# Aguacanal

## Impact Report 2021

June 2022

aguacanal

# Purpose of the report

Evaluate and measure the impacts generated during 2021 by Aguacanal.

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# 1

# Executive summary

# Introduction to Aguacanal

## Background

In the 90's, with the aim of contributing to the sustainable development of the region of Navarra, the Spanish Government and the Regional Navarra Government agreed on the construction of the Itoiz Reservoir and the Navarra Channel. The project planned to increase the irrigation area and enhance the intra-regional territorial cohesion. Since then, several phases have been completed:

- Construction of the **Itoiz reservoir**, a dam to regulate 418 $hm^3$ of water on the River Irati, operating since 2003.
- Construction of the **"Canal de Navarra"** (Navarra Channel), a water channel that transports the water from the Itoiz reservoir to southern regions of Navarra.
- Construction and operation of the **"Navarra Canal Irrigation Area"**, a distribution network from the Navarra Channel to the different irrigation sectors. This project has been structured into **three different phases (Phase 1, Phase 1 Extension and Phase 2)**, of which Phase 1 has been completed and Phase 1 Extension is under construction.

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Sociedad Concesionaria de la Zona Regable del Canal de Navarra

## Phase 1

The infrastructure constructed for Phase 1 of the "Navarra Canal Irrigation Area" has enabled the transformation of crops and land consolidation in the area, increasing the economic productivity of land. Thus, **Phase 1 has increased the yield, as well as the diversity of cultivated crops** (resulting in the cultivation of around 40 different new types of crops)**.**

In terms of water use, **the infrastructure is highly efficient** thanks to a digital monitoring system of consumption (+99% efficiency rate[1]), which **guarantees water supply** in times of water shortage.

The operation of the infrastructure tries to be environmentally respectful by **pumping water by means of gravity** in many cases, which reduces the amount of energy required to transport the water, and **consuming renewable energy**, as solar panels have been installed in different pumping stations.

In total, Phase 1 covers 22,398 ha. of agricultural land, serving to 59 towns and 4,211 land owners. This has resulted in the **transformation of rainfed to irrigated land in 19,667 hectares.**

**Aguacanal is the concessionaire company** in charge of constructing and operating the infrastructure. All the **infrastructure for Phase 1 is already built and in operation.**


*Figure 1: Project location.*

1. Efficiency in a water distribution system refers to the rate of water that is withdrawn to satisfy the consumption need.

# Methodology

**This report has been written following a methodology that is based on three different phases:**

**1 Materiality assessment**

In a first step, we identified and prioritized the SDGs and ESG aspects relevant to the activities of Aguacanal, for which we relied on international standards and frameworks such as GIIN-IRIS and/or IIGCC. This work allowed us to have a list of key material aspects on which to measure the impacts generated by the company.

**2 Impact measurement**

Subsequently, based on the material aspects of Aguacanal's activities identified in the previous phase, we proceeded to request key information (inputs), which allowed us to analyze the performance and measure the impact of the activities of the company, including the operation of the infrastructure. It also helped us to identify to which SDGs the company contributes. See Annex I for methodology details.

**3 Impact reporting**

Finally, we proceeded to consolidate the impacts obtained with the aim of designing an executive impact report that would reflect the performance and net impact generated by Aguacanal in 2021, highlighting the impacts of greatest relevance and providing context to facilitate their interpretation.


## Current case vs. base case

Many of the impacts included in this report have been calculated based on a **comparison between**:

- What is the impact based to the data of what has happened in 2021 in the plots where the infrastructure provides water **(current case);** and
- What would have been the impact in these same plots if the infrastructure wouldn't have been built and most of the agricultural land would have stayed rainfed **(base case).**

The difference in impact between both cases can be considered as the avoided or additional impact (depending on the measured impact) of having built and operated the infrastructure.

The **main differences** between both cases are the following **(base case vs. current case)**

**2021 data**:

### Number of plots:

- **decreased, x0.33**

### Hectares of rainfed land

- **2,731 hectares in 2021 (22,398 ha. In base case)**

### Hectares of irrigated land

- **19,667 hectares in 2021 (0 ha. in base case)**

### Main crops:

- **43 new types of cultivated crops**

### Water consumption ($m^3$):

- **+86,220,081 $m^3$ (0 $m^3$ in base case)**

### Electricity consumption (MWh, non-renewable):

- **+714 MWh**

### Electricity consumption (MWh, renewable):

- **+538 MWh**

# Contribution pillars of Aguacanal

**A materiality analysis of Aguacanal's activities, including the operation of the infrastructure of Phase 1, has been carried out to subsequently measure the impacts. This resulted in the identification of two main contribution pillars through which Aguacanal generated an annual positive impact.**

## Enabling local economic development

### Main impacts in 2021

Increasing the **benefit for land owners** by more than 17,402 k€ vs. base case

Enabling the creation of **agricultural employment** of 1,495 AWUs (Annual Work Units)

Increasing **tax contribution** by 10,959 k€

### SDGs impacted


## Carbon neutral

### Main impacts in 2021

Enabling the **carbon sequestration** of an additional 31,519 $tCO_2$ vs. base case

Avoiding the emission of 64.06 $tCO_2$ through **renewable energy production**

### SDGs impacted

# Contribution to the SDGs

**It is particularly relevant to understand how Aguacanal's activities contribute to the Sustainable Development Goals (SDGs) through its 2 contribution pillars.**


Aguacanal contributes to reduced poverty in rural areas by the benefits derived from the infrastructure (economic production, agricultural employment and fiscal contribution).


