

Green Economy In Mexico Derived From The Use Of Agricultural Drones.

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| <p>This Bachelor's thesis investigates and analyzes the understanding of producers, civilians, and CEOs regarding the green economy and the use of drones in the agricultural sector in Mexico. This research aims to analyze the situation in Mexico concerning the dissemination of information about the green economy and the new technologies applied in the Mexican agricultural area. Based on the analysis and discussion of the theoretical framework and the results of this thesis, Agrofumex implemented an action plan, creating an advisory system relating to the three topics: use of drones, sustainability and green economy.</p> <p>The theoretical background explains the knowledge that the author must understand before continuing with the qualitative research process. The theoretical framework of this thesis consists of green economy, sustainability and the use of drones. The theory covers, from the point of view of producers, civilians and CEOs.</p> <p>The method used in this thesis is qualitative. Information is collected through surveys of executive directors of sustainable companies, civil and agricultural producers from rural zones of Hidalgo, doing a study on each one relating the points to be covered according to the needs detected for the improvement of the service that Agrofumex offers.</p> <p>The findings show a remarkable lack of knowledge on the subject of the green economy and its benefits. The recommendations for Agrofumex were implementing a work plan where it is involved to advise the producers (clients) with whom it has worked and will work in the future. By publicizing their services in conferences organized by the same Agrofumex company, the support has been provided for understanding the three main topics to be discussed. This plan created a close relation with the client and increased the portfolio of Agrofumex, which positively impacted Agrofumex.</p> | |
| Keywords Green economy, use of drones, sustainability | |

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1.Introduction

There is great interest for countries in achieving green growth not only about lower energy intensities but also because it is related to a higher quality of life. The appeal has also led to a growing proliferation of scientific studies and research, whose main objective has been to identify the factors that contribute to green growth and the policies that must be implemented in the different countries to enter the path of green growth. The main objective of this research is to analyze from a socioeconomic and environmental perspective recent developments in three other areas, which are civilians, employees and CEOs (Grunewald Nicole 2015).

According to the United Nations Environment Program (2011), the economy must improve human well-being and social equity while significantly reducing environmental risks and ecological shortages. Green growth in Income and employment should, in turn, be driven by investments that reduce carbon emissions and pollution, improve resources and energy efficiency and avoid waste of biodiversity (Grunewald Nicole 2015).

The main greenhouse gas is carbon dioxide, and therefore, CO₂ is used as the world's leading indicator of environmental degradation. Other greenhouse gases considered are CH₄ and N₂O. To account for biodiversity, losses are based on the measurement of the Mexican forest area. (National Emissions Inventory 2011)

The main reason for the investigation is to know the different methods implemented within Mexican companies to help combat this problem. Due this, we must go back and see how it started.

1.1 Background

Environmental problems are as old as the existence of man whenever comes into contact with nature. The environment is impacted and today more than ever. Since there is an extensive network of causes, among which we can mention: the high population growth, the development and diffusion of industrial technology, growing urbanization and the advancement of the agricultural frontier, among others.

The unique significance of the environment has become generalized, integrating concepts such as quality of life and human settlements. Faced with the dilemma between ecological protection and economic development, it is necessary to have information about the realization of certain types of work, whether industrial, urban, tourist, and public, to understand their impact on the environment. The general opinion and the planners or executives of the public or private sectors can judge if the effects of such works on the environment are essential, beneficial or harmful and above all, if the community is going to receive both the benefits and the drawbacks of these projects, to decide on the progress of the works.

Agriculture dates back to the times when man replaced his nomadic habits for sedentary ones. Over time, the increasing human population size, per capita consumption, and the complexity of urban centres promoted constant increases in the demand for food, fibre, and energy (Evans 1993; Tilman et al. 2001). Indeed; World population and per capita consumption have grown considerably since 1950, both at a higher rate in developing countries than in developed ones, although per capita consumption was higher in developed countries than in developing countries as shown in the figures.

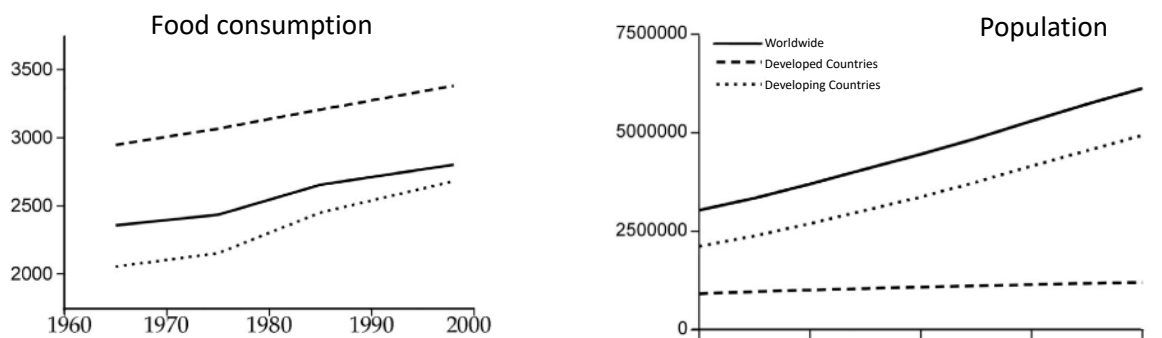


Figure 1 and 2. World population (upper) and food consumption (lower) in the world, in developed countries and in developing countries from 1960 to 2000 (FAO 2008).

This trend drove the expansion of agriculture and the intensification of production per unit area in the world. Agriculture progressively occupied and altered land spaces until it covered a large proportion of the planet's surface. As soils suitable for agriculture became limiting. Human needed to increase production per unit area through continuous technological innovations, leading to productive intensification (Evans 1993). In the postwar period and the subsequently accelerated industrialization in the world, the environment's deterioration begins. However, it is predominantly from the seventies in the last century that this

process expands, having global repercussions on the loss of biodiversity with an impact on human societies. In Mexico, the coverage of the country's natural ecosystems was reduced 62% in 1976, 54% in 1993 and 83% in 2002, with the most significant losses in the tropics (Mexico: National Commission for the Knowledge and Use of Biodiversity 2009).

According to the National Emissions Inventory (2011), Mexico emits more than 40.5 million tons of pollutants into the atmosphere. The water quality indicators show that 73% of the country's bodies of water are contaminated; 80% from urban centres and 85% of industrial pollutants are dumped directly into them without prior treatment, which directly affects Mexican soil, since these same pollutants when used for irrigation in Mexican agriculture, affect the soil affecting the harvested products at the time of their growth and even causing the infertility of the soil.

Given the problem. Different ecological methods and tools such as the use of new technologies for the agricultural sector have been developed. In Mexico exist an initiative that aims to bring the use of information technologies, drones and precision studies to a common practice in the Mexican countryside. Thanks to the formation of work teams made up of local talent in communities with agricultural activity as the primary source of work.

