.91	19,600.00	10,990.30	
	Torre No.1 y Generación Eólica	39,525.00	17,280.00	1,950.00	
Fase 2	Dique, Toma de Agua, Lago y Planta Procesadora de Agua	41,320.54	100,000.00	75,360.00	<b>382,742.82</b>
	Torres No.2 a No.5 y Acuicultura	139,654.60	190,479.20	25,523.84	<b>39,191.60</b>
Fase 3	Torres No.6 y No.7 Invernadero de Frutos Sanos y Apicultura	23,674.40	9,600.00	7,758.60	<b>682,179.60</b>
<b>Totales</b>		<b>384,612.82</b>	<b>378,459.20</b>	<b>148,783.39</b>	<b>756,918.40</b>





The creation of CIPES is planned to be carried out in 3 phases that together take 24 months, by which time the project should be starting to generate income.



#### d. Dissemination, visibility and communication strategy

The goal is to have 2 joint publications each year in indexed journals or conferences, either national or international, with a considerable impact, to strengthen relations with the beneficiary population and help humanity to face the problems of climate change. Our work with the populations of the region in the framework of the design, implementation, monitoring and evaluation of research projects or patents that our research center may develop, contributes to the external positioning of the universities, which in turn has an impact on greater and better links with other stakeholders in the private sector, government, national and international cooperation agencies, among others. The publicity of the partner organizations includes the spokesperson for television interviews, newspaper interviews, radio interviews and the use of social networks, for:

- Recommend the use of our facilities for research or testing of proposed intervention solutions to climate change problems.
- To attend to the general public with explanatory tours of the projects carried out at the research center, in order to promote the research center nationally and internationally as an educational ecotourism destination.





### e. Expected results

Our research and sustainable ecological production center will be made for humble people, therefore, the profit of this establishment will be very low at the beginning, it will only count with subsidies from the institutions that will provide such training.

To demonstrate that our projects are technically feasible and economically profitable as shown in the following table:

Projects	Unit Sales Price per Product <sup>2</sup>	Cost per Project
Wind Generation	0.1033 Balboas (kilowattthora, ASEP 2016)	B/. 39,525.00
Biopark <sup>3</sup>	10 to 20 balboas per plant	B/. 44,747.91
Healthy Fruit Greenhouse (Citrus and Coffee)	2.04 Balboas (Hundreds of Orange IMA 2006)	B/. 23,674.40
Water Processing Plant	0.95 Balboas (Liter of water, Panama America 2016)	B/. 41,320.54
Aquaculture	1.00 Balboas (Pound of red tilapia, Panama America 2007)	B/. 139,654.60
Training Center	No data	B/. 95,690.37

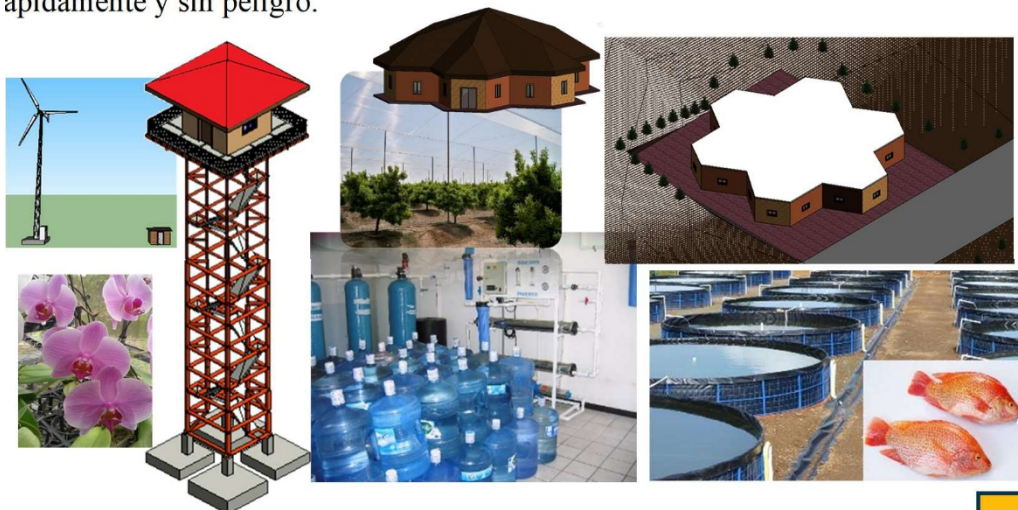


This center will be the setting for research on the practical application of trends in sustainable ecological production, where the projects listed below will be located in facilities interconnected with towers and cables to move between them quickly and safely.



This center will be the setting for research on the practical application of trends in sustainable ecological production, where the projects listed below will be located in facilities interconnected with towers and cables to move between them quickly and safely.

apidamente y sin peligro.





