GUIDE ON SUSTAINABLE START-UP

SUCCESS CASES OF AGRICULTURAL SUSTAINABLE BUSINESSES

INTELLECTUAL OUTPUT 3
MODUL 3
2020-1-ES01-KA202-082440

Co-funded by the Erasmus+ Programme of the European Union

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Authors:

Fundación de la Comunitat Valenciana para una economía baja en carbón

Area Europa scrl

Eszterhazy Karoly Egyetem

Federación EFAS CV la Malvesía

Järvamaa Kutsehariduskeskus

Stowarzyszenie Edukacji Rolniczej i Lesnje EUROPEA Polska

2021

INTRODUCTION

Sustainability is a cross-sectional concept, that can be introduce in all the aspects of human life and they European Union is highly contributing to increase the business and strategies that combine with the sustainable perspective, as one of the mechanisms that will help in the climate change mitigation.
In the following sections, there will be briefly explained the importance of creating sustainable businesses, together with examples on sustainable business actions that can contribute to the creation of more sustainable start-up, to briefly understand what characteristics are considered and what type of resources can be needed.

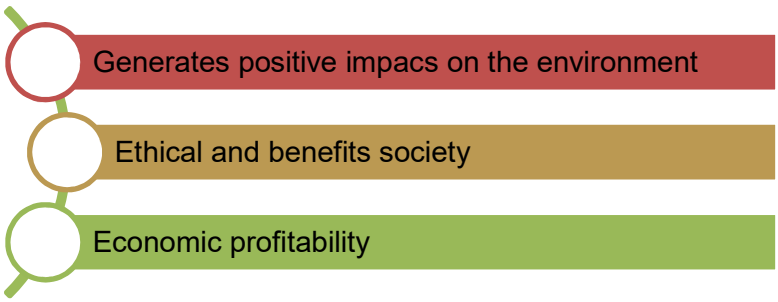
1. Contributing to ensure the future generations the possibility to satisfy their basic needs

Sustainable initiatives generates and extra value to the private sector that has been identified by companies and the world's most relevant international organizations and agencies. Something that traditionally was not even considered in a business plan, as it was completely irrelevant for the benefits of the companies, now has become indispensable in the innovation and the business value chain, increasing the new opportunities in green employment. There are several factors that contribute to this, among them the general citizenship opinion, that is becoming more concerned about the future of the planet. A reflection of it are the initiatives from official institutions that keep financing and promoting sustainable activities.

In this context, the private sector is extremely relevant, as it continues to be the engine of growth, wealth generation and human capital development of nations. For this reason, it is important to understand how this perspective can be included in the new generation of business that are being created, in order to use their leadership to generate high-impact initiatives and create effective and valuable solutions to current economic, social and environmental problems.

1.1 Social company vs sustainable start-up

As explained in module 1, in order to make a business more sustainable from its scratch, it is essential to understand that there are several fields to be taken into account: environmental, social and economics.



Therefore, to create a sustainable start-up it is necessary to include in the business model actions that seek to prevent, mitigate, correct, and compensate those actions that continue producing pollution. Moreover, it is also crucial to understand, help, adapt to the needs of the communities, while involving business ethics in all the different actions, also integrating new technologies that provide solutions to problems that may compromise its durability.

Those characteristics do not only apply to sustainable start-up but also to social business. One definition is not opposite to the other, as a start-up can include the social business model in order to create a sustainable start-up. Addressing ecological and social concerns can create business opportunities that benefit both the economy and society as sustainable businesses can help address society's concerns while providing profit-making opportunities.

Those sustainable business that includes entrepreneurship and innovation are fundamental for the success of start-up companies, providing innovative solutions to meet environmental or social challenges, but also having those into account when creating their business model.

Company

An organization that markets a product or service and earns money through this activity.

Start-up

A temporary organization that seeks a recurring business model and when it finds a successful recurring model it becomes a company.

The characteristics of a start-up are: innovation, risk and planning. It is important to have into account that innovation does not necessary means technology, as the innovation can be included in the product, in the business model and in the technology.

Therefore, the objective of a start-up is discovering how to create a sustainable business model, that once it has been achieved, will mean that the start-up has become a company.

2. Success sustainable cases in the agricultural sector: How is sustainability being implemented in the European community?

Here, in a nutshell, some short cases are presented as successful agribusiness examples of renewable energy use. The aim is to have a short glance at the stories. Some key phrases are in bold in every example. Using the links, you can find broader information on the related websites. This information is a brief overview that can be used as example case studies with students.

Green Drops Farm
https://greendropsfarm.com/
Green Drops Hydroponia is revolutionizing **crop production**. One of the biggest advantages of the **innovative equipment** is that it can be used to grow fresh, pesticide-free, nutrient-rich salads, herbs, some vegetables and fruits without land. The automatic system creates a new era in crop production, a brilliant solution for those who want to achieve abundant crops in an environmentally friendly way, with little work and in a **small space**.

Solar energy for water desalination
https://solnceenergy.in/
In many parts of the World, **underground water** – used for drinking and irrigation – contains dissolved substances, causing health hazards for humans and plants. **Desalination** can be supported by clean renewable energy resources available in lagging behind rural areas. Using the **local climatic conditions** – suitable for efficient solar energy harvest – the new solution is affordable for multiple actors.

CIST Africa Ltd.
https://startup-energy.org/startups/cist-africa-ltd/?lang=en)
CIST-Africa is producing **ethanol from cellulose**. One of their product, the ethanol cooking biofuel can be used by poor rural areas with no pipeline infrastructure. The other one, the hand sanitizer can provide cleaner households.

Metafarm – sustainable aquaponics system start-up
https://www.metrofarm.com.sg/oceansing-aquaponics-systems/
Metrafarm, a Singaporean firm, creates **smart aquaponics farming systems**. Fish rearing tanks, filter tanks, degaussing tanks, and planter tanks are all part of the Oceansing Aquaponics System (OAS). Solar energy is used to power the water pump and indoor lighting in the closed-loop, **self-sustaining** system. It's **simple to maintain** and produces larger yields while also **reducing the risk of mosquito outbreaks** caused by standing water.

CRISP

It is an online supermarket operating in the Netherlands that specializes exclusively in fresh produce: fruit and vegetables, fish, cheese, wine... all carefully selected to guarantee a high-quality daily

shopping basket. The business model is based on not having stock, as most of them are highly perishable.

They work on demand, purchasing products from small local suppliers and sending the purchase home the day after the order is placed. With this simple formula and under the premise of avoiding food waste, they have carved out a solid niche in the market.

What do they do?