The B01CO Drone Services Project aims to provide producers with accurate and up-to-date information about the conditions of their fields, which is interpreted and communicated by professional agronomists to facilitate agricultural producers in making decisions about differentiated management of crops. (Innova MX 2018). In Mexico, the General Coordination of Green Growth, which through the development of economic and political analysis and scientific research, provides the necessary elements to make decisions focused on the protection, conservation and sustainable use of natural resources and their interaction with the economy. These elements support theoretical and applied models, incorporate economic and statistical tools to estimate future costs associated with the climate change process and assess the benefits derived from the various sectors of the economy to face this process. The General Coordination of Green Growth works with a primarily economic approach, aligned with a national strategy aimed at a prosperous Mexico whose objective, among others, is to promote and guide inclusive and facilitate green growth that preserves Mexico's natural heritage while generates wealth, competitiveness and employment to move towards a competitive green economy and achieve low-emission development.

Green growth is a shared challenge that demands the participation of all actors in the public, private and social sectors. That is why the project that has been developed within the Agrofumex company has begun to reflect a change not only economic change also social by including and promoting this type of environmental awareness in order not only to have a better future but also to create new jobs.

Within the objectives of Agrofumex is to provide the Mexican farmer with the technological leverage that allows him to increase his production at low cost and more sustainably; advice is given on the correct use of agro-inputs that ensure the safety of production. The same as crop control, based on spatial monitoring in the field, the drone collected information on a specific area; Agrofumex carries out phytosanitary management in applying herbicides, fertilizers for agricultural production and productivity in an efficient way towards sustainable and sustainable agriculture. With this, the product reaches the plant without affecting society or the biodiversity of the environment. Thanks to the use of aerial technology such as agricultural drones.

Agrofumex is governed by the Official Mexican Standard NOM-107-SCT3-2019, which establishes the requirements to operate a remotely piloted aircraft system in Mexican airspace, approved by the National Constitutive Standardization of Air Transport.

1.2 The importance of sustainability

Sustainability is of great importance since it is the total efficient and rational administration of all resources so that it is possible to improve the well-being of today's society without compromising the quality of life of future generations. One of Mexico's main challenges in terms of sustainable development is to include the environment as one of the elements of competitiveness and economic and social development. The link between sustainable development, environmental protection and international trade is very close. Ecology preservation and scientific advances have become some of the priorities of the members of the international community (Green teksolutions 2018).

Among the key factors of sustainable development are population growth, energy demand, climate change, scarcity of resources and waste management.

1.2.1 Sustainable Development and Poverty.

Currently, the number of people in developing countries do not have satisfied basic needs, poverty is endemic, nor do they have the opportunity to improve their living conditions. This situation makes the world very prone to humanitarian, economic, and ecological crises that affect development, so the minimum requirements to achieve sustainable development are to offer a better quality of life.

1.3 Project Objectives and Scope

The purpose of this project is to learn about the objectives agreed with the Agrofumex company. Agrofumex implemented internal changes to cover the previously detected needs, based on mid-term analysis.

It is desired to request two essential certificates, the first is the ISO 9001: 2018 certification, which is an international standard prepared by the International Organization for Standardization that applies to the quality management systems of public or private organizations, regardless of their size or business activity. This is an excellent working method to improve the quality of products and services and customer satisfaction; this serves to guarantee consumers the improvement of their fumigation services.

| | |
|--------------|------------------------|
| Project name | Case Of Agrofumex |
| Author | Jason H. Reyes Peralta |
| Group | - |
| Date started | 22 September 2020 |

| | |
|----------------------------------|---|
| Background to the proposed work | 1.1 Background |
| Objectives | Create a green economy and a certificated company to train drone`s pilots |
| Business benefits | Advantage over the market |
| Assumptions | Petition to the government for certification |
| Constraints | Mexican aeronautics and federal rights law |
| Risks | Petition can be denied |
| Other areas of business affected | Socio-economic |
| Major dependencies | External and Internal |
| Stakeholders | Agrofumigacion de México S.A de C.V |
| Resources | Qualified partners |
| Outline estimates of time | 5 Months |

Figure 3. Scope made for Agrofumex (Jason, 2020).

The following certification valued will be ISO 14001, prepared by the same organization as those mentioned earlier, containing the requirements to implement an environmental management system, the ISO 14001: 2018 standard provides a green aspect to organizations and is considered one of the leading competitive mechanisms today in the business world.

1.4 Demarcation

The researched location in Mexico. The research is conducted in Hidalgo rural areas as Alfajayucan and Mixquiahuala. The target is the agricultural sector. Due to the investigation includes qualitative surveys with producers, civilians and CEOs. The author focuses on the collection of data from producers and employees.

The target market are producers, employees and CEOs from Hidalgo. At present people have a greater understanding of what is happening in their environment, having different

tools that facilitate obtaining information regarding a specific topic, which in theory, there is a low rate of disinformation.

The theoretical models on the agricultural sector come from Mexican government agencies such as the National Institute of Ecology and Climate Change. The theoretical framework of this thesis does not include another type of market. This thesis will not investigate the technical concepts related to the Agrofumex service. The competition analysis will be with the traditional form of aerial spraying such as helicopters due to it is the main competition of the agricultural drone. Currently, producers are trying to hire people to fumigate their crops without knowing that there is a more economical and efficient way to carry out this task.

1.5 ISO Certification

ISO is an independent international non-governmental organization with 165 national standardization bodies, founded in London in 1946. 65 delegates from 25 countries met to discuss the future of International Standardization. In 1947, ISO was officially born with 67 technology committees which are groups of experts that focus on a specific topic (ISO.Org 2021).

1.5.1 An International Approach

ISO standards have gone from giving an organization legitimacy to becoming a strategic tool for accessing and conquering global markets. Standards have become a powerful mechanism for leading positive change by sharing best practices that can revitalize the agricultural sector, creating effective business environments, stimulating economic growth and boosting a country's development agenda. ISO standards have become so crucial in the transfer of technical knowledge. Creating a more competitive and productive agricultural sector is of utmost importance, thus increasing agricultural security (ISO.Org 2021).

It is believed that the application of new technology to agricultural productivity is the solution to satisfying the food demand of the growing population. In a rapidly changing world, with the prospect of a decrease in arable land due to urbanization and industrialization, agricultural production requires a 70% increase in production levels and efficient growth in collection, distribution and consumption of resources to meet demand. Remote sensing technology is playing a pivotal role in precision agriculture. This document highlights how using unmanned aerial vehicles for image capture, processing and analysis. (H. S. Abdullah 2015).