Aguacanal has created direct quality employment, and indirectly, it has enabled an increase in local agricultural employment.


The inequality between rural and urban areas is reduced thanks to the generation of economic activity in the rural area of Navarra, where infrastructure is located.


The efficiency of water distribution can be considered as contributing to sustainable farming that increases land productivity and income of local small-scale food producers.


43% of the electricity consumed comes from installed solar panels, which allows Aguacanal to contribute to affordable and clean energy goals.


The increase in agricultural production, favored by the infrastructure, has an impact on the amount of $CO_2$ sequestered. Also, renewable energy avoids emissions into the atmosphere.

**Other SDGs with a considerable contribution:**


The infrastructure is considered to be resistant and high-quality, and has made it possible to distribute most of the water by gravity.


Water in the infrastructure does not damage the ecological flow of the river Irati (where water is sourced), therefore, aquatic life is not harmed.


The infrastructure has been built and operated both publicly and privately, demonstrating that there is a high degree of collaboration between all parties for the development of infrastructure with a positive impact.


The water distributed through the infrastructure that Aguacanal operate is consumed responsibly thanks to a digital monitorization.


Water consumption affects terrestrial biodiversity, but the distribution of water is very efficient (+99%) and avoids impacts in comparison with tradition average water distribution system in Spain

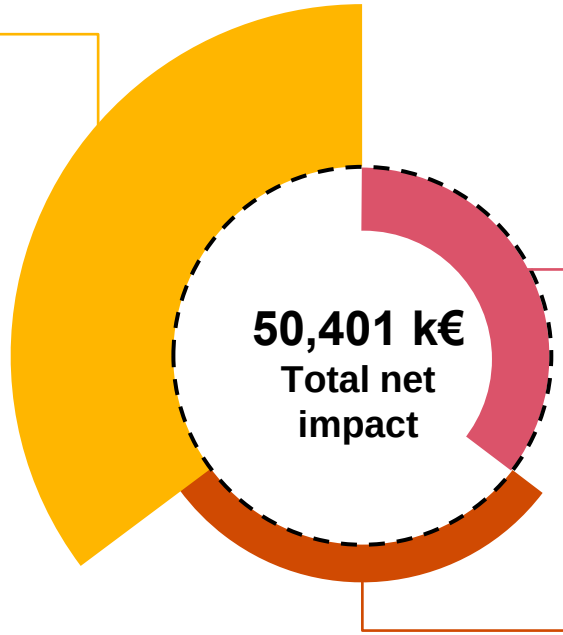
# Impact measurement (1/2)

**Aguacanal generated a net positive impact of 50,401 k€ through three impacts derived from its activities in 2021.**

Impact measurement is understood as the assessment, quantification and monetization (ultimately) of the changes that the activities or services provided by a project have on society and the environment as a whole. In this report, we have proceeded to measure the impacts of the infrastructure constructed and operated by Aguacanal through the two pillars of contribution previously identified, as well a potential environmental impact derived from water consumption.

**Enabling local economic development**

**55,908 k€**


**Potential environmental impact derived from water consumption**

**- 8,831 k€**


**Carbon neutral**

**3,324 k€**


This circle represents 0€.

Colored area represents impact of each aspect considered. Outside the circle represents a positive impact, while inside the circle represents a negative impact.

Negative figures refer to negative impacts generated by the activity of Aguacanal, while positive figures refer to positive impacts generated by the activity of Aguacanal.

# Impact measurement (2/2)

**Each of the three impacts is the result of adding up different but related smaller impacts, which have been assessed, quantified and monetized with different impact measurement methodologies.**

## Enabling local economic development

**55,908 k€**

**Description**

Converting from rainfed to irrigated lands lead to higher productivity and greater crop diversity. This change creates a positive economic impact on land owners, agricultural employments and tax contributions, enabling local economic development.

**Impacts included in 2021**

- **17,402 k€** from value of increased agricultural production
- **27,577 k€** from additional salaries (direct and indirect)
- **10,959 k€** from tax contributions
- **- 29.6 k€** from labor accidents


## Carbon neutral

**3,324 k€**

**Description**

The increase in crops causes a positive impact by sequestering greater amounts of $CO_2$. However, the distribution of water generates an electrical consumption that the base case did not have, although 43% of this consumption comes from renewable energies. In addition, emissions from diesel consumption of corporate vehicles generate a negative impact.