Crisp is the supermarket app for fresh and affordable food. The service delivers groceries nationwide 7 days a week, and ordered before 22:00 is delivered the next day. The range consists of products from more than 650 farmers, growers and makers. Crisp was launched in November 2018 by Tom Peeters, Michiel Roodenburg and Eric Klaassen. Crisp's mission is to make better quality food accessible to more people.

How are they sustainable?

MODERN MILKMAN

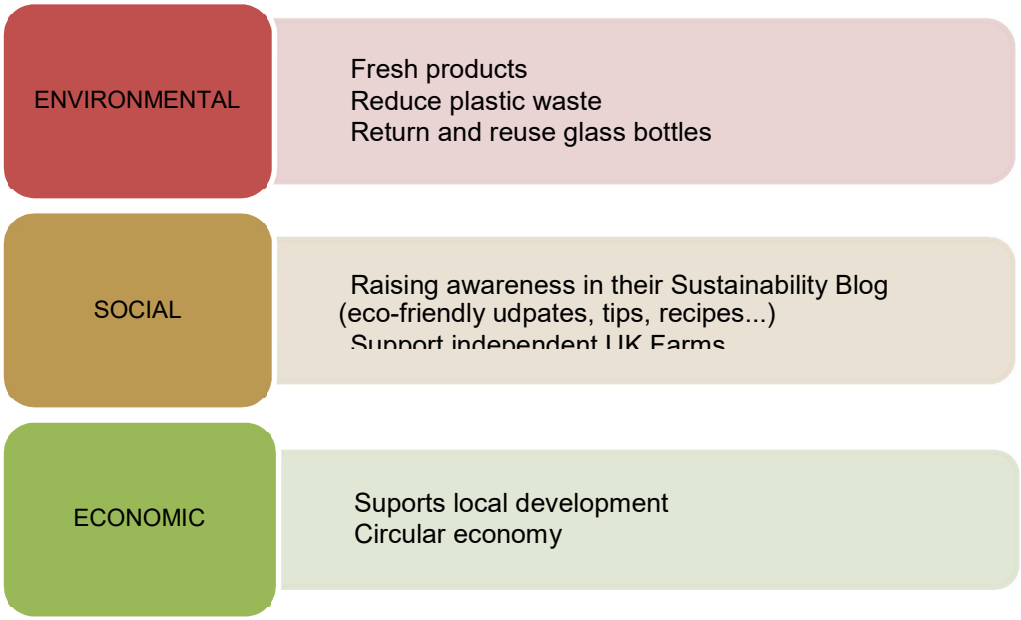
Located in Colne, Lancashire, in 2018, four friends with a truck decided to create this business worried about the plastic consumption. With a background in farming and agriculture and a desire to change the face of grocery shopping The Modern Milkman was born.

What do they do?

Doorstep milk deliveries. All their drinks come in returnable glass bottles, which they collect, wash and reuse. They also deliver household products in glass refills and tea and coffee in returnable metal caddies. Any packaging that isn't reusable is plastic free, recyclable or home-compostable (including their teabags).

They use the website or App for regular doorstep deliveries and collections up to three times a week. It is also possible to manage the orders on the App or website.

How are they sustainable?



eAGRONOM

eAgronom started with 3 people in August 2016 to empower farmers to change the world. eAgronom brings a unique combination of services to grain farmers – Carbon program, AI-powered consulting service and Farm Management Software enable farmers to build sustainable businesses and preserve nature. Farmers play a crucial role in society, as food production is the biggest industry in the world.

What do they do?

eAgronom give farmers more information about what is going on their fields so they can make better decisions next season. They offer consulting but the main innovation aspects are in their products, software for managers and workers. With their software, it is possible to include daily tasks from farm chores on the field to buying seeds and products, arranging crop sales and managing workers

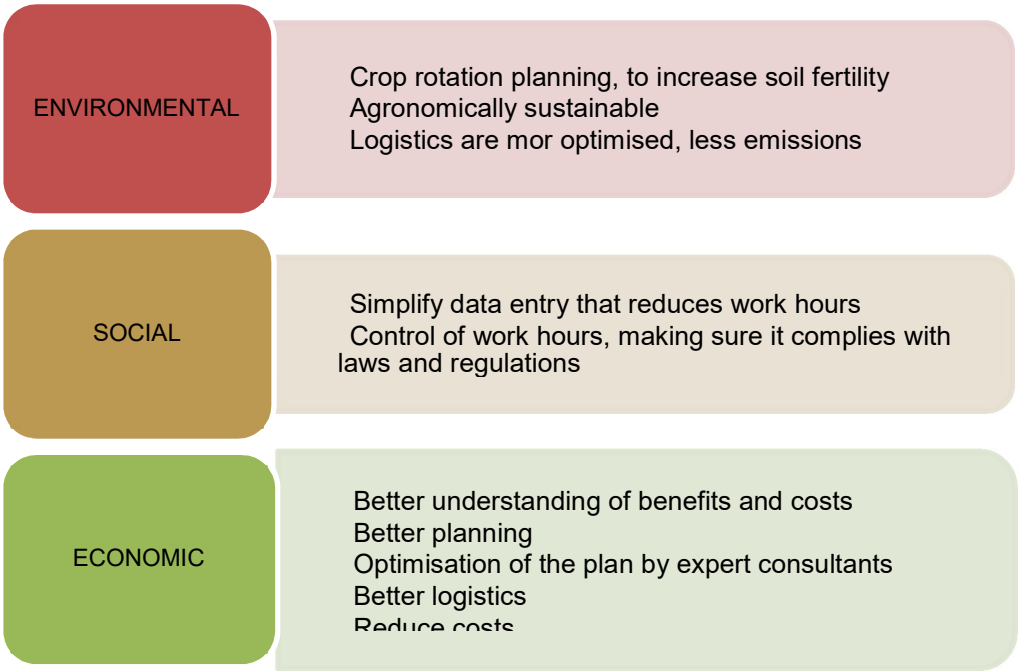
(following government rules), and also dealing with unexpected situations. eAgronom delas with all the complex data in an easy format where it is possible to find a complete overview of the farm; plan, monitor and analyse everyday farm activities; and manage and onboard workers. Moreover, this is compatible with the workers of the farm, as they will be able to add their task, plan logistics for the day and overview which products to use. All of this is possible through a mobile phone App available in iOS and Android.

The start-up is also working on the following goals:

- Automatic alerts about laws and regulations so you don't get fined
- Precision farming tools presented clearly and in one place to reduce costs and environmental impact
- Operator working hour management for less management overhead
- Machine integrations, machine planning, and analysis for reduced management and cost

How are they sustainable?