1.6 Expected Benefits for Stakeholders

Following the benefits mentioned above, the purpose of this project is to reach a more outstanding market consequent to the creation of improvements within the company to

cause a considerable impact and pave the way to an international company as well as promote the caring for the environment by using organic products and the contribution to the green economy of the country to generate new jobs.

According to the World Employment and Social Outlook report (2018), the global unemployment rate stabilized after an increase in 2016. In 2017, the prediction stood at 5.6%, with a total unemployment number over 192 million.

The great job opportunities in the coming years are presented in the so-called green economy; 163 economic sectors will benefit, including the agricultural sector. Due to this Agrofumex has taken this initiative to improve the quality of its services for a more significant benefit by adding agricultural drones.

The purpose of drones is to speed up and help in the different processes. For this specific sector, drones with unique characteristics are implemented to capture the information that the human being cannot see, with camera and spectral sensors, facilitating data acquisition.

Separating the different beneficial points of the project, three stand out: the environmental, economic, and socioeconomic impact. The following figure summarizes these points

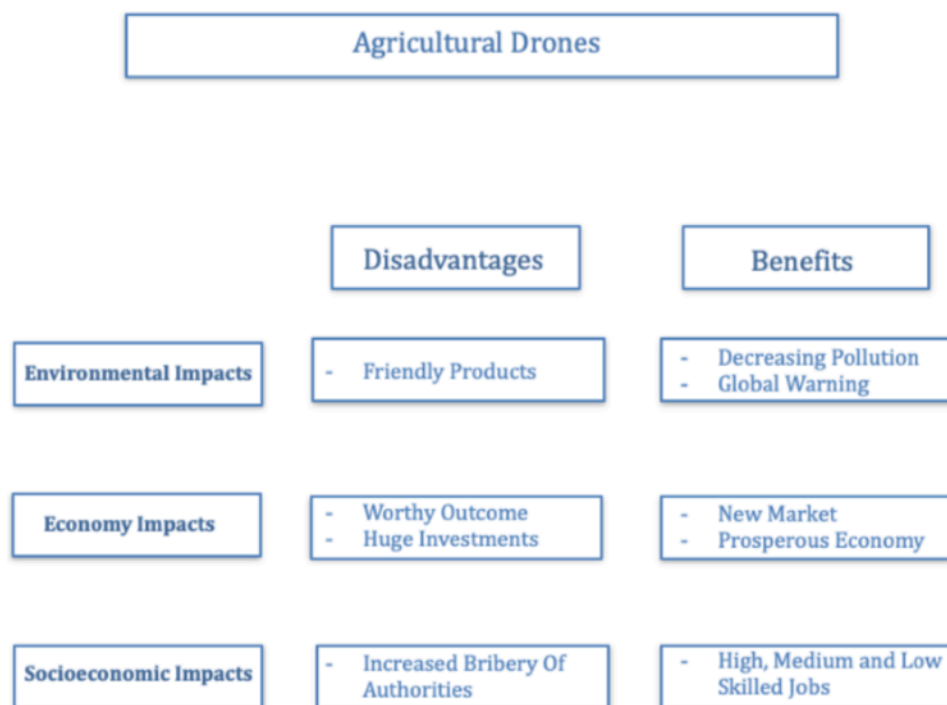


Figure 4. Disadvantages and benefits of agricultural drones (Jason, 2020).

The most noticeable short-term advantages in the green economy are the creation of high, medium and low skilled jobs, including improving the health and well-being of the population, which gives us more productivity within the country. It will be an opportunity for a prosperous economy attracting potential investors.

1.7 Case Company

Name: AGROFUMIGACIÓN DE MÉXICO S.A. DE C.V.

RFC: AFM170606 7V3

Address: CALLE ROSAS No. 1210 INT. 17, COL. GIRASOLES ELITE, ZAPOPAN, JALISCO. MÉXICO C.P. 45138

Phone Number: JALISCO: 33 2404 7240, CANCÚN Q., ROO 981209 4300

E-mail: agrofumex.direccion@gmail.com

Agrofumex is a company legally constituted in 2017 that works on the agronomic concept of crop control based on a spatial monitoring system in the field. Collecting information on a specific area. The objective is to carry out phytosanitary management, the application of herbicides, fertilizers for agricultural production and productivity efficiently towards sustainable agriculture with the purpose of the product reaching the plant without affecting society or the biodiversity of the environment. The company is constituted as follows:

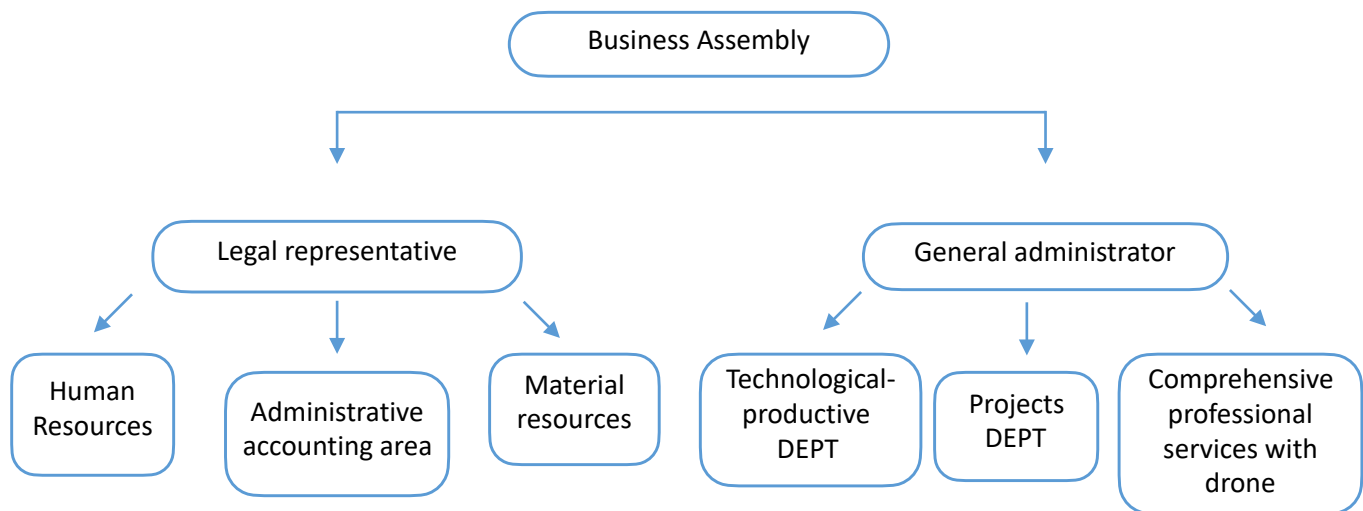


Figure 5. Company diagram according to the work area.