**Impacts included in 2021**

- **3,333 k€** from carbon sequestration
- **-2.2 k€** from the electrical consumption
- **-6.7 k€** from emissions generated by diesel consumption


## Potential environmental impact derived from water consumption

**- 8,831 k€**

**Description**

The potential terrestrial species affected by water consumption in the irrigated lands, consuming a natural resource generates a negative impact. However, due to the high efficiency of the distribution system (99%), the impact is less compared to conventional systems (75%).

**Impacts included in 2021**

- **-8,831 k€** from water consumption

# 2

# Impact measurement

# Impact measurement: **Enabling local economic development** (1/3)

**Positive impact in 2021 valued in:**

**55,908 k€**

**17,402 k€**
**Value of increased agricultural production**

**27,577 k€**
**Salaries (direct and indirect)**

**10,959 k€**
**Tax contribution**

**- 29.6 k€**
**Labor accidents**

**19,667 hectares of agricultural land were irrigated with water from the infrastructure that Aguacanal operates, allowing them to increase their yield and diversify their crops. As a result of this, the total benefits of land owners has increased by a factor of 5.36 over the base case.**

Phase 1 of the "Navarra Canal Irrigation Area" provides access to water from river Irati to 19,667 hectares of agricultural land which were previously rainfed, transforming them into irrigated land. This **access to water constitutes an important positive impact for local producers as it allows them to increase their harvest per hectare (kg/ha.), as well as to cultivate different crops** that are only suited for irrigated land and have a higher economic value. For example, wheat and barley are two crops that can be cultivated in both, rainfed and irrigated land, however, doing it with an irrigation system increases their yield per hectare by an average of 39%. In terms of crop diversity, some of the 43 estimated new cultivated crops that are grown thanks to irrigation are corn, sunflower, pea, tomato and broad bean[1].

These transformations on the agricultural output have a positive economic value, as farmers have a bigger harvest and new crops with higher economic value to sell. We have estimated that **revenues** (value of agricultural output) and **benefits** (revenue minus the costs of productions) **of an irrigated hectare are 3.76 and 5.97 times higher**, respectively, than a rainfed hectare. Considering that current case has mostly irrigated land , but also some hectares of rainfed, we can estimate that the **total benefits for land owners has increased by 17,402 k€ over base case[1].**

The **transformation of land into irrigated** has…

…**increased the yield** of previously cultivated crops by 39%…

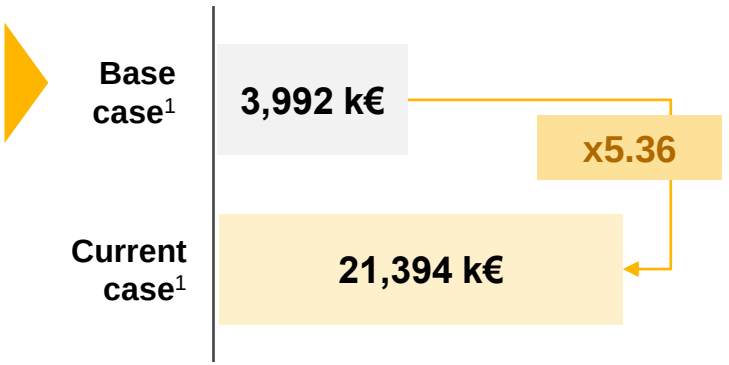
…and allowed the cultivation of around **43 new types of crops**

Higher yield and new crops **increased benefits per ha. by a factor of 5.97**

**Rainfed:** 178 €/ha

**Irrigated:** 1,063 €/ha

**Considering all hectares, the total benefit of land owners has increased by more than 17,402 k€ vs. base case**




1. Estimated by PwC based on information from Aguacanal, Comptos' study and public information.

# Impact measurement: **Enabling local economic development** (2/3)

**Positive impact in 2021 valued in:**

**55,908 k€**

**17,402 k€**
Value of increased agricultural production

**27,577 k€**
Salaries (direct and indirect)

**10,959 k€**
Tax contribution

**- 29.6 k€**
Labor accidents

**As irrigated hectares are more labor intensive compared to rainfed hectares (x6.43 more AWUs required), the transformation of lands into irrigated has meant the employment of a total of 1,495 AWUs, which add up to 26,735 k€ in additional salaries for the agricultural sector. Additionally, Aguacanal has spent 842 k€ in salaries.**

The increase in production thanks to the irrigation systems also make the lands more labor intensive, thus, farmers have had to increase agricultural employment in their lands. **Annual Work Units (AWUs) per hectare**, defined as the amount of human labor provided on each agricultural holding, **increase 6.43 times (from 0.014 to 0.09)[1] when transformed from rainfed to irrigat**ed.