This start-up helps other businesses in becoming more sustainable through their App, helping other farmers in the following aspects:



3. Success case in social business in the Spanish context

The following companies have created a product that helps in the production of a more sustainable agriculture and livestock. The main point in common is that they try to make the work in the agricultural field easier and more environmentally-friendly, helping the different owners with digital tools to achieve their objectives. In this section, there is more detailed information on how the sustainable approach is included, taking into account economical, social and environmental approaches.

L'HORTA DEL RAJOLAR[1]

Horta del Rajolar is a social agriculture project developed by the Fundació Cívica Novessendes de Betxí in collaboration with the Town Council of Betxí through the Environmental Department.

L'horta del rajolar contributes to an economic development with social benefit and, especially, with an impact on the improvement of the quality of life of people in our local environment. In this sense, the training and experimental itinerary of entrepreneurship that the project proposes aims at a cooperative model of employment, therefore participatory and democratic, and in a productive sector that respects the health of people and the natural environment itself.

They approach a new model of employment based on social agriculture, which brings benefits to people in difficult situations, which encourages local consumption of quality, healthy and organic products, therefore oriented to new trends of work and consumption more responsible and beneficial to people.

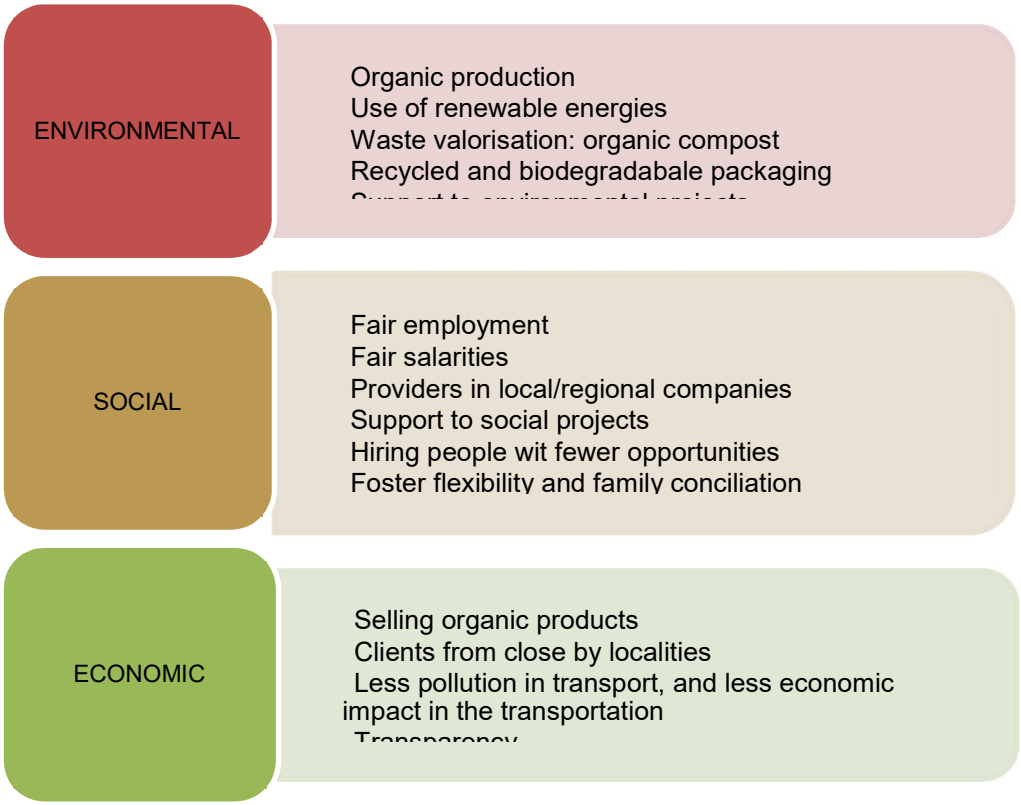
What do they do?

They work in the garden to be able to commercialize our organic vegetables and distribute them among the different points of sale. the different points of sale. We present a model of collaborative purchase of standard boxes of seasonal vegetables, in which each user in which each user (client) commits to a weekly or monthly consumption. Only the surpluses are sold punctually according to the retail order.

The objective is to bring a quality organic product to the consumer with social and environmental guarantees throughout the production process.

How are they sustainable?

[1] http://hortadelrajolar.novessendes.org/wp-content/uploads/2019/10/memoria_horta_VAL.pdf



3.1 Success start-up case in Spain

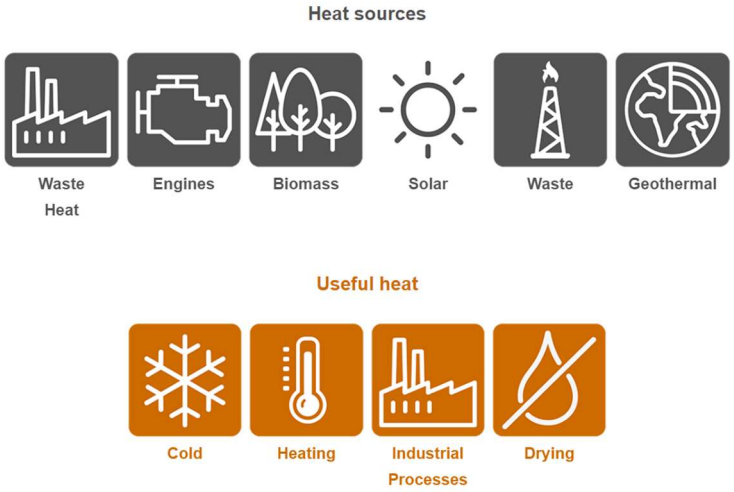
RANK®

Rank® is a Spanish technology-based company founded in 2010, as a spin-off of the Universitat Jaume I (UJI). Nowadays, it is an independent company focused on generating electric and thermal energy from renewable resources. It has more than 10 years of experience in the design and manufacture of energy recovery systems based on Organic Rankine Cycles (ORC) and high temperature heat pumps (BCAT).

What do they do?

Rank® ORC products are intended to revalorize low-temperature heat sources above 90 °C for clean electricity production. Rank® HP BCATs can generate heat at higher temperatures than other products on the market with a small energy input, contributing to the decarbonization of district or industrial heating applications.

Their slogan says: *A machine for every need*. They have a portfolio of models adaptable to different temperatures, thermal powers and applications that guarantee minimum cost, maximum efficiency and reliability.



Source: Rank.® Retrieved from: https://www.rank-orc.com/solar-en/

How are they sustainable?

ENVIRONMENTAL	Their products contribute to the use of energy based on renewable energies Organic products Decarbonisation
SOCIAL	Simplify data entry that reduces work hours Control of work hours, making sure it complies with
ECONOMIC	Support to an economy less dependend on fossil fuels

4. Renewable energies in farming: Hungarian context

4.1. How to improve winery efficiency

https://www.energiamonitoring.hu/evi-48-millio-forintos-energiakoltseg-radikalis-csokkentese-egy-neves-magyar-boraszatban/

The wine company is a major supplier of wine to international and domestic retail chains.