Currently, they operate in the southeast region of Quintana Roo, central hydrological region 12, which is located in Jalisco and Hidalgo, with expansion plans towards Guanajuato to Queretaro. The service they offer is carried out with state-of-the-art technological equipment being JMR-X1380 and T1-10L Black Hawk, the main models. In order to successfully carry out the next step for Agrofumex, it has been decided to set an agenda to improve the quality of services as well as to have certifications that legally verify all these processes that are carried out to provide the best customer service and taking care of the environmental area.

Agrofumex started with a low client portfolio and with a high profit, for which it was decided to promote the client retention plan which sought to inform the agrofumex work scheme as well as advice on crop care, use of technologies, advantages when hiring the service of a sustainable company, information about the green economy that is created in Mexico and the demonstration of the agricultural drone service. The main market that Agrofumex had was the two municipalities of the state of Hidalgo. these were some of Agrofumex client's at the beginning of the project.

| Name | Location | Crop | Application date |
|--------------------------------|--|-------|------------------|
| ARNULFO VICTOR GARCIA TREJO | EJIDO STA. Ma. LA PALMA, ALFAJAYUCAN, HGO. | wheat | 13/10/20 |
| SEBASTIAN ZAMUDIO CASTILLO | EJIDO SAN ANTONIO, ALFAJAYUCAN, HGO. | wheat | 13/10/20 |
| TEOFILO BENITEZ TORRES | EL PEDREGAL; 3a. MANZANA, ALFAJAYUCA, HGO. | wheat | 13/10/20 |
| ING. JOSE DANIEL CERON ALVAREZ | LA VEGA, MIXQUIHUALA., HGO. CEAL:PROGRESO DE O. HGO. | wheat | 13/10/20 |
| GILBERTO ROMERO FLORES | CINTA LARGA, EJIDO MIXQUIHUALA, MIXQUIHUALA., HGO. | wheat | 13/10/20 |

Table 1. Agrofumex client portfolio.

1.8 Project Plan

Analyzing the circumstances Agrofumex is going through it is essential to do a market study to assess the pre-established actions with the company. Therefore, a qualitative method will be implemented to obtain the necessary data, having three different perspectives: civilians, companies, and employees related to the niche, having a better understanding of the issue.

| Area | Environmental impacts Q | Economy Impacts Q | Socioeconomic impacts Q |
|-----------|-------------------------|-------------------|-------------------------|
| Companies | 10 | 10 | 10 |
| Employees | 10 | 10 | 10 |
| Civilians | 10 | 10 | 10 |

Table 2. Number of questions of each survey (Jason 2020).

The survey consisted of 30 questions divided into three sections taking into account the economic, environmental and socioeconomic part since it was intended to highlight the point of view of each of the sectors to which the survey is directed. Once the data has been collected, we create a comparative table according to the positive and negative results that were captured, analyzing the perspective of each of these areas, it also served to know how they observe each other's position.

The reason of this investigation is based more on the qualitative aspect to explore and describe this new agricultural method and know the critical impact it will have on society, seeing it from three different perspectives, as a company, producer and civil person.

The analysis obtained was carried out following a scheme where the different responses and perspectives in the areas mentioned above could be observed, better understand the subject

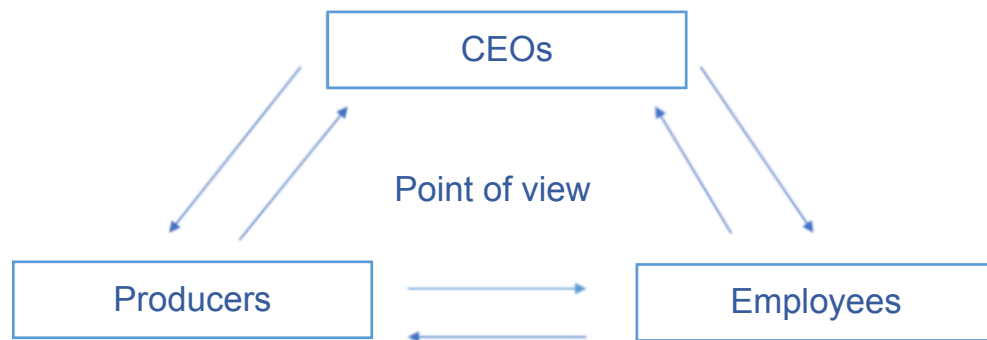


Figure 6. Analysis of the different points of view that were obtained (Jason, 2020)

To facilitate the collection of data that have been obtained, we used the Webropol survey tool. One of the risks that occurred was the non-response to the survey sent, but for this, 135 responses were successfully obtained, of which 50 were agricultural producers, another 80 were employees and 5 CEOs, which was very helpful to have a concrete idea of what happens when we relate sustainability in our daily lives.

Once these data have been analyzed, we rely on different comparative theory and practical models from different authors to validate the analysis so that the reader can trust the results without any problem.

The responses obtained through the qualitative method were recorded in a database to be counted and analyzed. To identify the data, the author examined each section in a personalized way.

2. Introduction of Drones

According to Space.com, a drone refers to an aircraft or spaceship without a pilot in aviation and space. Another term for it is an unmanned aerial vehicle or UAV. On Earth, drones are often used for military purposes because they do not put a pilot's life at risk in combat zones. In addition, drones do not require rest, allowing them to fly as long as there is fuel on the ship and no mechanical difficulties.

2.1 Military Use of Drones

The term "drone" refers to many different types of machines, some small enough to be portable and large enough to drop bombs and fly at altitudes higher than those used to document the extent of damage caused by the earthquake. The US military has been conducting drone strikes in Pakistan for a decade, averaging one every three days in 2010 (a number that has since declined). These attacks target people believed to be involved in terrorist organizations and killed many civilians, approximately 3,000 in Pakistan (AMA Journal of Ethics 2015).

2.2 Use of Drones In Humanitarian Response

The use of drones in humanitarian aid has a short history, but it has proliferated fast enough and generated enough interest that the United Nations Office for the Coordination of Humanitarian Affairs produced a report on the subject in June, 2014. The potential uses are multifaceted and are likely to proliferate as technology and coordination improve. They include mapping disaster-affected areas, search and rescue assistance, and acquisition and delivery of relief materials. These applications, especially the mapping of damaged areas, already showed promise during the 2010 Haiti earthquake (AMA Journal of Ethics 2015).

2.3 Agricultural Drones

Agricultural drones are destined to revolutionize global food generation systems. Agricultural drones are already swarming and hovering over farms located in agricultural areas. Their use remains rudimentary in many other regions, but drones are intended to engulf almost all growing belts; they are poised to offer a wide range of services to farmers and reduce monotony. Drones make crop production more efficient and economically advantageous. The most significant advantage of drones is providing accurate data that drone sensors are not feasible with human explorers, particularly at that speed, accuracy, and cost (K.R. Krishna 2018).