Thus, the **transformation of 19,667 hectares into irrigated has allowed the employment of a total of 1,495 AWUs**, which in monetary values, this could add up to **26,735 k€ in additional salaries for the agricultural sector[2]**. On top of this, it is important to also value indirect impacts that this increase in local employment constitutes, such as the reduction in migration of younger population from rural to urban areas of the country, as well as the induced impact on other local economic activities.

Lastly, it is important to take into account the **direct quality employment that Aguacanal generates**; at the end of 2021, Aguacanal had an employee **headcount of 17 people**, all of them with a permanent contract, and with an **average salary of 49.5 k€** (well above the Spanish national average)[3]. Also, Aguacanal spent 4.85 k€ in employee training during the year[3].

**An Irrigated hectare requires x6.43 more AWUs than a rainfed hectare…**

Base case

+1,495 AWUs

Current case

**27,577 k€ in salaries**
**vs. base case**

**842 k€ in salaries**
**for corporate employees**

**+26,735 k€ in salaries added in the agricultural sector**

**Aguacanal creates direct quality employment in Navarra…**

**17 employees, all with permanent contracts** (incl. operators)

1. According to report 1ª Fase Embalse de Itoiz, Canal de Navarra y su zona regable.
2. Estimated by PwC based on information from INE or information from Aguacanal.
3. Data from Aguacanal

# Impact measurement: **Enabling local economic development** (3/3)

**Positive impact in 2021 valued in:**

**55,908 k€**

**17,402 k€**
Value of increased agricultural production

**27,577 k€**
Salaries (direct and indirect)

**10,959 k€**
Tax contribution

**- 29.6 k€**
Labor accidents

**The transformation to irrigated agriculture and the activities of Aguacanal has an impact on the governments' budget through taxes that amount to 10,959 k€. These include 278 k€ in corporate tax and 2,530 k€ in value added tax, both from Aguacanal, as well as the additional contribution from agricultural land owners (8,151 k€).**

Thirdly, the activities of Aguacanal generate an impact in terms of tax contributions. In this aspect, we can consider two main types of contributions; firstly, taxes payed directly by Aguacanal, which include corporate taxes and value added taxes, and secondly, the additional tax payments from land owners who have had their land transformed into irrigation. The additional income that municipalities have gained where transformed plots are located are because irrigated land has a higher tax rate for having a higher reteable value over rainfed land, as well as a greater value of adjudications of communal land.

According to information from Aguacanal, **corporate taxes amounted to 278 k€ and value added taxes to 2,530 k€**[1]**.** The additional municipalities' income is estimated to be 103.05 € a year for an hectare of rainfed and 517.47 € for an irrigated hectare. This results in an **estimated additional tax contribution from land owners of 8,151 k€ compared to base case**[2].

Additionally, Aguacanal has reported only **one labor accident** which resulted in 26 sick days. According to our estimations[3], the injury could have a **cost for the government and the individual of 29.6 k€**.

**Aguacanal has directly payed in taxes…**

**278 k€**
**in corporate tax**

**2,530 k€**
**in value added tax**

**10,959 k€**
**tax contribution generated**

**The infrastructure has enabled…**

**8,151 k€ in additional municipalities' income vs base case**

| | |
|---|---|
| **10,459 k€** In current case | **2,308 k€** In base case |
| **103.05 €/ha** if rainfed land | **517.47 € /ha** if irrigated land |

**-29.6 k€**
**estimated cost** for the government and the individual

**1 labor accidents** during the year (26 sick days)

1. Data from Aguacanal.
2. Estimated by PwC based on information from Aguacanal and Comptos' study
3. UK Government's Health and Safety Executive