In December 2015, a renowned Hungarian winery was dissatisfied with the energy awards that skyrocketed.

By 2015, its electricity consumption reached HUF 35 million / year, and its gas consumption reached HUF 20 million / year. This was already an expense for the company that it wanted to rationalize.

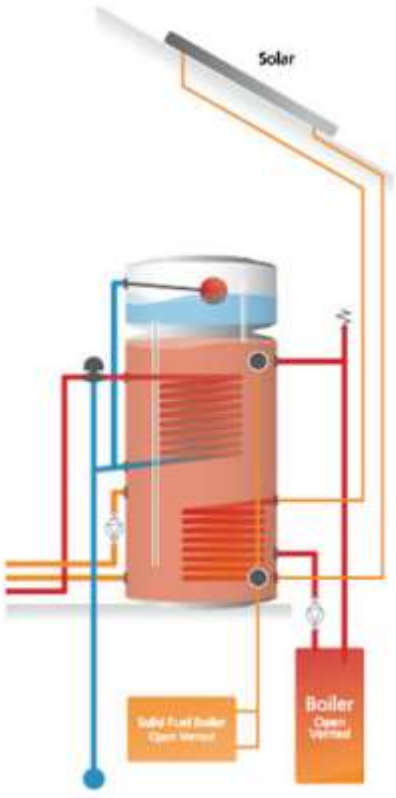


Figure A schematic view of solar heat-use in a winery. Heat generated by fermentation can be integrated too (Source: Smyth ate al. 2011)

The solution is based on the fact that when the wine is fermented, a high heat is generated, which the wineries release into the open air with ventilation, which is a very big waste, because the heat leaving can also be stored. We can conduct the heat to the depths of the earth through various probes and then use it later for heating, for example in winter, but in the case of winemaking, the production of heat for bottling is also covered.

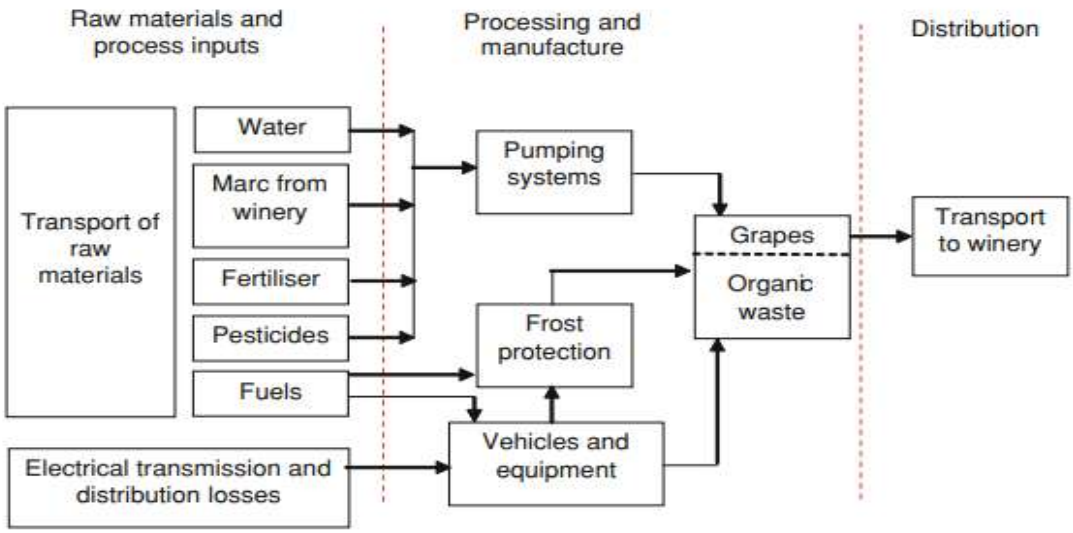


Figure Vineyard energy and fuel needs (Source: Forsyth et al. 2014)

In the future, it is also planned how to heat service buildings, such as offices, from waste heat energy, which is available in an almost unlimited amount in a winery, and from the waste energy that wineries simply "scatter" through the window, while reducing energy costs. it can reach the order of HUF 10 million.
In addition to waste heat, the company also plans to utilize its own 36 ° C hot water well, which could be a unique concept in the country for the time being. In order to meet the company's energy needs, a solar system with a rate of return of just over 4 years can be developed in the future.

4.2 Complex biogas power plant – agricultural by-products supporting economy and communities

http://hir6.hu/cikk/58174/atadtak_hazank_legnagyobb_biogazuzemet

The utilization of agricultural and food-industry waste is a crucial question of the sectors, because of legal and technological barriers.
Hungary's largest and most modern biogas plant was established in Szarvas with nearly 500 million forints of EU support out of about 4.5 billion forints. The investment was implemented by Aufwind Schmack Első Biogáz Kft. The local government and Gallicoop Zrt., An agricultural plant, cooperated in setting up the 4.17-megawatt plant.
The power plant now produces 12.5 million m3 of CO2 biogas per year through the processing of more than 40,000 tonnes of problematic waste from food production and an additional 53,000 tonnes of organic manure from surrounding livestock farms. The investment took place at two sites connected by a 4.2 km gas pipeline.

The biogas plant and its service facilities were built on the outskirts of Szarvas, while the small-scale trigeneration power plant at Gallicoop Pulykafeldolgozó Zrt.
According to EU regulations by-products can be divided into three categories in terms of energetic use:

- Diseased animals' bodies, pet bodies, and specialized kitchen and food sector wastes. Biogas plants are not permitted to process these items.
- Livestock carcasses, unused slaughterhouse waste, liquid manure, gastrointestinal contents, and milk. These items may be processed with appropriate authorisation and after a specified preparation procedure (pressure sterilization).
- Animal waste from slaughterhouses, kitchen and food industry trash. After pasteurization, these goods can be processed in biogas facilities (hygienization). (Deublein, 2008)

The company is able to use waste according to the regulations thus saving high amount of money in waste management.
More than 80% of the biogas produced here (approximately 55,000 giga joules in total) is used for energy purposes, which means that approx. It will be possible to replace 1.5 million m^3 of natural gas.
In addition to electricity, the plant produces biofertilizer containing high-value soil improvers, which allows the replacement or replacement of fertilizer on thousands of hectares of agricultural land.
Thanks to the technology and control designed for maximum efficiency, it is possible to follow the Hungarian network feed-in tariffs and the development of electricity demand, so it stores biogas in the low-fee period and feeds electricity into the network only during the maximum demand period.
The plant, which is also capable of supplying the entire energy supply of the city of Szarvas, with a population of about 18,000, was financed by r.e Bioenergie GmbH with an investment of HUF 4.5 billion, to which the New Hungary Development Plan contributed HUF 494 million.