#### **f. Number of direct and indirect beneficiaries**

This project aims to work together in education, conservation and valuation of the ecosystems of the region. Although we know that the tourist development is almost null, since it only presents tourist movements once a year; it is for this reason that we plan to maintain this movement throughout the year and involve the same inhabitants so that they are the main defenders of our project. The construction of the CIPES will directly and indirectly benefit 118,982 inhabitants of the province of Herrera and 7,740 inhabitants of the district of Las Minas where the community of Macaraquita in Chepo de las Minas is located and all international visitors (researchers and ecotourists) who visit the center. We intend to foster a sense of pride in the natural wonders that exist in their environment. We intend to encourage forest conservation by offering incentives not to cut trees unnecessarily.

**Economic or social impact:** This project will benefit the community located in Macaraquita de Chepo de Las Minas because it will generate income that can be used for the progress of the community. It is expected that with the sale of orchids, coffee, citrus and others, not only between monetary factor, but it seeks to make this site a tourist and attractive place for foreigners who visit our country, highlighting the most beautiful thing that hides our Panama. On the other hand, considering the people as part of our project, small courses will be offered to them so that they can put into practice the realization of this project.

**Environmental impact:** Every project has an unfavorable impact on the environment; however, our objective is to mitigate such negative events. We seek to teach the community to take advantage of the resources they have and the favorable climate for the production of the plant, trying to cultivate and maintain our national flower as protected as possible, considering that its sale is prohibited.

**Gender Impact:** This project seeks to integrate both women and men for the work, care, production, and sale of orchids, coffee, citrus and others; noting that everyone has the right to opportunities regardless of gender, class; and try to create a new ideology in the region.





Impacts on the disabled: This place that allows to admire in addition to the Flower of the Holy Spirit, orchids, coffee, citrus and others, will be adapted so that people with different disabilities can visit the greenhouse and not have problems for the mobilization; in addition to the resources obtained as already said will benefit the community, trying to collect funds to help people who suffer from any disease or disability.

The payback period criterion is difficult to relate to any particular objective of the center; but it gives primary importance to its liquidity and short-term acceleration of its revenues.

Projects	VAN <sup>4</sup>	IRR <sup>4</sup>	R B/C <sup>4</sup>
Wind Generation	B/. 47,092.92	37.0	2.19
Biopark	B/. 5,737.59	13.0	1.13
Healthy Fruit Greenhouse (Citrus and Coffee)	B/. 5,852.46	18.0	1.38
Water Processing Plant	B/. 45,587.89	19.0	1.34
Aquaculture	B/. 73,524.83	93.0	6.23
Training Center	B/. 1,278.49	18.0	1.38





## Bibliographic References

[1] My Environment (December 11, 2021). Orchids: The world's most complex and diverse jewels reign in Panama <https://www.miambiente.gob.pa/orquideas-las-joyas-mas-complejas-y-diversas-del-mundo-reinan-en-panama/>

[2] INEC. (2021). Industry: year 2020  
[https://www.inec.gob.pa/publicaciones/Default3.aspx?ID\\_PUBLICACION=1091&ID\\_CATEGORIA=4&ID\\_SUBCATEGORIA=15](https://www.inec.gob.pa/publicaciones/Default3.aspx?ID_PUBLICACION=1091&ID_CATEGORIA=4&ID_SUBCATEGORIA=15)

[3] <http://plantas.facilisimo.com/como-hacer-un-vivero-de-orquideas>

[4] Francisco Cedeño's Project and civil works evaluation course manual.

[5] MINERPA. (2019). IDB: year 2019  
<https://minerpa.com.pa/poblacion-por-provincia-y-distrito/>