3. Implementation of Agricultural Vehicles In Two Different Companies.

At this point, we compared the Agrofumex company with a traditional spraying company which uses the spraying helicopter as its primary vehicle to carry out the Agricola service, making a detailed analysis of the advantages and disadvantages in the use of two different vehicles entails taking into account the productivity and efficiency that each one possesses, also valuing the mission and viewer of the companies.

3.1 Agrofumex Introduction

As we already know, Agrofumex is a company made up of a broad team adopting the use of advanced technologies in the agricultural field, which is the use of spray drones such as the T1-10L Black Hawk model.

| | |
|-----------------------------------|---|
| Dimension | 1436*1436*550 mm (arm unfolded, without propellers) 710*820*550 mm (arm folded, without propellers) |
| Diagonal Wheelbase | 1300 mm |
| Total Weight | 10.5 kg (without battery) 23.5 kg (with battery, Full Loaded) |
| Standard Take-off Weight | 23.5 kg |
| Max Take-off Weight | 25 kg |
| Hovering Time | 10 min (23.5kg take-off weight) * 25 min (13.5kg take-off weight) * |
| Max Operating Speed | 8 m/s * |
| Max Flying Speed | 10 m/s * |
| Recommended Operating Temperature | -10°C~40°C |
| Liquid Tank Volume | 10 L |
| Number of Nozzle | 4 |
| Spraying Span | 3.5-4m |
| Theoretical Operating Efficiency | 200,000m ² /day (8hs, 6 sets of batteries) |
| Max Spraying Speed | 1.6L / min |
| Max Transmission Range | 1000 m (Unobstructed, Free of Interference)** |

Figure 7. Technical specifications of the T1-10 L Black Hawk model.

Making more effective the different services they provide to the client, such as phytosanitary management that is the control of pests and diseases, foliar fertilization, which consists of the application of nutrients, weed control by applying selective contact and syste-

mic organic herbicides, control of the pre-emergent weed, weed control in pastures which are prairies or pastures and finally the control of the mosquito infected with dengue, chikungunya and Zika.

In order to have good use of the different products, tests are carried out with sensitive cards to identify the impact on the crop since it must be between 200 to 250 drops / cm², this amount guarantees a penetration of 120 drops / cm² in the centre of the biomass of the crop, an average of 170 and 65 drops / cm² at the base of the upper and middle third respectively.

Agrofumex works with an agronomic concept of control of agricultural crops based on spatial monitoring in the field to collect information on a specific area,

3.2 HMU Helicopter Maintenance Unlimited S.A. de C.V.

HMU is a company focused on the use of helicopters for spraying different fields. The Robinson R22 Beta II, R44 Raven I and R44 Raven II helicopters are the primary vehicles that this company uses to perform its services. The choice of the helicopter depends on several factors such as the budget, altitude above sea level of the area to be fumigated, the surface to be applied and obstacles on the surface such as trees, cables, buildings, among others.

| | |
|--|-------------------------------------|
| Model | R44 Raven II |
| Engine | Lycoming IO-540 with fuel injection |
| Cylinders | 6 |
| Maximum Takeoff Weight | 2,500 pounds |
| Empty Weight (includes basic equipment and oils) | 1,500 pounds |
| Fuel Main Tank (30.6 gallons) | 184 pounds |
| Auxiliary Tank Fuel (18.3 gallons) | 110 pounds |
| Passengers and Baggage with a full Main Tank | 816 pounds |
| Cruising speed (estimated) | 135 miles per hour |
| Maximum Range (estimated, without reservation) | 350 miles |
| I GE Service Ceiling (Maximum Weight) | 8,950 feet |
| O GE Service Ceiling (at 2,300 lbs.) | 7,500 feet |
| Ascent Rank | 1,000 per minute |
| Maximum operating altitude | ————— |
| Electric system | 28 volts |

Figure 8. Technical specifications of the R44 Raven II model.

3.2.1 Comparison of the Different Services

| Per hectare | Black Hawk | R44 Raven II |
|-----------------------------------|------------|-----------------|
| Fumigant required | 10 L | 30 L |
| Product cost in relation to water | 300 pesos | 500 pesos |
| Fumigation time | 20 minutes | 10 - 15 minutes |
| Cost of operation | 150 pesos | 160 pesos |

Table 3. Companies comparison (Jason, 2020).

After analyzing the comparative data, we observed the cost-benefit ratio, which Agrofumex has an advantage, being that it has more equipment for fumigation, making the work faster with greater precision to penetrate the soil adequately.

3.3 Green Economy Factor

According to the United Nations Environment Program, a *green economy* is low-carbon, resource-efficient and socially inclusive (UNEP 2020).

A green economy improves human well-being and generates social equity while reducing environmental risks. A green economy is an excellent alternative to the current economic model, a shame for the environment and human health.

Once taking into account the green economy, we can deepen the technology that we could implement in the agricultural area; this technology will be agricultural drones. according to Drone USA Inc. "The agricultural industry, which continues to incorporate new and evolving technology, has found drones to be an indispensable tool for farmers around the world." Nevertheless, why does it make them so unique? What makes them so profitable and suitable for the agricultural area is that they improve productivity since they go hand in hand with the demand generated by society; for example, experts have said that by the year 2050, the world population will be approximately 9 billion. At the same time, it is estimated that agricultural consumption will increase by 70 per cent. The needs grow alongside the difficulty of tracking so many crops, but drone technology will help overcome these problems for these hurdles. They are also well adapted to different climates and help reduce pollution (UNEP 2020).

3.4 Swot Analysis

| Strengths | Weaknesses |
|-----------------------|----------------------|
| Personalized service | Three states covered |
| Advanced technology | Limited resources |
| Eco friendly products | Slow expansion |
| Qualified personnel | |

| Oportunities | Threats |
|-----------------------------------|--------------------------------|
| Green economy | Denial of certifications |
| Certificated company | Failure of plan implementation |
| National and international market | |
| World situation | |

Figure 9. Swot analysis of Agrofumex (Jason 2020).

Within the table, we observe two critical factors, the internal and the external factor, and this helps us identify the different points to cover to have a better development to take advantage of our opportunities to the maximum.

3.5 Summary

The use of the different tools that help the human being in the different work areas has evolved according to the needs, as has been previously analyzed in the comparison of two related companies in the agricultural field, where one of them works with a less practical method compared to the use of drones, making it more efficient and automated, having the advantages of reducing costs, increasing benefits and customer satisfaction.

It has brought personal benefits and helps the environment, working sustainably in each of its projects, generating a social conscience about what we are experiencing, making the most of the necessary resources, and supporting creating a green economy.