4.3 DBD Orchidea – horticulture with renewable energies

https://dbdorchidea.hu/hu/bemutatkozas/

An orchid greenhouse was established in 2017 in the Kaposszekcső industrial park. However, the operation is based on a complex system, an energy farm, which produces bioethanol, electricity, disinfectants and orchids. It also reduces the complexity of the system in a global context.
Renewable energy produced in a biogas plant ensures the operation of gas engines that provide waste heat to heat horticulture. The raw materials for biogas production include agricultural and communal by-products, some of which have so far landed in arable land or landfilled. The raw material consists of dilute and straw pig manure, cattle manure, chaff, low-value or broken grains, meadow sorghum, silage sorghum, and bio-ethanol sludge.

Figure Integrated biogas power plant and bioethanol factory in Kaposszekcső, Hungary (Source: https://agroforum.hu/agrarhirek/megujulo-energia/bioetanol-es-biogaz-egymas-mellett-kaposszekcson-kepek/)

The basis of the heating system is that the hot water used to cool the engines is transferred to the horticulture underground, so that they can provide a tropical climate for the flowers, even in cold winters. The complex system also supports the operation of the biogas plant, as the power of the engines increases in parallel with the heat dissipation.
There are many opportunities to use the 4.5 million liters of alcohol produced annually in the ethanol plant, and the bioethanol produced is processed locally in addition to contracted partners. This raw material is also used to make a disinfectant gel and a leaf polish used for flowers.

4.4 Thermal water utilization in horticulture and fish farming in Szentes

https://docplayer.hu/1558740-A-geotermikus-energia-hasznositasa-es-annak-nehezsegei-eloado-bako-daniel-ugyvezeto-bako-kerteszeti-kft.html
Hungary has excellent hydrogeological conditions, the earth's crust is thinner than the world average. The pool is filled with good thermal insulation sediment, clay, sand, which prevents large amounts of heat from reaching the surface and then from there into the atmosphere. Thanks to all this, the geothermal gradient is 5 C per 100 meters instead of the world average of 3.3 C / 100m. There are many successful examples of this local potential for agricultural use.
Bakó-Kertészeti Kft. Operates in Szentes, Southern Hungary. The utilization of geothermal energy around the city began in the 1960s and 1970s. As a result of the economical and environmentally friendly use of thermal energy, production cooperatives and other utilization organizations have been

established: poultry farms, public institutions, residential buildings, drying plants, balneology departments and horticulture.
The Szentlászló Foil Gardeners' Cooperative operates here, which is a 20-hectare privately owned foil cooperative with 163 members. The plant utilizes 40-45 degree thermal water, which drops below 30 degrees by the end of utilization. The Bakó Kertészeti Kft. owns 1ha of this unit. The company is a multi-generational family business whose main activity is the cultivation of vegetable vegetables based on thermal water. Its most important product is peppers from Szentes. The company produces in an innovative way using isolated soilless cultivation technology. This has eliminated bidirectional soil contamination and contamination. As a result of the new technology, a significant increase in yield and quality was achieved (average yield: 20-25 kg / m2 quality: 95% extra and class I quality). In addition, the utilization of irrigation water became more efficient (1000 liters of water / 1 m2 / year 10kg of tomatoes and 5kg of peppers can be produced in the open field, with 25kg of tomatoes and 15kg of peppers using the same resources.
The plant also uses biological plant protection by planting predatory insects. Automated ventilation, humidification, shielding and increased hygiene requirements are used against other pathogens (eg fungi). The company sells products in large batches through TÉSZ, which guarantees sales.
They have seen an excellent opportunity to recycle already cooled water for African catfish production. During the implementation of the investment, a number of innovative solutions had to be applied, which guarantee the adaptation of the variable temperature and amount of water from the horticulture to the optimum temperature of the fish. It is provided by a PLC (Programmable Logic Controller) based remote monitoring control system. In the fish farm a significant part of the electricity supply is provided by solar panels.
Further improvements are planned in the future, geothermal energy reserves are available, but certain legal constraints are hampering the project for the time being.
Water supply is available long-term sustainable with reasonable, regulated and non-exploitative use. Use for heating purposes is not a continuous activity throughout the year. There is time for recovery and maintenance within a year.

4.5 Solar Sheeps - ASTRASUN

https://astrasun.hu/mit-kinalunk/szolarbirka-kolcsonzes

One of the most common ways of utilizing solar energy is the construction of small and large solar power plants installed on the surface of the earth. However, depending on the soil cover, the growing vegetation cover under and next to the solar panels should also be addressed. As a result of climate change, the active phase of plants has been extended, which means more frequent mowing from spring to late autumn. ASTRASUN is a solar power plant project development company that has developed an innovative yet traditional solution for this. Undergrowth grows more abundantly in the semi-shaded environment of large-scale solar power plants. If the grass growing high rubs the bottom of the solar panels, flammable situations can occur in the area of solar power plants. Grass that may grow even higher may shade the solar panels, significantly reducing production.

Accordingly, mowing should be done up to 4-6 times a year. However, organizing this is a time and money consuming activity. Moreover, with modern fossil fuel lawnmowers, this activity cannot be called ecologically sustainable.
ASTRASUN, which started sheep farming in its model farm in Bicske in the spring of 2020 specifically for the purpose of keeping cattle in the grass of solar parks, offers a new way to do this. From March 2022, the "solar bond service" will be available to solar power plant operators.

Figure Solar sheeps in action
(Source: https://www.astrasun.hu/astrasun-brand/referenciak/kepgaleria)

The company provides a complex service throughout the growing season, ie from March to November. This includes renting 30-40 sheep per hectare. The exact number depends on the species composition of the grassland. The company provides regular supervision of the animals, as well as the mobile pen, the self-filling drinking trough and the licking salt.
ASTRASUN cares for hard-to-reach areas around the animals using traditional methods.

5. Sustainable agricultural businesses with renewable energy use in Italy

Italy is third among the members of the European Union in terms of the amount of direct energy used in food production. It is consequently necessary to encourage the building of medium and large-scale plants, especially through integration with the agricultural sector, in order to meet the European Union's output from renewable sources objectives.

Based on these findings, and as documented by the PNRR (the Italian Plan for the Next Generation EU), Italy has suddenly changed its agricultural and energy policies in an effort to get around obstacles that were put in place at the height of the country's first phase of renewable development.