# Impact measurement: **Carbon neutral** (1/2)

**Positive impact in 2021 valued in:**

**3,324 k€**

**3,333 k€**

**Carbon sequestration**

**- 2.2 k€**

**Electricity consumption**

**- 6.7 k€**

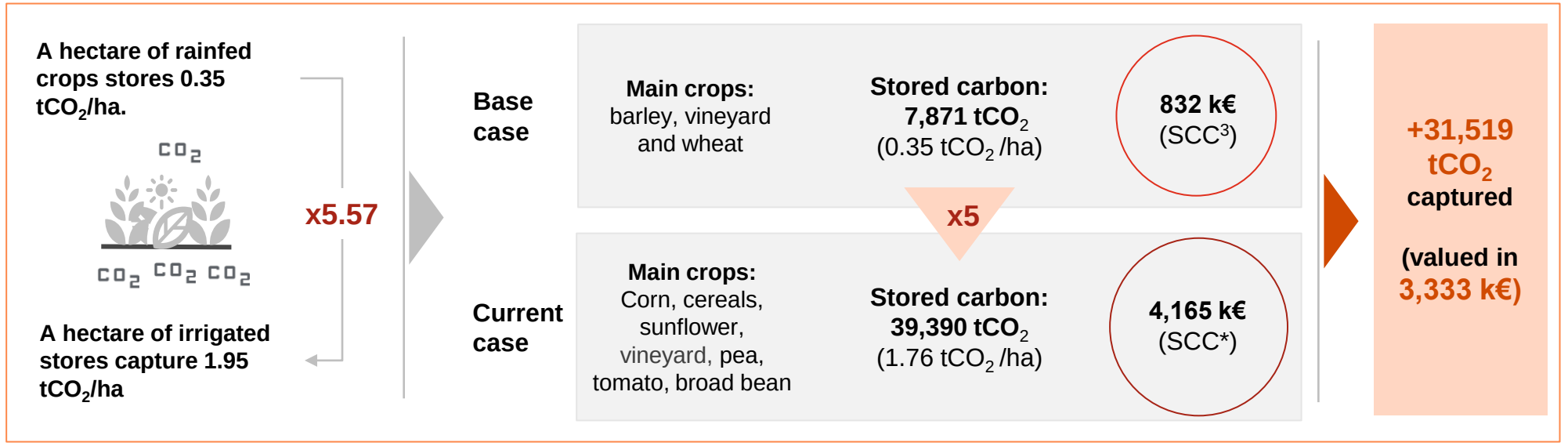
**Diesel consumption**

**Removing carbon from the atmosphere through sequestration can be achieved by cultivating certain crops that have a higher capture capacity, and by increasing the amount of cultivated plants (yield). Thus, the infrastructure has allowed an additional sequestration of 31,519 $tCO_2$, which avoids a social cost of 3,333 k€.**

Carbon sequestration can be achieved by capturing $CO_2$ from the atmosphere and storing it in terrestrial reservoirs, reducing atmospheric $CO_2$ levels (FAO[1]). There are certain types of crops that have a greater carbon capture capacity, and the more plants you cultivate, the more carbon is captured. Thus, the average carbon sequestration of cultivated plants where the infrastructure provides water has increased due to the transformation from rainfed to irrigated harvest.

It has been estimated that that **rainfed land can sequester less $CO_2$ (1.17 $tCO_2$/ha) than irrigated crops (6.51 $tCO_2$/ha) each year**[2]. However, carbon stored in the soil, and actually removed from the atmosphere for a longer term, is only a portion of captured carbon. This is because agricultural waste returns part of the captured $CO_2$ and nitrous oxide emissions from fertilizers back to the atmosphere – **only 30% of the captured carbon is considered to be stored**[2].

According to our estimates, **a total of 39,390 $tCO_2$ are stored** in the land covered by Aguacanal (22,398 ha), which are valued at **4,165 k€.** If this is **c**ompared to the value of carbon stored in the base case (in which only 7,871 $tCO_2$ are stored[2]), there is a **positive impact of 3,333 k€.**




1. The Food and Agriculture Organization of the United Nations (FAO).
2. Estimated by PwC based on information provided by Aguacanal and public information.
3. Social cost of carbon (explained in methodology, page 22).

# Impact measurement: **Carbon neutral** (2/2)

**Positive impact in 2021 valued in:**

**3,324 k€**

**3,333 k€**

Carbon sequestration

**- 2.2 k€**

**Electricity consumption**

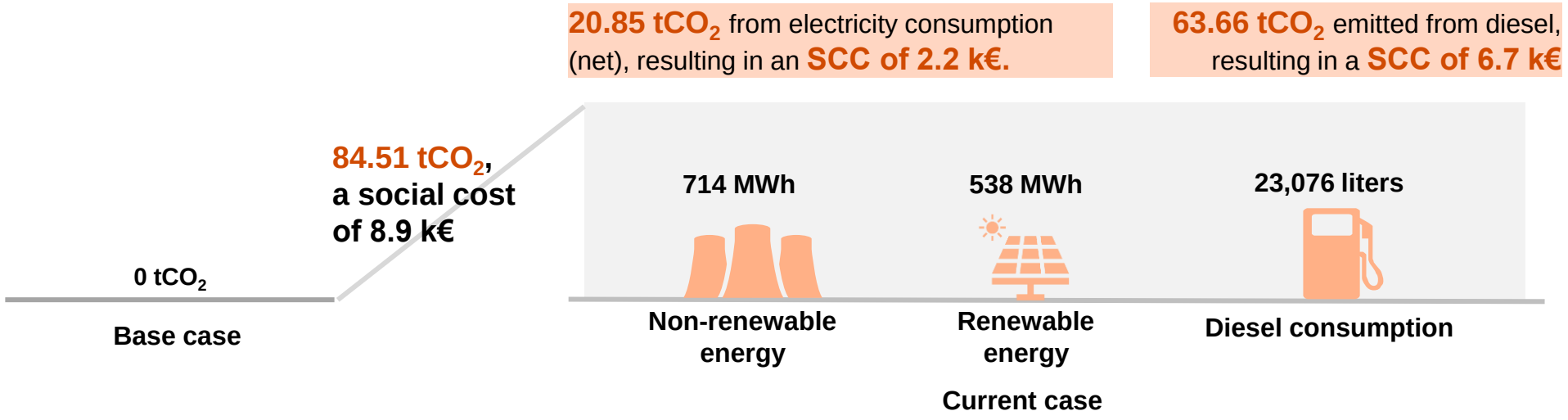
**- 6.7 k€**

**Diesel consumption**

**However, the increase in electricity consumption by Aguacanal has caused the emission of 20.85 $tCO_2$, which cause a social cost of 2.2 k€, and Aguacanal's diesel consumption has a negative impact valued in 6.7 k€. These two impacts result in a net negative impact of 8.9 k€.**