4.2 Research Design and Method

This sub-chapter aims to explain the research design and research method plan of why and what I interviewed for the research process of this thesis. The analysis approach will be qualitative. The data collection methods are primary research.

As explained in chapter 1, there is a problem concerning environmental care, which has led us to a world crisis over the years. The surveys were divided into three areas (Appendix 4). Each of these was directed towards a specific audience as well as the questions. I focused the questions on capturing information according to each area to have a contrast, in the final analysis, to know the knowledge of an employee about sustainability and the understanding of a producer who probably only attended elementary school.

Simplicity in expressing a concept is the highest degree of complexity in any theory. For this reason, and without prejudice to what comes later, It is define qualitative research as the study of people based on what people say and do in the social and cultural setting presented to them in each question.

Qualitative research aims to provide a research methodology that allows understanding the complex world of lived experience from the point of view of the people who live it (Taylor and Bogdan 1984).

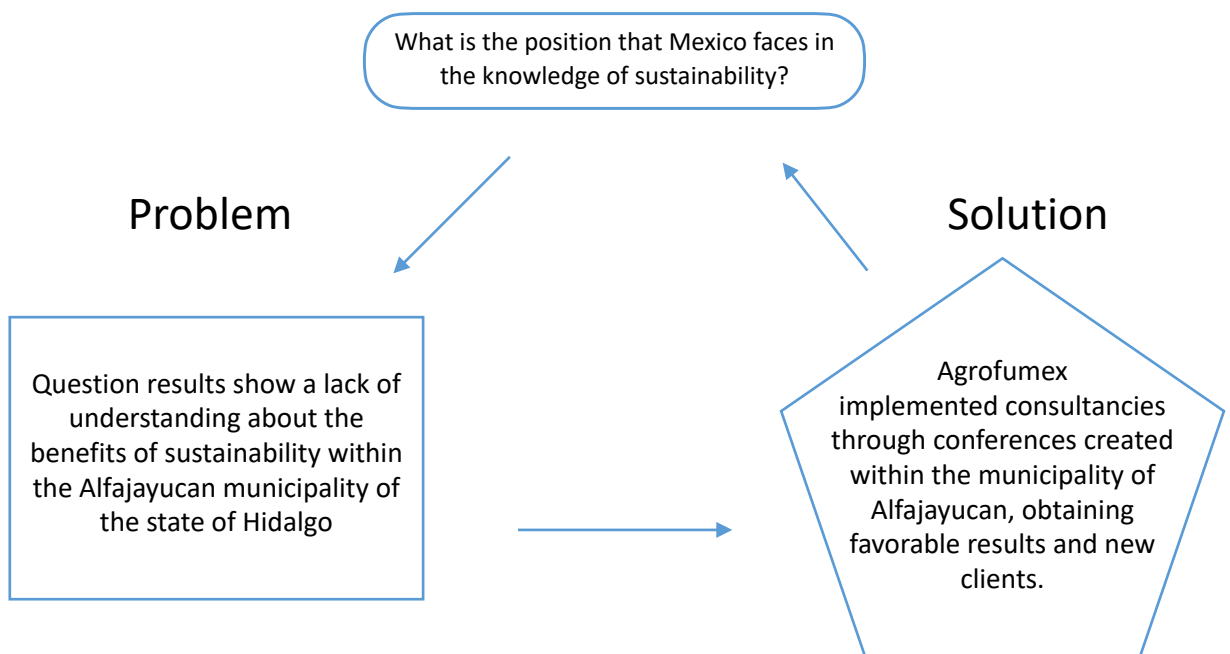


Figure 11. RQ's approach to the problem and its solution.

4.4 Project Assessment

In the analysis of the surveys, we noticed some crucial points concerning the wisdom and implementation of ecological activities inside and outside the companies and the place where the general knowledge of the average Mexican on the green economy is situated.

Doubts were raised related to the meaning of sustainability in the responses obtained by civilians, which at first most of the participants did not know what the green economy is and its importance, having a rather alarming result regarding the dissemination of information that is given within the country about this issue.

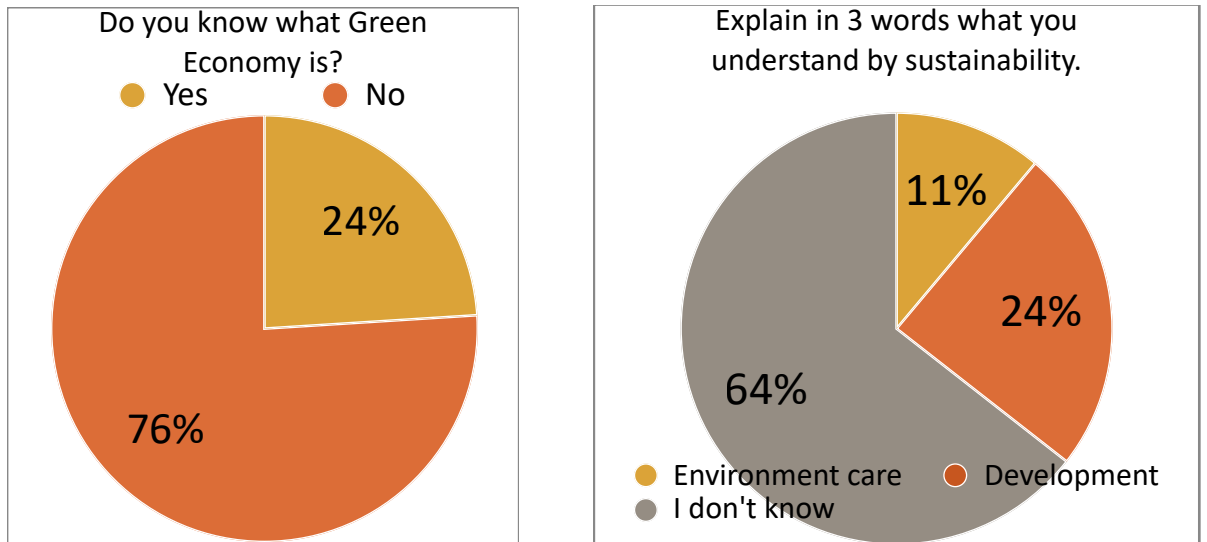


Figure 12 and 13. Results of the producer surveys of question one and five (Jason, 2021).

38 of 50 responded that they do not know information regarding the green economy, and the seven claimed to know about the subject but once going to question 5 that is related to the meaning of sustainability, 29 out of 50 participants did not know how to summarize it in 3 words, this was repeated in the employee surveys generating a concern for agrofu-mex which was not aware of this situation.