5.1 The development of "Agrisolar Parks"

Through the installation of photovoltaic systems on building roofs for productive use in the agricultural, livestock, and agro-industrial sectors, with a total installed capacity of about 0.43GW, the measure and the calls will specifically encourage sustainability and energy efficiency in the agricultural sector. In this way, the investment aims to encourage the modernization and upgrading of production facilities in the agricultural sector, with positive effects also on the quality of crops and livestock housed, in addition to enabling the supply of energy from renewable sources, with obvious financial savings.

5.2 The development of "agri-photovoltaic facilities"

Agri-photovoltaic projects have a hybrid nature, integrating the demands of producing green energy with those of maintaining the features of land used for agricultural or animal farming operations, with a view to creative, technologically sophisticated, and multifunctional agriculture.

This measure aims to encourage the installation of medium-to-large photovoltaic systems with innovative features that allow the land hosting the photovoltaic installations to be used for agricultural or livestock farming purposes, in contrast to the measure on "agri-solar parks," which allows for the installation of "traditional" photovoltaic systems on the roofs of buildings.

5.3 Development and uncertainties in incentive regulations for PV systems in agricultural areas

The Legislature has already made a number of changes to the regulations currently in force in order to remove some regulatory barriers that did not allow, or severely limited, the potential for the development of renewables in the agricultural sector, while waiting for the Ministry of Ecological Transition to publish the guidelines on requirements and criteria for agri-photovoltaic installations to access the measures provided by the NRP.

5.4 Authorization aspects of agro-photovoltaic plants and the first jurisprudential approaches

Agri-photovoltaic plants are subject to the same authorisation processes as "conventional" photovoltaic plants because there is no ad hoc law for them as of yet. However, a legislative intervention in this respect appears essential, even in light of the initial jurisprudential orientations articulated on the matter, considering the innovative character and little environmental effect that such initiatives are likely to entail.

A different territorial compensation will need to be offered in comparison to the traditional photovoltaic plants, able to absorb the impacts resulting from their insertion and to rebalance the weight of the intervention in a different way to restore the effects in the overall landscape and environmental and territorial conditions, given that agri-photovoltaic plants allow, on the one hand, the cultivation of the land, but, on the other hand, they present taller and more spaced poles.
According to certain interesting studies1, it will undoubtedly be required to I avoid places with ecosystems of protection and interest; (ii) create biological corridors; and (iii) use specific finishes on the PV panels' exposed surfaces.

5.5Renewable energy sources in Polish agriculture

In Polish legislation, the definition of renewable energy sources (RES) in general is contained in the Energy Law. In Polish legislation, the definition of renewable energy sources (RES) in general is contained in the Energy Law: Renewable energy source using in the production process the energy of wind, solar radiation, geothermal energy, waves, sea currents and tides, dams on rivers, as well as the energy obtained from biomass, biogas from landfills, as well as biogas produced in the process of discharge or treatment of sewage or decomposition of plant and animal components. In Poland, we can use all types of RES. We invite you to watch a video showing the benefits for municipalities and their residents of well-functioning agricultural biogas plants.

6. Successful agricultural businesses with renewable energy use in Poland

Educational films promoting agricultural biogas plants:

Filmy edukacyjne, promujące biogazownie rolnicze - Krajowy Ośrodek Wsparcia Rolnictwa (kowr.gov.pl)

Renewable energies

Renewable energy, often referred to as clean energy, comes from natural sources or processes that are constantly replenished.

The agricultural biogas plants in:
Boleszyn - https://youtu.be/8603O545U3s Konopnica - https://youtu.be/iooXa7NAQ6A and Grzmiąca - https://youtu.be/pJ4zZ0hGImU show the principles of operation and the benefits for the municipality and its inhabitants.

7. How to become more sustainable using renewable energies?

From the beginning, it is possible to include some features from other sustainable business models that can contribute to the creation of a green or sustainable start-up. Renewable energies are used for becoming more environmentally friendly. Going green is an important aspect in terms of sustainable companies and start-up, but also a general important challenge for many companies across the globe, in order to operate in a responsible way.

Many companies, but also start-up, create green targets in order to analyse and measure their environmental impact. Those objectives are transferred into commitments and become initiatives that provide a clear indication on how the sustainable environmental plan will be implemented.

Nowadays, the most used energies in businesses are wind and solar energy, competing with fossil fuels in terms of cost. Of course, methods vary from country to country, depending on their specific conditions (hours of sun, access to river streams, type of easily reachable renewable resources…) and the type of sector, as solar panels will not be used in the same way in an office than in a field. In the following scenario, there is a description on how solar and thermal energy can contribute to take care of the environment, while being more self-efficient and obtain more benefit due to the reduction of the expenditure in electricity.

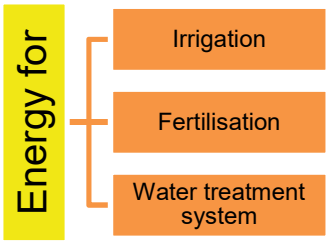
8. Solar photovoltaic installation from the sustainable point of view in an agricultural business

The main purpose of the intended installation is to supply energy for irrigation, fertilisation and water treatment on the farm. The solar photovoltaic installation will be made up of the photovoltaic panels which will be connected to the equipment, which in turn incorporates the functions of inverter, regulator and battery charger. which in turn incorporates the functions of inverter, regulator and battery charger. The same equipment will be connected to the lithium batteries to charge them. The equipment generates a three-phase 3x230/400 grid for its use.

8.1. Photovoltaic study example

For a better understanding on how solar can help to achieve a better sustainability for an agricultural business, but also to understand how all the process is elaborated, the following example will show the energy produced to cover the needs of a specific company. This includes the calculation of energy, the equipment and the environmental impact reduced.

8.2. Energetic demand



The daily consumption for each month is taken into account to carry out the calculation of the solar photovoltaic system capable of supplying the energy necessary to drive the irrigation, fertilisation and water treatment system.

MONTH	POWER OF THE WATER PUMP	WORK HOURS OF THE WATER PUMP	ENERGY CONSUMPTION NEEDED PER DAY
January	3000 W	0.97 h	2992 Wh
February	3000 W	0.97 h	2992 Wh
March	3000 W	1.30 h	3896 Wh
April	3000 W	1.95 h	5844 Wh
May	3000 W	2.27 h	6818 Wh
June	3000 W	2.92 h	8766 Wh
July	3000 W	3.25 h	9740 Wh

August	3000 W	3.25 h	9740 Wh
September	3000 W	2.92 h	8766 Wh
October	3000 W	2.27 h	6818 Wh
November	3000 W	1.62 h	4870 Wh
December	3000 W	0.97 h	2922 Wh

Source: Heliotec 2006 S.L.