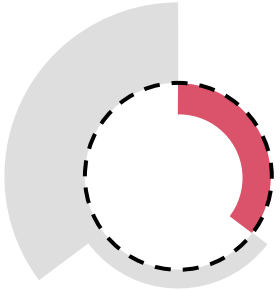
Before the infrastructure was built, all of the hectares of agricultural land were rainfed, thus, the base case registers no energy consumption. This causes a negative impact in the current case as the distribution of water with the infrastructure consumes electricity (for pumping). However, the use of **renewable energies (43% of total electricity consumption)** reduces the total impact associated with electricity consumption. In 2021, 1,252 MWh were consumed to operate the infrastructure, of which 538 MWh came from the solar panels installed along the infrastructure[1]. Additionally, we have considered the emissions associated with the consumption of diesel, with amounts to 23,076 liters.

In the current case, the emissions were 63.66 $tCO_2e$ from diesel consumption and 20.85 $tCO_2e$ from electricity consumption (emissions from non-renewable energy minus the avoided emissions from renewable energy consumption)[2]. These two values result in a social cost of 2.2 k€ from the electricity consumption and 6.7 k€ from the diesel consumption[2]. In the base case, as there was no energy consumption (neither electricity nor diesel for vehicles), the total emissions emitted were 0 $tCO_2$. Combining these two results, we can estimate that **the infrastructure generated 84.51 $tCO_2$ in total, which can be valued as a social cost of 8.9 k€**[2].




1. Data from Aguacanal.
2. Estimated by PwC.

# Impact measurement: **Potential environmental impact derived from water consumption**



**Negative impact in 2021 valued in:**

**- 8,831 k€**

**- 8,831 k€**

**Impact on terrestrial ecosystems**

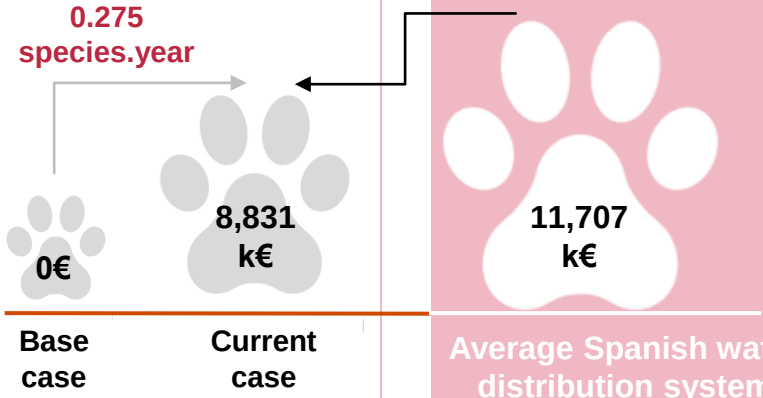
**The water consumption associated with the infrastructure generates a negative impact on terrestrial biodiversity that is valued in 8,831 k€. However, this is 2,876 k€ lower than what an average irrigation system would cause.**

The **water consumption associated with the infrastructure** (86,220,081 m³)[1] **has an impact on terrestrial species** caused by the amount of water that is consumed and therefore does not return back to the ecosystem - it is absorbed by cultivated crops. The estimated consumption of water that generates this impact is estimated to be 70% of water consumption. According to our methodology, the estimated amount of water consumed in 2021 had an impact on 0.275 species.year, which is valued in 8,831 k€[2]. As in the base case there is no consumption of water due to zero hectares being irrigated, the impact in the current case is its total estimated impact.

**86,220,081 m³ of water consumption**

**0.275 Species.year**

**The total impact of water consumption on terrestrial species is estimated to be 8,831 k€**




## Current case vs. average case

The infrastructure of Aguacanal is considered to be very efficient when transporting water, as it loses less than 1% of water. If we compare a traditional system that has the Spanish average efficiency (75%, according to data from the FAO[3]) against this, we can estimate that the infrastructure efficiency has avoided an impact of -0.0896 species.year, which is valued in more than 2,876 k€[3].

**Comparing the efficiency of the infrastructure to the average Spanish water distribution system in Spain, we can estimate that the efficiency has avoided an impact of 2,876 k€ less.**

1. Data from Aguacanal.
2. Estimated by PwC based on information provided by Aguacanal.
3. The Food and Agriculture Organization of the United Nations (FAO).