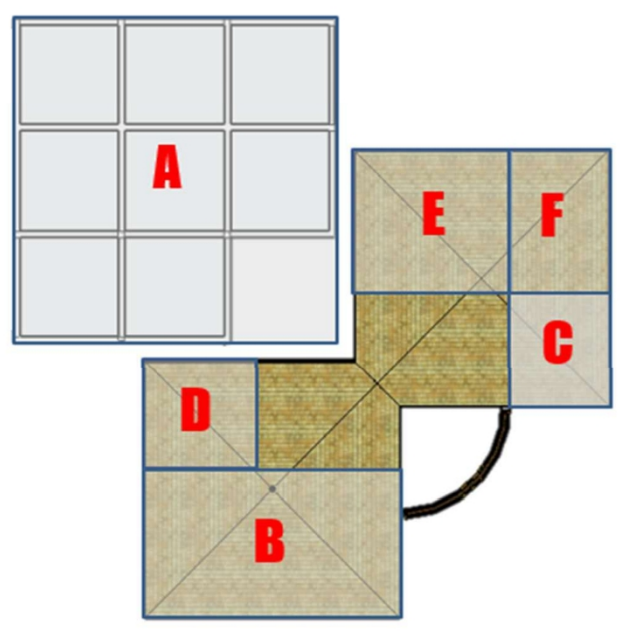
**ANNEXE**  
**S**



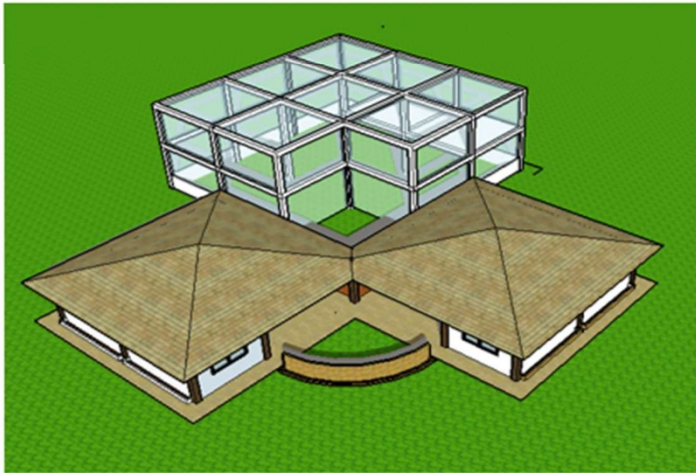
Proyecto de Construcción de Orquideario

**Distribución de espacios**

- A** Orquideario
- B** Área Científica
- C** Administración
- D** Depósito
- E** Baños
- F** Dormitorio



## Complejo



### Conceptualización

Se plantea la abstracción de una orquídea por su función en la temática.

Se trabaja con las partes de la orquídea, conformando la parte arquitectónica con el cual se pretende desarrollar el proyecto en forma funcional y estéticamente agradable.

## Complejo



**Vista frontal**



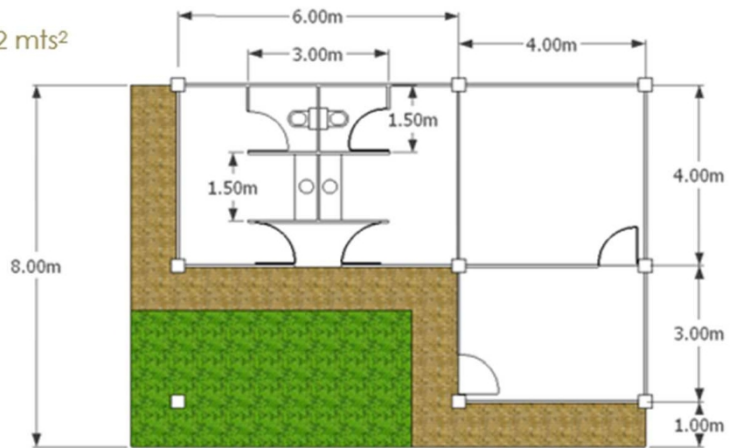
**Vista lateral**



## Edificio 1

**Área: 88 mts<sup>2</sup>**

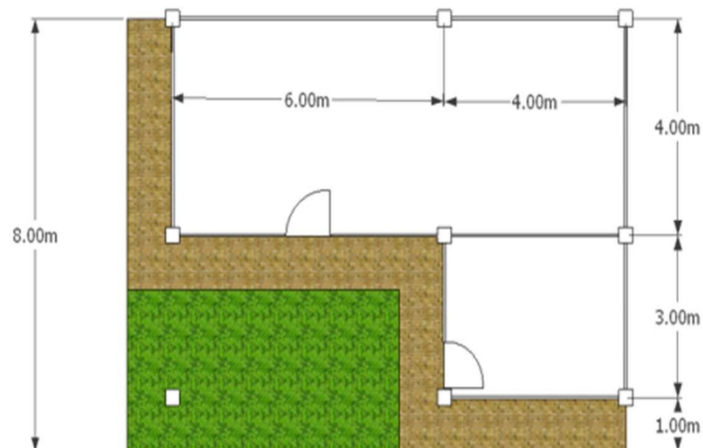
- Baños: 24 mts<sup>2</sup>
- Dormitorio: 16 mts<sup>2</sup>
- Área administrativa : 12 mts<sup>2</sup>
- Jardín interno: 18 mts<sup>2</sup>
- Pasillos: 18 mts<sup>2</sup>



## Edificio 2

**Área: 88 mts<sup>2</sup>**

- Área científica: 40 mts<sup>2</sup>
- Deposito: 12 mts<sup>2</sup>
- Jardín interno: 18 mts<sup>2</sup>
- Pasillos: 18 mts<sup>2</sup>





## Modelado y entorno