8.3. Radiation study

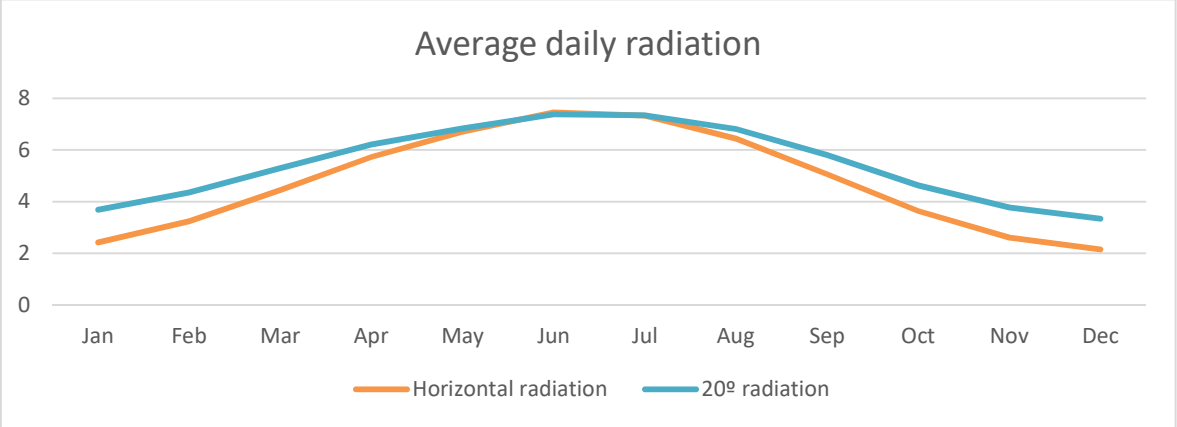
According to the location and the coordinates, it is possible to calculate how many sun rays can the solar panels received. Depending from this information, it is possible to calculate how much energy can be generated and how much of the energetic demand can be covered by the solar panels. This data is extracted as an example related to the horizontal radiation, from the PVGIS® of the European Commission:

MONTH	DAILY RADIATION [kWh/m2/day]	Days month	Monthly radiation [kW/m2/month]
January	2.42	31	74.93
February	3.24	28	90.62
March	4.44	31	137.73
April	5.73	30	172.04
May	6.71	31	208.08
June	7.45	30	223.35
July	7.32	31	226.79
August	6.44	31	199.73
September	5.06	30	151.66
October	3.64	31	112.87
November	2.61	30	78.27
December	2.15	31	66.59
Annual average	**4.77**	**365**	**145.22**

Source: Heliotec 2006 S.L.

8.4. Photovoltaic panels

In order to maximise the energy capture from the sun rays in the months where the energy is mostly needed, the tilt of the panels can be customised. In this scenario, in the PV modules can be installed with an inclination of 20º and azimuth of 0º. The following figure shows the difference in incident radiation on the horizontal plane and the plane of the photovoltaic modules (20º):



Source: Heliotec 2006 S.L.

8.5. Power required and installation

The required photovoltaic power is calculated on the basis of the radiation on the plane of the photovoltaic modules, system yields and energy requirements. The calculations are made on a spreadsheet designed for this purpose, so that during the winter months (lower production) the photovoltaic system is capable of supplying sufficient energy to the irrigation, fertilisation and water treatment system.

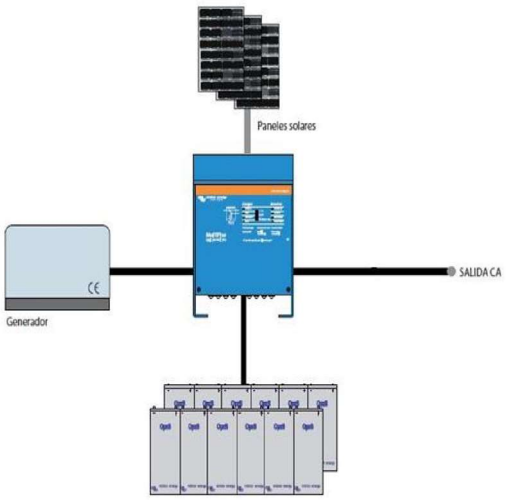
The installation to supply the requested demand will consist of:

- 8 photovoltaic modules of 450 Wp, connected by cable with a suitable 10KW inverter/regulator/charger, with a peak generation power of 3.6 Wp.
- 6 lithium-ion batteries, each with a capacity of 2.4 kWh, connected in parallel, giving a system voltage of 48 V and a total capacity of 14.4 kWh.[2]

[2] In this case, as it is an off-grid installation, the batteries are necessary to cover the energy demands during the night, or cloudy/rainy days.

- A 10KW three-phase inverter/regulator/isolation charger will be installed, which will generate a three-phase grid.
- A tilted aluminium structure.
- DC/AC protection and control panel.

In addition, as the main use of the installation is irrigation, fertilisation and water treatment for agricultural exploitation, which is considered a non-essential use, and the activity will not be carried out on a daily basis (if there is not enough energy available, the installation will be postponed until it becomes available), the autonomy of the installation is 1.82 days, less than the 3 days recommended. Meanwhile, during the peak hours of daily production the activity will be performed using the energy generated directly without the use of batteries.



Sketch of the installation. Source: Heliotec 2006 SL.

8.6. Energy saving and diversified energy

From the calculations made above, it is obtained that the photovoltaic installation will be able to produce 5,617 kWh annually, of which it is estimated that 70% will be used for the irrigation system. Therefore, the photovoltaic energy used by the irrigation system is:

Annual production = 3932 kWh/year

This production will avoid the emission of pollutant gases into the atmosphere, estimating that it will avoid the emission of:

3932 kWh/year * 0.4 kg CO2/kWh = 1572.76 kg CO2/year

The economic savings of the photovoltaic installation are calculated on the basis of the current energy cost, which is produced by a genset with a consumption of 0.15 l/kWh. Considering 1.05 €/l, the annual saving is calculated as follows:

Annual saving = 0.15 (l/kWh) * 1.05 (€/l) * 3,932 (kWh) = 619.29 €/year

SUMMARY ENERGY CALCULATIONS

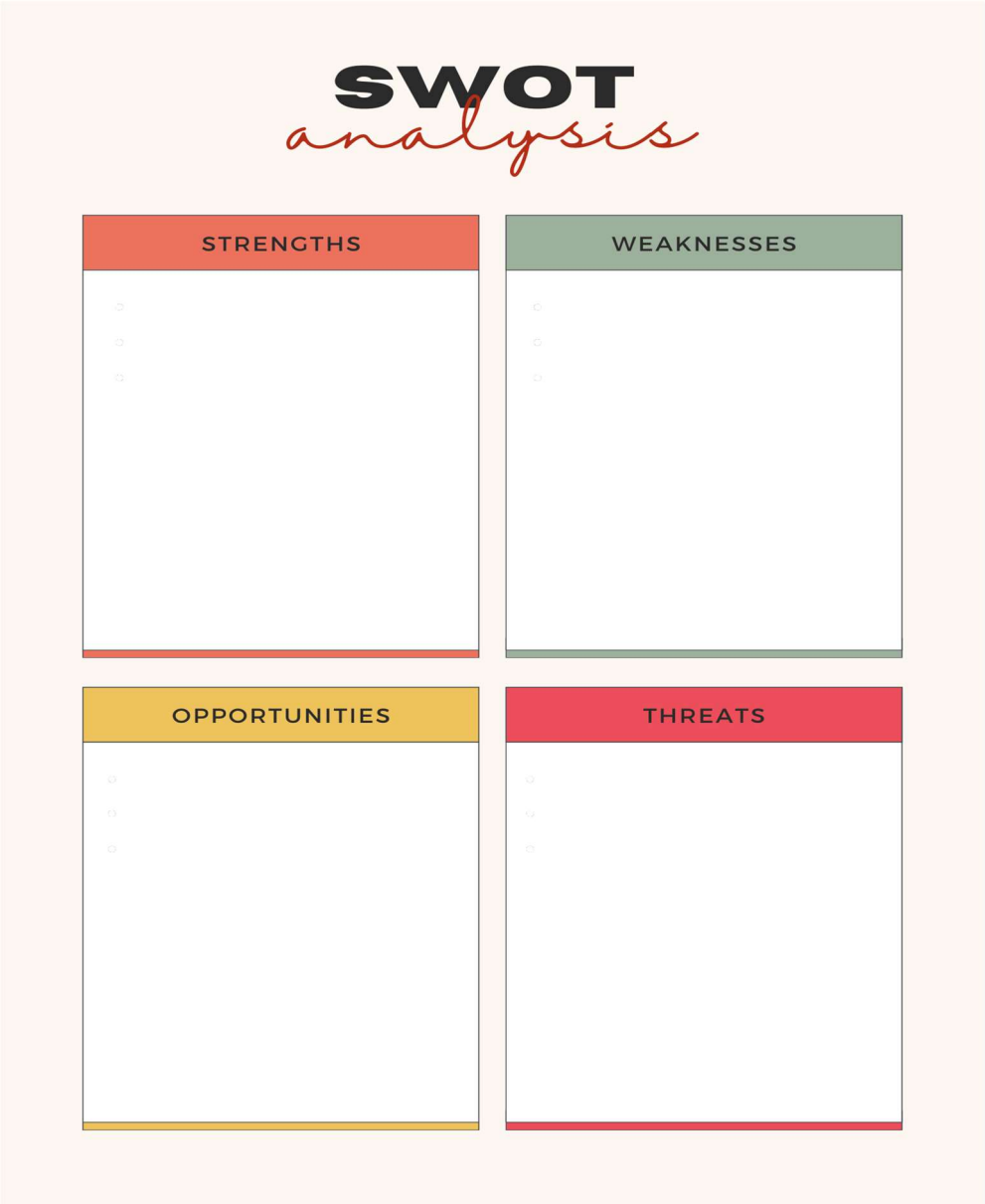
Annual Renewable Energy Production	3932 kWh
Annual Primary Energy Savings	8296 kWh
Annual economic savings	620 €

9. Introduction to SWOT analysis

9.1 What is a SWOT analysis

An organization's internal and external aspects, whether favourable or unfavourable, are mapped out using the SWOT (Strengths, Weaknesses, Opportunities, and Threats) analytical approach to help decision-makers formulate their strategies. It facilitates the execution of a successful marketing strategy.

The internal and external elements that could potentially have an impact on the planned business or activity, either positively or negatively, are suitably identified and structured in a SWOT matrix, which is a 2-by-2 matrix.



The first row of the diagram lists internal elements, or parts of the company that are dependent on the organisation and that it has control over. The organization's strengths are listed in the first quadrant (row 1, column 1), and its flaws are listed in the second quadrant (row 1, column 2). The organisation has the ability to actively change both its strengths and faults.

The external aspects, on the other hand, are shown in the second row. Since the organisation has no influence over these circumstances, they must be considered as contextual elements that cannot, however, be directly impacted.

As a result, the first column shows elements that are favourable to the firm, while the second column

lists those that are unfavourable. Obviously, the parameters vary depending on the type of firm. Indeed, some people may be negatively impacted by variables that positively affect others.

A SWOT matrix is a 2 by 2 matrix in which a company or person identifies the internal and external elements, favourable or negative, with regard to a decision they must make or with regard to a certain market environment.

9.2 What is the purpose of the SWOT matrix? When to use it?

Organizations (businesses, NGOs, and governmental agencies) and people utilise the SWOT analysis matrix as a tool when making strategic decisions. A decision is deemed strategic if it will have a long-term effect on how the organisation positions itself, produces, communicates, interacts with the outside world, structures itself, and so forth, and if it will be challenging to undo, meaning that any necessary adjustments will be expensive and time-consuming.

A company's decision to use a CRM system, for instance, is a strategic one in the field of marketing. Of course, the first option is make-or-buy, or selecting the route of internal development as opposed to purchasing and modifying a commercial solution. Selecting an open source or licenced system is the second stage of the strategic decision. A third choice is which vendors, or other vendors, to rely on as technological partners, and so on.

People must also make strategic decisions. attend a traditional or scientific school? Engineering or medicine for a degree? Working overseas or remaining in Italy? For each of these strategic decisions, the SWOT matrix can be used as a tool to help organise the various considerations and come to a decision.

In conclusion, it makes sense to utilise the SWOT matrix to take into account all the aspects that are important for directing the choice whenever you feel like you need to make a decision or analyse a scenario to take strategic measures.

10. Annex

10.1 Resources created for lerning

- Educaplay (2021). Business and start-up.

https://es.educaplay.com/recursos-educativos/11898057-business_and_start_up.html

10.2 References, useful websites

Crisp. Website: https://www.crisp.nl/

eAgronom. Website: https://eagronom.com/en/sustainably-profitable-farming/

EducaPlay. Create learning games. Website: https://es.educaplay.com/?lang=es

Heliotec 2006 S.L. (2021). *Memoria técnica: Proyecto de instalación fotovoltaica aislada para suministro eléctrico*. La Vall d'Uixó, Castellón.

Horta del Rajolar. Website: http://hortadelrajolar.novessendes.org/

Rank®. Website: https://www.rank-orc.com/es/sobre-rank/

The modern milkman. Website: https://themodernmilkman.co.uk/