# 3

# Annex I - Methodology

# Methodology: **Impact measurement**

### What is impact measurement?

Impact measurement is understood as the assessment, quantification and monetization (ultimately) of the changes that the activities or services provided by a project have on society and the environment as a whole.

### How is impact measurement applied?

In order to carry out an adequate impact measurement, the first step is to understand the activities done by the assessed company by identifying the variables, both operational and managerial, that can impact social and environmental aspects. Once the key variables have been understood, the relevant impacts associated with each variable are identified, and it may be the case that different variables generate the same impact.

This process is iterative, allowing to readapt the variables and impacts identified as the process advances, which will finally allow us to create the so-called "Impact pathway" (graphic illustration of the modifications that each variable generates on its environment and how these, in turn, impact on society). Once the "Impact pathway" has been defined, we proceed to request real information (inputs) on both operations and management. After processing and consolidation, and following the defined impact-pathway, proxies are identified that allow these inputs to be transformed into impacts.

At this point, the calculated impacts tend to have different units that cannot be added up, thus, to facilitate the aggregation of all the impacts and their communication, the impacts are monetized, i.e. impacts calculated are transformed into economic terms.

### Executive Impact Report

In this context, and following the methodology of impact measurement, the positive impact that Aguacanal generates on society was measured and evaluated through the three pillars of contribution. Likewise, the negative impact generated by water consumption was measured and evaluated.

# Methodology: **Current case vs. base case**

**What do current case and base case mean?**

Many of the impacts included in this report have been calculated based on **a comparison between**:

- What is the impact based to the data of what has happened in 2021 in the plots where the infrastructure provides water **(current case);** and
- What would have been the impact in these same plots if the infrastructure wouldn't have been built and most of the agricultural land would have stayed rainfed **(base case).**

The difference in impact between both cases can be considered as the avoided or additional impact (depending on the measured impact) of having built and operated the infrastructure.

**Data for base and current case:**

| | Base case | Current case | Decreased / Increased | Difference |
|---|---|---|---|---|
| **Number of plots** | 16,860 | 5,620 | Decreased | -66.66% |
| **Hectares of rainfed land** | 22,398 | 2,731 | Decreased | -87.81% |
| **Hectares of irrigated land** | 0 | 19,667 | Increased | +19,667 |
| **Main crops** | Barley, fallow land, vineyard and wheat | corn, barley, fallow land, sunflower, wheat, tomato, vineyard, apeseed, pea and broad bean | Increased | NA |
| **Water consumption ($m^3$)** | 0 | 86,220,081 | Increased | +86,220,081 |
| **Electricity consumption (non-renewable) (MWh)** | 0 | 714 | Increased | +714 |
| **Electricity consumption (renewable) (MWh)** | 0 | 538 | Increased | +538 |

# Methodology: **Enabling local economic development**

**Positive impact in 2021 valued in:**

**55,908 k€**

Aguacanal, as a result of enabling a higher agricultural production, it generates local economic activity by increasing benefits, employment and taxes.

**What are we taking into account in the impact calculation?**

In order to calculate the impact of the infrastructure in the local economic development, we have firstly compared the changes in yield and crop diversity though the base case vs current case methodology. This has allowed us to estimate the increase in **benefits obtained from land owners** due to the increase of economic value of cultivated crops. Secondly, the increase on **employment** and **tax contribution** has been estimated through proxys found in previously done reports and information provided directly by Aguacanal. Finally, the impact caused by the **labor accident** has also been included here.

**How do we give economic value to these impacts?**

The **benefits** obtained by land owners has been calculated based on estimating the average economic value of a rainfed and irrigated hectare though two different methodologies. The first methodology used information such as: yield of each crop, cultivated hectares of each crop and the selling price of each crop. The second methodology was based on the information provided in the Comptos' study on Phase 1, which provides the estimated benefits per hectare, and inflation rates.

The monetization of **employment** has been done by estimating the salaries generated. Here, we included the salaries payed directly by Aguacanal, which is information provided by the company. In relation to the employment generated (AWUs) in the agricultural lands, the economic value was estimated based on the average salary of the agricultural sector.

To calculate **tax contributions**, we have taken into account direct contributions (corporate taxes and value added tax) and indirect contributions (taxes paid by land owners to the local municipalities). The direct contributions were obtained by information provided directly by Aguacanal. The indirect contributions were estimated using proxys from Comptos' study on Phase 1 and inflation rates.

Lastly, we have monetized the **labor accident** occurred in 2021 estimating the total costs of workplace injuries and ill health includes, both financial costs and a valuation of human costs.