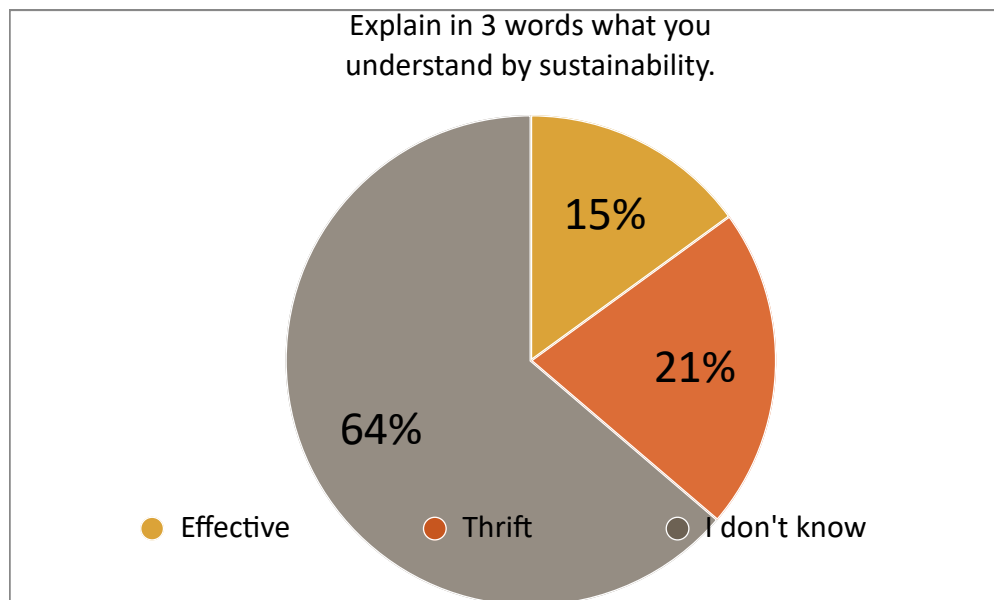


Figure 14. Results of employee surveys of question four (Jason, 2021).

We wanted to know what was happening within the companies of these employees, so we contacted the CEOs of the five companies where these surveys were applied because a percentage of 64% was presented, which is equivalent to 51 out of 80 employees who do not know what it is sustainability.

So we applied a survey to each CEO to determine what they noticed as being the ones in charge. The results on whether there is any talk related to sustainability was not congruent with the responses of the employees.

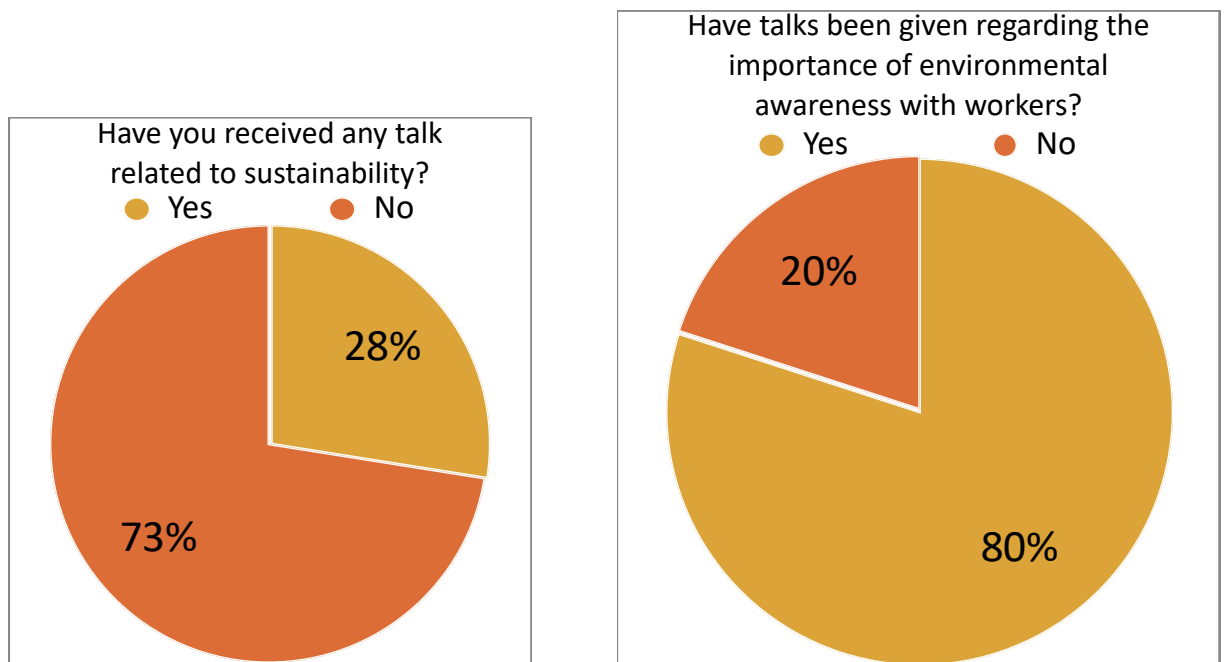


Figure 15 and 16. Results of employee and CEOs surveys, question number 3 “employees” and 4 “CEOs” (Jason, 2021).

According to the results of the employees, there is no type of talk or advice to solve the doubts of their workers and that they have more information about how belonging to a sustainable company benefits them just like the company.

Finally, we ask the producers if they know something about the new technology applied in the agricultural sector.

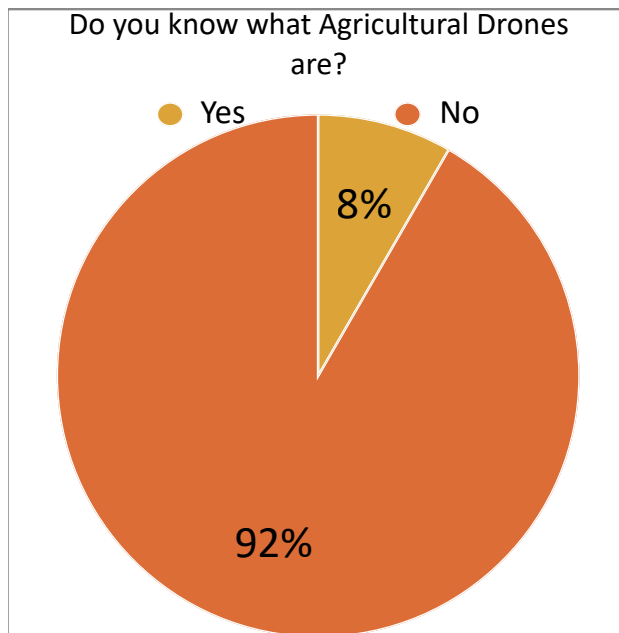


Figure 17. Results of producer surveys, question number 6 (Jason, 2021).

With a negative answer, we started a plan to publicize agrofumex services and provide vital information to relate producers to the world of the green economy. With this, both producers and our employees became more familiar with the subject; demonstrations were also given on how the service is carried out in the agricultural field for a practical within these meetings held in different municipalities of Hidalgo.