**Main bibliography references used**

[1] ESYRCE. 2020. Encuesta sobre Superficies y Rendimientos Cultivos
[2] Comptos. 2015. Zona Regable del Canal de Navarra
[3] Ministerio de Agricultura, Pesca y Alimentación. 2021. Precios medios nacionales 2021
[4] UK Government's Health and Safety Executive. 2018.

# Methodology: **Carbon neutral**

**Positive impact in 2021 valued in:**

**3,324 k€**

Aguacanal, as a result of the increase in carbon capture, generates a positive impact on the environment. Electricity and diesel consumption generate small negative impacts.

**What is the social cost of carbon?**
The social cost of carbon (SCC) represents the monetized damages associated with a one metric ton increase in $CO_2$ emissions. In this report, we use the proposal for update of the USA's SCC made by Climate Impact Lab.

**What is sequestration of carbon?**
Carbon sequestration is the capturing, removal and storage of carbon dioxide ($CO_2$) from the earth's atmosphere. Agriculture and its crops is one of the ways to encourage such an event.

**What are we taking into account in the impact calculation?**

To measure the impact on climate change, we have taken into account emitted and avoided emissions:

**Emitted emissions** into the atmosphere include emissions from the generation of the non-renewable electricity consumed for the operation of the infrastructure and the corporate building, as well as the diesel consumed for corporate vehicles.

**Avoided emissions** include the emissions not emitted thanks to the use of renewable energy and the change in sequestration from the different agricultural output obtained.

All the emissions are obtained from applying conversion factors that convert consumption to emissions. These conversion factor are sourced from different resources.

**How do we estimate carbon sequestration?**

The estimation of $CO_2$ sequestered in the base case and current case is based on the $CO_2$ captured of the different cultivated plants according to literature and the yield of each plant.

Then, we have estimated that the amount of carbon stored (sequestered) in the soil is not all the carbon captured, considering agricultural waste releases part of the captured $CO_2$ back to the atmosphere and the emitted nitrous oxide emissions from fertilizers.

**How do we give economic value to these impacts?**

The monetization of emitted and avoided carbon emissions is done by calculating their estimated **social cost**. Thus, in the case of avoided emissions, we are considering the avoided social cost.

**Main bibliography references used**


[1] ESYRCE. 2020. Encuesta sobre Superficies y Rendimientos Cultivos
[2] Carvajal, M et al. 2011. Investigación sobre la absorción de CO2 por los cultivos más representativos
[3] Areal, F. J. and Riesgo, L. 2022. Sustainability of Bt maize in Spain (1998-2021): An economic, social and environmental analysis.
[4] Department for Business, Energy & Industrial Strategy. 2021.
[5] Red Eléctrica de España. 2021.
[6] Climate Impact Lab. 2021.

# Methodology: **Potential environmental impact derived from water consumption**

**Negative impact in 2021 valued in:**

**- 8,831 k€**

Aguacanal, as a result of water consumption to carry out its activities, generates a negative impact on the environment.

**What is ReCiPe?**

ReCiPe is a methodology developed by a consortium of Dutch universities and scientific organizations under the direction of the National Institute of Public Health and the Environment of the Netherlands. The methodology is considered to be versatile and can be applied both globally and at a more detailed level (area, business, projects, etc.).

**What is 'species.year'?**

Species.year is an unit proposed by ReCiPe 2016 to homogenize different biodiversity impacts. As it depends on the number of species that currently exist, and this only can be estimated with an uncertainty of several orders of magnitude, this unit should not be interpreted literally.

**What are we taking into account in the impact calculation?**

According to ReCipe, **water consumption** has three impact pathways which derive on impacts on (1) human health, (2) aquatic species and (3) terrestrial ecosystems. However, the only impact considered in the infrastructure is the one on the terrestrial ecosystem. This is because aquatic species are not affected as the ecologic flow of the Irati river is not bellow limits, and the impact on human health is also not considered as the human develop index of Navarra is high enough to avoid any considered impact.

In order to have a comprehensive view, the impact of consumption has been monetized for three scenarios: **base case, current case and average case** (current consumption but with an average water distribution infrastructure).

Additionally, from the water consumption in the infrastructure, we consider that only the **water that is actually consumed by plants** and does not return back to the ecosystem has an impact on terrestrial species. The estimated consumption of water that generates this impact is estimated to be 70% of water consumption.

**How do we transform water consumption into species.year and how do we give economic value to species.year?**

For the impacts of water consumption, we have used the ReCiPe's water consumption methodology for impacts on terrestrial ecosystems, which turn $m^3$ of water consumption into species.year though a characterization factor (CF).

To turn species.year into economic value, we have obtained the **average economic value of an ecosystem in the World** ($/(species*year)) through a meta-analysis of bibliography about biodiversity valuation. Eventually, we have updated the value to inflation.

**Main bibliography references used**

[1] Huijbregts M.A.J. et al. ReCiPe 2016.
[2] McVittie, A. & Hussain, S. 2013. The Economics of Ecosystems and Biodiversity – Valuation Database Manual.

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