Image 1 and 2. Evidence of meetings in the state of Hidalgo.



Image 3 and 4. Evidence of training in the state of Hidalgo.

In these meetings, topics such as the importance of belonging to a green economy, sustainability in Mexico and benefits according to government projects towards support for agriculture producers were discussed. With this, we had a growth in the hiring of our services, from 22 clients that we had at the beginning of the project, it increased to 56 and not only that, people began to be motivated to have more information about drones and the different functions they can do for the collection of data according to their crop.

A survey was applied to 135 people, divided as shown in the table.

| Producers | Employees | CEOs | Total |
|-----------|-----------|------|-------|
| 50 | 80 | 5 | 135 |

Table 4. Number of participants (Jason, 2020).

Agrofumex decided to anonymize the employees and CEOs who responded to the surveys to avoid any problem within their work area and obtain honest answers.

5. Conclusion

Throughout five months, we have observed the results that have emerged within the company, reporting the growth of 34 clients who have received adequate information about the drone service as well as talks regarding environmental awareness, explaining how Agrofumex has been improving each of the areas to guarantee exceptional quality of work.

Agrofumex projected a goal for the future. To obtain the certifications ISO 9001:2018 and ISO 14001:2018 that will legally validate every promise made by this company and introduce a new market, having different benefits for them and their workers.

Based on the analysis of the surveys, Agrofumex chose to be more relevant in terms of disseminating information on what it means to be a sustainable company, this due to the results of workers who still do not have explicit knowledge of the subject. The plan that agrofumex implemented since November 2020 has worked effectively to keep producers and the community informed.

Not leaving behind the people who are not related, planning is being carried out to be able to have talks in institutes such as high schools and universities, either face-to-face or virtual, to talk about the importance of being part of a green economy in the country with the use of new technologies such as agricultural drones offering tests in real-time if it is possible, to have a better understanding with which it seeks to motivate new generations to be part of this great project.

Undoubtedly agrofumex has had a different experience and a visualization of what happens within the agricultural sector, assuming the responsibility of creating a positive impact by helping producers and clients, keeping them informed, caring for future generations to know how interesting it can be. be this sector and how the technology has evolved in this area, making the work more practical and granting an efficiency.

5.1 Reliability

Regarding the methods that were used to obtain results, they have been systematically precise as was the survey created for each of the areas, having hard data on the position in which each one is, facilitating the analysis of each question. On the other hand, the waterfall method helped to keep a detailed agenda to apply and observe each step previously written, which generated a fairly good communication with the company and its employees.

At the beginning of the project there were a couple of complications due to the lack of relationship with this organizational method, but as the tasks progressed, we understood its functionality better to achieve all the objectives.

5.2 Recommendation

This sub-chapter aims to offer recommendations and suggestions for the company with which this study was carried out based on the analysis of the results, discussion and general conclusions previously done.

It is recommended to have a follow-up in the plan that was applied in this project for the introduction of new markets because it has had optimal results in the interest of the producer, which is a significant factor if Agrofumex wants to expand or even attract more customers in the places where they currently work.

Following the customization of conferences and creating forums for the dissemination of information related to the agricultural sector. The management of these practices through the use of methodologies such as the waterfall methodology will be beneficial due to the high understanding that employees maintained this project, which served to differentiate the tasks and dates of completion.

5.3 Evaluating the Research

This sub-chapter explains how optimal data quality, meaning it is valid and credible, was ensured.

The research design shown in chapter 4.2 was followed, resulting in 50 surveys answered by producers, 80 by employees and 5 CEOs. The author thinks it is efficient for this research because these 50 producers were within the area to be covered by agrofumex, which increased from 22 clients to 56, gaining 34 clients in the course of 5 months, which was the duration of the project.

5.4 Personal Learning

In these five months of the project, I was able to familiarize myself with a sector to which most Mexicans do not give importance as such, we know that it exists, but we do not reflect on the benefits that it can bring to our lives if we implement the different supports that they exist in Mexico to create a company and even sustainable energy. One of the points in which I learned the most was in the lack of interest in the search for information by a specific area which was the producers, they were governed by the wisdom acquired by past generations and not by studies carried out and published in reliable sources such as Innova MX or the autonomous university of Mexico. This project was fascinating because I understood concretely the needs that we have as Mexican people, which is the use of technologies to inform us every day and implement them in our daily and work lives.

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Appendixes

Appendix 1. Questions for Employees

1. Do you consider that the company where you work is sustainable?
2. In what percentage do you consider that it is sustainable?
3. Have you received any talk related to sustainability?
4. Describe in 3 words what a sustainable company means to you
5. What do you think is the importance of belonging to a sustainable company?
6. Do you take care of the environment during your post-work hours?
7. How often?
8. Have you heard about environmental awareness?
9. How important do you consider environmental awareness to be for the workplace?
10. Briefly describe whether the company where you work has done a good job in relation to sustainability

Appendix 2. Question for Agriculture Producers

1. Do you know what Green Economy is?
2. On a scale of 0 to 10, how much information do you know about the topic "Green economy"?
3. In 3 words for you what it is "Green Economy"
4. On a scale of 0 to 10, how important is the green economy for job creation?
5. Explain in 3 words what you understand by sustainability.
6. Do you know what Agricultural Drones are?
7. On a scale of 0 to 10, how well do you know the functionality of an agricultural drone?
8. Select the most important concept
9. Have you contributed to caring for the environment?
10. How often do you generate these contributions?

Appendix 3. Questions for CEOs

1. Do you consider that your company is sustainable?
2. Does your company currently have one of the following certifications?
3. What percentage of effectiveness has the implementation of these certifications had?
4. Have talks been given regarding the importance of environmental awareness with workers?
5. How often are these types of talks given?
6. In what percentage do you think they have been effective?
7. Do you think that the use of sustainable methods has made your company grow?
8. In what percentage?
9. Briefly explain 5 reasons why you chose to create a sustainable company.
10. Briefly explain, what is the next step for your company to continue to be sustainable?

Appendix 4. Overlay Matrix of the Thesis

| Investigative Questions (IQs) | Theoretical Framework ¹ | Methods | Results |
|--|------------------------------------|--|-------------|
| IQ 1. What is being part of a green economy? | Chapter 3.3 | <ul style="list-style-type: none"> - Qualitative research - Survey | Chapter 4.4 |
| IQ 2. What is the knowledge about sustainability? | Chapter 1.2 | <ul style="list-style-type: none"> - Qualitative research - Survey | Chapter 4.4 |
| IQ 3. Is there any case where the company has taken this problem into account? | Chapter 1.6 | <ul style="list-style-type: none"> - Qualitative research - Surveys and interviews | Chapter 4.4 |